

CULTIVATING COMPUTER PROGRAMMING  
SELF-EFFICACY THROUGH SUPPORTIVE SOCIAL AND  
SELF-REGULATED LEARNING STRATEGIES FOR  
FIRST YEAR STUDENTS IN HIGHER EDUCATION

MR. GRAHAM ANTHONY GLANVILLE

SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF  
DOCTORATE IN EDUCATION

UNIVERSITY OF HERTFORDSHIRE

FEBRUARY 2020



## Acknowledgements

Firstly, I would like to thank my supervision team, Dr. Jon Berry, Dr. Neil Spencer and Dr. Karen Smith, for their guidance, support and direction. In particular, it was a real privilege to work under the direct supervision of Dr. Jon Berry, who from the outset, inspired me to challenge my knowledge and assumptions to build meaningful connections between theory and practice. I would like to thank my fellow research scholars, Cohort 9, we acted as a family throughout this process and their support and encouragement was invaluable in passing through the various milestones of this journey.

I would like to acknowledge my professional colleagues for their support, and a special thanks to Kathleen Embleton and Amanda Russell, who were a constant source of support and encouragement. I would like to thank Neil Gallagher, for sponsoring this thesis, for believing in me and pushing me forward. I am very grateful to the various students and work colleagues who have willingly given their time to my research, without their participation this research would not have been possible.

A special thanks also goes to Seamus Duffy, who rang me after every trip to UH to get an update on progress made, and for showing a genuine interest in my work.

To my wife Valerie, and Dylan, Holly and Annabelle, enormous thanks goes to them for putting up with my frequent travels and long nights of study. Through their sacrifice they allowed me to complete this thesis, for this, I am extremely grateful, and I dedicate all to them.

## Abstract

This research is centred on first year computer programming students enrolled on a BSc in Information Technology, within a private higher education institution in Dublin, Ireland. There are known challenges in learning computer programming, such as its abstract nature, the length of time it takes to grasp basic principles and the pre-existing perceptions students have of Computer Science programmes in general. Computer programming is associated with high drop-out rates and poor retention, and this research set out to investigate suitable tools and institutional supports that could be put in place to enhance engagement in learning computer programming. An initial review of the teaching and learning approaches for computer programming in the focus institution revealed the absence of group work, which was considered a counter-productive learning approach. In addition, no strategies for the self-regulation of learning were introduced to the students furthering the learning engagement problem.

An action research methodology was identified as a suitable research approach because of its problem-focused orientation. Three research cycles were carried out between 2014 and 2016. The first two research cycles were based on the use of an individual reflective learning journal to be used in conjunction with computer programming. These studies revealed that many students did not derive any benefit from completing the learning journal, the activity became a mundane task with no obvious advantage, leading to a sense of frustration for some. What was evident from the findings within these first two research cycles was the desire for students to learn in groups, this led to research into social learning activities with a specific focus on group learning in computer programming

The third action research cycle involved a control and treatment group. The treatment group experienced social learning delivered through Problem Based Learning (PBL) and Peer Assisted Learning (PAL) interventions over the course of a semester. The findings revealed an encouraging response from the treatment group expressed through their enjoyment of working with others in solving problems, and positive engagement in programming was observed by faculty members. Emerging as a benefit, the treatment group enjoyed interacting and learning with their peers, irrespective of race, culture and diverse perspectives. This finding underscores the importance of introducing students to simulated multicultural work experiences reflective of the multicultural team environments found within the IT industry. In addition, there was a positive increase in students' academic self-efficacy in group-based computer programming activities, but no strong evidence was found that social learning activities enhanced programming ability.

The actions taken during this study have positively influenced faculty peers in the consideration of group learning for their subjects and influenced the focus institution to establish a Student Mentoring Academy, in which Peer Assisted Learning (PAL) is supported by student mentors.

The recommendations are to consider social learning through the introduction of PBL and PAL related activities to facilitate student engagement and enhancement of self-efficacy. Further work is required to examine approaches and tools to build social learning capacity across the focus institution and in the identification, training and retention of suitable student mentors.

**Keywords: Social Learning, Reflective Learning, Self-efficacy, Student Engagement, Programming, Action Research**

## Related Publications

**The following papers were written prior to the submission of this thesis and report some of the work herein.**

Becker, B.A., Glanville, G., Iwashima, R., McDonnell, C., Goslin, K., and Mooney, C. (2016) *Effective compiler error message enhancement for novice programming students*. Computer Science Education, 26:2-3, 148-175. DOI: 10.1080/08993408.2016.1225464

Becker, B.A., Goslin, K and Glanville, G. (2018) *The Effects of Enhanced Compiler Error Messages on a Syntax Error Debugging Test*. Proceedings of the 48th ACM Technical Symposium on Computer Science Education (SIGCSE '18), Baltimore, MD, USA, 2018.

Glanville, G. (2016) *Reflective Learning Journals in Computer Science: The Student Experience*. International Conference on Engaging Pedagogy (ICEP2016). Maynooth University, Maynooth, Co. Kildare, Ireland: Dublin, Ireland, Dec. 2, 2016.

Glanville, G. (2017) *Enhancing Student Engagement: Introducing social learning in computer programming*. International Conference on Engaging Pedagogy (ICEP2017). Griffith College, South Circular Road, Dublin 8, Ireland: Dublin, Ireland, Dec. 15, 2017.

Glanville, G. (2019) *Cultivating Academic Self-Efficacy through Supportive Social and Self-Regulated Learning Strategies for Students in Higher Education*. Postgraduate Research Students Conference. Trinity College Dublin, College Green, Dublin 2, Ireland, May 18, 2019.

Glanville, G., Becker B.A. (2014) *Introducing Contemplative Pedagogy to the Classroom Implementation, Experience and Effects on Concentration*. International Conference on Engaging Pedagogy (ICEP2014). Athlone Institute of Technology: Co. Westmeath, Ireland, Dec. 5, 2014.

Glanville, G., Becker B.A. (2015) *Mindfulness and Contemplative Practices: The Voice of the Student*. International Conference on Engaging Pedagogy (ICEP2015). College of Computing Technology (CCT): Dublin, Ireland, Dec. 4, 2015.

Glanville, G., McDonagh, P., and Becker, B.A. (2013) *Efforts in Outreach Programmes to Inform Secondary Students on Studying ICT at Third Level: Providing a Realistic Experience in Coursework and Accredited Assessment*. International Conference on Engaging Pedagogy (ICEP2013). Institute of Technology (IT Sligo), Sligo, Ireland, Dec. 6, 2013.

## Table of Contents

<b>Acknowledgements</b> .....	<b>i</b>
<b>Abstract</b> .....	<b>ii</b>
<b>Related Publications</b> .....	<b>iii</b>
<b>Chapter 1 Introduction to Study</b> .....	<b>1</b>
1. Introduction and Background to Study .....	1
2. Drop-out and Progression.....	2
3. Research Questions .....	4
4. Outline of Thesis .....	6
5. Summary .....	8
<b>Chapter 2 Literature Review</b> .....	<b>9</b>
1. Introduction .....	9
2. Focus 1: Private Higher Education: Challenges and Opportunities .....	11
3. Focus 2: Computer Science Higher Education .....	13
3.1 Retention in Computer Science/ICT Programmes .....	14
4. Focus 3: Student Motivation and Engagement .....	16
4.1 Student Motivation.....	16
4.2 Student Engagement.....	19
5. Focus 4: Reflective Learning .....	21
6. Focus 5: Social Learning.....	22
6.1 Student Diversity.....	25
6.2 Collaborative Learning and Group Work.....	29
7. Focus 6: Academic Self-Efficacy.....	35
8. Conceptual Framework .....	38
9. Engagement in Computer Programming: Action Research Planning .....	39
9.1 Reflective Learning .....	39
9.2 Problem Based Learning and Peer Assisted Learning .....	42
9.3 Measuring Student Engagement.....	43
9.4 Measuring Academic Self-Efficacy .....	45
10. Literature Review Summary .....	45
<b>Chapter 3 Research Methodology, Methods and Tools</b> .....	<b>48</b>
1. Introduction .....	48
2. Research Methodology .....	48
3. Action Research .....	51
3.1. Experimental Design .....	53
4. Research Methods and Tools .....	54
4.1 Questionnaire .....	55

4.2 Interview .....	57
4.3 Focus Group.....	58
4.4 Qualitative Feedback Tools .....	59
5. Ethical Considerations and Validity .....	60
6. Summary of Action Research Data Collection (2014 – 2016) .....	64
6.1 Action Research Cycle 1 (2014).....	65
6.2 Action Research Cycle 2 (2015).....	68
6.3 Action Research Cycle 3 (2016).....	71
7. Summary.....	77
<b>Chapter 4 Self-Regulated Learning and Social Learning.....</b>	<b>78</b>
1. Introduction.....	78
2. Self-Regulated and Social Learning .....	78
2.1 Data Collection Process for AR Cycle 1 (Reflective Learning).....	78
2.2 Data Collection Process for AR Cycle 2 (Reflective Learning).....	80
2.3 Data Collection Process for AR Cycle 3 (Social Learning) .....	82
3. Analysis of Study Behaviour Questionnaires (AR Cycles 1 and 2) .....	85
4. Analysis of Reflective Learning Journals and Post Treatment Feedback .....	87
4.1 Reflective Learning Journal Analysis (AR Cycles 1 and 2).....	87
4.2 Post Treatment Focus Group Analysis (AR Cycle 1).....	88
4.3 Post Treatment Interview Analysis (AR Cycle 2).....	90
5. Analysis of interviews and social learning activity feedback for (AR Cycle 3).....	96
5.1 Lecturer Interviews – Pre and Post-Treatment .....	96
5.2 Social Learning Activity Feedback – Activity Feedback Forms.....	99
5.3 Social Learning Activity Feedback – Participant Interviews .....	104
6. Summary of data collection methods.....	110
6.1 Effectiveness of Data Collection Techniques Used – AR Cycle 1.....	110
6.2 Effectiveness of Data Collection Techniques Used – AR Cycle 2.....	110
6.3 Effectiveness of Data Collection Techniques Used – AR Cycle 3.....	111
7. Usefulness in Answering the Research Questions.....	111
7.1 AR Cycle 1 and AR Cycle 2 Research Questions .....	111
7.2 AR Cycle 3 Research Question .....	112
8. Conclusions and Recommendations .....	114
8.1 Conclusions.....	114
8.2 Further Research.....	115
<b>Chapter 5 Measuring and Evaluating Student Engagement.....</b>	<b>119</b>
1. Introduction.....	119
2. The Questionnaire Tool .....	119

3. Method of Analysis .....	121
4. Findings and Analysis .....	123
5. Comparison with National Data .....	140
6. Usefulness in Answering the Research Questions .....	152
7. Conclusions and Further Research .....	154
7.1 Conclusions .....	154
7.2 Further Research .....	156
<b>Chapter 6 Measuring and Evaluating Academic Self Efficacy .....</b>	<b>158</b>
1. Introduction .....	158
2. Measuring Self-Efficacy .....	158
3. The Research Tool .....	159
4. Analysis .....	161
5. Usefulness in Answering the Research Questions .....	172
6. Conclusions and Further Research .....	175
6.1 Conclusions .....	175
6.2 Further Research .....	177
<b>Chapter 7 Reflexivity .....</b>	<b>178</b>
1. Introduction .....	178
2. Reflexivity in Practice .....	178
3. Narrowing the focus of research .....	180
4. Reflections on research methods, tools and interventions .....	184
4.1 Action Research .....	184
4.2 Questionnaire (measuring student habits and preferences) .....	184
4.3 Focus groups .....	185
4.4 Interviews .....	185
4.5 Reflective learning journals .....	186
4.6 Qualitative feedback forms .....	187
4.7 PBL and PAL as social learning tools .....	187
4.8 Measuring and Evaluating Student Engagement .....	188
4.9 Measuring and Evaluating Academic Self-Efficacy .....	189
5. Summary .....	190
<b>Chapter 8 Conclusions, Recommendations and Further Work .....</b>	<b>192</b>
1. Introduction .....	192
2. Findings and Conclusions .....	193
2.1. Action Research Cycle Conclusions .....	193
2.2 Key Findings .....	200
2.3. Answering the Research Questions .....	203
2.4. Contribution to the Practice of Education .....	209



3. Suggestions for Further Work.....	211
<b>References.....</b>	<b>216</b>
<b>List of Tables.....</b>	<b>249</b>
<b>List of Figures .....</b>	<b>251</b>
<b>Appendices .....</b>	<b>254</b>
Appendix A – Study Behaviour Questionnaire Tool (Cycle 1 and 2) .....	254
Appendix B – End of Semester Focus Group Questions. (Reflective Learning) (Cycle 1).....	255
Appendix C1 – Reflective Learning Journal v1 (Cycle 1).....	256
Appendix C2 – Reflective Learning Journal v2 (Cycle 2).....	257
Appendix D – End of Semester Interview Questions (Reflective Learning) (Cycle 2).....	258
Appendix E – Social Learning Individual Feedback Form (Cycle 3).....	259
Appendix F – Student Engagement Questionnaire Tool (Cycle 3).....	260
Appendix G – Academic Self Efficacy Questionnaire Tool (2016) .....	269
Appendix H – Start and End of Semester Interview Questions (Programming Lecturer) (Cycle 3) .....	271
Appendix I – End of Semester Interview Questions (Social Learning Treatment Group) (Cycle 3).....	273



# Chapter 1

## Introduction to Study

### 1. Introduction and Background to Study

This study took place in a private third level higher education college in Dublin, Ireland. The college offers a number of undergraduate and postgraduate programmes in Information Technology, Computing and Business, with some part-time professional course offering. The student body is predominately international, with a majority requiring student study visas to both study and work in Ireland. The college has over 1100 students, 45% female, 55% male, and an average age of 28.

I have been employed in the college since 2007 and have progressed through various roles, including Lecturer, Programme Coordinator, Head of IT Faculty, and currently as Dean of School. As a relatively small educational provider in the landscape of private higher education in Dublin, my role combines both Dean of School activities and lecturing in both IT and Business across our undergraduate and postgraduate programme offerings. I have a background of working in Information Technology, acting as both an IT manager and IT consultant through various roles I have held in Dublin, but teaching has always been central throughout my career, whether through professional or academic programme offerings. Prior to commencing this study, I had identified that Computer Programming was characterised as a difficult subject area for undergraduate students. This was acquired through tacit and explicit forms, including through my own observations, through conversations I had with students, and through the progression statistics within our BSc in IT programme. Although the college offered support classes in programming the official results were notably lower when compared to other computing subject areas.

Although not primarily a programming lecturer, I can understand that learning to programme is difficult, and some students fare worse within this area than others. For further context, the students within the focus institution were enrolled on a BSc in IT, which was made up of several IT related subject themes, including Programming, Web Development and Networking. Students performed much better in Web Development and Networking, but struggled with Programming, to the point that some would drop out after the first semester, and certainly by the end of first year. This area interested me through concern for the students and their general disengagement with programming, leading to dropout and retention issues. When I commenced this study, understanding and finding a solution to this problem was

central to my work. Although computer programming was a central theme, I wanted to identify engagement and learning tools that could also be applied to other areas within higher education where students found a subject area challenging or difficult. This interest would form the basis of my investigation, with the understanding that research into the problem needed to be explored from a number of perspectives.

This study sought to examine the effectiveness of the introduction of reflective and social learning strategies for students undertaking computer programming in higher education. The study examines student engagement and introduces various learning engagement strategies to measure not only student engagement, but self-efficacy in computer programming. This chapter is an introduction to the study and provides justification for the research, outlining the main research questions followed by an outline of the thesis chapters.

## 2. Drop-out and Progression

Transitioning or returning to higher education represents a challenge for some students. The Irish Higher Education Authority (HEA) supports this challenge through a range of initiatives, including the on-going reform of the transition from second level education to higher education, the National Plan for Equity of Access to Higher Education 2015-2019, and through the National Forum for the Enhancement of Teaching and Learning. A core aim of the National Forum, since its inception in 2012, is focused on activities associated with ‘teaching for transitions’ enhancement. Naturally, when examining transitioning, a consideration must be made as to the previous knowledge/experience a student has before entering higher education, and what positive or negative impact this may have on their ability to transition successfully. The difficulties come from various factors, including the inability of individuals to separate themselves from previous forms of educational organisation, the difficulty for individuals to adapt to new and more challenging demands, both academic and social, of the college environment (Tinto, 1993). A student conducted in Ireland (Sheridan & Dunne, 2012) focused on first year undergraduates and their challenges in successful transition to third-level education, following the Irish Leaving Certificate examination. They cited difficulties ranging from the social to the academic, expressed difficulty with group work, making friends and knowing what information to take from lectures. These difficulties also present in mature-age learners as they and return to higher education. Tinto (1993) suggested that if the students feel integrated in both the academic and social aspects of the college environment, their commitment to remain at their current institution is strengthened.

The issues identified in the National Forum report on *Student non-completion on ICT Programmes* (National Forum, 2015a) serve to highlight the issue of the lack of a computing curriculum in national secondary school education in Ireland. Unlike the United Kingdom secondary school curriculum, the Irish national secondary school curriculum has no dedicated Computer Science or Information and Communications Technology (ICT) provision (Stokes, 2010), and the absence of computing among the formal subjects for the Leaving Certificate has been identified as a substantial issue (Connolly and Murphy, 2005). Within the United Kingdom, since the Education Reform Act of 1988, ICT has been compulsory for all students aged 5 to 16 in schools (Office for Standards in Education, Children's Services and Skills (UK), 2011). Computer Science was introduced for the first time in September 2018 as a pilot

within a small number of secondary schools in Ireland, which may address some of the transitioning issues a student faces when entering Computer Science/ICT programmes in higher education. Although identified as an issue, the majority of students within the focus institution are international, and therefore would not have progressed through the secondary level education system in Ireland. A large proportion are native to Brazil where computing is not a dedicated subject area within the secondary school curriculum.

The academic study of ICT programmes is often misunderstood by prospective students with little real-world or practical insight into these fields (Tangney, et al., 2004). Within my institution we provided a summer series of ‘taster courses’ aimed at secondary school students in their 4<sup>th</sup> or 5<sup>th</sup> year, England Key Stage 5 (years 12 and 13). This programme was designed to give students a realistic experience of studying ICT at the third level, particularly due to the lack of ICT in the Irish second level curriculum. We conducted research (Glanville et al., 2013) centred on student assessment results and issued two surveys – one given at induction and another at programme completion. The survey results revealed less than half of students had any exposure to ICT curricula prior to the programme, and most of these being trained in the use of ICT rather than being exposed to any curricula in ICT itself. Surveys also showed that most students’ perceived skill levels increased dramatically as a result of participation in the programme that we conducted, and that participating in the programme did affect students’ decisions on studying ICT at the third level.

Retention and dropout rates in Computer Science are still higher than other disciplines of study, for example, an analysis conducted in the U.K through *The Complete University Guide* provided a comparison of entrants no longer in higher education after one year by subject area, Computer Science students had the highest dropout rate (12.5% overall) in 2010–11, while medicine and dentistry having the lowest (2.2%) (The Complete University Guide, 2017). This further highlights the need for further research to understand the reasons why students fail to progress to year two in Computer Science programmes, and to consider the types of supports and resources required to assist transitioning students. In addition, it must also be noted that despite ICT being a feature of the secondary school UK education curriculum, dropout rates still remain higher than other study disciplines which raises questions as to what effect will ICT being introduced to secondary schools in Ireland have on retention and progression. At the very least, it will provide students with a basic grounding for what is involved in the study of ICT which may assist in their course choices when progressing to higher education.

Unlike their younger counterparts, or ‘traditional students’, ‘non-traditional students’ may not have experienced IT in their earlier educational experiences. Traditional students are described as those who participate in higher education immediately after their secondary level education, whereby non-traditional students refer to adults who are classed as mature learners (over 23 years of age) and may have major life and work roles and responsibilities. The Department for Education and Skills (2002) identified that most 16-year olds use the internet regularly and 67% of them have authored web pages often as part of a school project. In 2019, at the time of writing, it can be safely assumed that this percentage has increased. Therefore, traditional students expect technology to be a part of their learning whilst non-traditional students may be confounded and even, to some extent, disadvantaged by its inclusion. In addition to technology issues, there are well-documented barriers that affect non-traditional students returning to higher education. Psychological factors such as feeling out of place

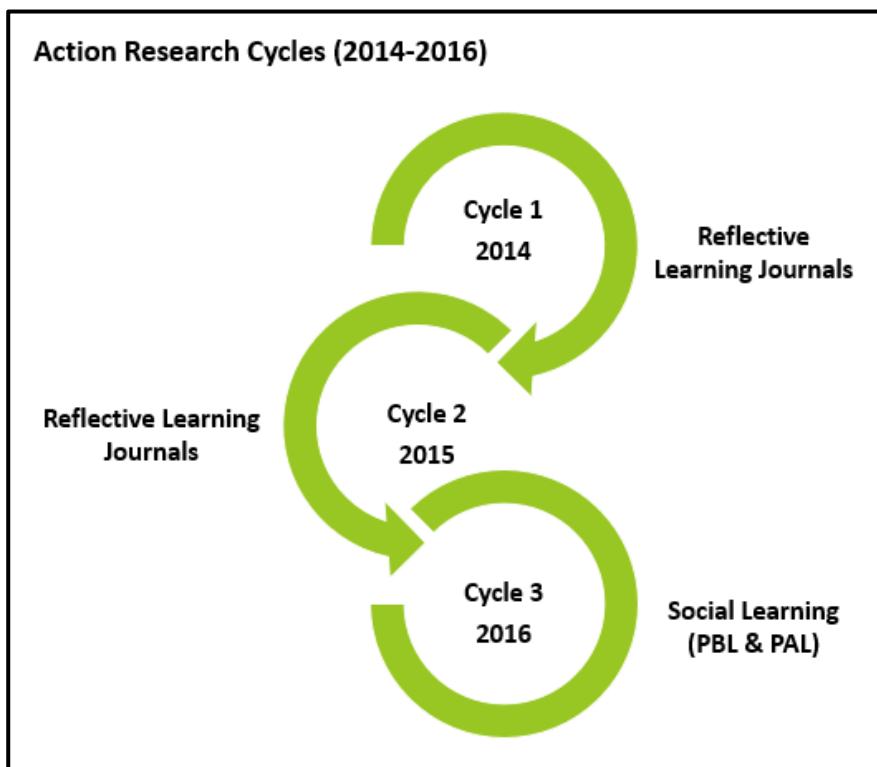
among younger students or fear of competition with younger students may be a barrier to learning (Scala, 1996). With that said, Sursock and Smidt (2010) note that mature or adult learners tend to be highly motivated and will present as autonomous learners, something that I have positively observed within my institution.

The higher education landscape is experiencing a period of rapid change in line with the broader economic changes in Ireland and Europe (Department of Education and Skills, 2011). *The National Strategy for Higher Education to 2030* report stresses the key role that Ireland’s higher education system must play in developing an innovative knowledge economy. The report calls for the sector to “innovate and develop if it is to provide flexible opportunities for larger and more diverse student cohorts” (Department of Education and Skills, 2011, p.10). The report also calls for clear pathways for progression and transfer, as well as clear and accessible non-traditional entry routes. To support this, the Irish Higher Education Authority (HEA) is continuing to support Springboard and Springboard+ funding provision initiatives targeting non-traditional students in acquiring National Framework of Qualifications (NFQ) Level 7 to Level 9 awards. A further discussion on the challenges with transition and retention in computer science programmes is discussed in Chapter 2.

### 3. Research Questions

This study implemented an Action Research approach and the justification for adopting this method is discussed in Chapter 3 – Methodology, Methods and Tools. To provide context for the research questions, the action research cycles are visualised in Figure 1.1 below.

**Figure 1.1: Action Research Cycles (2014 to 2016)**



**Principal Research Question:**

Can the introduction of social and self-regulated learning strategies encourage the development of self-efficacy in computer programming and enhance student engagement for students in higher education?

**Research Questions from Action Research Cycles (2014 to 2016):**

**Cycle 1: Research Questions (2014):**

- Q.1:** What modules do first year BSc in IT students identify as challenging subject areas?
- Q.2:** What are the study preferences and study challenges of first year BSc in IT students?
- Q.3:** Do first year BSc in IT students see any benefit in the process of reflecting on learning?
- Q.4:** Do first year BSc in IT students derive any benefit in using a spreadsheet based reflective learning journal tool?

**Cycle 2: Research Questions (2015):**

- Q.5:** What modules do first year BSc in IT students identify as challenging subject areas? (used as a comparison with the 2014 study)
- Q.6:** What are the study preferences and study challenges of first year BSc in IT students? (used as a comparison with the 2014 study)
- Q.7:** Do first year BSc in IT students see any benefit in the process of reflecting on learning?
- Q.8:** Do first year BSc in IT students derive any benefit in using the revised spreadsheet based reflective learning journal tool?

**Cycle 3: Research Questions (2016):**

- Q.9** Are Problem Based Learning (PBL) and Peer Assisted Learning (PAL) suitable social learning approaches that can be used within a computer programming module?
- Q.10** Can social learning activities encourage students to engage in individual reflection?
- Q.11** Can social learning enhance overall student engagement?
- Q.12** Can social learning enhance self-efficacy in computer programming?
- Q.13** Are social learning activities linked to better performance in computer programming?

For the above questions, an effort to draw firm conclusions are presented in Chapter 8 – Conclusions, Recommendations and Further Work, and are further addressed throughout this study to provide context during the discussion on the individual action research cycles.

## 4. Outline of Thesis

This thesis contains eight chapters, which are outlined below.

### **Chapter 1: Introduction to Study**

This chapter provides an overview of the study, with an initial discussion on the principal problem area under investigation, leading to suggested literature review focus areas. This chapter also presents the principal research question, along with the research questions for each action research cycle.

### **Chapter 2: Literature Review**

This chapter explores a number of key literature areas relevant to this study, including a focus on computer science and retention and progression, student engagement, reflective learning, social learning and academic self-efficacy. A conceptual framework is also presented along with the identification and selection of suitable tools and approaches for the interventions used within the three action research cycles.

### **Chapter 3: Research Methodology, Methods and Tools**

This chapter presents the rationale for the research methodology and a discussion on the research methods and tools, together with a summary of the data collection process for the action research cycles. This chapter also presents a discussion on ethical issues and considerations, and the challenges of conducting insider research.

### **Chapter 4: Self-Regulated Learning and Social Learning**

This chapter explores self-regulated and social learning, and an analysis and discussion on the findings of all elements within Cycle 1 and Cycle 2, and some elements from Cycle 3 of the action research approach. These elements are grouped together to allow for comparison across individual and group learning. The elements examine study behaviour, reflection, and social learning, and specifically the Reflective Learning Journal, Problem Based Learning (PBL) and Peer Assisted Learning (PAL) interventions.

### **Chapter 5: Measuring and Evaluating Student Engagement**

This chapter examines the use of a modified structured questionnaire tool to measure institutional student engagement, which was carried out within Cycle 3 of the action research approach. In addition, institutional engagement data is compared against national findings. The engagement tool was deployed to measure student engagement in conjunction with the social learning activities (PBL and PAL) previously discussed in Chapter 4. The data is examined quantitatively followed by discursive analysis.



## Chapter 6: Measuring and Evaluating Academic Self Efficacy

This chapter examines the use of a structured measurement tool to measure student self-efficacy within computer programming. Alongside the student engagement questionnaire discussed in Chapter 5, this measurement tool was deployed in Cycle 3 of the action research approach requiring student participants to self-measure their efficacy in computer programming across a semester. The data is examined quantitatively followed by discursive analysis.

## Chapter 7: Reflexivity

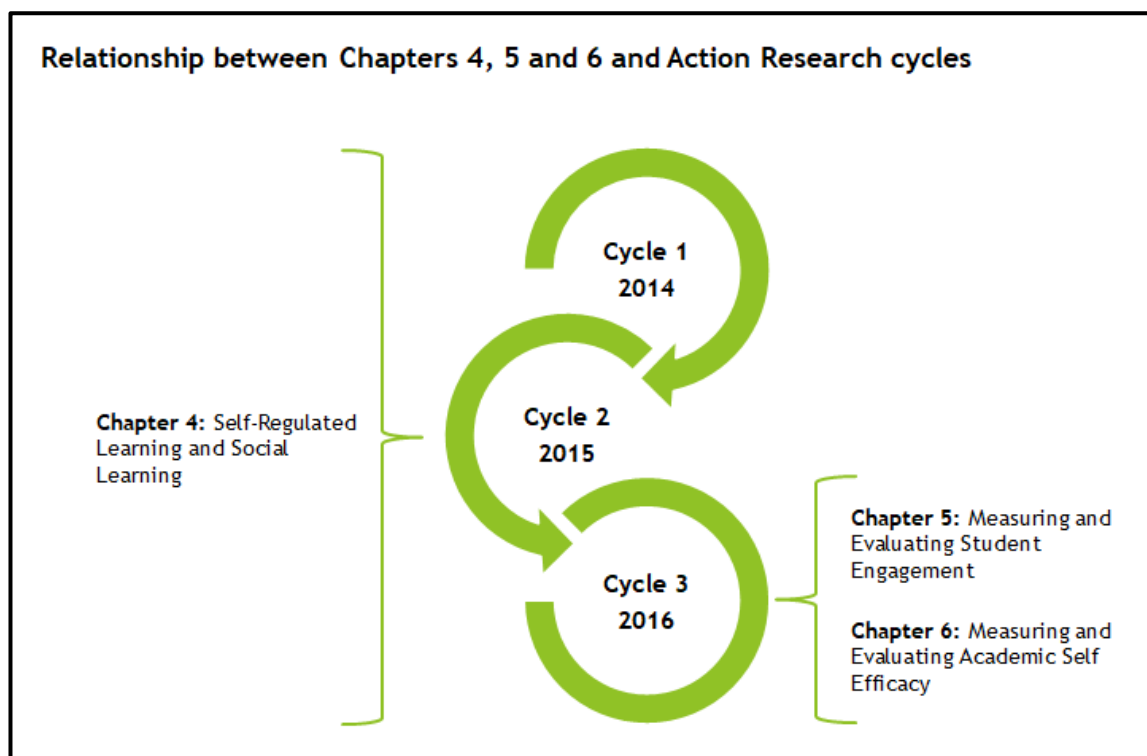
This chapter discusses reflexivity in practice and how the practice of reflection assisted in the development and planning throughout the course of this study. This chapter also presents a reflective evaluation on the use of the various tools and methods within the three action research cycles. This discussion and evaluation may be useful for those considering similar research in their own institutions.

## Chapter 8: Conclusions, Recommendations and Further Work

This chapter provides the summary conclusions from the action research cycles and the study as a whole, along with key findings and suggested further work. It also addresses the research questions presented in Chapter 1, including an appraisal of the contribution to practice for both the focus institution and beyond.

Figure 1.2 below provides a graphical representation of the relationship between the three action research cycles and their respective chapters within this study.

**Figure 1.2: Relationship between Chapters 4, 5 and 6 and Action Research cycles**



## 5. Summary

This opening chapter has provided the basis for the research investigation, which is centred on engaging students in computer programming, with a view to investigating different tools and approaches to facilitate positive student engagement within this subject area. This will be achieved through an action research approach, with each cycle informing the next uncovering the problem, while reflecting on methods used and their usefulness in assessing the research questions. This study is a significant undertaking within the research practice environment, specifically because the institutional approach to teaching computer programming does not include any group work, and there is a belief that the only way to learn computer programming rests solely on the individual themselves. This is further problematic as labelling begins to emerge, there is a sense of identification with what can be called ‘good’ and ‘bad’ students relating to how they grasp computer programming concepts. Those that are struggling within their first or second semester can be left behind through this approach and may be viewed as percentage losses rather than students who simply do not learn at the pace of others. This study will examine the problem with learning computer programming, and through an action research approach, identify how we as an institution can better support our students through recognised challenging subject areas.

Chapter 2 will discuss key findings from the literature, focusing on student retention, engagement, reflection, social learning and academic self-efficacy. These focus areas are useful in understanding the problem under investigation, from a student, lecturer and institutional perspective. The results of an initial literature review led to the identification of appropriate context-based interventions for the action research cycles.

# Chapter 2

## Literature Review

### 1. Introduction

This literature review will look at several areas within the literature that are useful in addressing the engagement and progression issues for first year BSc in IT students, and the challenges associated with learning computer programming. There are recognised issues within the literature that point to potential reasons why students fail to engage or succeed within their first year of study in higher education. While the focus on hard technical skills is a core focus within the institution, there are other factors that can facilitate the learning process for students, some of these factors include a sense of belonging (Hausmann et al., 2007); social integration with peers (Wilcox et al., 2005); interactions with teaching staff (Cuseo, 2007); and exposure to new people and ideas (Pascarella and Terenzini, 2005). These factors are perhaps considered organic and conditional on the level of engagement of the students themselves, but aside from the emphasis on technical skills, these transversal skills are worthy of formal consideration within the focus institution.

To provide context for this literature review, the first area of focus is private higher education, and the challenges and opportunities of conducting research within this environment. The most obvious difference between public and private higher education institutions, particularly from an Irish context, is no educational funding provided by the Government, and also tighter regulation from the national qualifications awarding body. There is also a negative perception of private higher education which stems from high profile cases involving private institutions operating purely for profit with no consideration for the quality of education. A small number of private higher education providers have been proven to operate in this way in the past which is difficult to defend against. Private institutions are effectively private businesses, and this is how they are perceived by the public in general.

The second area of focus for this chapter provides a discussion on computer science and transitioning to computer science higher education programmes. Prior to entering higher education, there is often a lack of student awareness of what the study of ICT or Computer Science programmes entails, leading to misconceptions about the subject mastery required to be successful (Beaubouef and Mason 2005). Students' beliefs that strong capability in general IT application skills, (such as word processing, spreadsheet usage, web browsing), prior to starting college suggests an aptitude for ICT/Computer Science, which underscores a lack of awareness of the level of mathematical knowledge necessary to succeed in such programmes.

In addition to awareness, the Irish national secondary school curriculum has no dedicated Computer Science or Information and Communications Technology (ICT) provision (Stokes, 2010). These issues cannot be addressed prior to a student enrolling on a Computer Science programme. However, if such factors have an influence on the student experience, retention and progression, then consideration for support resources in the first year may mitigate the transitioning challenges.

The third research focus, supporting the transitional theme, is student motivation and engagement. A central factor in student learning and personal development during college life is the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes (Astin, 1993; Pascarella & Terenzini, 2005). Kuh (2009a) defines engagement as a term that represents constructs such as quality of effort and participation in productive learning activities. Carini et al. (2006) state that student engagement is generally considered to be among the better predictors of learning and personal development. Engagement and motivation to learn is also influenced by institutional environments that are perceived by students as all-encompassing and supportive, and where expectations for performance are clearly communicated and set at reasonably high levels (Kuh, 2001; Pascarella, 2001).

The fourth area of focus is reflective learning, which is an important process for not only students, but for faculty members too. Reflection may occur informally (cognitively) which can be described as a deliberate attempt to critically contemplate what was learned, or experienced, and to plan for future action. Freire's (1972) concept of critical consciousness is based on the idea that the richest learning begins with action, which is then moulded by reflection, and this reflective process gives rise to additional action. Students through reflection are encouraged to look back on what they have already experienced, or completed (Jordan et al., 2008), in this way, associations can be made between new material arriving bottom-up from the environment and top-down material already retained in memory. Teachers play a key role in the reflective learning process and ideally teachers should design material that stimulates learners' cognitive processes and encourage learners to make mental connections for themselves. Reflection encourages teachers to see the problem through the learners' eyes, which is helpful in designing appropriate learning experiences that are more impactful for the target audience (Jordan et al., 2008).

The fifth focus area discusses the importance of social interaction and integration for success. Many early programme stage learners, such as the first-year target audience for this study, report a lack of what Crenshaw (2008) calls community identity, and programmes are sometimes lacking in socialisation aspects which can bring about the development of such identities. Dewey (1963) emphasised the importance of the interaction between the learner and the teacher and encouraging learners to share their views, which in turn allows the teacher to get to know the learners better, thus benefiting the overall learning experience for all concerned. Vygotsky also stressed the importance of social interaction with family, friends, teachers and peers for knowledge construction, which further highlights the importance of social interaction across all aspects of life. Vygotsky referred to the people that we learn from as More Knowledgeable Others (MKOs) and the process of learning through social interaction as being in the Zone of Proximal Development (ZPD) (Vygotsky, 1962, 1978). He also contributed to the concept of scaffolding to describe the teacher's role in engaging with students and supporting their growth while they were in the ZPD. Bandura (1986) has also

significantly contributed to the concept of social learning; he described this dynamic relationship as ‘Reciprocal Determinism’ in which individuals, their behaviours and their social setting are dynamically linked together in a process.

The sixth, and final focus area, is academic self-efficacy. Self-efficacy can be simply described as your belief in your capability to perform a task, which suggests that your belief in your capability can lead to engaging or disengaging from an activity or action (Bandura, 1991).

These six literature focus areas are all valuable in examining the problem under investigation, particularly as the focus institution has no formal supports for transitioning students and for reflective and social learning. If these areas are all considered student success factors, then they require consideration. Upon the completion of this literature review, a conceptual framework is presented to visualise the connections and relationships found within the literature and how these attributes form a practical implementation model. Section 8 of this chapter is informed by the conceptual framework in which the identification of suitable tools and approaches are considered for the interventions within the action research cycles.

## **2. Focus 1: Private Higher Education: Challenges and Opportunities**

Regarding the focus institution, it is worthwhile discussing the challenges and opportunities of the private higher education landscape. First, I will discuss the current landscape of private higher education and secondly, I will explore the concept of ‘student as consumer’. There is a general view that private higher educational institutions are not equivalent to public educational institutions. There is a perception that because private institutions are for-profit, they are run like businesses and primarily concerned with intake numbers and less focused on the educational journey. This perception is not unfounded as there are many examples whereby private institutions have exploited the educational system to run their colleges as businesses and focus primarily on profit taking. Collini (2013) provides a good example, in 1998 Ashford University had just 300 students; it was taken over by Bridgepoint Education Inc., and by 2008 boasted 77,000 students, nearly all online. Bridgepoint was described by the Senate committee’s chairman as a ‘scam’, still collecting profits despite having drop-out rates of 63% for bachelor’s degrees, and 84% for Associate degrees. An investigation by the Huffington Post in 2012 of another private provider, Educational Management Corporation, found that after it was taken over by Goldman Sachs, its recruiters were issued with scripts which instructed them to find potential applicants’ pain-points to convince them that college might be a solution to their struggles. These types of findings do nothing to support the ‘level playing field’ concept the Irish and UK governments believe they are trying to create between public and private education institutions. Changes in modern markets everywhere are putting pressure on the core principles of public higher education. At the end of July 2012, the U.S. Senate Committee on Health, Education, Labour and Pensions presented an 800-page report, the culmination of a two-year investigation into ‘for-profit’ higher education institutions. The senators found that at such institutions only 17.4% of annual revenue was spent on teaching, while nearly 20% was distributed as profit. They also found that high numbers of students from the disadvantaged sections of society

were burdened with large debts, having enrolled in, and subsequently dropped out of, courses which were never suitable for them in the first place (Collini, 2013).

Private providers in the UK are subject to some regulation, perhaps a stronger regulatory regime than has historically been enforced in the US, but they are still exempt from many of the obligations of public institutions (Collini, 2013). Private providers in Ireland are subject to similar regulation, but recent changes within the student visa application process has tightened the control on which providers will be allowed to run validated visa-approved programmes. The Irish Government has introduced recent regulation that forces visa-seeking students to apply for higher education programmes that are accredited by the Irish government, namely programmes validated by Quality and Qualifications Ireland (QQI). Any visa seeking student who wishes to enrol on a non-QQI validated programme will run the risk of being blocked from securing part-time work opportunities. UK awarding bodies were accepted in the past, but this is no longer the case as of February 2015. The ability to work part-time is a key incentive for a student requiring a visa, so strategically the Government can ensure most visa-seeking students enrolling on education programmes will be bound to the QQI system. By having only one national accreditation body the Irish government's strategy is similar to the strategy for higher education in the UK, in what it believes will create a level playing field that will enable private providers to compete on equal terms with public universities (Collini, 2013). With this considered, there is a tendency to provide evidence of public and private educational performance. Private institutions may feel compelled to showcase their excellence in education, and the best way to achieve this is to compare progression rates and other associated educational performance metrics with that of the public sector. This drive may set a strategy in place to ensure progression targets are met at all costs. After all, the public facing figures are what matters in public media, and not the internal workings of the learning facilitation. This is of course short-sighted, as graduates will indeed be the product of a system, and 'quality' will be determined by potential employers or other transfer institutions. George (2007) suggests the market becomes a questionable structure for effective higher education once it is recognised that the university has two quite separate educational functions, the best known of these functions – having students leave who are better educated than when they entered – and the less appreciated function – measuring the extent of the education – are markedly different as to their public nature. It is the latter of the two that has the more clearly 'public good' characteristics. The public benefits from knowing the levels of education that people attain and thus at least partially, the public is as much the university's customer as is the student. Within a private institution, public image is a core marketing activity. The more the public positively perceive the private institution the more likely they will make a sale, bearing in mind its operating in a competitive market like any other business. Treating each student as a sale may seem crude, but this can be a reality, and what occurs after the sale are educational activities, which may be under-resourced as the emphasis is on the next sale.

Another challenge for both public and private institutions is the notion of the student as a consumer. According to Riesman (1998) student consumerism began with the student empowerment movements of the late 1960s and gained strength over the decade that followed as universities were progressively required to rely on tuition payments as other funding sources deteriorated. Eagle et al. (2007) argue that education is an industry like any other, and the primary purpose of an industry is to satisfy its consumers. Students are seeking the

easiest way to acquire a qualification and expect a packaged solution to be delivered with low levels of individual effort. As consumers, they have a right to complain and will exercise their right to do so, leading to a culture where students believe that failure to achieve desired assessment outcomes should be blamed on the provider rather than the student.

To conclude, it can be difficult to bring in change within a private institution if the change is one that is not aligned to the recruitment of new students and has little marketing value. To approach this, one can attempt to persuade management to engage in the proposed change process, or, one can seek to attempt to bring in change from the bottom up, to use this as a base to build vertically through the organisation. Just like any business, a cost-benefit analysis is performed on any suggested change strategies; this naturally limits experimental studies with no perceived monetary value. These implementation considerations will be reflected on within this study.

### **3. Focus 2: Computer Science Higher Education**

Undergraduate Computer Science and ICT programmes in higher education offer some variance depending on the college or university, but generally they include computer programming as a mandatory component, and in some cases, programming spans several if not all semesters of a programme. Within the BSc in IT programme in the focus institution, computer programming spans both semesters of first year, and is embedded throughout subsequent years, along with other streamed areas including networking and web related technologies. While Computer Science and IT programmes are not exclusively producing computer programmers, an expected outcome of a Computer Science graduate is programming skill (McCracken et al., 2001), which is also an essential capability for employment in several IT industries (Orsini, 2013). However, learning programming is difficult for many. Acquiring programming skills is usually challenging and difficult for most students and requires considerable practice to have a basic practical understanding (Yang et al., 2015).

The first-year programming course in a degree program often has high failure rates (Porter et al., 2013). Further, difficulty with computer programming has been shown to contribute to well-documented dropout rates in Computer Science programmes (Caspersen and Bennedsen, 2007). Computer Science and IT programmes typically involve other important subject streams, such as computer networking and web technologies, and while these may be career preferences for some undergraduate students, successfully progressing through computer programming is required, regardless of whether the student pursues programming as a career.

Examining computer programming as a module, typically Java is the preferred computer language that is introduced to students in first year. It should be noted that the choice of Java as an introductory programming language is not without criticism (Siegfried et al., 2012) due to the length of time it takes to grasp basic understanding, use and purpose. An alternative to Java is Python, which has recently grown in popularity as an introductory language (Guzdial, 2011), on some counts overtaking Java. Regardless of the language used, navigating compiler errors (a fundamental technology component) is a skill that needs to be acquired in first year. Compiler error messages are crucial for rectifying errors but are often difficult to understand and pose a barrier for progression for many novice programmers. Compiler error messages



also create difficulties for educators, particularly in the context of instructor led or supported laboratory sessions. Coull (2008) identified that tutors spend large amounts of time resolving trivial syntactic problems and that time spent with any individual student may be substantial, and the time other students must wait for help is therefore prolonged. In addition, students tend to make mistakes similar to their peers at similar stages, and tutors find themselves resolving the same problems for several individuals repeatedly. Denny et al. (2014, p. 278) noted: “As educators, we have a limited amount of time to spend with each student so providing students with automated and useful feedback about why they are getting syntax errors is very important”. Understanding and navigating through syntax errors is an important learning process in programming. In a piece of academic research that I co-authored (Becker et. al., 2016), we customised an Integrated Development Environment (IDE) that enhances Java compiler error messages, intended to be more useful to beginners than those supplied by the compiler. This IDE provided further instruction/guidance to the learner as to what the specific error message was pointing to, potentially facilitating early stage learners. The effectiveness of this approach was tested in an empirical control/treatment study of approximately 200 students creating almost 50,000 errors. The design allowed for direct comparisons between enhanced and non-enhanced error messages. The results revealed that the intervention group experienced reductions in the number of overall errors, errors per student, and several repeated error metrics. This was a positive finding and revealed that learners using the enhanced error message system were learning from the errors that were highlighted by the compiler, potentially furthering their motivation to learn computer programming.

Outside of the programming language adopted for teaching first year students, there is an informal view from faculty members that there are those who ‘can’ programme and those who ‘cannot’, and the focus of attention can be with those who ‘can’. This can be framed as those who are struggling with programming should be left to struggle, as this is an expected phenomenon of learning computer programming; they will either grasp it, or they will not, with a view that support systems to facilitate those who are struggling are counterproductive. This belief system is linked to Merton’s (1968) ‘self-fulfilling prophecy’; for example, if a lecturer has high expectations of a learner, and they are aware of this, they will perform at a level that matches those expectations. Equally, if there are low expectations of a learner and they are aware of this, their performance will suffer. This stance can further the divide between those who are progressing well through the programming exercises, and those who are failing to grasp concepts. This position can lead to the enforcement of individual work, individual assignments, and no encouraged group collaboration, which is the current practice within the focus institution for this empirical study.

### **3.1 Retention in Computer Science/ICT Programmes**

A research study conducted by the National Forum for the Enhancement of Teaching and Learning in Higher Education (National Forum, 2016) in Ireland on why students leave captured feedback from students between the academic years 2014-15 and 2015-16. 331 students who did not complete their programmes of study took part in the research. The findings of this study tie closely with other National Forum research within the Teaching for Transitions enhancement theme. The main drivers for non-completion are ill-chosen courses



and courses not meeting the expectations of students. Non-completion is also strongly predisposed by the stress associated with external factors to a course of study, such as financial concerns, commuting distance and unexpected life events (National Forum, 2015d). The importance of students being well prepared for what higher education is, their responsibilities within the learning process, and what their chosen course entails, has also been demonstrated (National Forum 2015a, 2015b, 2015c, 2015d).

For ICT students, and particularly Computer Science students, it is accepted that learning to programme is difficult. High failure rates and low retention rates from these programmes, predominantly in the early stages, have been conveyed internationally (Caspersen and Bennedsen, 2007). Attrition rates from Computer Science programmes during the first two semesters are often between 30% and 40% and can be as high as 50% during the first semester (Beaubouef et al., 2001; Beaubouef and Mason, 2005). Failure rates in introductory programming modules have been reported as being between 20% and 50% (McKinney and Denton 2004; Sloan and Troy 2008). Learning to programme requires substantial practice, but large classes, limited computer laboratory resources, along with limited time for student mentoring, all reduce the time and conditions to develop key programming skills (Crenshaw et al., 2008). In addition, it can be an intimidating experience for some students, and when students experience ‘programming anxiety’, these difficulties can end with them leaving their studies (Connolly et al., 2009). These issues, combined with the particular needs of first year students, can result in further discouragement for students (Beaubouef and Mason 2005). Many early stage ICT students report a lack of what Crenshaw (2008) calls community identity, and ICT programmes are sometimes lacking in socialisation aspects. This is also backed up by Biggers et al. (2008), where they highlighted low levels of human interaction within ICT programmes, exemplified by a lack of peer-to-peer interaction, peer mentoring and learning. These issues are prevalent in how computer programming is currently taught within the focus institution where the approach to learning is very much a solitary one and social learning is not considered.

With the above findings considered, several additional factors within the literature have been linked with positive retention. Some of the factors include class sizes (Cuseo, 2007), engagement in study and broader life on campus (Pascarella and Terenzini, 2005) and self-efficacy (Chemers et al., 2001). Class sizes in the focus institution for this study are generally large, with a ratio in some cases of one lecturer to eighty students, which can only further the limitations of a lecturer to facilitate one-to-one or small group learning support within a class. The focus institution has a positive reputation with student and staff interaction, but again, with large class sizes this is further constrained. Regarding life on campus, further work needs to be carried out by the focus institution to facilitate social interaction between students within areas not related to their programmes. Practical examples of this include sport and club societies and social events. While there are some small group activities, they mostly organically formed with little support from the institution. The exposure to new people and ideas is therefore limited, other than group work initiated through assessment. In most cases, group work within the institution permits groups to organically form, which reduces exposure to new people and new ideas. These small groups can form in first year and continue with the same members throughout the entire programme. The final element, self-efficacy, and the belief in one’s capability, is a critical consideration as the role assessment plays can either facilitate the development of positive self-efficacy or contribute to lower levels of self-

efficacy at early stages of a programme, or module. Computer programming is generally described as difficult – this is the general perception which has a basis of evidential truth and when students join in first year, they are aware of the programming challenge. This can further lower the self-efficacy of some students, even before they have entered the classroom.

These examples are worthy of further consideration, the lack of peer interaction and the known challenges with computer programming are centrally embedded into the interventions in this study and will be further discussed.

### **4. Focus 3: Student Motivation and Engagement**

An important factor in student learning and development during college is student engagement, or the value of effort students themselves dedicate to educationally purposeful activities that contribute directly to preferred outcomes (Astin, 1993). Carini et al. (2006) state that student engagement is generally accepted to be among the better predictors of learning and personal development. By way of contrast, others have defined engagement as the process whereby institutions make deliberate attempts to include and empower students in the process of shaping the learning experience (HEFCE, 2008). Combining these perspectives, Kuh (2009a, p.683) has defined student engagement as “the time and effort students devote to activities that are empirically linked to desired outcomes of college and what institutions do to induce students to participate in these activities”. Kuh’s description is based on the combination of both the individual and institutional responsibilities within the engagement process. The last piece of Kuh’s definition of Student Engagement refers to what institutions do to induce, or motivate, students to participate in engagement related activities. Motivation will now be examined, followed by engagement, leading to measuring engagement.

#### **4.1 Student Motivation**

Motivation to study is another area to examine, and how motivation can be stimulated when challenging learning situations arise. Intrinsic motivators are internal factors to the individuals that are rewarding in themselves without the need for incentives, for example self-esteem (Jordan et al., 2008), and extrinsic motivators are external factors to the individuals that motivate them to respond, for example high grades. Generally, intrinsic motivation is more effective and lasting than extrinsic motivation (Gagné and Medsker, 1996). With this in mind, any possible empirical studies should consider how to encourage intrinsic motivational development. Deci and Ryan (1987) produced a model which identifies extrinsic and intrinsic motivational orientations, summarised in Table 2.1 on the next page, in the context of higher education. This table is modified in the context of computer programming as a subject.

**Table 2.1: Examples of motivational orientations (adapted from Deci and Ryan, 1987).**

IM Intrinsic	ID Identified	IJ Introjected	EM External
Student enjoys computer programming	Student enjoys computer programming, but it is also a mandatory course requirement	Student does not enjoy computer programming, but it is also a mandatory course requirement	Student has no interest in studying computer programming but goes because of parental pressure

The external motivational (EM) orientation within my research practice may not apply because of parental pressure, but from regulatory and legal bodies. The visa requirements of international students are based on a set attendance percentage and this is a motivational factor for some, and perhaps just to attend the class but not necessarily to engage in the learning materials. Programming is a mandatory module, so therefore Introjected (IJ) would be applicable to some who do not like the subject. The ideal scenario is to have a majority cohort made up of Intrinsic (IM) and Identified (ID) orientations, but to suggest that simple institutional actions can eliminate the IJ and EM orientations would be unrealistic. However, this table serves as a reminder of the types of motivational orientations our students may have when entering the computer programming class, and the potential limitations of any potential interventions proposed given the current motivational orientation of the learners.

The Polish-American scholar Frederic Herzberg and his colleagues held a two-factor theory of motivation (Herzberg et al., 1959). They referred to ‘hygiene factors’ which do not stimulate motivation but prevent dissatisfaction. Basic educational hygiene factors such as heating, lighting and seating can have a negative effect on student learning (Bleakley, 1998). Herzberg’s theory suggests that once hygiene factors have been satisfied motivators such as achievement, recognition, responsibility and promotion come to the foreground. This serves as a reminder of the importance of the ergonomic learning environment and the potential impact this can have on motivation. The focus institution has always strived to make the environment comfortable for the learner, but this is challenging with growing class sizes where space because a luxury.

Expectancy theory suggests three cognitive factors in relation to motivation. Those being anticipation of the gain, the expectation of attaining this, and the importance of success to the learner (Cohen et al., 2007). Expectancy is grounded in self-esteem and self-efficacy. Self-esteem refers to people’s perceptions and evaluations of their own worth, while Bandura (1977) suggests a learner’s self-efficacy is affected by past performances, experiences of seeing a role model perform a task and through encouragement by teachers or peers. Self-esteem and self-efficacy reinforce expectancy as people who believe they can accomplish difficult tasks persist for longer and work harder to achieve desired outcomes (Bandura, 1982). The importance and relevance of self-efficacy for computer programming is discussed in further detail later in the chapter.

Regarding motivation and self-regulation of learning, Pintrich et al. (1990) provide a general expectancy-value model of motivation for conceptualising student motivation. The

model identifies three motivational components that are linked to three different components of self-regulated learning that expressed below.

- an expectancy component: beliefs about a students’ ability to perform a task;
- a value component which includes students’ goals and beliefs about the importance and interest of the task itself and;
- an affective component, which includes students’ emotional reactions to the tasks.

These motivational components and their relationship to self-regulated learning components are expressed Table 2.2 below.

**Table 2.2: The relationship between motivational and self-regulated learning components (adapted from Pintrich et al., 1990).**

Self-regulated learning component	Motivational learning components	Student perspective
Metacognitive strategies for planning, monitoring and modifying cognition	<i>Expectancy</i> - students’ belief that they can perform the task	“Can I do this task?”
Management and control of their effort on classroom academic tasks	<i>Value</i> – students’ beliefs about the importance and interest of the task	“Why am I doing this task?”
Cognitive strategies to learn, remember, and understand subject material	<i>Affective</i> – emotional reactions to the task (e.g. anger, pride)	“How do I feel about this task?”

Table 2.2 highlights the importance of the student perspective in a learning context. Students are motivated by the subject being studied, the attainment of learning objectives, the credit of that achievement, and by the sense of personal autonomy in learning (Jordan et al., 2008). In a study on assessment and motivation within a computer programming course, Azmi et al. (2017) discussed the importance of active interaction within the classroom to develop positive motivation. Their findings reported on the negative student reactions to the study of programming in recognition of the difficulty to engage with it, but through carefully designed assessment strategies that allow for performance-based formative feedback, motivation was sustained. Formative feedback is sometimes over-looked and can be difficult to maintain with large class sizes but providing feedback throughout a module is a key component in developing motivation and engagement.

Students require the motivation to engage in the learning process, this can be developed intrinsically or extrinsically influenced, which places the importance on engagement and how to cultivate engaged and motivated learners. An emphasis must also be placed on extrinsic motivation and the institution needs to ensure an engaging and appropriate learning environment is provided for students. This in turn may influence the intrinsic motivation of students to engage in subject materials and particularly those with lower levels of intrinsic motivation.

## 4.2 Student Engagement

Ashwin and McVitty (2015) suggest student engagement is essentially centred on engagement with learning activities, which is what the National Survey of Student Engagement (NSSE) survey attempts to measure. However, student engagement can also refer to students' engagement with their courses (UK National Student Survey (NSS)) or it could refer to students' engagement with the knowledge that they are learning on their programme. The engagement focus for this study is to build understanding on the ways in which student engagement can help students to improve their module learning outcomes (Ashwin & McVitty, 2015). As this study is aligned to the Irish Survey of Student Engagement (ISSE), the engagement focus is on engagement with learning activities. Engagement with learning is examined through the engagement effort of individual students, interactions between students and staff, and the evaluation of the resources and supports the institution provides to facilitate student engagement.

Kuh (2009) defines engagement as a term used to represent constructs such as quality of effort and participation in productive learning activities. Engagement is more than participation - it requires feelings and sense-making as well as activity (Harper and Quaye, 2009). Carini et al. (2006) state that student engagement is generally considered to be among the better predictors of learning and personal development. Students who are involved in educationally productive activities in college are developing habits of the mind and heart that expand their ability for continuous learning and personal development (Shulman, 2002).

Coates (2007, p.122) describes engagement as “a broad construct intended to encompass salient academic as well as certain non-academic aspects of the student experience”, comprising of the following:

- Active and collaborative learning
- Participation in challenging academic activities
- Formative communication with academic staff
- Involvement in enriching educational experiences
- Feeling legitimated and supported by university learning communities

These points above resonate with what was previously discussed regarding motivation. In addition to Coates (2007) engagement elements, although focusing on engagement at school level, Fredricks et al. (2004, 62-63), identify three dimensions to student engagement, as outlined below:

1. Behavioural engagement  
*Students who are behaviourally engaged would typically conform with behavioural norms, such as attendance and involvement, and would exhibit 'good' behaviour*
2. Emotional engagement  
*Students who engage emotionally would experience affective reactions such as interest, enjoyment, or a sense of belonging.*
3. Cognitive engagement  
*Cognitively engaged students would be invested in their learning, would seek to go beyond the requirements, and would appreciate a learning challenge.*

From examining the construct proposed by Coates (2007) and the three dimensions proposed by Fredricks et al. (2004), engagement ultimately requires the agency of the individual student (Krause and Coates, 2008; Hu and Kuh, 2002), the role of the institution (Kuh, 2009a), teaching staff (Astin, 1993; Quaye and Harper, 2007) and other staff, such as student affairs and academic support professionals (Kuh, 2009b). Student engagement is clearly made up of many attributes, which all require consideration. This complicates which aspect to focus on in terms of possible short-term interventions, but worthwhile focus areas, as studies have consistently shown the positive links between engagement and improvements in specific desirable outcomes, such as cognitive development (Anaya, 1996; Astin, 1993; Kuh, 1993, 1995) and self-esteem (Bandura et al., 2000; Chickering and Reisser, 1993). Although this study is not specifically focused on improving grades, studies in student engagement have discussed improved grades as an outcome (Astin, 1993; Tross et al., 2000).

Upon reflection of the above discussion, it is worth examining how engaging the focus institution is at present before considering implementing possible changes to enhance student engagement. The environment plays a key role in the engagement process. According to Hu et al. (2001), the most promising approach to encouraging higher levels of student engagement is to change the perceptions that students have of certain aspects of the institutional environment. Kuh (2009) makes the point that institutions cannot change who students are when they start college, but institutions should identify areas where enhancements in teaching and learning could increase the chances that their students attain their educational goals. The environment can encourage and create space for learners to interact through extracurricular activities, and these interactions can also influence engagement. Kuh (2009) also suggests that institutions should identify and better understand how student and institutional characteristics interact to encourage or discourage student engagement in educational purposeful activities in college.

Identifying the characteristics of students who are disposed toward disengagement is challenging because of the lack of agreement on what these characteristics actually are (Kuh, 2001). A well-known set of engagement indicators is the Seven Principles for Good Practice in Undergraduate Education (Chickering and Gamson, 1987). These principles include student-faculty contact, cooperation among students, active learning, prompt feedback, time on task, high expectations, and respect for diverse talents and ways of learning. Also important to student learning are institutional environments that are perceived by students as inclusive and affirming and where expectations for performance are clearly communicated and set at reasonably high levels (Education Commission of the States, 1995, Kuh, 2001; Kuh et al., 1991). These elements of good practice are broad, but student-faculty contact, cooperation among students, active learning and prompt feedback particular stand out as areas that could be improved within the focus institution.

Astin's (1993) large-scale U.S. correlational study of what matters in college (involving 27,064 students at 309 U.S. institutions) found that two environmental factors were by far the most predictive of bringing about a positive change in students' academic development, personal development and overall satisfaction. These two factors were interaction among students and interaction between faculty and students. These factors carried by far the largest weight and affected more general education outcomes than any other environmental variables studied, including curriculum content factors. This finding is useful as it narrows the focus for the development of appropriate interventions, which at this point suggests facilitating

interaction among students, interaction between faculty and students and the provision of prompt feedback.

When examining interaction among students, peers substantially influence how students spend their time and the sense they make of their experiences, including their personal happiness within college (Astin, 1993; Pascarella and Terenzini, 1991). Perhaps seeing that their studies can have practical value encourages students to become more actively engaged in the college experience, and how what they are learning connects and interacts within a bigger picture. Faculty members can also make tangible links between what students are reading and discussing, and should design assignments that require students to demonstrate how to use what they are learning in other settings (Kuh et al., 1994). The purpose of these interactions is to motivate the learner, to encourage progression, and to provide support mechanisms for those most susceptible to dropping out. If a student feels that their college supports them, not only academically but also socially and personally, and if they feel that they are intellectually challenged, they will be more likely to gain academic competency, which will encourage them to remain at college (Reason et al., 2006). Challenging students, but at the same time, providing them with the support they require to succeed, are vital components (Coates, 2007).

At present, the instruction of programming in the focus institution is passive. In the process of learning programming a non-interactive pedagogical approach often leads to some level of student disengagement during class. Azmi et al. (2016) suggest that a programming subject needs to be taught with active engagement of students and that programming courses need to be taught with the involvement of group work, in which Problem Based Learning (PBL) is suggested.

## **5. Focus 4: Reflective Learning**

Reflective learning, according to Boyed and Fales (1983), is the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of the self, which results in a changed conceptual perspective. Reflective learning places the emphasis on the self as the source of learning and is intrinsically an individual and cognitive process. Boud et al. (1985) state that reflection is an important human activity in which people recapture their experience, think about it and evaluate it. Reflective learning may be an approach to formally introduce to first-year computer programming students. Reflection could possibly be treated as a skill that can be taught, which may facilitate better subject matter understanding, potentially leading to better engagement in computer programming.

Bandura (1986) believed that people are capable of self-reinforcement, which he further described as people being able to teach themselves to act in a certain way by thinking about the potential consequences of the action. Bandura expanded this into a broader concept which he referred to as self-regulation, or self-control. According to Bandura, self-regulation is the sum of a person's goals, planning, and self-reinforcement. As part of the self-regulation process people set their own internal standards of behaviour against which they judge their own success or failure. Writing in the *Annual Review of Psychology*, Bandura (2001) explained the concept of agency is to intentionally make things happen by one's actions. This

capability involves not only self-regulatory skills, but also other abilities that play a role in self-directed change.

Self-regulation of one's learning is a concept that appeals to the research environment for this study. Self-regulation of cognition and behaviour is an important characteristic of student learning and academic performance within a classroom context (Corno and Mandinach, 1983; Corno and Rorhkemper, 1985). This would infer that individuals can plan and develop their own learning strategies, despite the challenges of the environment or the teaching methods or style adopted by the lecturer. This strategy could be deployed without the need to persuade lecturers to change their module delivery approach. The challenge, therefore, is to motivate students to self-regulate their learning, especially when undertaking difficult subjects such as computer programming.

### **6. Focus 5: Social Learning**

Social Learning, or Social Constructivism, focuses on the learning that occurs within a social context. This context includes the classroom where rich social interaction can take place, this interaction can be supported, occur organically, or suppressed depending on the nature of the subject and facilitation. Social Constructivism suggests that people learn from one another, including such concepts as observational learning, imitation, and modelling.

Émile Durkheim, one of the nineteenth-century founders of the discipline of sociology, believed that education's function was to maintain and transmit social values through the socialisation of individuals. Durkheim (1956) states the curriculum should reflect the shared culture and aims of the society rather than developing individual talents, and that teachers should empower pupils to become useful members of society. Tajfel (1986), in his work on inter-group relationships, found that groups define themselves according to minimal criteria. The members of the group consider themselves to be the 'in group' and the other groups to be the 'out groups'. This suggests that being inside the group is 'good', and outside the group is 'bad'. This type of behaviour is observed within groups/teams in larger cohorts within the focus institution for this study. Within a given group, there can be a diverse range of experience and ability, this diversity can be harnessed for positive purposes if appropriate approaches and techniques are used to facilitate it. The positive outcomes of the group can be shared, with the potential to further the efficacy of everyone within that group, regardless of their individual role, but conversely, consideration should be made with groups who are underperforming, and how this can affect the individual efficacy of each individual member.

To investigate the opportunities and challenges of social constructivism, it is essential to evaluate the work of two principle contributors, namely Albert Bandura and Lev Vygotsky. Their work is well respected and has significantly contributed to the study of social constructivism, which can also be referred to in literature as Social Learning Theory (SLT). To begin with, the general principles of Social Learning Theory (SLT) are as follows:

- People learn by observing the behaviours of others and the outcomes of those behaviours. For example, students may observe a behaviour that is considered rewarding or something that carries a punishment. Intrinsically this observation can be motivating or demotivating.



- Learning can occur without a change in behaviour. Behaviourists say that learning must be represented by a permanent change in behaviour (Skinner, 1969), for example, the individual must have experienced it to bring about change. However, Bandura (1973) suggests that because people can learn through observation alone, learning may or may not result in a change in behaviour.
- Developmental stages are integrated into the theory of learning, meaning an individual's age and educational background are considered for forming groups, which can be based on several individual characteristics (i.e. strengths/weaknesses), and the identification of positive models to facilitate various mentoring activities.

Vygotsky (1930s) emphasised social processes as the means by which all reasoning and understanding arises. Vygotsky developed the concept of the More Knowledgeable Other (MKO) and the Zone of Proximal Development (ZPD). The concept of the MKO is fundamentally linked to the concept of the ZPD. In an educational setting, the ZPD illustrates the difference between what a student can achieve independently and what a student can achieve with guidance and encouragement from an experienced other, or the MKO. The MKO could be a peer, a mentor or teacher. Vygotsky (1978) described the ZPD as the distance between a student's actual development level, as determined by independent problem solving, and the level of potential development, as determined through problem solving under guidance, or in collaboration with more capable peers. Vygotsky (1978) believed the ZPD was an area where careful and thoughtful instruction or guidance should be provided, as this was the zone of learning that could lead to an individual to further develop skills they will then use on their own. Vygotsky also contributed to instructional concepts such as scaffolding, in which a teacher or more advanced peer helps to structure or arrange a task so that a novice can work on it successfully. Scaffolding strategies allow students to construct relationships with each other and allow student responses to direct lessons, and even to determine the teaching methodology and content. This type of approach is a key feature of student-centred learning. Vygotsky (1978) also recognised that the rate of learning may vary from learner to learner, and that many educators isolate particularly slow learners from their peers using programmed and frequently mechanised instruction. As discussed earlier, a similar teaching approach exists within the focus institution, whereby individuals who are struggling with programming are unsupported in the classroom, and therefore continue to struggle. This solitary learning approach facilitates the gap between those grasping concepts and those who simply cannot keep up with the pace of required learning. In contrast, Vygotsky viewed learning as a profoundly social process, and therefore teaching should represent the means through which development is advanced in the learners based on their actual development levels, furthering the need for alternative approaches of instruction to better the developmental needs of the individuals in the classroom.

Both the MKO and ZPD are concepts that can be applied in practice and would be suitable within the research environment. There are high performing programming students within first year, typically linked to prior programming experience, and these individuals could act out the role of the MKO with students who are struggling with programming.

In 1977 Albert Bandura offered a theoretical framework for his findings in Social Learning Theory, which he later renamed Social Cognitive Theory, because of the importance of individual reflection within the process of social interaction. During the development of

Bandura's Social Learning Theory, Bandura believed that there must be a way that people can learn simply by watching others, thereby removing the need to learn everything through experience. Miller and Dollard (1941) published one of the first scholarly books on observational learning, titled *Social Learning and Imitation*. The process of learning by watching others is called observational learning or vicarious learning and is closely related to the concept of modelling, in which people develop or imitate another. Julian Rotter had put forth his own theory of social learning in a 1954 book, titled *Social Learning and Clinical Psychology*. Rotter (1954) believed that people choose which behaviours to perform based on two factors: reinforcement value and outcome expectancy. Reinforcement value refers to the degree to which an individual values the expected reinforcement, or reward, for an action. Outcome expectancy refers to how strongly the individual expects the action to have a positive result.

Bandura suggests people may learn a wide range of behaviours by observation alone, they deliberately decide which ones to copy, or retain for potential future action. Bandura's Social Cognitive Theory has three core concepts; observational learning, mental states to learning and learning without altering behaviour, these concepts are now summarised below:

1. **People can learn through observational learning.** Bandura (1973) identified three basic observational models:
  - A live model, which involves an actual individual demonstrating or acting out behaviour.
  - A verbal instructional model, which involves descriptions and explanations of behaviour.
  - A symbolic model, which involves real or fictional characters displaying behaviours in books, films etc.
2. **The importance of mental states to learning.** Bandura refers to intrinsic reinforcement as a form of internal reward, such as pride in what you are doing, satisfaction, and a sense of achievement or accomplishment. Although Bandura is considered a behaviourist, he describes his social learning theory as a 'Social Cognitive Theory' further stressing the importance of cognition in learning.
3. **Learning does not necessarily lead to a change in behaviour.** Contrasting behaviourism, which believes that learning leads to a permanent behaviour change, observational learning argues that people can learn new information without altering behaviour. Bandura accepts that not all observed behaviour is retained. Bandura believed that the imitation of someone else's behaviour was not a passive process. Instead, it was an active choice involving four different mental functions:
  - **Attention** – This factor is affected mainly by characteristics of the person being observed and the situation.
  - **Retention** – This factor is affected mainly by the observer's ability to mentally process the observed behaviour and store it in memory.

- **Motor reproduction** – This factor referred to the observer’s ability to turn the stored memory into physical action. It also included the person’s capacity for mentally rehearsing the behaviour.
- **Motivation** – This factor referred to the observer’s desire to drive or copy the behaviour. Of all the factors, this one has the greatest influence on whether an observed behaviour is imitated.

While the above elements offer insight into the core elements of social cognitive theory, from a practical standpoint, the first of the above elements (observational learning) proposed by Bandura is realistically the only element that I would have direct control over, or, the only element that I can shape and develop. The other elements rely on the student, their sense of pride, their ability to reflect on what they are observing, and their internal motivation to do so. These elements can be influenced extrinsically through institutional actions, but it is more difficult to motivate an individual to learn if other negative factors are already cemented. This presents a challenge as the introduction of social learning within the classroom will be constrained by the existing perceptions of the learners. The introduction of social learning within the research practice requires an examination of student characteristics and challenges of implementing group work with such a diverse cohort. Section 6.1 and Section 6.2 examine student characteristics focusing on diversity and the challenges associated with group formation and performance.

## 6.1 Student Diversity

This section will examine the role student diversity plays in transition, peer interaction, and progression in higher education. The characteristics of the student body that are the focus of this research study will be integrated into the discussion, and for context, approximately 70% of the sample population are Brazilian nationals, with the remainder native to other South American countries, Europe and Asia. The average age is 28, and therefore the learners are classified as mature-age (over 23), and the gender split is 45% female and 55% male.

The importance of student diversity within higher education is well reported and research outlines several benefits including enriched educational experiences, personal growth by challenging stereotypes, development of critical thinking, effective communication skill development with people of varied backgrounds and fostering mutual respect through group and teamwork (Hardy & Tolhurst, 2014; Tienda, 2013; Turner, 2013). Diversity also enables the student to perceive differences both within groups and between groups (Gurin et al, 2002). Studies conducted by Gurin between 1985 and 1989 and between 1990 and 1994, involving 12,500 students from 189 institutions, found that students who had the opportunity to interact with peers from diverse backgrounds, both informally as well as inside the classroom, showed the greatest engagement in active thinking and growth in intellectual and academic skills (Gurin, 1999; Gurin et al., 2002). The accrual of these benefits, however, is contingent upon students’ willingness to participate both inside and outside the classroom through the various forums, groups and projects that are formally and informally established.

Regarding international students and learning it is important to consider the different preconceived views that learners may have of what learning means (Marshall et al., 1999). It may be assumed that learning is a well-defined standard experience for all learners but the

experience of learning across cultures has challenged this notion indicating that students' conceptions of learning differ (Jones, 2008). Tsai (2009) states that conceptions of learning profoundly impact learning outcomes. These conceptions of learning have been defined as logical systems of knowledge and beliefs about learning and all previous experiences related to learning (Marshall et al., 1999; Vermunt & Vermetten, 2004). Cano & Cardelle-Elawar (2004) refer to learning conceptions as individual constructions that develop from knowledge and experience, and these experiences influence how learning is understood. This can be viewed as how learners individually think about learning activities, strategies, tasks and processes (Vermunt and Vermetten, 2004), which can influence how students interact within the classroom environment and with peers (Marshall et al., 1999). Lin and Tsai (2008) state that students with multiple conceptions of learning use higher levels of cognitive learning strategies, such as self-monitoring, which enables them to be more academically successful.

Some examples from the literature highlight these diverse cultural conceptions of learning. Purdie et al. (1996) found that Australian students have a narrow view of school-based learning while Japanese students have a much broader community-based view of learning. Abhawawansa & Fonseca (2010) found that Sri Lankan students, while enrolled in an Australian University, held a belief about learning as being teacher centred while their Australian class peers perceived learning as student centred. Research has also reported a difference between Western and Asian class peers regarding conceptions of learning. Jones (2008) reported that Asian students see knowledge as having to do with things that cannot be measured, such as emotions, morality and social skills whereby traditional Western learning beliefs are built upon things that can be scientifically proven. There is a general trend within research to focus on western learning cultures and compare with non-western cultures, usually represented by Asia. This trend has led as the basis for cross-cultural theorising and other students from different geographical locations may not be included in the literature (Abhayawansa & Fonseca, 2010; Marshall et al., 1999; Tsai, 2009).

The majority of students enrolled in the research practice are mature-age and South American, with a significantly higher proportion from Brazil. When examining the experiences of South American students in higher education, a study conducted by Wilton & Constantine (2003) found high levels of psychological distress as they struggled to culturally adjust while studying abroad. Reynolds & Constantine (2007), in their study on South American students' sense of social competence, found a lack of confidence in their social, academic and career contexts and how this may have a profound effect on future career goal planning and achievement. Castaneda (2008) examined the academic needs of South American students in an international learning context and reported a number of key issues such as second language problems, quality of academic advice, availability to acquire financial support, level of integration in their respective programmes and cultural adjustment all had an impact on their academic experiences. Regarding learning conceptions, Crabtree and Sapp (2004) reported that the conception of learning for a Brazilian student is not constrained to a formal learning environment but represents an ongoing process in everyday life. Their study found that students in Brazil believe learning takes place within social, emotional, and physical closeness between teachers and students. These findings are further supported by the work of Santili et al., (2011) who found Brazilian students are comfortable spontaneously greeting their teachers on the street and expect instructors to be actively engaged and interested in both their personal and academic affairs. This research suggests that

whether Brazilian students are studying home or abroad they consider learning as a process that is not limited to the classroom. When exploring the learning setting in Brazil, Fidalgo-Neto et al. (2009) describe how the teacher plays a central knowledge transfer role and that students play a more passive role in the learning process. Passive learning can lead to diminished motivation whereby students can be less likely to ask questions and engage the information they receive (Emelo, 2013; Pretress, 2008). This is particularly relevant as within an IT degree the focus is primarily on active learning and the application of knowledge. Active learning is considered a vital process to students' academic achievement because it develops long-term retention abilities, speeds up the learning process and facilitates recall (Seels & Glasgow, 1997).

From a teaching perspective, research highlights the importance of developing an understanding of students' conceptions of learning as this can facilitate the design and development of better teaching and instructional environments (Burnett et al., 2003; Chin & Brown, 2000; Tsai, 2009). This is not a new consideration as outlined by Hofstede (1986) emphasising the importance that all teachers at all levels of education need to be trained to become intellectually and emotionally accustomed to the fact that others in societies learn differently. This is more important than ever as learning environments have become culturally diverse teachers need to be able to effectively develop culturally inclusive teaching approaches. Murray and McConachy (2018) refer to lecturers as cultural mediators who can invoke cultural references from case studies from students' own countries and draw information from students themselves. Having such a diverse study body brings many advantages for all concerned as this brings a diversity of experiences and perspectives that makes teaching a more stimulating and informative process increasing creativity, innovation, and problem-solving (Murray & McConachy, 2018; Fine & Handelsman, 2010).

Another important student characteristic to consider is age and the majority of learners within the practice environment can be described as 'mature-age' which generally refers to ages 22-23 and up. Mature-age learners can also be identified as those that have completed their second-level education more than one year before beginning their undergraduate degree programme. In comparison, direct entry refers to students who have entered their undergraduate programme from second-level education. These cohorts have been formally referred to as 'non-traditional' and 'traditional' (Griffiths, 2011; McCune, Hounsell, Christie, Cree & Tett, 2011). This non-traditional age category is generally viewed as an important target demographic for higher education expansion due to increased market demand for increased and diversified skills which are very typical of the ever changing and fast paced computing landscape. Several studies have attempted to identify the barriers that mature-age learners face when transitioning to higher education. These include educational factors, described by Burton et al. (2011) as, a lack of preparedness for learning in higher education, or a long break in study resulting in undeveloped approaches to learning (Hardin, 2008). Mallman & Lee (2016) point out that mature-age learners are not necessarily the already-competent learners that institutions, teachers, and fellow peers assume they are. Leathwood & O'Connell (2003) state their educational pathways are often disjointed and, in some cases, non-linear pathways. Reay (2003) suggests that mature learner past failures can be an indication of their educational potential outcomes, supported by Cantwell and Grayson (2002) in which they suggest the impact of prior experiences of educational failure can have a negative impact on perception of self as a learner and that different types of learning within an

institution can bring about the notion of personal inadequacy. Situational barriers can also negatively impact the transitional experience, such as the management of personal and professional responsibilities (Finnegan et al., 2014). Many mature-age learners already fulfil multiple roles when they return to higher education and acquiring the student role can add an additional burden (Stone, 2008; Cullity, 2006) and a role they have difficulty inhabiting (O'Donnell & Tobbell, 2007). Psychological barriers may also be prevalent in the mature-age learner, such as poor self-confidence (Merrill, 2012) and anxiety (Hardin, 2012). Crossan et al. (2003) also refer to mature-age learners' complicated engagement with the learning environment due to their age and differing life circumstances, and perceived age in relation to others can affect learning dynamics in and outside of the classroom (Brooks, 2005; O'Boyle, 2014). Reay (2002) suggests mature-age students grapple with feelings that their age disqualifies them as full legitimate members of a learning community, or even as 'imposters' (Reay 2002). While these age related factors are useful for reflection and planning purposes, caution is required as categorisation can eliminate other factors underpinning them, such as gender, culture and diverse experience which can form a bigger picture of an individual student (Jones, 1995, Bowl, 2001).

With regard to student identity and peer interaction, Christie et al. (2008) state that many mature students experience fragile identities as learners through challenging experiences relating to learning environments, supported by O'Shea (2013) who refers to the challenges of participation and identity formation. The creation of student identity and the ability to engage in the learning environment are important for academic success, and research shows that peer interaction and social integration in higher education are closely linked to student retention, progression and performance (Stuart, 2006). Christie, et al. (2005) state that there has been poor consideration in higher education research of the emotional dynamics of inhabiting a new learner identity amongst other students, which is especially vital for understanding the first-year transition (Christie 2009). Lave and Wenger's (1998) social theory of learning suggests people first learn as peripheral participants and move eventually toward a legitimate and full participation. For international learners who are away from their families, the importance of social support is underscored as these students rely on local relationships to understand and navigate the higher education system and environment (Wilcox et al., 2005). Gallacher et al. (2002) also note that mature adult learners may not necessarily engage as much in the social supports within institutions because of pre-existing social networks negating the need to engage in the development of a new social network. However, it is important to note that many mature-age learners engage with their courses with enthusiasm and determination to succeed, and Howard (2002) reported that mature students tend to have a higher level of classroom participation than younger students. Reay et al. (2009) described this determination as a sense of resilience that arises from students' internal conversations (Archer 2003, Hammersley & Treseder 2007) as well as from their conversations with others such as family and friends about how to balance their ambitions with the conflicting demands on them from employment and self (Youdell, 2012).

This assessment of diversity further strengthens the need to consider methods of engagement and supports required for mature-age international learners, and Finnegan and Merrill (2017) suggest institutions need to continually evaluate and align their existing culture to meet the needs of all students.

## 6.2 Collaborative Learning and Group Work

This section will discuss collaborative learning from the perspective that accountability does not exist between students as they engage in an informal learning process and there is no specific target to be met, and group and team work from the perspective of individual accountability and responsibility in undertaking a group task or project with a measurable outcome. Student diversity will be integrated into the discussion and how it contributes to both the positive and negative aspects of academic social interaction.

Educationalists argue that passive lectures can fail to engage students (Brown, 2001; Harden, 2012), while active learning approaches, such as collaborative learning, can bring about richer engagement in the classroom. Collaborative learning approaches are purposefully designed to encourage knowledge sharing and knowledge development with the additional benefits of academic achievement, enhanced motivation, and the development of social skills (Johnson & Johnson, 1989; Huang et al., 2011). Lubell and Vetter (2006) suggest that learners who are meaningfully integrated with their peers are more likely to be protected against early drop-out, which is relevant to the participants within this study as they are entering their second semester of first year.

Tinto (1997) stresses the importance of students' involvement in academic and social groups, including learning circles both within and outside of the institution. These learning groups positively correlate with persistence and completion, and through social interaction with peers, student identity can be formed (Hilman, 2005). Baxter & Britton (2001, p.94) describe this process of identity formation through social interaction as a 'conscious reshaping of the self'. Dirkx (1997) refers to this as a transformative learning process whereby the learner builds new meaning constructs to make sense of their changing world. This process requires the learner to broaden their perspectives and to engage in the values and beliefs of others, though different from their own, are equally valid (Taylor, 2000). Cranton (2006) warns that personal change can itself bring about a degree of uncertainty as students attempt to maintain assumptions and worldviews that provide safety which can be exposed or challenged within a learning community. As previously stated, this process can raise psychological barriers for the student such as self-confidence (Merrill, 2012) and anxiety (Hardin, 2008) as they navigate the many academic and social dimensions of higher education. Cranton (2006) suggests that a better social transitioning experience can be achieved through the creation of a learning community, that Tinto (1997) describes as an establishment that provides shared knowledge and shared knowing. Shared knowledge can be achieved through the construction of an educational experience that allows for students to share connected knowledge, while shared knowing relates to not only how students interact and know each other, but also how they come to share the experience of learning.

This study is primarily focused on implementing social learning through peer learning approaches such as Problem Based Learning (PBL) and Peer Assisted Learning (PAL). PBL falls into the category of Group Work as there are defined roles and responsibilities for each individual member, whereas PAL can be considered as Collaborative Learning as each member is not necessarily accountable as no specific project goal or target has to be met. Implementing collaborative learning with a large student cohort creates an obvious challenge for the teacher, but there are ways of incorporating some facets of small group teaching into the large group setting, some examples include breakout groups, pair and share, games and

quizzes (Steinart & Snell, 1999; Edmunds & Brown, 2010). Jordan et al. (2008) suggest that in order to promote positive peer group integration and cohesion, teachers should use small-group learning that encourages less confident students to participate, and to develop strategies to stimulate healthy group competition in learning with consideration for the composition of groups in terms of culture, gender and/or ability.

The importance of group work within higher education correlates with market demand, and particularly within the computing industry where the majority of graduate roles require an ability to work effectively in a team. These work teams are formed to create or service products which go through rapid development and as such, teams are disbanded regularly, and new teams formed to address new development initiatives. Employers seek employees who can work effectively within a team environment (Tarricone & Luca, 2002) and Cotton (2001) points to this as early as 2001 and states that it is widely accepted that developing subject-specific technical skills is no longer sufficient for developing students' employability. Group work practiced in the classroom (or virtually online) creates opportunities to acquire the basic collaborative skills required before graduating (Chowdhury et al., 2002). This demand from industry highlights the need for higher education institutions to develop students' group and team skills (Graen et al., 2006) and has led to terms such as group-based learning in higher education curricula (Chapman et al., 2006). Students themselves also recognise the importance of acquiring group work skills as highlighted in a study by Hodge & Lear (2011) where international students rated group work as the most important skill out of a list of 15 skills. Within the same report, faculty members ranked group work skills in fourth place after interpersonal skills, critical thinking and problem solving. Similarly, Kavanagh and Drennan (2008) revealed that students acknowledged employers' expectations of strong communication, analytical, professional and team work skills. Problem Based Learning is the formal group work approach for this study, and Katinka et al. (2005) examined group work skills among graduate students from schools who used problem based learning study programmes (where group work is encouraged), and non-problem based learning study programmes (without group work practice). The results showed that students from problem-based learning schools showed better preparation with respect to several competencies, especially communication skills and group work.

A number of studies have identified learner group composition as a fundamental issue and research has shown that different grouping criteria for small groups affects learning performance and social behaviours of grouped members (Hooper & Hannafin, 1988; Lin, Huang & Cheng, 2010; Webb, 1982). Johnson & Johnson (1999) suggest that diverse group composition enhances elaborative thinking which brings about a deeper subject matter understanding, enhances reasoning abilities and long-term retention. Webb & Palinscar (1996) further support diversity in group composition by members' gender, ability, and race in which they suggest facilitates positive collaborative learning. Jehn et al. (1999) suggest that diversity based on age and gender positively affect morale, satisfaction, commitment, and perceived performance. However, Milliken and Martins (1996) argue that diversity in groups such as race/ethnic background, gender and age prevent smooth group integration and can be disruptive to teamwork processes. Robbins and Fredendall (2001) found that homogeneity is positively related to team success and motivation. Maznevski (1994) concludes that diverse groups perform less well than homogenous ones do, although the disadvantage of diversity can be moderated through better communication.



With regard to gender diversity in groups, Johnson and Smith (1997) found female students were rated higher than males on traits such as effort, cooperation and initiative. Johnson and Smith (1997) suggest that these are desirable behaviour traits for group cohesiveness that contribute to success. Warrington et al.'s (2000) study suggests female students have higher communication skills compared to male students whereby male students are less inclined to engage in cooperative discussion and unwilling to collaborate to learn, although some studies suggest that female students participate less often than males (Crawford & MacLeod, 1990; Fassinger, 1995) while other studies did not find any significance regarding gender participation in group work (Howard, 2002). Bernard (1997) discovered that males found it difficult to cooperate in groups and that an all-male environment tends to compound the least attractive aspects of male attitudes and behaviour, including lack of cooperative elements in male traits.

Orlitzky and Benjamin's (2003) survey of 138 students revealed that mixed-gender groups outperformed more homogeneous groups and similarly, Wood's (1987) meta-analytic review suggests a tendency for mixed-gender groups to outperform same-gender groups. In a study conducted by Takeda and Homberg (2014) on the effects of gender on group work process and achievement, they implemented a self and peer-assessment method on 1001 students formed into 192 groups. Their results suggest that students in gender balanced groups display enhanced collaboration in group work processes due to reduced social loafing behaviours and more equitable contributions to group work, however, the results did not lead to higher student performance. On further analysis, Carli (2001) found that in gender diverse groups, male members exercised a stronger influence than female members and that contributions made by male members received more attention from other group members than contributions offered by female members of the group. This would suggest that female students have a better experience of the group work process with peer female students than with male students.

With regard to minority gender groups, Sormunen-Jones et al. (2000) define these groups as 'gender exception groups' whereby all members are one gender except one of the opposite gender. They found that gender exception groups achieved lower scores in group writing projects in content, organisation and style and in the total achievement score when compared to same gender or mixed gender groups. A study by Craig & Sherif (1986) found in their group composition study that males exerted a larger amount of influence over other members and groups' decisions when they were in a minority of one in a group. Carli's (2001) meta-analysis study supports these findings. Thus, previous studies suggest that males create a more influential position in gender exception groups and females are disadvantaged in gender exception groups making this group formation less equitable. When evaluating gender balance in groups caution is required as it may oversimplify and miss nuanced detail (Young, 1994; Knaak, 2004) as gender can be considered as both a personal and cultural construction (Chodorow, 1995).

Culture can also impact group cohesion and progression. Within a group project the lack of understanding of culture can increase the students' perceived difficulties of group work, particularly when the norms of behaviour, communication and decision-making are not agreed across all members (Shaw et al., 2015). International students may have a wide variety of learning experiences that are very diverse across a cohort (Shaw et al, 2007). Furthermore, some studies have highlighted that students' difficulties in understanding the pedagogies they

encounter are worse if teachers have not taught outside their own national context, making it more difficult for them to see their own society from an outsider's perspective (Haigh 2002; Baker and Clark 2010). This diversity of experience and perception of culture and group work needs be considered when forming groups, and perhaps a layered and scaffolded approach to group formation is more appropriate in establishing agreed group norms. Although outdated, the Delors Commission (1998) warned that Western education systems could potentially create problems by bringing people from different groups together in a context of competitive stress, which can be observed when the initial mention of group work is being announced to a cohort. This further underpins the need for careful consideration when forming groups, and to consider questioning the value of assessed and non-assessed group work.

Sweeney et al. (2008) observe that despite extensive literature, the benefits of multicultural group work on performance and in the development of group work skills were unclear. Their study, involving international and domestic students, did confirm that group work facilitates the development of interpersonal skills, cross-cultural collaboration, but that this link was conditional on students being prepared for multicultural group work, and on being coached during and debriefed after. This is also reinforced by Schullery and Schullery (2006) from their survey of research findings on diversity in membership of learning groups that there is no straightforward answer to whether mixed groups are an advantage. This is also supported by Sweeney et al. (2008) whereby positive aspects of multicultural group work were recorded, but difficult to suggest that group work is better than individual work when it comes to actual performance. Measuring engagement and participation in group work can be challenging and is not a new one, for example Goffman (1959) states that participation in and of itself positions students as good or competent while a lack of participation can label them as disengaged or disinterested. Cheng (2000) cautions against this labelling as non-participation may be a product of cultural discomfort with unfamiliar teaching methodologies and approaches or weak language skills (Tsui, 1996) rather than a lack of capability or engagement. In addition, students from collectivist cultures may feel reluctant to speak up in front of their peers or to be seen to take the initiative within a group setting. These behaviours may be considered by their peers as being indirect and quiet during group work (Gundykunst & Lee, 2003) which may result in them being disadvantaged because of the negative perceptions their behaviours induce. It is therefore important for lecturers to consider the cultural context nature of participation when evaluating student performance in addition to underscoring the importance of influencing students to examine the perceptions of their peer's performance based on these cultural norms.

Irrespective of status as international or domestic, students may be apprehensive of classroom participation activities and several studies have discovered that both home and overseas students can feel frustrated and angry when they are placed in mixed-culture groups (Volet & Ang, 2012; Murray & McConachy, 2018). This has implications for both students and lecturers who may need to act as mediators in group work disputes (Murray & McConachy, 2018). For example, home students have the expectation of participation based on their cultural norms and failure to observe those behaviours in their overseas peers can lead to resentment particularly when they feel they have to shoulder the greater proportion of the work in a group based project. This is compounded when group work is assessed without individual performance as home students often feel they have no choice but to lead on tasks and take on the greater body of work to ensure their grades do not suffer. However, Murray

& McConachy (2018) state that overseas students can feel that their contributions are not recognised in group work as they are not given sufficient opportunity to contribute to group tasks. Examining this further, some of the reasons underpinning the negative perceptions of group work include the structural constraints which can be intimidating for students (Fassinger, 1996; Fassinger & Howard et al., 2002), insufficient preparation on the part of the students (Tinto, 1997; Ethington, 2000) and language competence (Arkoudis & Kelly, 2016; Li, 2012). These issues can also arise where group work is continued outside of the classroom, such as the preparation of a group project or group presentation.

Chowdhury et al. (2002) state that students' attitudes toward group work differ and depend on their self-efficacy, which results in higher or lower individual satisfaction and individual performances on the group engagement level. McCorkle et al. (1999) claim that although students are aware that group work is important some students still preferred to work alone if the main goal is strong performance, although Landy (1989) states that a particular group member may be satisfied with the group environment despite a weaker group performance. Falls et al. (2014) concluded that students' perception of group work is influenced by personal factors and that this perception affects student performance as group members. Peslak (2005) examined the emotions of students who participated in a long-term group project and found that team emotions at the start of the project were more positive than negative, negative emotions prevailed over time though. Terveen & McDonald (2005) suggest that making students work in groups can imply unequal participation and therefore an unfair share of responsibilities and a similar finding was obtained in a study on students' attitudes towards group work conducted by Gottschall and García-Bayonas (2008). These authors found social loafing as the major perceived risk of group work. Social loafing is cited as one of the main causes of group failure, where social loafing can be described as group members failing to contribute to the group project, but benefit from others and acquire the same rewards as other members of the group. McCorkle et al. (1999) reported that 65% of students identify social loafing as a problem they experienced when undertaking group work and when group work is suggested in class it is the social loafing aspect that affects students' attitudes towards engaging in a group project (Pfaff & Huddleston, 2003; Stark et al., 2007).

There are a number of strategies that can be introduced to reduce the effects of social loafing and many teachers recommend peer-assessment (Cheng & Warren, 2000; Baker, 2008). Other empirical studies have evaluated its benefit (Chapman & van Auken, 2001; Pfaff & Huddleston, 2003) and it is a proven method in not only non-group related activity but also group projects as pointed out by Brooks and Ammons (2003) where they note a reduction in social loafing through the use of peer evaluations as both summative and formative assessment in group projects. Feichtner and Davis (1984) report that three out of five students have the best group experience when peer-evaluation is included in the grading system, as compared to one out of three when peer-assessment is not utilised. Peer and self-assessment are approaches that can be considered to allow peers to reflect on individual performance while considering the performance of their peers. The ability to reflect encourages qualities that assist in the development of professional development and lifelong learning skills (Boud et al., 1999; Boud, 2001; Nicol & Macfarlane-Dick, 2006) and Nicol (2010) also states that the ability to evaluate one's peers is an attribute many employers seek in new graduates.

Henneman et al., (1995) suggest appropriate collaboration between group members requires competence, commitment, respect, and trust between all group members, which suggests that early stage implementation strategies may not yield positive results as building respect and trust, for example, take time. Collaborative learning approaches, such as Peer Assisted Learning, may be more suitable to initially allow participants to engage in a learning process and build efficacy, while getting to know each other without the unnecessary burden of performance measurement. These interactions may facilitate the more formal introduction of group work whereby formal roles and responsibilities and performance measurements can be introduced. Referring to the participants within this study, they are undertaking their second semester of first year so having known each other for at least one semester may facilitate a more favourable outcome. It may be worth considering non-assessed group work to initially allow interaction and communication without adding in the unnecessary component of assessment stress, together with building in reflection as a way for students to examine their social learning experiences. Implementing group work for the first time comes with risks as no prior base experience for students' working with their peers exist. Cattani (2013) found that group members are more effective if they have been the successors of a previous common working experience suggesting efficacy is built upon positive group-based experiences and outcomes.

The teacher naturally plays a critical role in role in successful group work management through a coaching process (Bolton, 1999). This process involves offering students suggestions, observations and insights as work is carried out, and helping teams manage diversity and conflict and mediation where there is hostility. The teaching and learning methods students experience and the meaning they make of it within their educational setting is the result of an intrinsically intersubjective sense making process (Salvatore and Pagano, 2005). This intersubjective relationship is a dynamic one, and if a student begins to identify with other peers within a group who are performing at a higher level, or are highly engaged, then self-identity could potentially change creating expectancies that will affect overt behaviour. To ensure group interaction and cohesion, teachers should consider the importance of defining roles and responsibilities within a group task or project as this may help to mitigate negative group experiences. This places importance on regular teacher engagement with the group to evaluate goals and objectives of an on-going project. Goold et al. (2006) revealed that 15% of students did not like group work because of communication difficulties which usually escalates as group members leave participation and submission too close to due dates. Ruiz Ulloa and Adams (2004) found that students developed positive individual attitudes toward group work if the environment determinants, such as professional communication, interdependence, defined roles, and goals, were present during group work sessions.

Accepting the known challenges of introducing collaborative learning and group work, the possible benefits to both students and teachers need to be strongly considered with suitable implementation strategies evaluated for strengthening the opportunity for a beneficial all-round experience. Indeed, it could be that negative experiences indicate inadequate preparation or facilitation rather an intrinsic limitation of the method. In support of this position, while acknowledging the difficulties of mixed group work, Robinson (2006) stresses the importance of integrating critical reflection and dialogue to promote understandings of differences rather than to ignore them. This is also supported by Cathcart et al. (2006)

whereby they suggest that students should be asked to write up their experiences of group work drawing on explanatory concepts which reflect a critical perspective. It is therefore important that teachers working in internationalised higher education settings are provided the necessary guidance and training on the cultural nature of participation to ensure all students are afforded the opportunity to engage in the teaching and learning process. Equally, higher education institutions should educate students to build a greater collective understanding and appreciation of difference in the way students express themselves, and participate, according to their respective cultural diversity.

## 7. Focus 6: Academic Self-Efficacy

Perceived academic self-efficacy may influence why students choose to attend support classes and may also affect whether students make the necessary effort to engage in the learning process. For these reasons, self-efficacy is examined with a view to investigating if self-efficacy can be enhanced through various institutional support activities.

According to Rotter (1954), the way people ultimately act in a situation will be determined by two things: outcome expectancy; or how strongly they expect the behaviour to have a positive result, and reinforcement value, or how much they value the expected reward. Rotter (1966) also began looking at people's expectations about whether they could affect the rewards they received. Those who generally expected that they could achieve desired rewards through their own actions were said to have an internal 'locus of control'. Those who believed that rewards were due to fate or luck, and therefore out of their hands, were said to have an 'external locus of control'. Bandura's concept of perceived self-efficacy is similar to Rotter's locus of control. Each of these concepts relates to people's beliefs about their ability to acquire the results they want through their own actions. Research has indicated that there is some overlap between the two concepts, but this does not mean the two concepts are the same. In a 1991 article, 'Human Agency: The Rhetoric and the Reality', Bandura explained that perceived self-efficacy is concerned with people's belief about their capabilities to organise and execute a designated course of action. He went on to say that locus of control refers to people's beliefs that outcomes are dependent on their actions or are the result of chance, fate or luck. Self-efficacy highlights the importance of the mental state of someone's perceived ability to do something, and that internal measurement can lead to engaging or disengaging from an activity or action. This description of perceived self-efficacy is very useful and is an endeavour to understand why some students do not attempt a learning activity, meaning their belief in their capability may be a barrier to learning what might be perceived as difficult to them. This concept is worth exploring and may assist in investigating the problem under investigation for this study.

In 1977 Albert Bandura published a paper, titled 'Self-Efficacy: Toward a Unifying Theory of Behavioral Change'. Bandura had broadened his social learning theory to include a wide range of self-beliefs and self-control abilities. He described a system in which a person's beliefs, thoughts, feelings, and physical responses interact with both the environment and the person's behaviour. He then renamed his expanded theory to 'Social-Cognitive Theory', both to distinguish it from other social learning theories and to highlight the central importance of beliefs and thoughts. In 1986, Bandura published 'Social Foundations of Thought and Action:

A Social Cognitive Theory', which set forth his new theory of human functioning. A significant element of Bandura's Social Cognitive Theory is self-efficacy. Bandura defines perceived self-efficacy as people's beliefs about their capability to produce desired results through their own actions. According to Bandura, people with a high sense of self-efficacy approach difficult tasks as challenges to be encountered, rather than threats to be avoided. They also set challenging goals for themselves, and they maintain a strong commitment to achieving them. When faced with an obstruction, they quickly recover their confidence and simply intensify their efforts. Bandura (1986) states that this type of outlook leads to personal successes while reducing stress and decreasing the risk of depression. In contrast, people with a low sense of self-efficacy avoid difficult tasks, which they view as personal threats. They may also have a weak commitment to any goals they to decide to pursue and when faced with an obstacle, they dwell on their personal weaknesses and the potential for failure rather than looking for solutions. If a setback occurs, they are quick to give up and slow to recover their confidence afterwards. This type of behaviour resonates with learning computer programming. For example, students who categorises themselves as having low computer programming self-efficacy might rule out signing up for an advanced programming class before even considering how much work the class would require. At present, as computer programming is very much taught and assessed individually, it is easy to see how a student who has difficulty at the early learning stages can develop low self-efficacy, and this isolation compounds the problem into a cycle, potentially leading to disengagement and dropping out. The challenge, therefore, is to develop higher self-efficacy in students undertaking computer programming, but this must be achieved by making them believe they can do what is perceived as a difficult task. Bandura (1977b) posits that self-efficacy beliefs have such a strong impact because they affect four major psychological processes:

- **Cognitive processes** –The stronger people's perceived self-efficacy, the higher the goals they can set for themselves, and greater their commitment to achieving them.
- **Motivational processes** – People with higher perceived self-efficacy are more likely to expect that their behaviour will lead to a desirable outcome. On the other hand, people with lower perceived self-efficacy may not go after valued goals, because they do not expect to achieve them.
- **Affective processes** – People's beliefs about their ability to cope seem to have a significant effect on how much stress and depression they feel in threatening or difficult situations.
- **Selection processes** – In a 1994 article, 'Self-Efficacy', Bandura gave the example of perceived self-efficacy affecting career choice by suggesting that the higher the level of people's perceived self-efficacy the wider the range of career options they seriously consider, the greater their interest in them, and the better they prepare themselves educationally for the occupational pursuits they choose.

Bandura has outlined four ways in which a strong sense of self-efficacy can be developed. The first and most effective way is through mastery experiences. Simply put, past success strengthens the belief that future success is possible, while past failures undermine it. After people become convinced, they have what it takes to succeed, they are more likely to stick with their goals, even when problems arise. This suggests that in designing programming

activities consideration should be made as to the level of difficulty within the activity itself. Scaffolding the learning should be considered as each activity leads and builds towards the next, gradually increasing the difficulty while self-efficacy is being cultivated.

A second way to build strong self-efficacy beliefs is through vicarious experience; in other words, by watching other people perform the behaviour. The impact of modelling on perceived self-efficacy depends largely on how much the observer sees him/her as being like the model. The more similar the model and observer, the greater the effect. When people watch someone similar to themselves accomplish a task through sustained effort, they are more likely to believe that they can do it, too. At the same time, they may learn some of the skills they need to succeed by observing the successful model. On the other hand, when people see someone fail despite great effort, they are more likely to lose faith in their own abilities as well, which is worthy of serious consideration if implementing a social learning approach. Regarding the problem under investigation, student mentors with high self-efficacy, and proven ability in computer programming, could be selected from the same class and act as the mentors for the social learning activities themselves, this approach aligns to what is being suggested by Bandura for this element.

A third way to instil self-efficacy beliefs is by social persuasion, that is, by telling people that they can be successful. People who are persuaded by others that they have what it takes to succeed are likely to try harder and to be more persistent than those who hold self-doubts. Unfortunately, it is much harder to build self-efficacy this way than it is to destroy it. Unrealistically positive messages may be quickly disproved, leading to failure and demoralisation. On the other hand, overly negative messages may keep people from achieving as much as they could, by persuading them not to attempt a challenging task in the first place or by convincing them to give up at the first sign of difficulty. This element needs careful consideration, one approach through Problem Based Learning (PBL) allows for various roles to be created within the activity itself, thus allowing individuals to identify which aspect they would like to tackle depending on their efficacy of the task itself. Although working in groups to solve problems, each member has a responsibility, which may not be considered as a technical role, but all combined elements lead to the completion of the activity.

A final way that self-efficacy beliefs are reinforced is through emotional and physiological reactions. When people face a stressful or challenging situation, they naturally experience emotional and physiological arousal. Those who are high in perceived self-efficacy may see this arousal as a sign that they are energised. This energetic feeling, in turn, helps them perform their best, which adds to their sense of self-efficacy in the future. In contrast, people who have low self-efficacy may see arousal as a sign of stress they are helpless to control. For this study, as special consideration is given to those students with lower self-efficacy, consideration is required when designing the social learning activities to ensure they are not overly challenging, or deliberately contain stressful elements.

If self-efficacy development is to be proposed through social learning within the research environment, then a mechanism to measure cause and effect would be desirable. This can be achieved qualitatively through a variety of means, but quantitative data would be useful for the conclusion of the study itself. Quantitative data would also assist in generating interest from fellow computer science faculty peers who show a greater interest towards quantitative results than qualitative findings.

## 8. Conceptual Framework

Reflecting on the literature on student engagement and learning, the importance of self-regulation, self-efficacy and social learning were identified as key aspects to consider for the development of a conceptual framework that could be applied within the focus institution. The primary purpose of the conceptual framework was to facilitate engagement in computer programming, a known challenging subject area for first year students (Siegfried et al., 2012; Yang et al., 2015). Although this study is not specifically focused on improving grades, studies in student engagement have discussed improved grades as an outcome (Astin, 1993; Tross et al., 2000). The literature highlighted the importance of the self-regulation of learning through reflective learning approaches (Schön, 1983; Gibbs, 1998), and the concept of self-efficacy emerged as an important element in student engagement and retention as efficacy belief can contribute to action or in-action in the learning process (Chemers et al., 2001; Bandura, 1986).

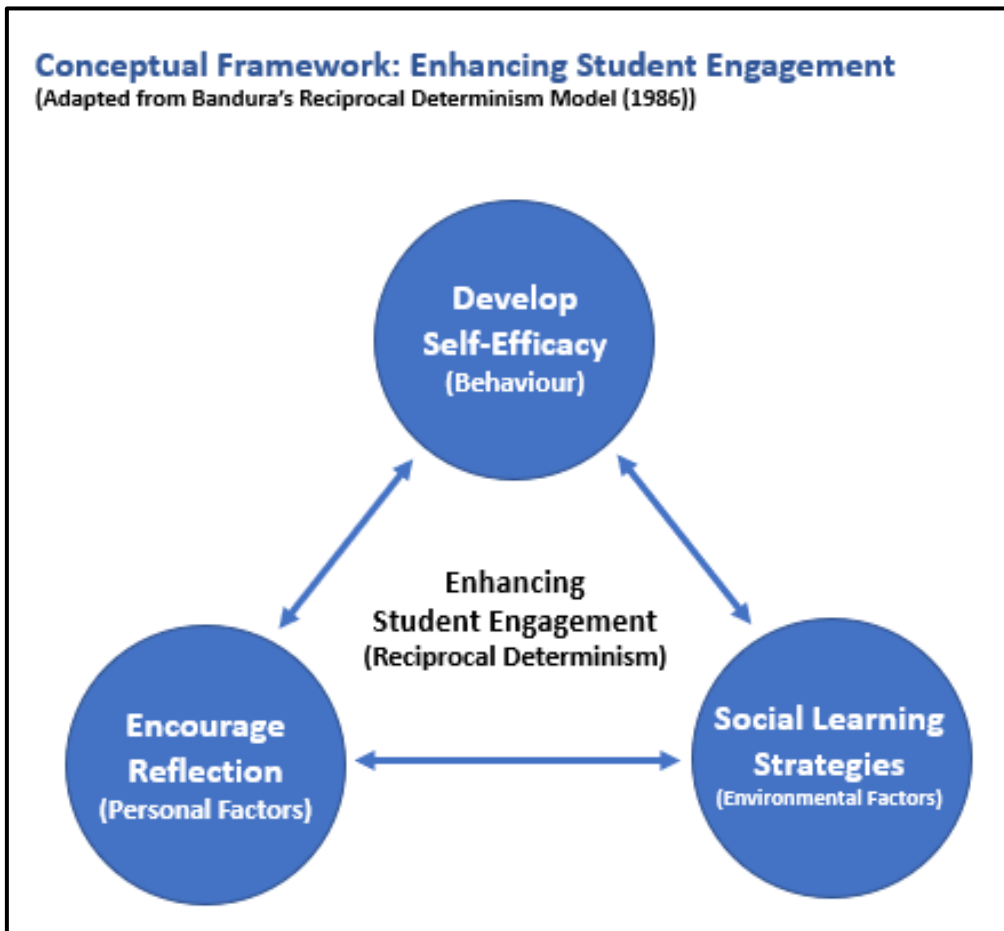
Social learning was also examined, and the literature confirmed what was observed in the focus institution regarding the low levels of peer interaction and peer mentoring (Biggers et al., 2008). Lubell and Vetter (2006) suggest that learners who are meaningfully integrated with their peers are more likely to be protected against early drop-out. Bandura (1977) developed his own Social Cognitive Theory which specifically outlined how learning can occur through observation alone. The introduction of social learning can also be facilitated by student mentors and this aligns to Vygotsky's (1930s) concept of the More Knowledgeable Other (MKO) and the Zone of Proximal Development (ZPD).

With the above key student engagement attributes identified, the conceptual framework for this study is adapted from Bandura's (1986) Reciprocal Determinism Model. Bandura's model describes a dynamic relationship in which individuals, their behaviours and their social environment are dynamically bound together in a process. Using Bandura's (1986, p.24) terminology of reciprocal determinism, environmental factors are substituted with 'Social Learning Strategies', personal factors with 'Encourage Reflection', and behaviour with 'Develop Self-Efficacy'. Student engagement is at the heart of the conceptual framework, and the context is engagement in learning computer programming. These three elements are interlinked and interact with each other. Self-Efficacy can be developed by providing a basis in which students can observe others learning who are similar to themselves, which is encouraged through individual reflecting-on-learning and supported through Social Learning Strategies facilitated by the focus institution.

Figure 2.1 on the following page is the conceptual framework which was used as the basis for building the interventions for the action research cycles. Section 9 discusses the considerations and decisions made in applying this conceptual framework in the focus institution.



**Figure 2.1: Conceptual Framework: Enhancing Student Engagement (adapted from Bandura's Reciprocal Determinism Model (1986))**



## 9. Engagement in Computer Programming: Action Research Planning

With consideration for the Conceptual Framework (Figure 2.1 above) there are several attributes that require tools, methods and approaches to enhance student engagement. This section puts forward the design and implementation decisions made for the interventions for the three action research cycles. The focus was on identifying suitable methods and tools to encourage reflection and for introducing social learning in computer programming. Tools were also sought to measure student engagement and self-efficacy to ascertain if the interventions (reflective and social learning) had any impact on the target participants.

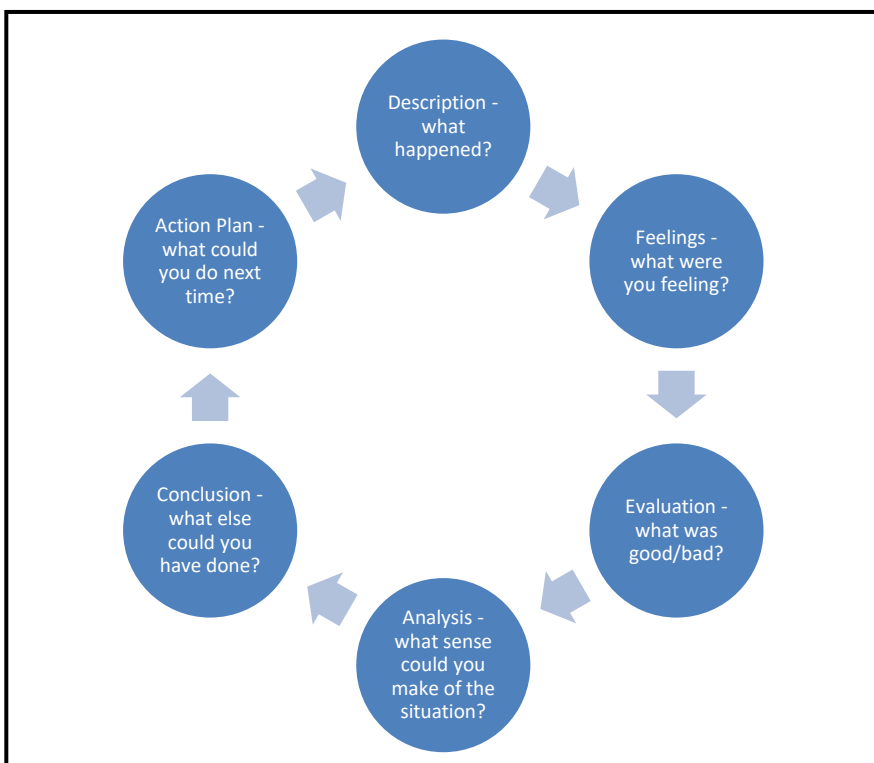
### 9.1 Reflective Learning

With the importance of reflection in the learning process acknowledged, the challenge moved to introducing formal reflective learning through practical means for first year computer programming students. I began researching reflective learning, and tools and approaches that could be used by students who were losing focus within certain subject areas, not necessarily just computer programming. Reflective learning places the emphasis on the self as the source of learning and is intrinsically an individual process. Boud et al. (1985) state that reflection is an important human activity in which people recapture their experience,

think about what they experienced, and then perform an evaluation to inform future action. This research suggested that if learning were to occur, reflection played a significant part. This led to the examination of various tools to facilitate reflection, such as a blog, electronic portfolios, and wikis. For example, with portfolios, Marques et al. (2018) pointed to the positive use of this tool as a reflective learning strategy, but also how the use of portfolios can create tension between the privacy of the students' thoughts as these can be shared or viewable by others, which may lead to discomfort for students. Wong et al. (1995) describe the positive benefits of using a reflective learning journal, which they described as process that is initiated when the learner documents the experience encountered, returns to the experience, recalls what has taken place and replays the experience, and a re-evaluation takes place. This concept of reflecting on action seemed like a practical way of encouraging reflection in computer programming, particularly as this is a very much a learn-by-doing subject.

Upon examining the various tools for introducing reflection, reflective learning journals emerged as the strongest contender. This is because the tool can be provided directly to the participant in a format they are familiar with, i.e. Excel Spreadsheet, and no new learning is required to build or learn how to use the tool itself. In addition, a pre-designed reflective learning journal enables the participant to commence the reflective process straight away. I was conscious of not providing further work on the part of the participant by requiring them to create a Wiki or Blog which would require considerable time to develop and maintain. The reflective learning journal needed to be informed by a reflective model to ensure the principles of reflection were observed. Gibbs Reflective Cycle (1998), Figure 2.2 below, is a well referenced reflective model that was considered for use as the basis for constructing a reflective learning journal for the research participants in this study.

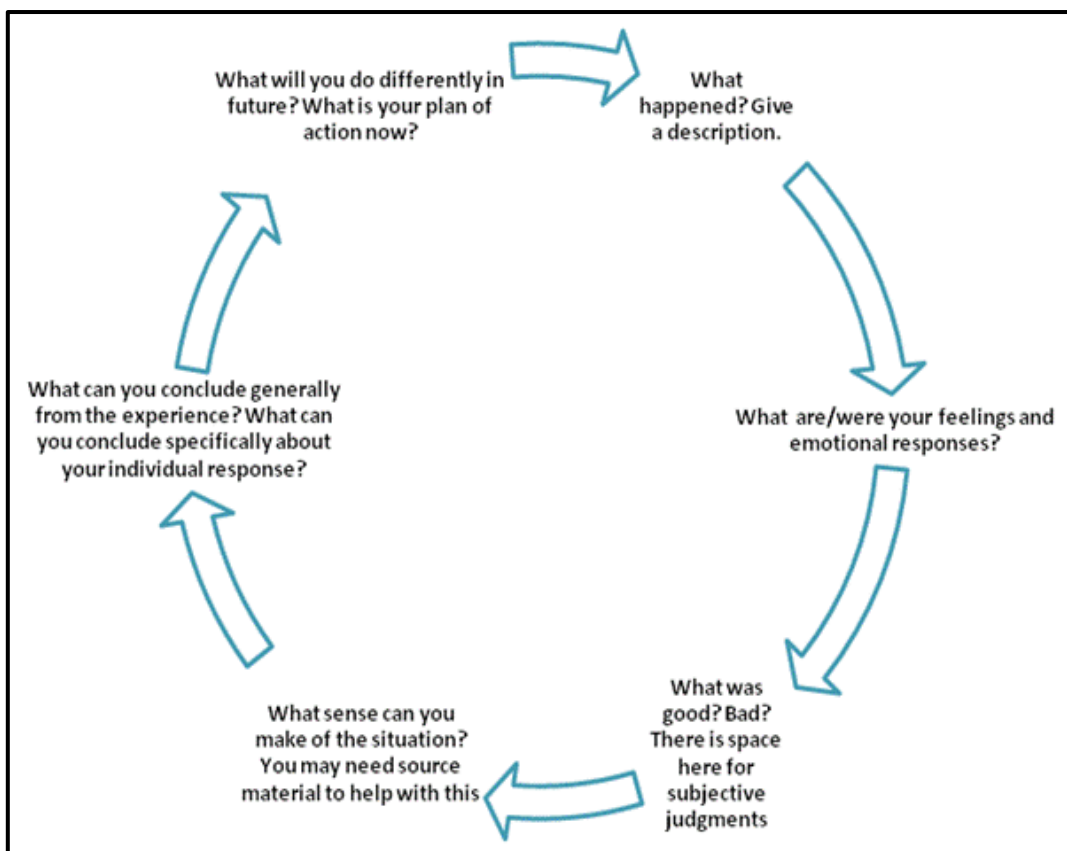
**Figure 2.2: Gibbs Reflective Cycle (1998)**



Gibbs model is useful as it signposts the elements that would need to be considered within a reflective learning journal. Another useful model is Schön's reflective model (Figure 2.3 below). Schön's model (1983) addresses two key aspects of reflection, those being reflection-in-action (thinking while doing the task) and reflection-on-action (thinking after the task). With reflection-in-action there is a need to reflect if the task in hand is going well or if there is a need to stop and re-evaluate ones' actions. Reflection-on-action allows the learner to evaluate what has just been completed, what could have been done differently and what decisions to make the next time the task is to be attempted.

Referring to the applicability to the research environment for this study, a reflective process could be carried out on a weekly basis, specifically after the computer programming module, or the completion of the associated weekly labs. These tasks are very practical in nature so reflecting on these specific elements were initially considered to engage with. One of the key benefits is also the elimination for the involvement of the principal programming lecturer, which initially presented a challenge in terms of requiring a change to how the module was taught and delivered. The reflective learning journal could be supplied to students in which they could reflect on the subject in their own time.

**Figure 2.3: Schön's reflection-in-action/Reflection-on-action model (1983)**



Both reflective models are useful, and contain similar elements with clear sign-posting of the desired steps of reflection. A reflective learning journal was developed based on the key elements of these two models, but a key consideration was the format to be used, and the length of time and effort it would take to complete a single journal entry. This is further discussed in Chapter 3 – Research Methodology, Methods and Tools.

## 9.2 Problem Based Learning and Peer Assisted Learning

The delivery model for reflective learning was introduced through a reflective learning journal, and the concepts of social learning through the practical delivery models of Problem Based Learning (PBL) and Peer Assisted Learning (PAL). PBL and PAL are both learning methods supporting social constructivism.

Regarding the tools and approaches for implementing social learning, Problem Based Learning (PBL) and Peer Assisted Learning (PAL) are the two approaches that stand out, simply because they can be applied to other modules in different subject areas. Both approaches also allow for two different structures, PBL requires group formation with roles and responsibilities, with input from the module lecturer, while PAL is less structured with mentors playing a crucial role in supporting students. In a PBL study conducted by Kinnunen and Malmi (2005) over several years, group work was generally considered a positive experience and they reported that students requested the experience of working in groups which was a major reason for students participating in their PBL studies. Their findings revealed that working in PBL exercises reduced the anxiety caused by the programming course itself, and, they found that it was a relief for many students to find out other members of their group knew as little about programming as themselves. From a performance perspective, their study on programming courses with embedded PBL activities revealed a dropout rate between 0-20%, and in comparison, to programming courses without PBL, the dropout rate was between 30-50%.

The work of both Vygotsky, specifically the MKO, ZPD and scaffolding are all relevant, and so too is Bandura's work on observational learning and Social Cognitive Theory. While computer programming is the specific focus for this study, it is hoped that any potential positive finding using social learning tools can be applied to other subjects and disciplines, and not exclusively for use within computer programming.

With consideration for the challenges of implementing social learning within the classroom, the positive effects of active collaborative learning on student engagement and retention have been well documented (Tinto 1997; 2000; Zhao and Kuh 2004). In Computer Science programmes, collaborative learning is often used to encourage community building with peer groups and project work to facilitate learning. More specific examples of student-led or student-supported approaches include Pair Programming (PP), Peer Assisted Learning (PAL) and Problem Based Learning (PBL). While the results of studies designed to examine the efficacy of PP/PAL/PBL are mixed, there are indications that the use of PP/PAL/PBL may have a positive effect on student engagement and retention within Computer Science programmes (McDowell et al. 2002; Williams et al. 2003; Braught et al. 2011). A growing number of empirical studies also emphasise that student interaction, like studying cooperatively or with peers, can lead to increased success (Howard and Smith-Goodwin, 2010; Hsiung, 2010). Thomas (1993) describes peer tutoring as the process in which one student helps the other student(s) learn a concept or practice a skill, and Comfort (2011) highlights studying with peers can foster new opportunities to members while they are actively engaged in the process. When a student tutors another student, both benefit from the experience. Research shows that the tutoring process leads to positive academic, social and team skill development, and provides the opportunity of receiving immediate feedback which can lead to positive academic achievement of tutees. (Fuchs et. al., 1995; Hsiung, 2010).

While social learning is a worthwhile approach to consider, there is still the issue of the lecturers' perception of group learning in technical subject areas. If the buy-in from both the lecturer and student is not there, then this type of approach may fail to yield any positive benefit. Working with and developing the implementation of social learning strategies with lecturers is critical, which represented an immediate challenge in the focus institution as faculty members were generally opposed to group learning, particularly in computer programming. For this reason, reflective learning was identified as an initial learning intervention as the process did not interfere with how the programming module was delivered and required no direct involvement of faculty members.

### 9.3 Measuring Student Engagement

A substantial body of literature evidencing the importance of students' personal investment in a course of study for their learning to be successful (Trowler 2010) is considered a strong shared understanding of 'Student Engagement'. Within the context of this study, the purpose of measuring student engagement allows for feedback on whether a student cohort has self-reported themselves engaged in a variety of educational activities. This can provide a basis for measuring cause and effect of recent institutional initiatives. In addition, results from previous surveys can be compared along with survey results potentially from other institutions within the sector. It must be noted that this section is not primarily focused on measuring engagement in computer programming but measuring holistic engagement across a variety of engagement themes.

Carini et al. (2006) suggest student surveys which measure student engagement are particularly popular as they are generally less expensive and easier to develop and administer than tests of student knowledge and proficiencies. There is sufficient evidence to indicate that student self-reports are valid and reliable under certain conditions (Pace 1984). These include conditions such as the questions are phrased clearly and unambiguously, the questions refer to recent activities, and the information requested is known to the respondents. As the participants are predominately international, and English not a first language, this aspect needs careful consideration within the design process.

In the United States, the use of the National Survey of Student Engagement (NSSE) is one such self-report that is widely used and accepted in academic work related to student engagement. The UK HEA piloted the NSSE in 2013, and due to its success, the project was extended into 2014. One of the key differences between the NSSE and UK engagement surveys (NSS, UKES) centred on the inclusion of questions to evaluate the level and quality of effort that students invest in their studies (Buckley, 2014) and not just based on their perceptions of their institution and associated support resources and facilities. This led to the inclusion of new questions related to critical thinking, collaborative learning, academic integration and course challenge.

NSSE rests upon a body of knowledge built up since the mid-1980s establishing the relationship between students' investment of time, effort and interest in a range of educational activities, and favourable outcomes such as improved performance, persistence and satisfaction. Astin's 1984 paper dealt with student involvement in their own learning, a concept that was subsequently extended to incorporate earlier aspects such as 'quality of effort' (Pace, 1980, 1984) and 'time-on-task' as well as later work (Pace, 1990; Chickering

and Gamson, 1987) on effective practices in teaching and learning, which ultimately emerged as ‘student engagement’ (Kuh et al., 1991; Pascarella and Terenzini, 1991; Ewell and Jones, 1996; Pace, 1995; Tinto, 1993; Coates, 2005).

Engagement factors measured by survey instruments, such as NSSE, include time spent on campus and participation in activities, such as membership of college sports teams or clubs and societies, leading to concerns from some (Bensimon, 2007, Harper and Quaye, 2009) about whether the assumptions underlying the conceptualisation of engagement apply correspondingly to ‘non-traditional’ students, those who are not full-time, straight-from-school and historically advantaged socio-economic classes. However, research has shown all students benefit from engagement, but some students benefit more than others (Pascarella and Terenzini, 2005). Studies have revealed the compensatory effect of engagement – meaning that those students who are least prepared academically benefit more from engagement than those who are most prepared with regard to effects on grades and persistence (Carini et al., 2006; Cruce et al., 2006; Kuh, 2009b; NSSE, 2007; Pascarella and Terenzini, 2005). However, Kuh et al. (2001) suggest that even though the NSSE is designed to meet with the conditions of a valid and reliable self-report, it does not necessarily mean that the surveys ask about behaviours that are related to desired outcomes, such as whether institutions that engage students at higher levels are adding value to the student experience.

Another tool that is commonly used to measure learning and engagement in the United States is the College Student Experiences Questionnaire (CSEQ). Hu et al. (2002) also believe that the CSEQ meets with the conditions of a valid and reliable self-report and colleges and universities in the United States used their CSEQ results to determine programme effectiveness, measure learning outcomes and impact of campus environments and assess student involvement in campus-wide activities. A modified version of the CSEQ was examined for this study, but from a practical viewpoint, the engagement survey tool that is delivered nationally to public sector colleges and universities in Ireland is based on the NSSE. It was more useful to develop a tool aligned to the Irish Survey of Student Engagement (ISSE) to allow for benchmarking institutional engagement data with that of national findings. Within the ISSE, which is closely aligned to the NSSE tool, students are asked to respond to more than one hundred questions about their experiences of higher education. In addition to question response, further interpretation is possible. The NSSE defines student engagement as students’ participation with activities and conditions likely to generate high-quality learning, and these activities and conditions are measured along five engagement scales (Coates, 2009):

- **Academic challenge** (extent to which expectations and assessments challenge students to learn);
- **Active learning** (students’ efforts to actively construct their knowledge);
- **Student and staff interactions** (level and nature of students’ contact with teaching staff);
- **Enriching educational experiences** (participation in broadening educational activities);
- **Supportive learning environment** (feelings of legitimation within the college community).



With regard to engagement survey instruments, Kuh (2009c) states that given the increasing diversity of college students today, it is inaccurate to presume that what works in one setting for certain students will have the same effects in other settings for different types of students. Because institutional contexts vary, students' experiences will vary, as will what they acquire from their college experience. This highlights the need to review any possible survey tool carefully, ensuring the questions can be easily understood by the participants, and also to treat the findings cautiously as the institution builds up experience in not only using the tool, but modifying it through empirical research and analysis.

#### **9.4 Measuring Academic Self-Efficacy**

There is no one-fits-all tool for measuring perceived self-efficacy (Pajares and Urdan, 2006) and measuring self-efficacy should also be distinguished from other constructs such as self-esteem, locus of control, and outcome expectancies (Pajares and Urdan, 2006). There are many questionnaires for assessing specific kinds of self-efficacy and types of beliefs that researchers have tried to study including self-efficacy for academic achievement, alcohol abstinence, mathematics, problem solving and science laboratory skills. As with any concept that is so broadly used, the results have varied in their nature and quality.

One critical aspect is whether self-efficacy beliefs really have as much impact on behaviour as Bandura claims. Bandura makes a strong case that they do and in a 2003 article, 'Negative Self-Efficacy and Goal Effects Revisited', he points out that this question has now been addressed using a wide variety of study designs and statistical techniques. In this article, Bandura points to statistical analysis of nine large studies which investigated diverse topics, including self-efficacy for work performance, social functioning, academic achievement and sports performance, involving children, teenagers and adults. Some included laboratory studies where self-efficacy beliefs were altered, experimentally, while others included studies of self-efficacy in real life. Two of Bandura's nine meta-analyses studies looked at the perceived efficacy of groups of people working together. The results revealed that groups of people with different levels of perceived self-efficacy tend to behave differently and that it is often possible to predict behaviour changes within individuals as their self-efficacy beliefs change over time. The results from these studies, using different designs, have found evidence for the power of self-efficacy which makes Bandura's claims more convincing. However, it is worth noting that Bandura's results show a degree of association between two variables, but it cannot show whether one caused the other. This needs to be considered for this study as it will be difficult to make strong claims that the proposed interventions have directly influenced self-efficacy measurement results.

The research supports the effectiveness of measuring self-efficacy beliefs but with some caution in interpreting the findings. Bandura developed a tool that can be adapted for use within this study to measure self-efficacy and is further examined in Chapter 3 – Research Methodology, Methods and Tools.

### **10. Literature Review Summary**

The literature review set out to identify possible tools, approaches and interventions to facilitate engagement in computer programming for first year BSc in IT students. Six

literature areas were explored, including the challenges within private higher education, progression and retention, programming as a known difficult subject area, student engagement and motivation, reflective learning, social learning and self-efficacy.

The literature confirms the difficulties with learning computer programming (Yang et al., 2015) and the high failure rates and poor retention as a result (Porter et al, 2013; Caspersen & Bennedsen, 2007). Student motivation was discussed, and intrinsic motivation was highlighted as critical for success, but difficult to stimulate within the learner. An expectancy-value model of motivation (Pintrich et al., 1990) was examined, and through this, reflection and self-efficacy emerged as research areas.

Reflection is perhaps something that can be implemented without too much disruption to the existing lecture structure and format, and because of this, reflective learning journals emerged as a potential tool to facilitate reflective learning in computer programming. Self-efficacy, and the belief in ones' capability within a given task (Bandura, 1977), was examined and according to Bandura (1977), people with a high sense of self-efficacy approach difficult tasks as challenges to be met, rather than threats to be avoided. Those with low self-efficacy avoid difficult tasks. When discussing self-efficacy there needs to be consideration for a tool to measure it, if interventions are proposed then the measurement of self-efficacy will be required to determine the cause and effect of such interventions.

The literature highlights the importance of creating active learning environments, the facilitation of group work and group learning, and the importance of formative feedback to facilitate engagement in learning. The literature suggests that learner interaction is associated with positive progression and retention. Vygotsky (1930s) suggests that teachers use cooperative learning exercises where less competent students develop with help from more skilful peers, or More Knowledgeable Others (MKO's). Bandura's (1973) Social Cognitive Theory also highlights the importance of individual reflection within the social learning process. A combination of both Vygotsky's and Bandura's concepts of social learning were considered in the design of suitable social learning interventions for this study.

Student diversity was explored and issues regarding learning conceptions, gender, age and culture were examined together with group composition and performance. Some studies suggest that diversity in group composition creates a positive group experience and enhances reasoning abilities and long-term retention (Webb & Palinscar, 1996; Johnson & Johnson, 1999) while other studies argue that diversity in groups prevents smooth group integration and can be disruptive to teamwork processes (Milliken & Martins, 1996; Robbins & Fredendall, 2001). These findings are worth considering when deciding on group composition for the social learning activities for this study.

The concept of student engagement was explored and its importance in learning was underscored (Carini et al., 2006). Student engagement ultimately requires the agency of the individual student (Krause and Coates, 2008; Hu and Kuh, 2002), the role of the institution (Kuh, 2009a), teaching staff (Astin, 1993; Quaye and Harper, 2007) and other staff, such as student affairs and academic support professionals (Kuh, 2009b). These engagement elements require consideration if engagement is to be enhanced within the institution. With reference to measuring student engagement, the Irish Survey of Student Engagement (ISSE) measurement tool emerged with consideration for modification for the research environment, this may also facilitate comparison of institutional data with that of national data.



In summary, there are several positive findings within the literature that suggest several strategies that could be introduced within the research environment, these included reflective learning and social learning. The list below represents key actions based on the findings from the literature review.

1. Develop appropriate tools for the implementation of a reflective learning journal.
2. Develop appropriate collaborative learning and group work tools and approaches to introduce in computer programming.
3. Develop tools to measure student engagement and academic self-efficacy.

Chapter 3 – Research Methodology, Methods and Tools will present the various justifications for the tools and approaches that informed the design and development of the action research interventions for this study. A summary of the data collected and the processes undertaken within each of the three action research cycles is also presented along with a discussion on ethical issues.

# Chapter 3

## Research Methodology, Methods and Tools

### 1. Introduction

This chapter will provide the rationale for the research methodology, methods and tools for this study. As the discipline focus is computer science, there is natural alignment to positivistic research within this discipline, where quantitative approaches to research are more widely accepted and perhaps expected. As this study was an investigation into the problem, without explicit knowledge of the problem itself, an inductive approach was deemed appropriate with the acceptance that this may shine light on the problem under investigation encouraging further research. To facilitate this exploratory approach, a pragmatic research methodology was identified, in which the ontological position was relativism, the epistemological approach was constructivism and the research approach was action research. The motivation and justification for the use of this methodology is further discussed in this chapter, along with the research methods and data collection tools.

The chapter will conclude with a summary of each of the three action research cycles carried out between 2014 and 2016, together with a summary of the data collected. This data will be analysed and discussed in Chapters 4, 5 and 6.

### 2. Research Methodology

A research methodology, or paradigm, can be described as a “loose collection of logically related assumptions, concepts, or propositions that orient thinking and research.” (Bogdan and Biklen, 1998, p.22). This paradigm can also be described as a worldview, which Gubba (1990, p.17) describes as “a basic set of beliefs that guide action”. This set of beliefs comes from a general philosophical orientation about the world and the nature of research that a researcher brings to a study. The types of beliefs held by individual researchers, generally influenced by discipline focus, can lead to embracing qualitative, quantitative or mixed method approaches to research.

An important aspect of a research methodology is the ontological position a researcher holds. Blaikie (1993) defines ontology as the science or study of ‘being’ as it deals with the nature of reality, and Maxwell (2013) similarly defines ontology as different perspectives of reality. Ontology is associated with a principal question of whether social entities need to be

perceived as objective or subjective. In this way, researchers may identify with different ontological positions based on individual ideas about reality, which can result in conclusions that differ in opinion. The two main paradigms that are traditionally presented as fundamentally opposed are those of positivism/post-positivism and constructivism/interpretivism (Creswell & Plano Clark, 2007). These can also be described as Objectivism (Positivism) and Relativism (Interpretivism). A positivistic approach to research suggests that social entities exist in reality external to social actors concerned with their existence (Saunders et. al, 2009), in which social phenomena exist independent of social actors. This approach is generally associated with quantitative methods in the belief that research should be conclusive. This type of approach is typical of the discipline of focus for this study, namely computer science. Relativism, on the contrary, perceives that social phenomena are created from perceptions and subsequent actions of those social actors concerned with their existence. Bryman (2004) states that researchers may present a different version of social reality, rather than one that can be regarded as definitive. This stance is generally associated with qualitative methods in the belief that research can be interpretative, and not necessarily conclusive. An interpretive approach allows for greater flexibility when drawing on experience but carries the risk of convincing others of the value of research findings, specifically if relativism is an approach in a dominant positivistic research discipline.

I have taken the ontological position of relativism as I believe that my research is an investigation into how the social actors (students, teachers) interact with each other and their environment in the process of learning, and that my findings are not conclusive but exploratory in nature for a deeper understanding of the problem under investigation. The relativist stance also suggests that there is no absolute truth, in that truth is always relative to some frame of reference, for example, the environment, teacher or students involved. When taking the relativist position within research, a distinction can be made between what is referred to as weak and strong forms of relativism (Stanford Encyclopedia of Philosophy, 2018). Strong relativism is the claim that one and the same belief or judgment may be true in one context (e.g., culture, framework, or assessment) and false in another. Weak relativism is the claim that there may be beliefs or judgments that are true in one framework but not true in another, simply because they are not available or expressible in a different context. In terms of research for this study, weak relativism is assumed given the ontological position (based on experience), and the participants and environmental variables will differ if the study was to be reproduced in another context. Some of the outputs of this study may yield a stronger form of relativism, perhaps relating to research data acquired from structured third-party questionnaires, but still requires caution, as the application of a questionnaire will be intrinsically linked to the local research setting and characteristics of the research participants. With that said, weak relativism does not reduce the impact a study can have on a practice environment.

Within a research methodology it is important to consider what types of knowledge are being sought. Epistemology is the theory of knowledge that defines what kind of knowledge is possible and legitimate, where ontology represents different ideas about reality; epistemology is how we can gain knowledge of it. Epistemology is the process in which an individual acquires new knowledge, and with that considered, I will seek this knowledge from active engagement with the research participants. This epistemological position, or approach

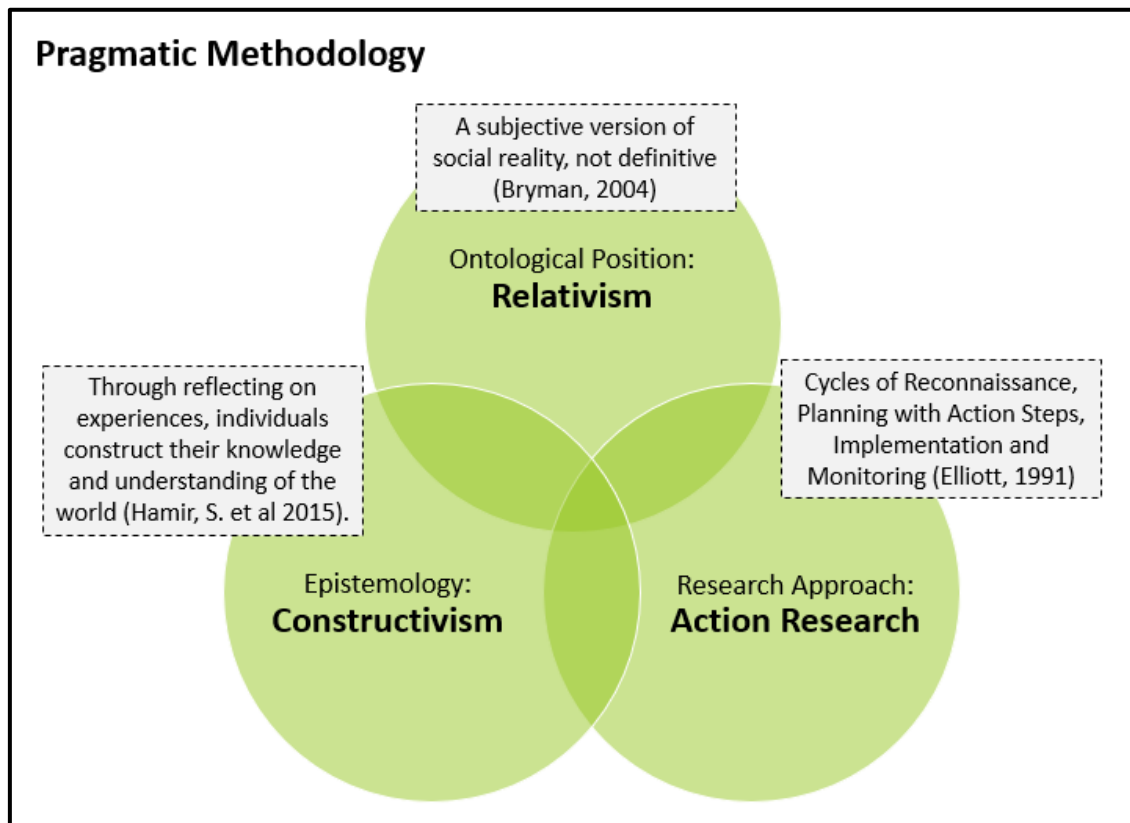
to acquiring new knowledge, can be described as constructivism. Constructivism is a theory of learning based on experience and observation, and reflecting on these experiences, individuals construct their knowledge and understanding of the world (Hamir et al., 2015). The constructivist stance accepts that our understanding of this world is inevitably our construction, rather than a purely objective perception of reality, and no such construction can claim absolute truth, again linking to the relativist position. This is widely recognised both in science (Shadish et al., 2002, p. 29) and in our everyday lives; we recognise that what people perceive and believe is shaped by their assumptions and prior experiences as well as by the reality that they interact with. From this perspective, every theory, model, or conclusion is necessarily a simplified and incomplete attempt to grasp something about a complex reality (Maxwell, 2013), which is associated with a view of knowledge as tentative, and needing to be actively critiqued (Gill et al., 2004).

The work of Creswell (2009) and Guba and Lincoln (1994) describes the epistemological approach of the relativist as one in which the researcher and the participants are linked, constructing knowledge together, usually leading to generally qualitative research methods. The research problem under investigation is also not clearly understood, and I believe the participants are integral in understanding and defining the problem, perhaps in a subjective contextual way, which is fitting with the relativist ontology.

This study can be summarised as a Pragmatic Methodology, in which my research is formed through an ontological position of relativism (constructionism/subjectivism) and my epistemological position is constructivism. A pragmatic methodology supports a mixed-methods approach, allowing a researcher to identify with, and select, a variety of research tools to acquire both quantitative and qualitative data that are deemed useful in assessing research questions, thus being practical within the context of research. This approach does not sit comfortably within positivism or constructivism, but Denscombe (2008, p.273-275) argues that pragmatism is a relevant research paradigm for all types of research. Pragmatism allows the researcher to be free of mental and practical constraints imposed by the “forced choice dichotomy between postpositivism and constructivism” (Creswell & Plano Clark, 2007, p. 27). This further endorses pragmatism as a suitable orientation when embarking on an action research study due to the nature of investigation and reflection required upon the completion of the action research cycles.

My research approach is based on Action Research which is problem-focused and allows for interpretation and suitable for a mixed methods approach. Although relativist research typically aligns with qualitative data, there is a need to capture, analyse and present quantitative to bring about change in practice. As the research environment is predominately made up of positivistic research faculty members, I believe peer engagement in this study would require quantitative data to inform discussion. Action Research is further discussed in Section 3.

Figure 3.1 on the next page provides a visual representation of the pragmatic methodology adopted for this study.

**Figure 3.1: Pragmatic Methodology (Visual Representation)**

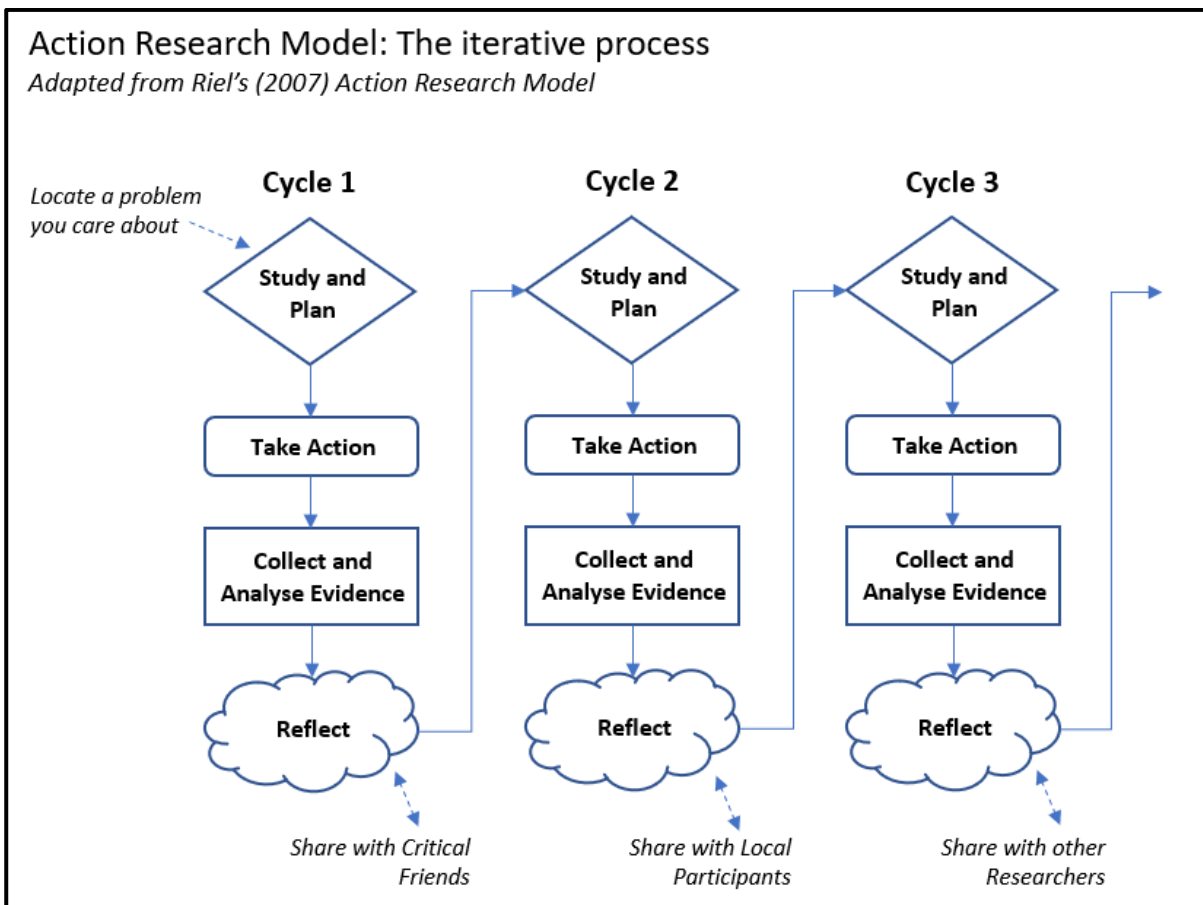
### 3. Action Research

This study was developed through an action research approach that Koshy (2009) defines as an approach involving action, evaluation, and critical reflection, including the reflective interpretations of research participants. Reason and Bradbury (2001) state one of the main purposes of action research is to combine practical outcomes with new understanding, and as a method used for improving practice (Koshy, 2009). Improving practice is a key focus of this research study, Parkin (2009) suggests the purpose of action research is to bring about change in specific contexts, but to create social change in the settings within which it is used (Munford and Sanders, 2003). This is further highlighted by Carr and Kemmis (1986) as they suggest the project takes as its subject-matter a social practice, regarding it as a form of strategic action disposed of improvement.

Meyer (2000) maintains that the strength of action research lies in its focus on generating solutions to practical problems and its ability to empower practitioners, by getting them to engage with research and the subsequent development or implementation activities. Grundy (1982) describes practical action research as a process in which practitioners and researchers come together to identify potential problems and their underlying causes. Mutual understanding is sought, and the goal is understanding practice and solving immediate problems, and this kind of action research is common in the field of education (McKernan, 1991). This is a fitting approach in assessing the research questions and the nature of investigation required for this study.

Mills & Butroyd (2017) describe the basic process of conducting action research consisting of four steps, identifying an area of focus, collecting data, analysing and interpreting the data and developing a plan of action. Sagor (2000) provides a seven-step approach to action research, which begins with selecting a focus, clarifying theories, identifying research questions, collecting and analysing data, reporting results and taking informed action. Kemmis and McTaggart’s (2000) action research spiral is also a useful framework to implement action research from a visual perspective. The action research framework for this study was informed by Riel’s (2007) progressive problem solving through action research model which contains four steps in three cycles, those being planning, taking action, collecting and analysing evidence, and reflecting. An adaptation of Riel’s (2007) model, and the iterative process of action research, is displayed in Figure 3.2 below. The analysis of the action research cycles will make reference to this model throughout the thesis, and particularly in Chapter 4: Self-Regulated and Social Learning, Chapter 5: Measuring and Evaluating Student Engagement and Chapter 6: Measuring and Evaluating Academic Self-Efficacy.

**Figure 3.2: Action Research Model: The Iterative Process (Adapted from Riel’s (2007) Action Research Model)**



### 3.1. Experimental Design

An important consideration when carrying out action research is the design of the interventions, or experiments. The studies themselves can be described as experiments, as each study involves introducing a treatment followed by an evaluation, potentially leading to further action. Creswell (2014) describes the types of design available in experiments as pre-experimental, quasi-experiments, true experiments, and single-subject designs. With pre-experimental designs, the researcher studies a single group and provides an intervention during the experiment; this design does not have a control group to compare with the experimental group. In quasi-experiments, the researcher uses control and experimental groups but does not randomly assign participants to groups (e.g. they may be intact groups available to the researcher, which was the case within Action Research Cycle 3). In a true experiment, the investigator randomly assigns the participants to treatment groups. A single-subject design involves observing the behaviour of a single individual (or a small number of individuals) over time. Table 3.1 below outlines the specific experiment design types that were considered for the empirical studies.

**Table 3.1: Types of experimental designs considered for empirical studies (Adapted from Creswell (2014), p.171-173):**

Design Type	Description
One-Shot Case Study	This design involves an exposure of a group to a treatment followed by a measure. This can be expressed as follows: Group A x-----O
One-Group Pretest-Posttest Design	This design includes a pretest measure followed by a treatment and a posttest for a single group. This can be expressed as follows: Group A O1-----x-----O2
Non-equivalent (Pretest and Posttest) Control-Group Design	This design is a popular approach to quasi-experiments; the experimental Group A and the control Group B are selected without random assignment. Both groups take a pretest and posttest. Only the experimental group receives the treatment. This can be expressed as follows: Group A O -----x-----O Group B O -----O

Considering the research questions being assessed and the research methodology, Table 3.2 on the following page outlines the experimental designs that were selected for the interventions within the action research cycles between 2014 and 2016.

**Table 3.2: Experimental Designs selected for AR Cycles (2014-2016)**

Year	Cycle	Context	Experimental Design
2014	Cycle 1	Reflective Learning Journals (v1)	One-Shot Case Study
2015	Cycle 2	Reflective Learning Journals (v2)	One-Shot Case Study
2016	Cycle 3	Social Learning (PBL and PAL)	Non-equivalent Control-Group Design

The interventions in Cycle 1 and Cycle 2 targeted one group and were based on the same experimental design. Cycle 3 required a control and treatment group and was informed from the findings acquired from Cycle 2.

#### 4. Research Methods and Tools

A pragmatic paradigm was identified for this study, and with Action Research as the approach, this allowed for both qualitative and quantitative methods to be considered. Carey (1993) states that using quantitative and qualitative methods allows the researcher answer substantial questions from several useful perspectives.

The qualitative-quantitative debate is a much discussed topic amongst researchers (Trochim, 2006), since each paradigm boasts a number of advantages over the other. However, the arguments between quantitative and qualitative researchers has been essentially unproductive (Miles and Huberman, 1994). Much of the debate stems from the fact that the two paradigms are based upon very different epistemological assumptions. The quantitative paradigm is based upon positivism, whereby science is seen as the way to get at truth (Krauss, 2005) and the data and its analysis are objective. McNabb (2004) claims that quantitative researchers are often detached from the research study, particularly as the research methods are based upon producing statistics, but statistics are particularly useful for convincing others of change. Qualitative research is based upon constructivism, and Robson (2002) suggests the task of the researcher is to understand the multiple social constructions of meaning and knowledge. Qualitative researchers will often be immersed and dynamically involved in the research in an effort to study more about a situation, consequently, data and its analysis can be largely descriptive.

All empirical research activities for this study were designed around a mixed-methods approach, combining both quantitative and qualitative data. The data from these methods served three main purposes, those being:

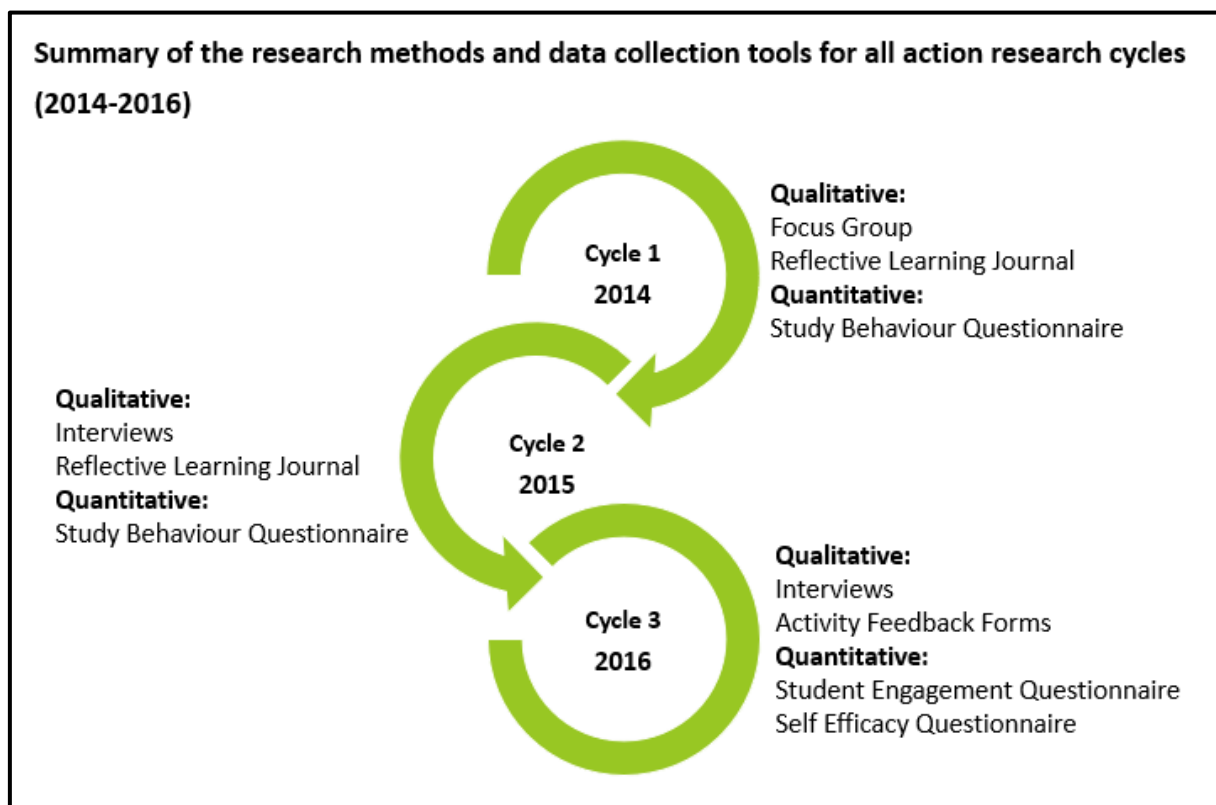
1. Quantitative data will facilitate engagement with my fellow Computer Science faculty members, where most take a positivistic stance within their own research. As this is principally practice based research, with an aspiration to bring about change, quantitative findings may generate the interest of my fellow peers.



2. Qualitative data will assist in my understanding of the problem, based on my experience and the experience of the participants. This approach allows the participants to have a voice within my research and not to solely rely on quantitative findings.
3. Both quantitative and qualitative data allow for triangulation to potentially identify relationships to further assist in drawing conclusions.

I have adopted the use of questionnaires, focus groups, activity feedback forms and interviews as the principal research methods and tools within all action research cycles. Figure 3.3 below provides a summary of the research methods and data collection tools selected for all action research cycles.

**Figure 3.3: Summary of the research methods and data collection tools for all action research cycles (2014-2016)**



#### 4.1 Questionnaire

A questionnaire was the main data collection tool used for this study, it was initially selected as the process could be done relatively quickly so that data analysis could begin right away, allowing for initial insights to emerge. Questionnaires also allow for an objective means of collecting information about participants' knowledge, beliefs, attitudes, and behaviour (Oppenheim, 1992). Quantitative data from questionnaire results can also positively inform any proposed qualitative methods. There is also the advantage of offering anonymity for the participants, which may yield more valid responses. The biggest pitfall of questionnaire usage as a research method is the poor response rate. When considering what is

an appropriate response rate, Babbie (1992) suggests that 50% is 'adequate', 60% is 'good' and 70% is 'excellent'.

The questionnaires used in my empirical studies were to investigate the students' existing study habits, preferences, and behaviour, and to measure student engagement and perceived programming ability. I was particularly mindful of the structure of the questionnaires, especially the sequence of questions, as suggested by Cohen et al. (2007) who suggest commencing with unthreatening factual questions moving towards more open-ended questions that seek responses on opinions, attitudes, perceptions and views together with reasons for these responses. This was considered when designing the questionnaires.

When determining the question wording the researcher must understand who the audience of the questionnaire will be. An important issue that was considered was how respondents may react to particular words and phrases, as the target participants were predominantly international students where English was not a native language. In addition, Fowler (2002) outlines situations that should be avoided when creating questions for questionnaires, such as using direct questions on sensitive issues, avoid the requirement of unnecessary detail, and questions involving knowledge or memory. While this was considered, some of these points could not feasibly be considered within some of the questionnaire tools, particularly regarding the measurement of perceived self-efficacy in computer programming, whereby individuals rating their perceived ability might be perceived as a sensitive issue.

As well as paying attention to question wording, it is also important to consider effective question design, the question design will depend on what kind of information is required from the respondent. There are three basic types of questions that are more generally used in questionnaire design, and these are open-ended, closed-ended and rating scales. I have designed the questionnaires for this study to only focus on closed-ended and rating scales, primarily because this is a mixed methods approach, I wanted to distinguish between the methods of qualitative and quantitative data. This was to facilitate potential triangulation between quantitative data from questionnaires and qualitative data from reflective journals, interviews, and activity feedback forms.

Closed-ended questions provide specific answer choices, however, with these types of yes/no type questions, there is the possibility that additional insightful information may be missed. Rating scales give a numerical value to some kind of judgement (Oppenheim, 1992). This type of question is often popular in questionnaire design since ratings can be applied to almost anything - individuals, objects, abstractions and ourselves. Most scales use five points, more points can be used but respondents can be discouraged by too many choices and often do not use the whole scale (Gillham, 2000). Rating scales were not adopted within all questionnaires, but they were particularly important in the student engagement questionnaire, whereby the external tool design incorporated rating scales. This tool was modified from an existing questionnaire tool, namely the Irish Student Survey of Engagement (ISSE). These modifications were necessary as the research environment was not comparable with the larger public-sector universities for which the tool was originally designed for. Creswell (2014) points out that when a tool is modified for a study, the original validity and reliability may not hold for the new instrument, and it becomes important to re-establish validity. This is particularly important from a statistical perspective, which was considered when presenting findings relating to the reliability of this research tool. Statistical significance testing should also be considered when using questionnaire tools, particularly if a significant cause and

effect claim is being made. Statistical significance testing reports an assessment as to whether the observed scores reflect a pattern other than chance (Creswell, 2014). This was considered carefully for each empirical study, especially when adopting a quasi-experiment design approach, and therefore claiming significance was avoided from a statistical perspective.

When questionnaires are designed, a researcher needs to consider either using a paper-based or web-based data collection method. This will of course depend on the number of participants, the environment and the practicality of processing data. Response rates are also a consideration when electing to use a paper based or web-based version of the questionnaire. Several researchers suggest that web-based surveys attract lower item non-response rates (Boyer et al., 2002; Denscombe, 2006), as well as noting that there is a higher number of participants who leave web-based questionnaires incomplete (Brecko and Carstens, 2006). Manfreda (2008) suggests web survey respondents tend to be anxious about their data being transferred through the internet and may consequently be reluctant to participate. However, web-based questionnaires have advantages, such as the accuracy at the point of data capture using tick boxes, rating scales and electronic text entry. Also, the processing of data is much more efficient, and possibly accurate, as the data is already captured electronically without the need to duplicate this process from paper to electronic form. Both methods were considered for the various empirical studies.

Piloting the questionnaire is the final, but vitally important research design activity. Oppenheim (1976, p.25) stresses "pilot work can help us with the actual wording of questions, but it can also help with such procedural matters as design of a letter of introduction, the ordering of question sequences, and the reduction of non-response rates". I piloted the questionnaires with a number of students from different cohorts to ensure the wording was clearly understood, and to ensure the questions did not require further explanation to understand and appropriately answer.

Table 3.3 below provides a summary of the use of questionnaires as a data collection tool for all three action research cycles (2014 – 2016).

**Table 3.3: The use of questionnaires within action research cycles (2014 – 2016)**

Cycles	Tool	Format	Description
Cycle 1 and Cycle 2	Appendix A: Study Behaviour Questionnaire	Electronic	Start of semester structured questions
Cycle 3	Appendix F: Start and End of Semester Student Engagement Questionnaire	Paper based	Start and end of semester structured questions
Cycle 3	Appendix G: Start and End of Semester Self-Efficacy Questionnaire	Paper based	Start and end of semester structured questions

## 4.2 Interview

Interviews were used as a research method within action research cycle 2 (2015) and action research cycle 3 (2016). A research interview is an informal conversation or discussion, as described by Moser and Kalton (1971, p. 271) as "a conversation between interviewer and respondent with the purpose of eliciting certain information from the respondent". Often, qualitative data from an interview can be used to complement quantitative data from a

questionnaire, to provide a conceptual insight into fact and figures. This method was used as a way of providing depth and dimension to previously gathered data, including action research cycle 1 in 2014. This was the reason for choosing interviews as a data collection method in action research cycle 2 (2015). Interviews were carried out with students to uncover the reasons for their use, or non-use, of the reflective learning journal tool, and to explore study behaviour, habits and trends within the participant cohort.

Interviews are commonly divided into three types: structured, semi-structured or unstructured. Each type varies in format and the choice of the interview will depend upon the information required by the researcher. Atkinson (1967) outlines two principal purposes for interview questions, firstly to ascertain facts (using closed questions) and secondly to ascertain opinion or attitude (using open questions). I selected a semi-structured interview format with open questions as I wanted to ensure I had question consistency between the interviews but also allow the conversation to develop where new themes or depth was offered by the interviewee. This approach can potentially reduce the possibility of comparing data between interviews given the free-flowing nature, but it can yield insights not already considered by the researcher or generate new findings worthy of further investigation.

Table 3.4 below provides a summary of the use of interview as a data collection tool for the action research study. All interviews were recorded (audio only) and transcribed for analysis.

**Table 3.4: The use of interview as a data collection tool within all action research cycles (2014 – 2016)**

Cycle	Tool	Format	Description
Cycle 2	Appendix D: End of Semester Interview Questions	Face to Face - Recorded (audio)	Semi-Structured Questions
Cycle 3	Appendix H: Start and End of Semester Interview Questions (Programming Lecturer)	Face to Face – Recorded (audio)	Semi-Structured Questions
Cycle 3	Appendix I: End of Semester Interview Questions (Social Learning – Treatment Group)	Face to Face – Recorded (audio)	Semi-Structured Questions

### 4.3 Focus Group

Focus groups can be used at the preliminary or exploratory stages of a study (Kreuger and Casey, 2000) in order to help generate hypotheses or gather background information. They can also be used during a study to diagnose problems or stimulate new ideas that can be used later. For this reason, a focus group was held within action research cycle 1 and the findings from this cycle subsequently informed the development and direction of cycle 2 and cycle 3.

A focus group involves an organised discussion where participants discuss their views and experiences of a topic in a non-threatening social environment. Questions are predetermined by a moderator and are usually open ended to spur discussion amongst the participants. This type of group research is a form of group interviewing. During a group interview, the researcher will pose questions separately to the participants with the main emphasis being on the interaction between the researcher and each of the participants, which may provide insight not considered before (Gibbs, 1997). The number of participants for a focus group is an

important consideration, with an ideal size, according to Kreuger and Casey (2000) of 4-8 people. This range should ensure a continuous stimulating conversation amongst the group while at the same time allow each participant enough time to express their unique opinions (Vaughn et. al, 1996).

The focus group held in Cycle 1 (2014) involved 7 participants and was open to students who did, or did not use, the reflective learning journal tool. The room itself was arranged informally, as suggested by Morgan (1998) with chairs arranged with participants facing each other, since eye contact is vital between participants (Kreuger, 1994). The focus group discussion was recorded (audio only), primarily to validate responses and transcribe for analysis. Focus group research provides a unique source of data that can be difficult to find using other research methods. The use of open questions to promote discussion allowed me to gather a large and rich amount of data. Moreover, I could draw upon the participants' feelings and beliefs in order to obtain a deeper understanding of the question being examined. However, like all research techniques, focus group interviews can have limitations. I had little control over the data produced since I did not have full control of the interaction between the participants, and I identified at least two individuals who seemed to have a greater presence during the discussion who were more vocal than others, perhaps intimidating or influencing others to contribute to various discussion points raised. Table 3.5 below outlines the use of focus group as a data collection method within the action research approach.

**Table 3.5: Focus Group Approach for Empirical Research Studies**

Cycle	Tool	Format	Description
Cycle 1	Appendix B: End of Semester Focus Group Questions	Group Based – face to face – recorded (audio)	Semi-Structured questions

#### 4.4 Qualitative Feedback Tools

Qualitative and quantitative methods have different strengths when used to address different kinds of questions, and research goals (Maxwell and Loomis, 2002). Qualitative feedback can provide an understanding from the participants' perspective, which is a crucial part of what I wanted to understand. I wanted to know how the participants in the various studies made sense of the tools and methods that were utilised. The focus on meaning is central to what is known as the 'interpretive' approach to social science, a fundamental aspect of most qualitative research (Maxwell, 2013). Miles and Huberman (1994) argue that field research is far better than solely quantified approaches at explaining the actual events and processes that lead to specific outcomes.

Table 3.6 on the following page summarises the various qualitative data collection tools that were used to gather participant feedback through the course of the action research cycles from 2014 to 2016.

**Table 3.6: Qualitative feedback tools used within all action research cycles (2014-2016)**

Cycle	Tool	Format	Description
Cycle 1	Appendix C1: Reflective Learning Journal (v1)	Electronic (MS Excel)	Weekly journal entries
Cycle 2	Appendix C2: Reflective Learning Journal (v2)	Electronic (MS Excel)	Weekly journal entries
Cycle 3	Appendix E: Social Learning Individual Feedback Form	Paper based	Feedback forms for PBL and PAL sessions

## 5. Ethical Considerations and Validity

This section will discuss ethics, and ethical implications that arose during the three action research cycles, and briefly discuss validity and challenges that were encountered. Research ethics is an integral process of conducting empirical research, and as such, there are several considerations to be made during the planning, implementation and presentation of findings of a study. Ethical consideration is not a once-off activity that appears only in the planning phase, it needs to be considered throughout an entire study, and changes made as necessary despite original planning. The British Educational Research Association (BERA) Ethical Guidelines for Education Research (2018) handbook was referred to throughout the three action research cycles. For all three action research cycles, ethical applications were approved through the university and consent was required from participants and faculty members to participate in the various studies.

BERA describe consent as a process of voluntary informed consent which should be obtained at the commencement of a study and that a researcher needs to remain sensitive to requests from participants to withdraw their consent at any time. In addition to student participation, BERA (2018) also describe the importance of those indirectly affected by research activity, and to consider whether action is appropriate, and when information should be supplied to others, otherwise, there is risk the research could be considered as covert. This was an issue for the first two action research cycle interventions, the use of a reflection journal was supplied to computer programming students and I needed to discuss this with the principal programming lecturer to obtain informal consent to conduct the studies. Upon the completion of reflections from Cycle 1, as suggested by Riel (2012), I passed on my initial reflections to faculty members and to other senior members of staff, which helped me develop a network of critical friends. The reflections were informally passed to all students in the computer programming class, whether they participated in the study or not. This was done through a short presentation with summarised key reflections. This process continued for the remaining two action research cycles.

Regarding data protection, privacy and data security, I followed not only Data Protection Act regulation, subsequently GDPR (General Data Protection Regulation) in May 2018, but also referred to BERA (2018) guidelines whereby they describe the entitlement of both the institution and the individual participants to privacy and their rights to confidentiality and anonymity. The security of data was fortunately something I had professional experience with, this enabled me to build a number of local and cloud-based servers to host and secure

data, including backups, and with no third-party technical involvement which minimised the risk of data loss or leak.

One of the greatest ethical challenges for this study was my role within the focus institution, which changed during the study too. I commenced the study as a Programme Manager, then promoted to Head of ICT Faculty, and now currently Dean of School. Despite these professional role changes, I was consistently a lecturer and researcher. As this was a practice-based research study, it can be considered that I was an ‘insider’ within the research. Insider research can be defined as research conducted by researchers who are already members of the institution (Coghlan and Brannick, 2005). BERA (2018) describe dual roles as a researcher and how this may introduce explicit tensions in areas such as confidentiality. BERA suggest that this can be addressed, or minimised, by making the researcher role very explicit, or involving an independent third party in the research process. As this was practice-based, it was difficult for me to consider a third-party, specifically because I did not clearly understand the problem I was investigating, I needed to be as close as possible to the research and the data.

Merton (1972) describes how insider researchers have privileged access to kinds of knowledge, and Roseneil (1993) states the insider researcher has deeper levels of understanding because of prior knowledge, and knowledge of terminology familiar to field participants. This was clearly an advantage I had within this study, I had the technical knowledge but also experience of the problem, perhaps indirectly as I did not teach programming, but knowledge that allowed me to identify it as a problem. Roseneil (1993) also describes how the insider has a greater potential for establishing rapport and trust of participants, which was the case throughout the entire study. However, Taylor (2011) points out that insider research is not faultless, and that just because someone identifies as an insider it does not mean that this view is the only correct way of seeing the problem under investigation. Within the initial planning stages of cycle 1, which was investigating the problems associated with learning computer programming, I had formed a basis for what I believed was the problem but Mercer (2007) suggests that with greater familiarity insiders are more likely to take things for granted and assume their own perspective of a problem. I was cautious as my discussions with faculty members and through what I found within the literature were somewhat contradictory. This was either a problem with student ability, engagement in learning, or how we are teaching programming, or perhaps all three. Cycle 1 allowed me to explore this further by identifying existing study habits and behaviours. A reflective journal was provided to all research participants in Cycle 1 and Cycle 2. The participants were required to reflect on a weekly basis on their experiences with computer programming. Upon the completion of Cycle 1, there were some issues with student participants suggesting the journal was excessive and time-consuming, which was endorsed by stronger findings of the same process in Cycle 2 whereby participants did not acquire any benefit in engaging in the activity, and felt it was time consuming and a distraction to their studies. This finding was not anticipated, but upon reflection, perhaps it was no surprise as Cycle 1 had initially pointed to the process of formal reflection through a journal as a problem. BERA (2018) point out that ethical research design should avoid making excessive demands on participants, and that in advance of data collection the researcher has the responsibility to think through their duty of care to reduce the potential for distress, discomfort or harm that may arise. Although I feel I may have harmed some of the



participants through the reflective learning journal activity, I am satisfied that I did not coerce or persuade participants to continue to engage in the activity, and with ethical consent, the participants could have opted out at any stage. However, this is a strong reflection that I have made within this study and will be a serious ethical consideration for all future studies involving excessive involvement. It could be argued that my position of power within the focus institution encouraged some of the participants to complete the entire reflective journal.

Within Cycle 1 I hosted a student participant focus group and in Cycle 2 and Cycle 3 I hosted a number of student participant interviews. Reflecting on my role as researcher, but also as lecturer, Shah (2004) suggests that people may not share certain information with an insider for fear of being judged. This may have been an issue in the low up-take for request for interview in the conclusion of the treatment activity in Cycle 3. To support this, Taylor (2007) suggests participants might be more willing to express their true honesty to a detached outsider rather than someone intimately bound to the institution. As my role was more senior to the principal programming lecturer at the time of the pre and post-treatment interviews for Cycle 3, I was aware that my position of power/authority may have influenced the responses during the interviews. I had a friendly relationship with the programming lecturer, but we had opposing views at the time of the pre-treatment interview. The lecturer did not believe group work would be a positive approach to teaching programming, I could not guarantee success with this approach, but I was hoping the lecturer would be willing to engage in the group-based interventions. Taylor (2011) points out the risks of role conflict, disagreement and offence that may potentially disrupt a friendship and suggests that it is probable that such close friendships will shape the researcher's work. This was not an issue for me during the interview process as I was conscious of my reactions to responses and the language I used, I needed to allow the lecturer to speak freely, and honestly, and I supported this fully. That said, participant interview distortion is probably greater within the context of insider research. Preedy and Riches (1988) suggest that research participants may temper the truth in the knowledge that their professional relationship must continue after the research has been completed.

My role also sat between senior management and lecturers, and as such, the information shared with both sides was of a different nature. Humphrey (2012) states that researchers may have relevant experiences and reflections during a research study, but they may be unwilling to publish on matters which could be damaging to their institutions. Mercer (2007) describes a situation where a number of teachers were made redundant during the research study and as the research was faculty appraisal, the researcher felt their own position shift towards the insider end of the continuum. Within Cycle 3 specifically, I was gathering data from students regarding their experiences within, and of, the focus institution. There was an interest from the focus institution regarding specific aspects of this data, and how it could be potentially used to support operational activities. BERA (2018) suggests researchers involved in practice-based research need to consider the tensions arising between collecting data and how this can be used for different purposes, i.e. evaluation purposes or research purposes. In addition, BERA suggest researchers should not involve themselves in work that can be perceived as a conflict of interest, or where commercial gain might compromise the objectivity of the research. I was uncomfortable with operational suggestions from the focus institution, and therefore, withheld specific findings that may have caused potential harm in the long-term, for both faculty and students. There was also an issue with reporting a positive research finding to



senior management, and how this finding was then seen as the solution, rather than seeing something positive as a reason to conduct further exploratory research.

Another notable ethical issue I encountered arose in Cycle 3, where I had conducted an intervention with a treatment group involving social learning activities. Towards the end of the treatment, the control group wanted to know why they were not engaging in social learning activities too and felt disadvantaged. I followed BERA guidelines when designing the study and informed the students within the control group that there were no perceived benefits for the treatment group at the commencement of the study. That said, because the students within the treatment group began discussing positive benefits with their peers in the control group, this led to a feeling of being disadvantaged. Unfortunately, I could not offer the same treatment to the control group upon the completion of the study, as it was the end of the semester and classes had finished. BERA (2018) suggest the intervention should be offered to the control group after the end of the intervention, so I did engage with the control group and completed social learning activities with them in the following semester. To conclude, as suggested by BERA (2018), all participants within the action research cycles were provided outcome information in relevant and useful ways, including debriefing participants in a lecture style discussion.

Regarding threats to validity, Creswell (2014) describes several threats that raise questions about a researcher’s ability to conclude that an intervention affects an outcome, and not some other factor. Although a pragmatic approach was used for this study, and no statistical significance claims are presented, threats to validity are still worth considering when examining findings and discussing outcomes from a study. Researchers should identify potential threats to the internal validity of their experiments and design them so that these threats will not likely arise or are minimised. There are two types of threats to validity, internal threats and external. Internal validity threats are experimental procedures, treatments, or experiences of the participants that threaten the researcher’s ability to draw correct interpretations from the data about the population in an experiment. External validity threats arise when the researcher generalises beyond the group in the experiment to other social groups not under study, to settings not examined, or to past or future situations. Table 3.7 below outlines the internal and external threats to validity, that were considered useful for reference purposes for the experiments carried out between 2014 and 2016, and the minimising action that was taken. True experiments were not carried out, the experiments for this study can be referred to as quasi-experiments as research participants were not randomly assigned. The control and treatment group were already formed by the institution based on class size, these two groups studied the same programming module but on different days with the same lecturer.

**Table 3.7: Considered threats to internal and external validity (Adapted from Creswell, 2014, p.174)**

Type of Threat to Internal Validity	Description of Threat	Action Taken
Diffusion of treatment	Participants in the control and experimental groups communicate with each other. This communication can influence how both groups score on the outcomes.	The groups under examination were separated by a schedule, mitigating this influence, and the control group were not aware of the specific activities the treatment group were receiving.

Compensatory / resentful demoralisation	The benefits of an experiment may be unequal or resented when only the experimental group receives the treatment (e.g. experimental group receives therapy and the control group receives nothing).	This process was difficult to manage during the final action research cycle as the issue did emerge; the control group were invited to participate in similar treatment activities the following semester.
Compensatory rivalry	Participants in the control group feel that they are being devalued, as compared to the experimental group, because they do not experience the treatment.	To mitigate this feeling, I outlined to the control group why the treatment group were selected, in this case because of class size, and reminded them that benefit was not assumed during this phase.
Testing	Participants become familiar with the outcome measure and remember responses for later testing.	As one of the data collection tools was used twice, the time intervals were sufficient to mitigate against this, and the tool itself contained a large quantity of questions.
Instrumentation	The instrument changes between a pretest and posttest, thus impacting the scores on the outcome.	This was not an issue as the same instrument was used for the pretest and posttest measurement.
<b>Type of Threat to External Validity</b>	<b>Description of Threat</b>	<b>Action Taken</b>
Interaction of selection and treatment	Because of the narrow characteristics of participants in the experiment, the researcher cannot generalise to individuals who do not have the characteristics of participants	I restricted claims about groups who did not receive the treatment and did not generalise the results. I propose to conduct additional experiments with groups with different characteristics.
Interaction setting and treatment	Because of the characteristics of the setting of participants in an experiment, a researcher cannot generalise to individuals in other settings.	I did not generalise to other settings but have considered conducting additional experiments in new settings to see if the same results occur as in the initial setting.
Interaction of history and treatment	Because results of an experiment are time-bound, a researcher cannot generalise the results to past or future situations.	I did not generalise to past or future situations but have considered the need to replicate the study later to determine if similar results are found.

## 6. Summary of Action Research Data Collection (2014 – 2016)

This section will summarise the data collection methods and data captured within all action research cycles. To ensure consistency of presentation, I have followed Miles and Huberman’s (1994) suggestion as to how to present information about participants and site, such as the a) the setting (i.e. where the research will take place), b) the actors (i.e. who will be observed or interviewed), c) the events (i.e. what the actors will be observed or interviewed doing), and d) the process (i.e. the evolving nature of events undertaken by the actors within the setting). An additional element has been added, namely ‘The Experience’, to provide a lessons learned summary of using these data collection methods and approaches.

With reference to participant selection for each study, Creswell (2014) describes the selection process for participants as either random or non-random (e.g. conveniently selected). With random selection or random sampling, everyone has an equal probability of being selected from the population, ensuring that the sample will be representative of the population (Keppel and Wickens, 2003). In many experiments only a convenience sample is possible because the researcher must use naturally formed groups or volunteers. When individuals are

not randomly assigned, the procedure is called a quasi-experiment. When individuals can be randomly assigned to groups, the procedure is called a true experiment (Creswell, 2014).

## 6.1 Action Research Cycle 1 (2014)

### Data Collection Summary

*Research Description:* To investigate the current study habits and preferences of first year BSc in IT students to uncover themes. In addition, to introduce a reflective learning journal tool to encourage engagement in computer programming. Post treatment, a focus group was carried out to evaluate the usefulness of the reflective learning journal.

*Timeline:* January to June 2014.

*Experimental design:* One-Shot Case Study (treatment, followed by measurement).

*The setting:* College campus – lecture room and private meeting room.

*Lecture room:* The lecture rooms for both the computer programming and personal and professional development modules were large air-conditioned and wi-fi enabled rooms configured in a traditional style format with the whiteboard and projectors positioned at the top of the room. Each student had their own desk area, although small, it allowed each student to use their laptop within the classes. The room itself could hold up to 100 students, and the attendance was generally between 70 to 80 students per class.

*Meeting room:* The focus group was held in a small meeting room located on a floor dedicated to IT faculty members. The room had a window, but the participants could not be viewed during the discussion unless an individual entered the room. A notification was placed on the door during the focus group discussion.

*The actors:* First year, second semester, BSc in IT students with the characteristics of being international (predominantly from Brazil), mixed-gender, and mature-age (over 23). Two modules within this semester were primarily used to discuss and/or capture data for this cycle, those being Computer Programming and Personal and Professional Development.

*Participant selection:* Convenience sample (naturally formed group with volunteers). All three data collection events required volunteers from the same group. This group was already formed as they were in their second semester of first year. Participation in the questionnaire and reflective learning journal were open to all students. The focus group discussion was

only available to those who participated in the reflective learning journal activity over the course of the semester.

*The events:* Computer Programming was the target module which was further supported through a Personal and Professional Development module. A questionnaire, a reflective learning journal tool and a focus group discussion were introduced to capture, examine, and discuss the participants experience of computer programming over the semester.

*The process:* Three data collection methods were introduced commencing with an online structured questionnaire, followed by a reflective learning journal tool, and concluding with a semi-structured focus group. As the target cohort were enrolled on a Personal and Professional Development module that I facilitated within the same semester, I was able to discuss my research purpose and my plan to collect data directly with the students. I invited volunteers to participate in the study which commenced with an online structured questionnaire that contained 10 closed questions and 28% (n=31) of the sampling frame completed it. As the questionnaire was structured and captured digitally, I was able to share a results summary to the entire class the following week. This was followed by a general class discussion which enabled the class to speak freely about the positive and negative aspects of their educational experience to date. Computer Programming, as revealed in the questionnaire, was identified as the most challenging subject area for this cohort.

The second data collection tool was a structured reflective learning journal designed using Microsoft Excel. I provided a lecture on reflective learning and introduced the reflective learning journal tool to the class. 70% (n=77) volunteered to participate in the completion of the reflective learning journal on a weekly basis in conjunction with computer programming, although students had the option of using the journal tool for other subjects within their semester. I sought consent from those who volunteered as I needed to identify the students who completed the reflective journal so I could request volunteers to participate in an end of semester focus group discussion.

The final stage of the data collection process was a semi-structured focus group. As I was able to identify the participants who completed the reflective learning journal, I invited them to volunteer their participation in a focus group discussion to review their collective experience of the process and use of the tool itself, 7 students volunteered to participate in the focus group.

Further information on the process for cycle 1 is detailed in Chapter 4 – Self Regulated Learning and Social Learning, section 2.1, page 78.

*The Experience:* When I initially designed my data collection plan, I needed to consider how to interact with the target cohort and consider the ethical issues that were applicable. As the primary focus was on computer programming, which was not a module that I facilitated, I needed to discuss my research with the principal programming lecturer. I was fortunate that the programming lecturer was very

engaged in what I was trying to achieve and was happy to put aside time to assist in the research process. The initial fact-finding questionnaire that was issued to the students was facilitated by the principal programming lecturer. In addition, the programming lecturer also encouraged and reminded the participants to complete their reflective learning journals on a weekly basis. This was very helpful as the endorsement of the use of the tool by the programming lecturer held considerable weight with this cohort. As I held a senior role at the time, I was aware that my position may have had a persuasive influence on participation. To mitigate this I provided transparent information to the students, including printed information sheets on the purpose of the research and means of data collection, storage and use, and detailed consent forms which outlined my agreement with the participant and how I was accountable to them and others outside the institution with contact information if they had any issues along the way. Upon receiving the completed reflective journals I was able to identify those that engaged in the activity over the semester, this enabled me to email this cohort and seek volunteers for participation in a focus group to discuss their experience.

The focus group was conducted in a small meeting room located on a floor within the building dedicated to IT faculty. At the time of the discussion the area itself was quiet as it was at the end of the day. The room was bright and contained a large round table with chairs evenly placed around it. I reminded the 7 participants that I would be recording the discussion and making all comments anonymous. I also took notes during the discussion and used a semi-structured approach. The discussion began well, and the participants took their turn in answering the initial questions. As we moved through the questions some members became more vocal and seemed to dominate the initial response to questions, the discussion took a more negative tone in which others became less vocal and seemed to follow the dominate voices as the discussion progressed. As this research method was new to me, I did not know how to intervene without abusing my perceived position of power, I did not want my opinion to lead the participants in any way. I found this challenging, but I was satisfied that I had accurate responses to the structured questions that I had outlined. In addition, I believe I made them feel comfortable to speak freely as the general response to the use of the tool I designed was generally negative, which was the desired transparency I was seeking from the participants. If I were to conduct a focus group again, I would seek further guidance on how to manage dominate voices within a group discussion group.

One final note on experience would be ethical issues that arose within the entries contained in some of the participant reflective learning journals. Although the participants were informed on what they should and should not document, there were a number of journal entries that made negative and derogatory remarks about staff members within the institution, these staff members were known to me so I found this aspect difficult as it was my first real test of academic integrity in research. This served as a reminder of

the importance of data security and privacy and ensuring anonymity and the destruction of data beyond its original purpose.

Table 3.8 below provides a summary of the research methods and data collected for cycle 1.

**Table 3.8: AR Cycle 1 - Data Collection (January to June 2014)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Study habits questionnaire	Quantitative	110	31	28%
Reflective Learning Journal	Qualitative	110	77	70%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Focus group (reflective journal evaluation)	Qualitative	110	10	7

## 6.2 Action Research Cycle 2 (2015)

### Data Collection Summary

*Research Description:* To revisit the study habits and preferences of first year BSc in IT students (following the results from AR Cycle 1). In addition, to introduce a revised reflective learning journal tool to encourage engagement in computer programming. Post treatment interviews were carried out to evaluate the usefulness of the revised reflective learning journal.

*Timeline:* January to June 2015.

*Experimental design:* One-Shot Case Study (treatment, followed by measurement).

*The setting:* College campus – lecture room and private meeting room.

*Lecture room:* The lecture rooms for both the computer programming and personal and professional development modules were large air-conditioned and wi-fi enabled rooms configured in a traditional style format with the whiteboard and projectors positioned at the top of the room. Each student had their own desk area, although small, it allowed each student to use their laptop within the classes. The room itself could hold up to 100 students, and the attendance was generally between 70 to 80 students per class.

*Meeting room:* The participant interviews were held in a small meeting room located on a floor dedicated to IT faculty members. The room had a window, but the participants could not be viewed during the

interview unless an individual entered the room. A notification was placed on the door during the interview. This was the same room that was used for the focus group in cycle 1.

*The actors:* First year, second semester, BSc in IT students with the characteristics of being international (predominantly from Brazil), mixed-gender, and mature-age (over 23). Two modules within this semester were primarily used to discuss and/or capture data for this cycle, those being Computer Programming and Personal and Professional Development.

*Participant selection:* Convenience sample (naturally formed group with volunteers). All three data collection events required volunteers from the same group. This group was already formed as they were in their second semester of first year. Participation in the questionnaire and reflective learning journal were open to all students. Interviews were only available to those who participated in the reflective learning journal tool over the course of the semester.

*The events:* Computer Programming was the target module which was further supported through a Personal and Professional Development module. A questionnaire, a reflective learning journal tool and interviews were conducted to capture, examine, and discuss the participants experience of computer programming over the semester.

*The process:* Three data collection methods were used commencing with an online structured questionnaire, followed by a reflective learning journal tool, and concluding with semi-structured interviews. The process for cycle 2 was similar to cycle 1, with the difference being the use of interviews instead of a focus group discussion.

As the target cohort were enrolled on a Personal and Professional Development module that I facilitated within the same semester, I was able to discuss my research purpose and plan to collect data directly with the students. I invited volunteers to participate in the study which commenced with an online structured questionnaire that contained 10 closed questions and 66% (n=53) of the sampling frame completed it, which is a notable increase from those who completed the same questionnaire in cycle 1, despite a lower sampling frame. As per the results in cycle 1, Computer Programming, was identified as the most challenging subject area.

The second data collection tool was a structured reflective learning journal designed using Microsoft Excel. This was a modified version based on the feedback received in cycle 1. I provided a lecture on reflective learning and introduced the reflective learning journal tool to the class. 23% (n=18) volunteered to participate in the completion of the reflective learning journal on a weekly basis, the uptake was considerably lower than the first cycle. I sought consent from those who volunteered as I needed to identify the students who completed the reflective journal so I could request volunteers to participate in an end of semester interview.

The final stage of the data collection process was a semi-structured interview. As I was able to identify the participants who completed the reflective learning journal, I was able to seek volunteers to review their experience of the process and use of the tool itself, 4 students volunteered which was the desired target.

Further information on the process for cycle 2 is detailed in Chapter 4 – Self Regulated Learning and Social Learning, section 2.2, page 80.

*The Experience:*

As the primary focus was on computer programming, which was not a module that I facilitated, I needed to discuss my research with the principal programming lecturer as was the case in cycle 1. During the period between cycle 1 and cycle 2 a new lecturer for computer programming was hired. This presented a different challenge to that experienced in cycle 1 as the buy-in to my research was not initially there. Due to how the research was designed there was no requirement for the programming lecturer to engage in my research, or any requirement to use any of the class time to acquire data. The initial fact-finding questionnaire was issued to the students in my personal and professional development module. I was able to discuss the use of the reflective learning journal and invite students to participate within this module too. The programming lecturer had strong views on how best to teach programming and what approaches worked best and what was considered counterproductive. This presented a challenge to my research, but it did not interfere with the data collection plan.

As I held a senior role at the time, I was aware that my position may have had a persuasive influence on student participation. To mitigate this I provided transparent information to the students, including printed information sheets on the purpose of the research and means of data collection, storage and use and detailed consent forms which outlined my agreement with the participant and how I was accountable to them, and others outside the institution, with contact information if they had any issues along the way. Upon receiving the completed reflective journals, I was able to identify those who engaged in the activity over the semester, this enabled me to email this cohort and seek volunteers for participation in an interview to discuss their experience.

The interviews were conducted in a small meeting room located on a floor within the building dedicated to IT faculty. This was the same room that was used for the focus group in cycle 1. The room contained a large rectangular table with two chairs on each side. I reminded the participant that I would be recording the interview and how it would be anonymised. The approach was semi-structured, and I allowed the participant to go off topic, as necessary. I also informed the participant that I would be emailing the transcript of the interview in which they could make amendments as necessary if they felt their comments were mis-represented in any way. This approach allowed the participant to feel more comfortable and I was surprised at how confident they all were in expressing their opinions, which was very helpful in drawing conclusions. In addition to addressing



my questions the participants offered up new information that I had not considered before and there was a consistent message that students learned best when working with each other outside of the scheduled classes. The social interaction outside of class time seemed to be a critical element to learning programming for these participants.

Regarding the reflective learning journal submissions, a similar ethical issue arose with journal entries containing negative and derogatory comments about staff members within the institution. I was also approached by the programming lecturer who was seeking access to the journals which I immediately declined. Again, these issues underscore the importance of ethical procedures regarding data privacy and security.

Upon reflecting on both cycle 1 and cycle 2 it may have been useful to invite all students, whether they completed the reflective journal or not, to participate in the focus group discussion or interviews. The completion rate for the reflective learning journal was considerably lower in cycle 2, 23% completed it in cycle 2 versus a completion rate of 70% in cycle 1. I have no specific evidence as to why there was a notable difference in uptake other than there being a different programming lecturer for each action research cycle. This perhaps underscores the importance of engaging with faculty regarding research and seeking out champions who are willing to facilitate academic research.

Table 3.9 below provides a summary of the research methods and data collected for cycle 2.

**Table 3.9: AR Cycle 2 - Data Collection (January to June 2015)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Study habits questionnaire	Quantitative	80	53	66%
Reflective Learning Journal	Qualitative	80	18	23%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Interview (Journal evaluation, Study preferences)	Qualitative	80	4	4

### 6.3 Action Research Cycle 3 (2016)

#### Data Collection Summary

*Research Description:* The outcomes of action research cycle 1 and cycle 2 revealed a preference by students to study in groups. Cycle 3 set out to introduce social and peer learning in computer programming.

*Timeline:* January to June 2016.

*Experimental design:* Non-equivalent (Pretest and Posttest) Control-Group Design. (Quasi-experiment).

*The setting:* College campus – lecture room and private meeting room.  
Local Coffee Shop – bookable space.

*Lecture room:* The lecture room for the computer programming and personal and professional development modules were large air-conditioned and wi-fi enabled rooms configured in a traditional style format with the whiteboard and projectors positioned at the top of the room. Each student had their own desk area, although small, it allowed each student to use their laptop within the classes. The room itself could hold up to 100 students, and the attendance was generally between 70 to 80 students per class.

*Meeting room:* The participant interviews were held in a small meeting room located on a floor dedicated to IT faculty members. The room had a window, but the participants could not be viewed during the interview unless an individual entered the room. A notification was placed on the door during the interview. This was the same room that was used for the focus group in cycle 1 and interviews in cycle 2.

*Coffee Shop:* The interviews with the programming lecturer took place in a local coffee shop. The coffee shop was located close to the campus and had a bookable area on the top floor. The area was quiet, and the configuration was informal.

*The actors:*

- First year, second semester, BSc in IT students with the characteristics of being international (predominantly from Brazil), mixed-gender, and mature-age (over 23). Two modules within the semester were primarily used to discuss and/or capture data for this cycle, those being Computer Programming and Personal and Professional Development. This approach was used in cycle 1 and cycle 2.

- The principal computer programming lecturer facilitated the development of some of the social learning interventions and participated in a pre and post-treatment interview.

*Participant selection:* A control and treatment group were identified based on pre-established institutional class formation. One of the two pre-established groups had a larger pool of students to recruit volunteers from, this was the primary reason for identifying this group for treatment. Before this decision was made an efficacy in computer programming questionnaire was issued to both groups, the larger group had an overall lower score in group work related questions

which confirmed the initial decision to select the larger cohort for intervention. Students from both the control and treatment group were invited to participate in the study with only the treatment group receiving the planned social learning interventions. The principal programming lecturer participated by facilitating the interventions and through pre and post-test interviews.

*The events:*

Computer Programming was the target module which was further supported through the Personal and Professional Development module. Participants from both the control and treatment group were invited to complete a start and end of semester questionnaire on student engagement and self-efficacy. The treatment group engaged in five social learning activities over the semester (student volunteers were sought to act out the role of mentors) and participated in the completion of activity feedback forms and post-treatment interviews. The principal programming lecturer facilitated through the creation of the social learning intervention activities and by participating in a pre and post-test interview.

*The process:*

Both the control and treatment groups completed a student engagement and self-efficacy in programming questionnaire at the start and end of the semester. The treatment group participated in social learning activities throughout the semester, with volunteers completing feedback forms. Interviews were carried out with treatment group participants post treatment and the programming lecturer was interviewed pre and post treatment to capture feedback on the effectiveness of the social learning activities.

The research study was introduced to both the control and treatment group at the commencement of the semester through a Personal and Professional Development module that I facilitated. A key element of this study was to build on cycle 2 and the core focus was introducing social learning in computer programming. The participants discussed how studying in small groups outside of class was a very effective method of learning. The initial plan was to introduce formal social learning interventions within the scheduled computer programming class, and this required the approval from the principal programming lecturer. In cycle 1 and cycle 2 there was no formal requirement for the lecturer to participate in the study, so this cycle was notably different.

The process for identifying the treatment group was based on two factors. As the two groups were already established, one group contained a larger cohort (n=90 versus n=45) and initially seemed like a better group to perform the treatment with because of the potential of acquiring more data. Research had also pointed to the difficulty in engaging students in large groups. Both groups were asked to volunteer in the completion of a student engagement and a self-efficacy questionnaire at both the start and end of the semester. 49% (n=44) of the treatment group and 78% (n=31) of the control group participated in the completion of these questionnaires. At the commencement of the semester the efficacy score for the larger group revealed a lower overall score in the group work related

questions. This further endorsed the identification of the larger cohort as the treatment group and to receive the social learning interventions over the semester.

The social learning intervention activities were designed with the programming lecturer's input. The activities needed to be achievable within the time allowed, and at a level that was appropriate to the students' expected knowledge at the various stages of the semester. Students were invited to volunteer as mentors and based on their existing level of knowledge with programming, various roles and responsibilities were assigned depending on the type of planned treatment activity. Five student mentors were assigned a programming facilitation role and these mentors worked interchangeable through the course of the five interventions. Two additional mentors participated in setup and completion activities.

Upon the completion of each social learning activity (5 activities in total) participants were invited to complete a paper-based feedback form to capture their anonymous feedback on the activity itself. The uptake was generally low for this activity and this was partly due to the time available to complete the feedback form. The end of each activity corresponded with the end of class time which naturally conflicted with students' preparing for their next class or attending other external activities. 46 feedback forms were captured over the five social learning activities.

Upon the completion of all five social learning interventions participants from the treatment group were invited to participate in an interview to gather their feedback on the interventions that were carried out. As I was able to identify who participated in both the start and end of semester engagement questionnaires, I emailed this group seeking volunteers. 4 out of a target of 15 responded for participation and these interviews took place in the same meeting room that was used for the interviews and focus group in action research cycle 1 and cycle 2. Upon the completion of the interviews they were all transcribed and a copy sent to each participant to confirm the transcription was an accurate reflection of the interview, allowing for amendments to be made. Two of the participants put forward amendments which were carried out.

The programming lecturer was also interviewed at the end of the semester and this took place in the same local coffee shop as the first interview. A transcript of the interview was emailed to the lecturer to confirm the accuracy of what was said and the ability to make any amendments, as necessary.

Further information on the process for cycle 3 is detailed in Chapter 4 – Self Regulated Learning and Social Learning, section 2.3, page 82.

*The Experience:*

At the commencement of the semester I conducted an interview with the programming lecturer in a local coffee shop as I felt this would be a more comfortable environment for the lecturer to speak openly. The lecturer was very open about discussing group work and suggested this approach was counterproductive to learning computer programming. The lecturer described this further by suggesting that

there are individuals who have an innate ability to succeed in programming, and others who will never grasp it, and by grouping students together with varying ability you are holding the stronger students back from reaching their full potential. The lecturer expressed concerns about introducing group work as the existing approach through solitary learning activities worked well. I introduced my proposal for social learning interventions and the need to use a portion of the programming class time to achieve this, the lecturer was happy for me to do this which I was surprised at given the existing view of group work. The lecturer was interested in my approach but not convinced that my efforts would yield any positive result. As I held a senior role at the time of the interview, I needed to ensure the lecturer could speak freely and not feel obliged to engage in the study. We already had a friendly relationship which I believed facilitated a free and open conversation to take place, but of course I cannot guarantee that my role and position did not have an influence on the positive engagement from the programming lecturer. As the lecturer was open to discuss opposing views on social learning, and of finding any positive outcome to the proposed interventions, I believe I mitigated my position of power with a certain level of comfort.

Both the student engagement and self-efficacy questionnaires were paper based. Research had shown that paper-based questionnaires had a higher completion rate, but of course, had their draw backs such as reaching a wider audience and the potential errors when converting to digital format. I set aside time at the end of my personal and professional development module for the completion of the questionnaires, and I was surprised at the completion rate for both the questionnaires issued at the start and end of semester. My role may have had an impact on the high completion rate, and perhaps using paper-based questionnaires put more pressure on the students when handing it in. To mitigate this, I asked the students to hand back the questionnaire face down on my desk and reminded them that they can opt out of the study at any stage. The student engagement questionnaire contained many questions as I wanted to keep it closely aligned to the national Irish Survey of Student Engagement (ISSE) questionnaire and I did observe that some students struggled to complete the questionnaire as they navigated the various sections of it. Upon the completion of the study I had obtained a considerable data set on broad student engagement themes but realised that a lot of the questions were not useful to the study. If I were to reproduce this study, I would certainly reduce the amount of questions and only select those that I believe would be suitable in answering the research questions. Regarding the self-efficacy questionnaire, I realised that asking students to complete this while I was in the room may have been uncomfortable for some, as it was measuring their ability in computer programming.

The mentors were crucial in the implementation of the social learning activities, and it is important to point out these mentors were peers from the same class as the treatment group. While the

mentors were very positive about their experience throughout the process they did point to some difficulties with their peers outside of the interventions, such as the expectation that they would be able to help their peers at various other stages of the semester which added an additional burden of work for some mentors. This was not anticipated, and future sessions require the clarification of the role of the mentors to the participants to manage the expectations of support and engagement.

The treatment group participant interviews were conducted in a private meeting room on a floor dedicated to computing faculty within the campus. Out of the four participant interviewees, two were student mentors, one participated in some of the social learning activities and one did not participate in any of the social learning activities. I was initially disappointed in the overall response rate for interview participation but upon reflection, I believe my position of power and the purpose of the interview may have been the catalyst for the low uptake. It may have been more beneficial to introduce a second interviewer as this may have presented a more impartial view to the interview process perhaps attracting greater participation.

Table 3.10 below provides a summary of the research methods and data collected for cycle 3.

**Table 3.10: AR Cycle 3 - Data Collection (2016)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Start and End of Semester Student Engagement and Self-Efficacy Questionnaire – Group A (Treatment)	Quantitative	90	44	49%
Start and End of Semester Student Engagement and Self-Efficacy Questionnaire – Group B (Control)	Quantitative	45	31	78%
PBL/PAL activity feedback forms (5x sessions)	Qualitative	282	46	16%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Interview (start and end of semester with principal programming lecturer )	Qualitative	1	2	2
Interview (end of semester with treatment participants)	Qualitative	44	15	4

## 7. Summary

This chapter set out to describe the research paradigm for this study, with reference to the research approach, methods and tools to be used to address the research questions. I identified with the ontological position of relativism, as I accept that my version of social reality is subjective, with no claim that this study can be repeated with the same results in another context or time. The research methodology is based on pragmatism, as I needed to understand the problem under investigation, this is not based on a rigid theory but more of a process of reflecting on what it is I found, and through the findings of others within the research process. The epistemological position is one of constructivism, whereby I constructed knowledge through the work of, and with, research participants.

Based on this paradigm, an action research approach was identified as a suitable orientation and framework for the research investigation. Action research allows for three research cycles to occur through a process of exploration and learning, in which the first cycle informs the second cycle, the second cycle informs the third cycle, leading to a conclusion with suggestions for further action and research to be considered. Action Research also allows for a mixed method approach supportive of the pragmatic methodology. As the problem was not clearly understood, an action research approach was logical as it set out to narrow the focus of research to produce a relative conclusion.

The data collection tools identified enabled the acquisition of both qualitative and quantitative data. Quantitative data was captured through structured questionnaires on study behaviour, student engagement and self-efficacy, and qualitative data was acquired through semi-structured interviews, focus groups and qualitative feedback forms. A reflective learning journal was also developed, along with social learning strategies implemented using Problem Based Learning (PBL) and Peer Assisted Learning (PAL) techniques.

Each empirical study within the action research approach required a number of research tools, these studies and associated tools will be discussed further in Chapter 4: Self-Regulated Learning and Social Learning, Chapter 5: Measuring and Evaluating Student Engagement and Chapter 6: Measuring and Evaluating Academic Self-Efficacy.

# Chapter 4

## Self-Regulated Learning and Social Learning

### 1. Introduction

This chapter will present, discuss and evaluate the reflective and social learning interventions that took place within Action Research Cycle, 1, 2 and 3. The data collection tools, processes and initial findings will be presented and their usefulness in assessing the research questions.

### 2. Self-Regulated and Social Learning

Referring to the problem under investigation, through observations, discussions and through the data itself, students embarking on a computing or IT degree generally struggle with computer programming. Action research cycle 1 (2014) was centred on providing students studying programming with a tool that could potentially encourage the process of individual reflection on learning. The approach did not involve any disruption to the class, or lecturer, so I believed it was a rational decision that would cause the least amount of disruption to the existing processes, but potentially empower the individual learner. It was also the first cycle within the action research approach, in which a deeper understanding of the problem could be understood, with outcomes informing the second action research cycle.

Building on the knowledge acquired from the initial literature review, Gibbs' (p.40) reflective cycle and Schön's reflective model (p.41) address two key aspects of reflection, those being reflection-in-action (thinking while doing the task) and reflection-on-action (thinking after the task). With reflection-in-action the student needs to reflect if the task in hand is going well or there is a need to stop and re-evaluate what has been completed. Reflection-on-action allows the student to evaluate what has just been completed and ask what could have done differently, and to make decisions on what could be done the next time around. Both concepts informed the design of the reflective learning strategy for the intervention in action research cycle 1 and cycle 2.

#### 2.1 Data Collection Process for AR Cycle 1 (Reflective Learning)

For action research cycle 1 (2014), there were 110 students enrolled on a BSc in Information Technology programme, within their second semester of first year. As a lecturer



within the focus institution, I had access to the group through a Personal and Professional Development module, in which I introduced my research concept and invited participation. Those who volunteered their interest in participation were provided with relevant information and consent forms to participate. I acquired data using three data collection methods, an online questionnaire, the use of a reflective learning journal, and an end of semester focus group.

A summary of the data collected using these methods is summarised in Table 3.8 below (Provided in Chapter 3 but replicated below for convenience).

**Table 3.8: AR Cycle 1 - Data Collection (January to June 2014)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Student study habits questionnaire	Quantitative	110	31	28%
Reflective Learning Journal	Qualitative	110	77	70%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Focus group (reflective journal evaluation)	Qualitative	110	10	7

**Data Acquisition – Part 1 – Online Structured Questionnaire**

Students were asked to participate in an online structured questionnaire that was designed to capture their current study habits and study preferences, such as how and when they studied and which tools they found most useful when studying. They were also asked to identify the subject areas they had the most difficulty with, which included computer programming, networking and web design. The question list can be viewed in Appendix A.

**Data Acquisition – Part 2 - Reflective Learning Journal Entries**

A lecture on reflective learning was held followed by the introduction of the reflective learning journal tool. The tool was developed using Microsoft Excel which contained a pre-populated sample together with the weekly submission tabs. The students were provided advice and guidance as to how to use the journaling tool and advised to use it in conjunction with Computer Programming as this was a known difficult subject area. The participant responses within the weekly journal submissions were examined qualitatively. A screenshot of the reflective learning journal tool can be viewed in Appendix C1.

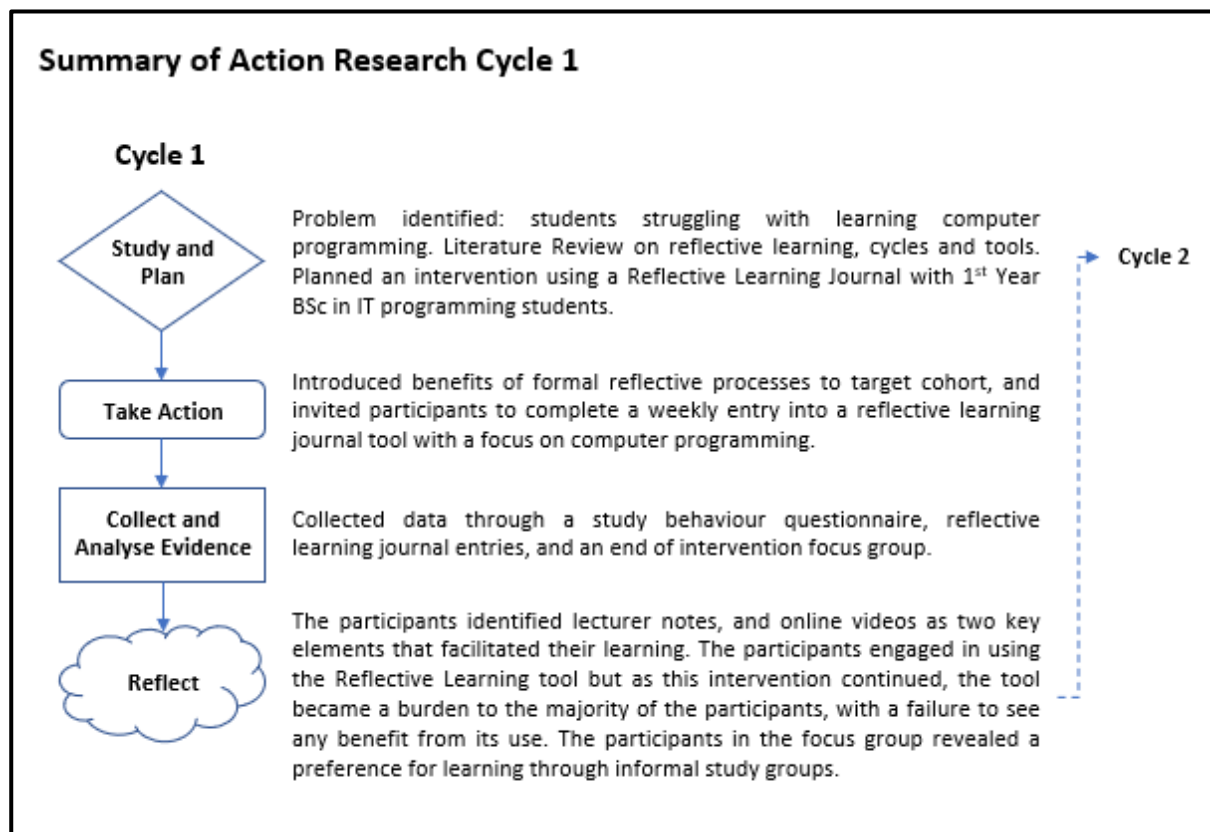
**Data Acquisition – Part 3 – Post Treatment Focus Group**

At the end of the semester, a small group were recruited for participation for a semi-structured focus group to gather feedback on the use of the reflective journal tool over the semester. This was deemed useful to ascertain other thoughts and feelings about the reflective journal tool and process that were not documented through the journal tool itself. During the

focus group I facilitated interaction between the participants through various questions, as the effectiveness of a focus group lies with the interaction between the participants (Gibbs, 1997). The list of questions used during the focus group can be viewed in Appendix B.

Figure 4.1 below provides a summary of Action Research Cycle 1 based on the process of planning, taking action, analysing and reflecting, which informed the planning phase for Action Research Cycle 2.

**Figure 4.1: Summary of Action Research Cycle 1**



## 2.2 Data Collection Process for AR Cycle 2 (Reflective Learning)

For Cycle 2 (2015) there were 80 students enrolled in first-year, second semester, on a BSc in IT programme. This was the same stage and semester as Cycle 1 to facilitate closer comparisons between research cycles. Within this study I proposed to gather data using three methods, a structured online study habits questionnaire, a revised version of the reflective learning journal tool, and semi structured participant interviews.

While the study itself has many similarities with that of Cycle 1, the key difference was the use of interviews post treatment as opposed to a focus group discussion. While the focus group conducted in Cycle 1 was useful, there were issues that arose during the discussion itself, mostly related to dominant participants who seemed to lead the narrative of the discussion. To address this, interviews were selected with the added benefit of exploring

individual perspectives on the use of the reflective learning journal. This data was also useful for comparison against the findings of the focus group in Cycle 1.

A summary of the data collected in Cycle 2 is summarised in Table 3.9 below (Provided in Chapter 3 but replicated below for convenience).

**Table 3.9: AR Cycle 2 - Data Collection (January to June 2015)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Student study habits questionnaire	Quantitative	80	53	66%
Reflective Learning Journal	Qualitative	80	18	23%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Interview (Journal evaluation and Study habits)	Qualitative	80	4	4

### Data Acquisition Part 1 – Online Structured Questionnaire

The questionnaire was introduced at the start of the semester using the online questionnaire software system Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)). The questionnaire was open for two weeks and allowed students to volunteer their answers anonymously. This was the same questionnaire that the previous cohort in 2014 completed, for the purpose of comparison of the basic aspects of their study behaviours, and perhaps identifying possible trends. See Appendix A for the full list of questions within the questionnaire.

### Data Acquisition Part 2 – Reflective Learning Journal Entries

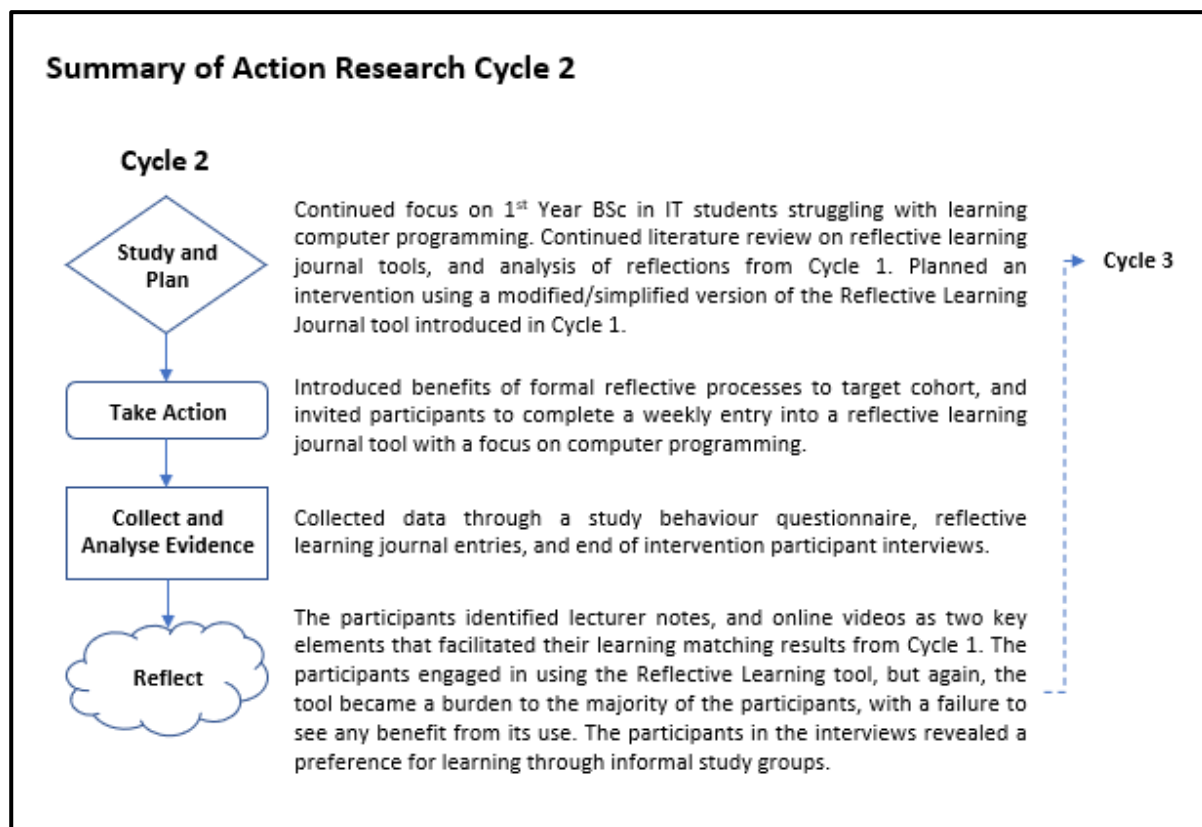
A lecture on reflective learning took place at the commencement of the semester followed by the introduction of the reflective learning journal tool, which was a revised tool informed through the findings of Action Research Cycle 1. The students were advised to use this journal in conjunction with computer programming, and that it would be submitted anonymously through a special web-based file uploader. The responses within the weekly submissions were examined qualitatively. A screenshot of the revised reflective learning journal tool is available in Appendix C2.

### Data Acquisition Part 3 – Semi Structured Interviews

At the end of the semester (May 2015) I requested volunteers to participate in an interview to gather feedback on their use of the reflective journal tool during the semester, or why they chose not to engage in the research activity. This was considered useful to ascertain other thoughts and feelings about the reflective journal that were not captured through the reflective tool itself. The interviews were semi-structured and were open to those who did, or did not take part, in the reflective learning journal exercise.

Figure 4.2 below provides a summary of Action Research Cycle 2 based on the process of planning, taking action, analysing and reflecting which informed the planning phase for action research cycle 3.

**Figure 4.2: Summary of Action Research Cycle 2**



### 2.3 Data Collection Process for AR Cycle 3 (Social Learning)

Cycle 3 was conducted in 2016 and represents the final cycle of the action research approach. The two previous cycles in 2014 and 2015 revealed a preference by the participants to study in groups. This informal group study activity existed outside of class time and was not part of the programming module. The approach to delivering the programming module in 2016 was based on an individual and solitary learning approach, no structured group learning was considered. I decided to introduce a social learning element to programming, but this required the cooperation and agreement of the principal programming lecturer. Initially I conducted an interview with the principal programming lecturer to understand the rationale for the pedagogical approach to teaching programming, and to open the discussion about introducing social learning in programming.

Based on previous empirical research within the research environment, and through action research cycle 1 and cycle 2, computer programming was identified as the module to introduce social learning as this seemed to cause students the greatest learning and engagement challenge. The method of delivery was through both Problem Based Learning (PBL) and Peer Assisted Learning (PAL) approaches.

A summary of the data collected using these methods is summarised in Table 3.10 on the following page (Provided in Chapter 3 but replicated below for convenience).

**Table 3.10: AR Cycle 3 - Data Collection (2016)**

Research Method	Data Type	Size of Sampling Frame	Responses	Response Rate
Start and End of Semester Student Engagement and Self-Efficacy Questionnaire – Group A (Treatment)	Quantitative	90	44	49%
Start and End of Semester Student Engagement and Self-Efficacy Questionnaire – Group B (Control)	Quantitative	45	31	78%
PBL/PAL activity feedback forms (5x sessions)	Qualitative	282	46	16%
Research Method	Data Type	Size of Sampling Frame	Preferred Sample	Actual Sample
Interview (start and end of semester with principal programming lecturer )	Qualitative	1	2	2
Interview (end of semester with treatment participants)	Qualitative	44	15	4

### **Data Acquisition Part 1 – Pre-Treatment Interview, Student Engagement and Academic Self-Efficacy Questionnaire**

As stated previously, an interview was carried out with the principal programming lecturer prior to any possible treatment or intervention. The research study required the agreement, and participation of the principal programming lecturer to allow time for the introduction of the proposed PBL and PAL activities within class time of the weekly scheduled programming module. Please see Appendix H for a list of the pre and post treatment interview questions that were used.

Quantitative data was captured through the use of two structured questionnaires, these required student participants in both the control and treatment group to measure their level of student engagement from an institutional perspective, and secondly, their academic self-efficacy regarding computer programming. Both questionnaire tools were provided to participants at the start of the semester, and then introduced again at the end of semester. This was to measure if the interventions received by the treatment group had contributed to any change in scores and for comparison of results with the control group. Please see Appendix F and Appendix G for the complete questionnaire used to measure both student engagement and self-efficacy in computer programming that was provided to the research participants.

### **Data Acquisition Part 2 – Social Learning Activity Feedback Forms**

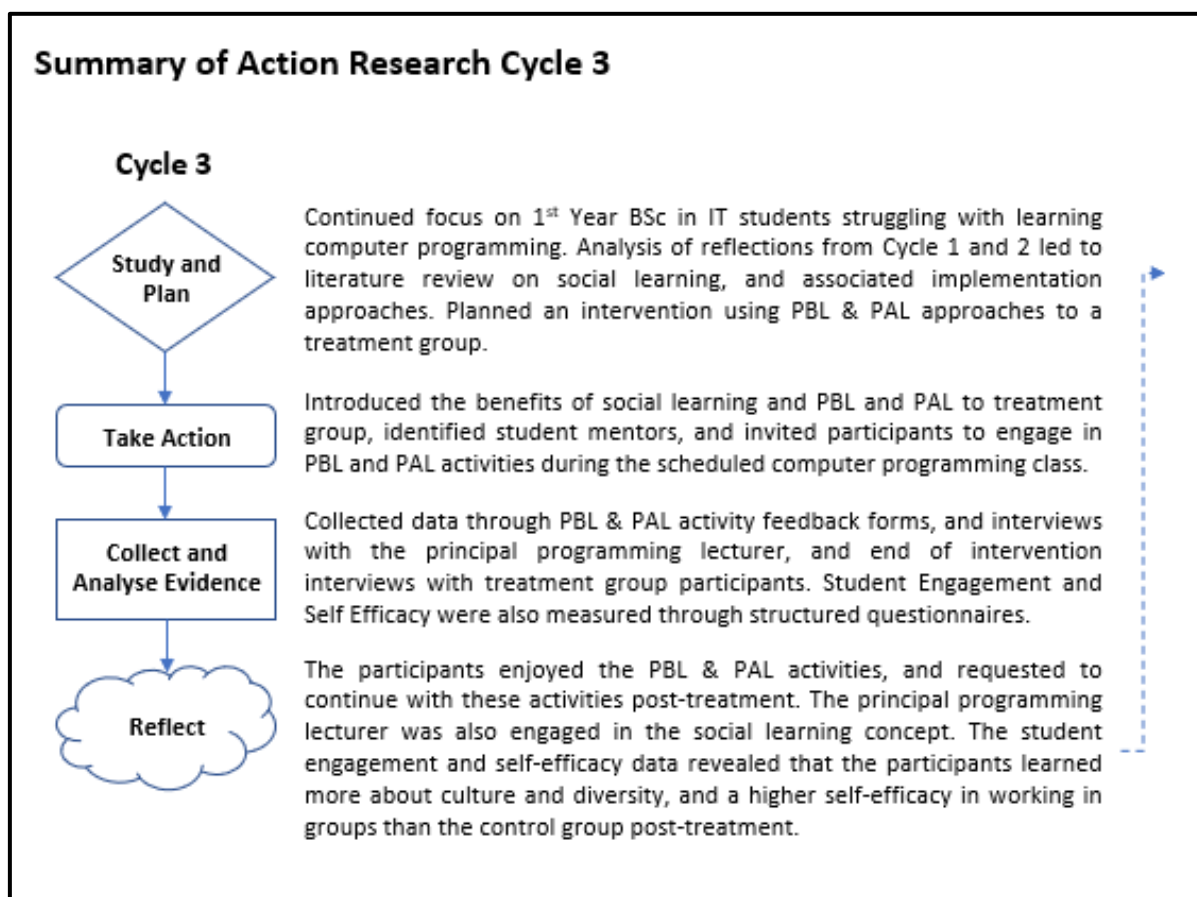
Throughout the semester, February to June 2016, the students who received the PBL and PAL treatment activities were invited to complete an activity feedback form at the end of each session. The forms were divided into three parts, the first part asked the participant to identify

their role within the activity and what they believed was the most important thing they learned, what they had spent more time on and what they felt they worked best on. The second part focused on the activity itself and what they enjoyed most and what was the least enjoyable aspect. The final part of the form was a free text box for participants to speak freely about any positive or negative experiences of the activity. This feedback enabled me to reflect on the responses and informed the design of the subsequent social learning activity. These feedback forms were analysed qualitatively. Please see Appendix E for the form that was used to capture individual activity feedback.

### **Data Acquisition Part 3 – Post-Treatment Interview, Student Engagement and Academic Self-Efficacy Questionnaire**

At the end of the semester, the student participants in both the control and treatment group were invited to complete the same student engagement and academic self-efficacy questionnaire that was issued at the start of the semester, which is discussed in the data acquisition Part 1 above. In addition, a second interview took place with the principal programming lecturer to discuss the PBL and PAL activities and to see if this approach would be suitable going forward. Interviews were also held with student participants within the treatment group, this was based upon the results of the End of Semester self-efficacy questionnaire.

Figure 4.3 on the following page provides a summary of Action Research Cycle 3 based on the process of planning, taking action, analysing and reflecting. With all three cycles complete further research can be considered. (For completeness, all three cycles are visually amalgamated in Figure 8.2, p.208).

**Figure 4.3: Summary of Action Research Cycle 3**

### 3. Analysis of Study Behaviour Questionnaires (AR Cycles 1 and 2)

The analysis below represents the results of the AR Cycle 1 (2014) and AR Cycle 2 (2015) study behaviour questionnaires. These will now be referred to as Cycle 1 and Cycle 2 for convenience. The target participant groups were first year BSc in IT students and they were asked to volunteer their participation in the reflective learning exercises. The questionnaire tool comprised of ten questions relating to their existing study habits and preferences at the commencement of their semester, the full list of questions can be viewed in Appendix A. The same questions were used in Cycle 1 and Cycle 2 for the purpose of comparison and trend identification. 30 out of 110 students completed the questionnaire in Cycle 1, and 53 out of 80 students completed the questionnaire in Cycle 2. The increase in response rate in Cycle 2 is possibly linked to how I presented the initial research investigation to the participants, and how I linked this with knowledge gained from Cycle 1. This is a subjective view but perhaps I was more confident in convincing them of the benefits of participation due to my recently gained knowledge of the subject area.

The participation in the questionnaire was positive, and the results over the two studies revealed similar trends. Question 3 asked the participants to rate their level of motivation to study outside of class time. In Cycle 2, 23% selected 'Very little motivation' (95% CI 11.7, 34.3) 49% selected 'Sometimes motivated' (95% CI 35.5, 62.5) and 28% selected 'Highly motivated' (95% CI 15.9, 40.1). The very little and sometimes motivated to study elements

represent 72%, which is worryingly high, even with the lower end of the 95% Confidence Interval considered. Cycle 1 results highlighted a similar score of 74% for the same question element which further endorses an examination of effective teaching strategies for in-class and campus learning and engagement.

Question 5 asked the students to select the method(s) they use when studying. In Cycle 2, 85% (95% CI 75.4, 94.6) selected 'I read the materials provided by the lecturer' and similarly, Cycle 1 data revealed 97% (95% CI 90.0, 100.0) for the same question. This indicates that two years in a row, both groups selected the importance of the materials provided by the lecturer as their number one method of focus in terms of the study options available. This further highlights the importance of providing relevant and easy to process subject matter materials for our students. Within the focus institution, it is not clear as to the extent that students follow uploaded materials and additional resources provided by the lecturer through the Virtual Learning Environment (VLE). Within the same question, 79% (95% CI 68.0, 90.0) of the participants in Cycle 2, and 54% (95% CI 36.2, 71.8) of the participants in the Cycle 1, selected 'I look at video clips related to the subject area' as their number two method of study. This result correlates with evidence from the interviews, which is discussed later, that our students strongly engaged with online video sources for study purposes. As the majority of our students are international, viewing educational videos in their native language facilitates their learning, as evidenced in the interview analysis discovered in Cycle 2. This highlights a weakness of the structured questionnaire design within Cycle 1 and Cycle 2, in that this only became evident when conducting the interviews in Cycle 2.

Question 6 asked the participants to identify reasons why they may find it difficult to study outside class time. Cycle 2 data revealed that 47% (95% CI 33.6, 60.4) selected 'I am too busy with my job' as the number one reason, which correlates with Cycle 1 data with 53% (95% CI 35.1, 70.9) selecting this option. Work commitments, particularly for international students, are a heavy burden in terms of their serviceable time. This also needs to be factored in when providing a framework for enhanced engagement.

Question 7 asked the students if they thought a new method of self-study would be helpful. In Cycle 2 51% (95% CI 37.5, 64.5) selected 'Yes' and 45% (95% CI 31.6, 58.4) selected 'Maybe' and in Cycle 1 2014 30% (95% CI 13.6, 46.4) selected 'Yes' and 57% (95% CI 13.6, 46.4) selected 'Maybe'. Both studies indicated an appetite for exploring new methods of self-study which was encouraging.

Question 8 asked the participants to select the subject areas they were having difficulty with. Unsurprisingly, as supported through the literature, Cycle 2 data revealed that 74% (95% CI 62.2, 85.8) selected Programming, followed in second place by Networking at 18% (95% CI 7.7, 28.3). In Cycle 1 there was a similar trend, 65% (95% CI 47.9, 82.1) selected Programming with 32% (95% CI 15.3, 48.7) selecting Networking in second place. While programming is a known difficult subject area, we need to understand the specifics of their difficulties in order to provide the appropriate supports.

As previously discussed, programming is a challenging subject area and the learning process is time consuming, the findings from the questionnaire confirm that students have little motivation to study outside of class time, that programming is challenging, but encouragingly they are open to investigating new methods of self-study. In addition, there may be other underlying causes for the lack of motivation to study outside of class time, it may not be just work-related, and this also needs consideration.



## 4. Analysis of Reflective Learning Journals and Post Treatment Feedback

The reflective learning journal tool that was used Cycle 1 was modified for use in Cycle 2, therefore, this needs to be considered in the discussion.

In Cycle 1 (2014), the reflective journal was analysed in two parts, A and B. Part A represented the quantity of students in the target group and the quantity of journals submitted at the end of the semester, which was further categorised as journals that were either ‘complete’ or ‘incomplete’. A completed journal was interpreted as one which contained a write up in the conclusion section, and an incomplete journal did not contain a conclusion section, but had a number of log entries. In Cycle 2 (2015) I did not categorise whether a journal was complete, or incomplete, this was because during the reflection process of Cycle 1 it was deemed inappropriate to label the journals in this way, as all journals contained useful information and should be treated equally in terms of providing insights.

Part B of the analysis asked the participants, in a free form text box, whether they would use the reflective journal again in their next semester. I interpreted their individual write-ups as either ‘Yes’, ‘No’ or ‘Maybe’ based on the comments they provided. The journals without a conclusion write-up were labelled as ‘Undecided’ I was careful when interpreting these results and only entered a clear ‘yes’ or ‘no’ based on a strong conviction in the student write-up. However, caution still applies given the nature of subjective interpretation.

### 4.1 Reflective Learning Journal Analysis (AR Cycles 1 and 2)

The analysis of the reflective journal exercise will now be summarised and discussed in two parts. Part A is an analysis on the level of participation with the activity and Part B is an analysis on whether students would consider using the reflective journal in their subsequent semester.

#### **PART A:**

The reflective learning journals were submitted upon the completion of the semester. The format for the journal was Microsoft Excel, and they were submitted electronically. Table 4.1 below provides a summary of the numbers of students who submitted a journal, those who submitted an incomplete journal and those who submitted a complete journal.

**Table 4.1: Interpreting the completion of the reflective journals**

AR Cycle	Registered Students	Journals Submitted	Journals Incomplete	Journals Completed
Cycle 1	110	77	58	19*
Cycle 2	80	n/a	n/a	18**

\* Journals that included a conclusion were deemed ‘completed’.

\*\* Journals were counted based on submission, and therefore ‘completed’.

**Analysis:** A low number of participants completed the reflective journal in Cycle 1 which raised concerns on the use of the journal tool. The time required to complete the journal on a

weekly basis was listed as an issue within some of the journal entries. However, it is worth noting that Cycle 2 had fewer journal submissions than in Cycle 1. This could have been because of a change of lecturer during these periods, but this cannot be confirmed as the cause. The initial findings of the analysis of the journals did not reveal any specific insightful information other than a similarity with the comments raised in Cycle 1.

### **PART B**

In Cycle 1 and 2, the reflective journal template completed by the participants contained a conclusion page, here the participants had the opportunity to enter whether they would use the reflective journal in their next semester. The conclusion sections within the submitted reflective journals were classified under the headings ‘Yes’, ‘No’, ‘Maybe’ and ‘Undecided’ as to whether the participant would use this tool in future semesters.

**Analysis:** Cycle 1 results revealed that 19 of the participants expressed an interest in continuing to use a reflective journal in their next semester, and perhaps in its existing format. Equally, 19 participants were categorised as ‘Maybe’ as generally the participants felt that some changes were required within the reflective journal template to make it more flexible to their needs, and to reduce what they generally felt was the repetitive nature of completing weekly log entries. 15 participants indicated a ‘No’ to using the reflective journal and they generally felt there was no true reflection taking place and the exercise was repetitive in nature, and as such, they felt there was no obvious benefit to them personally. 24 of the participant submissions were labelled as ‘undecided’.

In Cycle 2 the reflective journal tool was modified to reflect the feedback on the design of the tool acquired from Cycle 1. The original reflective learning journal tool issued in Cycle 1 contained six sections to be addressed, this was reduced and simplified to four sections in the tool for Cycle 2. This was to reflect what the participants stated about the amount of time it took to complete a journal entry, and some confusion as to what to include within the various sections. Out of the 18 journals submitted, 10 expressed an interest in continuing with a reflective learning journal. 5 participants indicated a ‘maybe’ response while 3 indicated either ‘no’ or did not complete this section. The interview analysis revealed relevant feedback on the experience of using the reflective learning journal, indicating that despite the re-design of the journaling tool, there was no obvious benefit to the participants.

### **4.2 Post Treatment Focus Group Analysis (AR Cycle 1)**

The focus group followed the submission of the reflective journals and a group of volunteers participated in a one-hour discussion on the use of the journal tool. Seven students volunteered their time and the discussion captured some useful findings which will now be discussed with links to relevant quotes from the participants, who are hereby referenced as participant 1 to 7. The question list is available in Appendix B.

For Question 1, the participants were asked if they engaged in any additional study outside of class time, and if so, what methods did they use, five references were made to group study.

The participants generally agreed that studying in a group setting enabled them to talk through problems to collaborate on solutions. Participant 3 stated:

*‘I prefer to study in groups when I am having difficulty with particular subjects; programming and maths are a challenge. In a group setting I find it easier to work through the difficult parts of the material’.*

Most of the difficulties the students discussed in terms of subject matter related to Programming. This evidence highlights the importance of group work to students and the benefit they receive; this may encourage greater facilitation of group work within class time. Although studying and working in groups outside of class time was a key theme, their responses to this question also revealed a desire to study on their own. Participants who specifically mentioned that they preferred studying on their own also described the difficulties with this method, such as the distractions of studying in a home environment and other associated distractions. Participant 2 stated:

*‘I like to study alone. I typically take notes based on material provided by the lecturer. At home there is a lot of distraction; I find it difficult to focus on studying at home’.*

This issue was raised by a number of participants and further highlights the need to provide students, particularly within their first semester, with methods and strategies for effective studying, and places to study.

Question 2 related to subject area difficulties and to what extent further study was required. Two comments were of interest, Participant 1 stated:

*‘I find web design interesting and do more study outside of class in this subject – just want to learn more about it. Maths, I find difficult and have to study for this, even though I don’t enjoy it’.* In addition, Participant 3 stated: *‘I study Maths and Programming – I find these subjects very hard. I’m using most of study time on things I don’t actually like – this is frustrating’.*

These comments are insightful as it serves as a reminder that students may use most of their free time to study subjects they feel are not of great importance to them. Question 3 asked the participants if they were using the reflective journal tool, and if so, how often they were updating it. There was a negative reaction to this question with some of the participants stating they did not really use it, and those who did, found it to be a repetitive exercise and not practical in terms of reflecting on learning. Participant 4 stated: *‘I didn’t use it [reflective journal] for programming, I used it for Maths. I didn’t find it practical’.* Participant 7 described how updating the journal on a weekly basis became a repetitive task and stated: *‘I changed the subject after a few weeks because the class style was the same, so it was a bit repetitive’.*

Question 4 asked the participants what they thought of the field headings within the reflective journal template, and if they would add or change headings. This question yielded a similar response to Question 3 in that the participants mentioned the repetitive nature of completing the journal, Participant 3 stated:

*‘Yes, I found myself repeating the journal entries each week, it became more of a chore and I didn’t see how I was reflecting in any particular way’. This was also followed by Participant 2: ‘I didn’t use it because I felt the answers would be same each week’.*

The key message from these responses was that the participants felt they were not reflecting, which is of concern. Other responses to this question were similar and all indicate an issue with the template itself, in terms of the field headings, and confusion surrounding how they were supposed to continually complete the journal. The issues of reflection were brought up in Question 5 in which participants were asked if they reflected on aspects of their journal entries. The general response was negative towards the journal, Participant 7 stated:

*‘..... no, I didn’t review on previous entries, I feel the same as others, I didn’t think I could learn anything from the entries I made on previous weeks’.*

This response was typical of the other participants and follows the general theme of Question 4. The responses further highlight the need to re-examine the field headings and process of reflection through the use of the journal in its existing format. Question 6 was the final question in the discussion group and asked the participants if they would use the reflective journal, or a similar journal tool, in the future. The responses were a mix of positive and negative. Participant 6 expressed no interest in participating in a similar exercise and stated: *‘It wouldn’t be relevant to me; I really don’t like the writing aspect as I have enough to do with other subjects’.* Participants 2, 5 and 7 all mentioned some positive aspects of the reflective journal exercise and in particular, Participant 5 stated: *‘It works for me, I think I am reflecting and learning from it, not sure how much but I am used to using it so I think I will use it in the future’.*

In summary, the discussion group was a worthwhile exercise and some key findings emerged. There needs to be a better approach to assist students with the weekly reflective process and an element of engagement between the students and facilitator may be required. The students generally did seem to struggle to find the journal useful in terms of reflection and this need to be examined. There were positives in that some students indicated that they would use a form of reflective journal in the future, the format of this needs to be explored.

### **4.3 Post Treatment Interview Analysis (AR Cycle 2)**

This section will discuss the results of Cycle 2 which used a modified version of the reflective learning journal tool (see Appendix C2), and this was followed by individual interviews to ascertain the effectiveness of its use. The findings from the use of the tool in Cycle 1 informed the modifications for the redesign of the reflective learning tool for Cycle 2. The tool in Cycle 1 contained six sections, and the participants in Cycle 1 pointed to the length of time to complete the tool as an issue, as well as trying to interpret what text to enter

in the various boxes. The modified tool for Cycle 2 contained only four sections to complete, with further instruction as to what types of information could be entered into the various sections.

Interviews were preferred instead of a focus group, as features of peer influence and power were observed in the focus group discussion in Cycle 1. While I was conducting the focus group in Cycle 1, I noted how some of the participants were quiet when it came to answering the questions, and one or two dominant voices steered the discussion, the remaining participants seemed to back up or agree very easily with what the dominant voices put forward. This made me reflect on the output of the focus group and whether a true grasp of the issues was captured. The focus group was also made up of volunteers, and no stratification was carried out, and Morgan (1996) suggests that stratification is a useful approach to create categories of participants which facilitates discussions by making the participants more similar to each other. The focus group experience also made me reflect on interviews on how individuals can speak freely around certain topics, this was the basis for selecting this method over a focus group for Cycle 2.

Three semi-structured interviews were carried out with four student participants. The third interview involved two participants, at the request of those involved. The interview questions are available in Appendix D, and a summary of the raw data collected is summarised in Table 4.2 below:

**Table 4.2: Interview Raw Data (June 2015)**

Interview No.	Participants	Audio Length	Word Count
1	1	38 minutes	5560
2	1	41 minutes	7703
3	2	53 minutes	9329

The interviews were coded, and themes were generated for analysis. The Coding Manual for Qualitative Researchers (Saldana, 2009) was the basis for creating a coding structure for the interviews, which was a mix of inductive and deductive coding. Transcript codes were identified based on the findings from the literature review, the semi-structured questions within the interview, and the focus of my investigation. Other codes emerged through the analysis of the collective interviews.

Table 4.3 on the following page represents the codes used to analyse the interviews. The definition provided is an interpretation in the context of my investigation, the interview direction, and related questions.

**Table 4.3: Codes used to analyse interviews**

Code	Definition in Context
Motivation-I	Internal motivation to study, to engage, to progress
Motivation-E	External motivation that influences engagement to study, to focus, to progress
Study Habits	The current attitude to, and methods, of studying on the BSc in IT programme
Employment	To what extent is work distracting from study, from engaging in the BSc in IT programme
Journal-N	What aspects of the reflective learning journal exercise were negative
Journal-P	What aspects of the reflective learning journal exercise were positive
Peer Influence	Have class peers positively or negatively influenced engagement and study practices
Recommendations	Teaching and learning recommendations from the interviewee perspective
Flag	Unexpected / insightful comments (in the context of the interview theme)

### Interview Analysis

It was clear that within each interview there was a strong emphasis on the need to communicate and interact with peers within the classroom, which was also highlighted in the focus group conducted in Cycle 1. The discussion below is based on a summary of the findings using the various codes expressed in Table 4.3 above, the analysis does not include the codes ‘Recommendations’, ‘Flag’ and ‘Motivation-E’ as the findings from this analysis were not useful for this discussion.

#### Internal motivation to study, to engage, to progress (Motivation-I)

This theme identified responses within the interview that were interpreted as intrinsic motivation to engage in studying. Participant 1 stated:

*‘I’m doing online courses and tutorials.....connection between what is covered in class and what is shown online, I see in class I understand what I see that on the online courses’.*

This participant made reference to conducting additional study online for further subject matter understanding, an indication of the internal motivation of this student to go beyond the simple understanding of topic areas covered in class, perhaps this is influenced by the external motivation to achieve better grades, but I would argue it can be interpreted as rewarding without the need for incentive. Participant 3 referred to their mature age as being a motivating factor, perhaps through peer observation:

*‘I’m 28 and I think it’s time to have my degree’..... ‘I came from a city of 4000 people, I’m doing everything on my own, so it’s going to be really important for me’.*

This is a mature perspective, and the background of the participant is used as a motivating factor to succeed.

### **The current attitude to, and methods, of studying on the BSc in IT programme (Study Habits)**

Participant 1 stated *'I always consulted Google and YouTube for that kind of tutorials anyways'*. This participant indicated their preference for online sources for study, not surprisingly YouTube is mentioned, which is consistent with the findings from the questionnaire results in cycle 1 and cycle 2 whereby participants had rated support videos and online materials as an effective support resource. Support videos are a very popular learning resource amongst our IT students and perhaps this needs to be considered when developing learning materials for our students. Participant 2 also supported this by stating:

*'I obviously prefer to watch YouTube videos...and sometimes in your own language that helps because sometimes you are like listening but you try to understand the meaning of one word and after it's like, ok, let's try to listen to both languages'* and also *'normally I'm the kind of person who writes down, if I don't write it down it's like, it's gone'*.

Again, this participant highlighted the importance of videos for their learning and study practices. And interestingly, they mention the importance of listening to support content in their own language – this enables students to ensure they have understood something correctly. Particularly in IT related programmes, there is a vast amount of terminology to comprehend within many subject areas, thus adding an additional layer of learning complexity.

### **What affect does employment have on the ability to study and engage in the BSc in IT programme (Employment)**

Most of the cohort engaged in part-time employment, and these types of roles included late-night/early morning shifts based on rostering systems. This employment is necessary to pay for rental accommodation, associated bills, and save for subsequent years of study. The requirement to work is known through general discussions with students across the focus institution. Participant 1 stated:

*'....work is a big factor in terms of preventing putting a lot of time into studying.....but work definitely, at least in my case, is getting in the way'*.

This finding correlates with the findings of the student study behaviour questionnaire carried out in Cycle 1 and Cycle 2, whereby 47% in 2014, and 53% in 2015, selected work as the primary reason inhibiting them from studying. The other three interview participants did not make any reference to work as being a factor in distracting them from their studies.

### **What aspects of the reflective learning journal exercise were positive (Journal-P)**

This theme identified what participants indicated as positive aspects of using the reflective learning journal over the course of the semester. Participant 1 stated:

*'...helped me like, okay, what did I learn really today? So I just focusing on web design....it was easy, it's just questions and you don't have to go like deep.....actually it's like a sort of blog about my things'. And in addition, 'It helped me with my English, helped me organise things, it's definitely a tool for me, it's a tool for me I can use for improving my life a little bit'.*

This participant referred to the reflective learning journal as a 'blog' which perhaps aided in how they understood it and used it. They also mentioned how it helped with their English which is interesting as this was not specifically considered before. Participant 2 stated:

*'Definitely very simple, and for me will be something more like a personal journal that I will have, and I will try to find like a – I don't really need to write down what happened. I just need to write down what I learned'.*

This student indicated a positive experience, they suggested it was simple for them to use and it was of some use in the learning process.

### **What aspects of the reflective learning journal exercise were negative (Journal-N)**

Participant 1 stated:

*'I didn't use it during the day, sometimes I hadn't the time to sit down and think what I'm doing....so there's nothing, there's no reward for using the journal.....it's like students are rabbits in a lab, like you have to give something'.*

The student relates to the journal as a form of assessment which has no reward. The student expects some type of reward for participating in the activity itself. This is perhaps associated with all other activities that the lecturers provide, which do carry marks which accrue to their continuous assessment mark. The participant also highlights their perception of how the journal will be reviewed by referring this to a form of lab experiment, which further highlights concerns with the activity. Participant 2 stated:

*'When I was doing that, it was um, like extra assignment. I saw it like that because I had to put it like that, it means – it was not habit for me.....I had to come back to the sample to see, what is he – what does he really want like right here?'*

This participant again raises the issue of not having a reward for completing the journal and struggles to see the point of the exercise, and interestingly, suggests that it must be



completed in a particular way to appeal to the reviewer/assessor. This was further highlighted by Participant 4:

*‘For me, it’s still not a better way to do, how can I say that, to evaluate a student because you just memorize the thing that should be done and nobody is going to grade you’.*

This confirms that without reward, it is challenging to engage students in activities that are outside of what is classed as graded activity. This is not to suggest that the completion of the reflective learning journal should have obvious rewards, the challenge is engaging students in activities that may have no immediate benefit or reward.

### **Have class peers positively or negatively influenced engagement and study practices (Peer Influence)**

This theme identified responses related to peer interaction, and the positive and negative experiences encountered while engaging in study. Participant 1 referred to the importance of coming to class:

*‘I think the motivation is different to come to class in that way, and that could be one because if you are among people with the same way of thinking at least they are studying the same way’.*

This participant referred to their peers and the importance of sharing and interacting with them, this is a motivating factor for this participant. Participant 3 referred to family, and the sense of pride in achievement: *‘In 2017 when my father comes here, everybody will be here and I really want a big celebration’.* Participant 3 also referred to the importance of peer interaction in the classroom by stating:

*‘One guy for me in my case was the same one that’s in the first year, like the labs he finished in five minutes and other stayed there for the whole afternoon and still couldn’t finish. So I was thinking, ok, he’s very good, I’m not, so I have to – he was actually my motivator I think’.*

Participant 2 stated:

*‘yesterday we were studying and I have one of my friends, she’s a senior but she’s studying this, so she said like ‘I can’t believe that you do all this note taking’ and then she said ‘I might do it like this’, she came back to me and told me that it worked for her’.*

This response confirms how students can learn from each other, in terms of their existing approach to learning.

Participant 2 also went on to say:

*So, for me it's try to do an effort like in maybe ask, talk with the people who knows. Like, sit behind him, you – you identify somebody who knows. Sit behind him, do the exercises with him, you will learn because some guys or girls are really nice and they explain, and – or read in – check in the internet, check in YouTube'.*

These comments further highlight the importance of peer interaction and how these interactions can positively influence learning and the student experience. As there are many mature students in the cohort, some have previous qualifications and experience within various fields, including Information Technology. Participant 4 highlighted how this knowledge can be shared with peers:

*'.....and I know some guys in the class already have more knowledge, had their own past, so some of those work in Network, some of those are IT programmers, so I found really nice when we say our weakness for the colleges, the course just, (and they say) "I can help you to understand that." And for me this is really nice like we have a friend who teaches Network in their own way, so I -- that's really nice'.*

This comment highlights how the experience and knowledge of others can be integrated into the learning process.

## **5. Analysis of interviews and social learning activity feedback for (AR Cycle 3)**

In action research cycle 3 (2016), qualitative data was captured through the use of interviews that were conducted with both the principal programming lecturer and the research participants. Qualitative data was also captured using an activity feedback form that was provided to the research participants (Appendix E) at the end of each of five social learning activities that took place throughout the semester (January to May 2016). The sections below will discuss the findings from the principal programming lecturer interviews and the overall feedback from the social learning activities that were introduced to the treatment group.

### **5.1 Lecturer Interviews – Pre and Post-Treatment**

Two lecturer-based interviews were conducted within Cycle 3, these interviews were with the same principal programming lecturer for Year 1, Computer Programming, as part of a BSc in IT. The purpose of interviewing the principal programming lecturer was to ascertain the lecturer's view on how programming should be taught, and if a new social learning-based approach could be considered. In addition, a post-treatment interview took place to capture the feedback from the programming lecturer, and to investigate if these, or similar activities, would be useful going forward. The first interview with the programming lecturer took place on the 14<sup>th</sup> January 2016. The end of semester interview with the programming lecturer took

place on the 2<sup>nd</sup> June 2016. The semi-structured interview question list can be viewed in Appendix H. The interviews were audio recorded, and subsequently transcribed for analysis. For comparison analysis, the results of both interviews will be presented together. It should be noted that my senior position within the focus institution may have had an influence on the responses to the questions raised during both interviews. I conducted the interviews off-campus to reduce the potential power-influence to mitigate this.

Table 4.4 below provides summary details on the two interviews conducted with the principal programming lecturer for the final stage of the action research cycle.

**Table 4.4: Principal Programming Lecturer Interviews**

Interview	Description	Audio Length	Word Count
1	Pre-treatment interview, January 2016	23 minutes	2950
2	Post-treatment interview, June 2016	21 minutes	2762

In the first interview, Question 4 asked the participant if group learning is used or is worth considering for use in class (referring to programming). The participant explained that group work was not a useful approach to learning programming, and stated that '*group work would only drag the good students down*', which was further expanded to describe a process in which the '*good*' students might be performing well in class, and because group work is forced upon the cohort the '*good*' students would waste time working with '*weaker*' students in the process of learning programming, thus holding them back. The participant also referred to the belief that those who work hard at programming should be rewarded, and that there is generally a class percentage who simply do not work hard enough in class to learn programming, so no additional responsibility rests on the college to engage with them. The participant was asked about Problem Based Learning (PBL) in Question 5, and the participant was aware of its use but suggested it was more successful in its application at higher framework levels, i.e. third and fourth year and not in first or second year.

In the second interview conducted post-treatment at the end of the semester, the key discussion pieces within the first interview were revisited to see if any change had occurred within the participants' rationale for their approach to teaching programming. The participant was asked to recall their opinion of group work at the start of semester, the participant stated:

*'I generally thought it was a bad idea, and that students should work independently, because if they worked independently, we could identify their individual strengths and weaknesses. I would have thought that working in groups was a bad idea because some students can coast on the good work of others in the group.'*

I then asked the participant if that was their experience as a student when they were in college and the participant responded by saying:

*'Yes, nothing was a group-based activity....generally everything was individual it was never really a group work, in the first year or second year it was always independent work'.*

I then moved the questioning to the social learning activities and asked the participant what their experience was during the first introduction of Problem Based Learning (PBL) for the treatment group, the participant responded by saying: ‘

*When we gave them the problem-based activity the first big thing was how eager they were to engage in the process, it wasn't just another class and another exercise, but because we gave, they some new resources like the whiteboards, pens and paper, they thought of it as a different exercise. They weren't against the idea, they're were willing to embrace it but overall there just seems just a lot more engagement in what we were asking them to do, it was a different way of doing things with different rules'.*

This was a positive response, and the participant also stated:

*'It wasn't just like, here's a problem, go and figure it out, and normally if they're working together obviously some of the students sometimes help each other and they can often they can often do that despite it being an individual activity, but the fact we were encouraging them to work as a group was new to them. Normally when they are working in groups it can be frowned upon, so this was unusual as we wanted them to team up and work together to solve the problem'.*

The participant identified with the positive benefits of working in groups, perhaps this was also because the activities were non-assessed, which may have facilitated a wider engagement within the class.

I asked the participant to refer back to ‘engagement’ and to describe this further, the participant stated: ‘

*But because we encouraged them to work in a group it almost gave them a different kind of way of doing things, they sort of felt as if they're almost like a little kind of company working together. They were all trying to solve a problem that was given to them, like real-world scenario....you have to deal with other people and listen to other people's ideas. Overall they just seem to be quite engaged in the process that it was a new way of doing things... I think the students really engaged in this, and understood the importance of why we were doing this'.*

This was a positive response, and again, revealed how engaged the participant was in the activities, and referring to the PBL approach as useful to reflect what occurs in industry.

Both PBL and PAL were discussed during the interviews, I asked the participant if there was any noticeable difference between these two approaches that were used, the participant stated:

*'Yeah, they're often so focused on getting some small elements of their assignment doing that they're missing the bigger picture or asking the right questions, why are they doing this, not necessary how do we do it? This could lead to just focusing on shortcuts on how to do things basically'.*

This was an interesting response and reflects an over-focus on the assignment aspect of the module, rather than considering the general learning that should occur within the module.

We then discussed the control and treatment group and I asked the participant if there was any notable difference between the engagement levels between the groups over the semester, the participant stated:

*'.....the engagement was generally quite good overall, but again we sort of have a bias as a lecturer because what we see is the first 20% of the room from standing at the top. The engaged students generally do most of the talking, the ones that are not may say nothing at all. But between both groups as time progressed I think Group A [treatment]) got more engaged and thinking outside the box, and Group B [control] seemed to just focus more on the assignments, just getting over the hurdles, but Group A (treatment) were asking more questions in class'.*

This was a very positive response and highlights a potential impact of the social learning intervention activities.

## **5.2 Social Learning Activity Feedback – Activity Feedback Forms**

Upon the completion of each of the social learning interventions in Cycle 3, the students in the treatment group were invited to participate in the completion of a paper-based feedback form to capture specific elements of their experience of the both the PBL and PAL activities. Table 4.5 on the following page presents a summary of the data captured through the use of the activity feedback form in both the three PBL and two PAL activities over the course of the semester.

**Table 4.5: Social Learning Activity Feedback Forms – Data Acquired**

Date	Activity	Sample Frame	Responses	Response Rate
30 <sup>th</sup> March 2016	PBL Activity 1	71	14	20%
6 <sup>th</sup> April 2016	PBL Activity 2	45	10	22%
7 <sup>th</sup> April 2016	PAL Activity 1	62	6	10%
14 <sup>th</sup> April 2016	PBL Activity 3	54	9	17%
21 <sup>st</sup> April 2016	PAL Activity 2	50	7	14%

The quantity of data collected was generally disappointing, but understandable for a number of reasons. Firstly, this was a post-activity request and most students were packing up and perhaps thinking of their next lecture or planning their trip home or to work rather than committing to completing an activity feedback form. Secondly, it was anonymous so perhaps some questioned the value in completing it, particularly as the activity had already concluded.

The activity feedback forms contained a number of blank boxes which asked the participant to enter responses against a number of questions. Table 4.6 below provides an overview of the key fields and questions that participants were asked to address after the completion of each activity.

**Table 4.6: Social Learning Activity Feedback Form Structure**

<b>About YOU in this Activity</b>	Your Role?
	Most important thing you learned?
	What you would have liked to spend more time on?
	What part of the activity did you do your best work on?
<b>About the Activity</b>	What was the most enjoyable part of the activity?
	What was the least enjoyable part of this activity?
<b>Overall Feedback</b>	Other comments or suggestions?

Each completed form from the Problem Based Learning (PBL) activities were labelled PBL1 up to PBL33, and each Peer Assisted Learning (PAL) completed form was labelled PAL1 up to PAL13. The discussion and analysis below will refer to the labelling and identification system used, whereby the number represents a participant group within the study.

To better understand the analysis below, the PBL activities were between 1.5 and 2 hours in duration. Each member of the group had to identify with a role, i.e. to be in charge of the documentation, research, coding or the management of the group, and they also had to

identify what they were individually responsible for. The group collectively reviewed the problem they were provided, then reflected on what they already knew, and finally what they needed to know to address the problem. The group would then carry out the activity acting out their roles and present a conclusion within the time permitted.

The PAL activities were less formal, and no specific roles were required. Student mentors introduced the activity for the class, and the students, working in groups, would attempt to carry out the activity with the support of others and the mentors.

### 5.2.1 Feedback Analysis for PBL Activity No.1, 30<sup>th</sup> March 2016

For the first PBL activity, 14 completed forms were collected. As this was the first in a series of group-based activities within computer programming, there was an expectation that the students would need time to adjust to this type of activity, and there was no assumption that the students would engage in the activities as they were not graded or required formal submission.

From looking through the responses within the submission forms, it is clear the participants enjoyed working in a group where ideas and knowledge could be shared. This was captured in PBL7: *'I learned I can work in a group. Although I most of the times would rather work alone, working in a group does make problem solving a lot easier'* and PBL5 stated: *'I wish to spend more time working in groups'*, and PBL3 stated: *'That we could all talk about what we were learning and sharing our knowledge'*. I also informally observed this during the live activity, and it was a very encouraging sign that the students had participated so positively in the activity.

With regard to the least enjoyable aspects of the activity, some students referred to the planning aspect as boring (PBL7: *'Planning! That's boring!'*), but most importantly, an issue involving the time to complete the activity was mentioned several times, which may have led to some frustration. This was captured in PBL3: *'I believe there was not enough time to finish'*, and in addition to time, PBL11 suggested the mentors who were facilitating the activity were not giving or offering enough support: *'Even though we have colleagues helping, we needed more help'*.

To conclude, this activity provided clear evidence that the participants enjoyed the activity and working with their peers. This was not without some frustration experienced by some, regarding planning aspects, lack of knowledge in some cases, but mostly not having enough time to complete the activity. The feedback in PBL3 accurately summarises the overall experience of this activity:

*'I did enjoy working in teams, but at the end, I was getting frustrated as I knew we didn't have time and started making more mistakes. Nevertheless, I think I learnt a good couple of things today'.*

### 5.2.2 Feedback Analysis for PBL Activity No.2, 6<sup>th</sup> April 2016

For the second PBL activity, 10 completed forms were collected. As this was the second activity, the students had some basic experience of the format and process. The same mentors were also used, and some of the feedback from the first activity was considered, particularly with not having enough time.

The comments in terms of learning were positive, participants discussed the importance of working together and how it assisted in the process of problem solving. This was highlighted in PBL17:

*‘These activities really makes more interaction among friends and for a given problem, we can solve it with many the best ways. And need to be continued in the coming weeks’*

Supporting this positive experience, PBL20 stated:

*‘Really enjoyable as I am better working with people. I’m a really nervous person and individual evaluations makes me so nervous that I cannot concentrate’.*

There was also a positive reference to skills being applied, PBL22: *‘Applying our skills in a real-life situation was very helpful’*. The feedback did raise some concerns, and some negativity towards the activity. Some participants highlighted their frustration of their own lack of knowledge within programming, this was captured in PBL24:

*‘I did not get the idea of the project. We were just trying to solve the programming with no idea, because I do not think that we have enough learning to apply it’.*

Supporting this issue, PBL23 stated: *‘On the code in great, I think need more of these support classes for us to understand more’*. A sense of frustration was captured in PBL20: *‘Frustrated a bit as the code wasn’t running at the end’*, although this participant was happy to be working with others, as stated earlier. As the PBL activity was timed, it was understandable that some groups did not complete the activity within the time allowed, the concept here was that the group reflect on where they went wrong, and how they would approach the task in the future. Perhaps, this only led to further frustration for some who believe programming is simply too difficult for them. This should be considered for future exercises, but a balance needs to be sought in terms of the entire cohort and their existing level of understanding and motivation within programming.

One piece of feedback, captured in PBL24, expressed confusion as to why they were asked to work in groups, when they had already experienced group work in a different module:

*‘As I wrote before, I did not get the main idea of the project. I felt that we missed one class that could be used to learn code (since it is a programming class) and apply it to the main assignment. The idea of project in a group we already had in the business class’.*

This response just reinforces the need to explain the importance and rationale for group and team work, and how this is a fundamental aspect of working within the IT sector.



### 5.2.3 Feedback Analysis for PBL Activity No.3, 14<sup>th</sup> April 2016

For the third PBL activity, 9 completed forms were collected. As this was the third activity, the students and mentors had a better understanding of what worked previously, and what the key issues were. One of the key modifications carried out was to the exercise itself, adjustments were made so the basic implementation of what was asked could be achieved more easily, with a further extension within the activity for those groups who wished to push themselves further. The rationale for this approach was that the groups, regardless of their experience, all had a strong opportunity to engage and to complete the activity.

To begin with, there was positive responses concerning working in groups, this was captured in the section that asked participants what they enjoyed the most, PBL28 stated: *'Team work, sharing ideas'*, PBL31 wrote: *'Work in teams and come up with solutions by listening to everyone's ideas'*, and PBL33 positively referring to learning by stating *'I always learning more when I work in a team'*. There was consistent evidence of positive team work experience, particularly around sharing ideas with others.

In terms of the least enjoyable part of the activity for these participants, the time to complete the task was again expressed (PBL26: *'Wish we had more time to complete the problem'*), despite the modifications made to this activity, along with potential frustration with not being able to run or complete the activity. There was one negative comment regarding the general interaction within the team stated in PBL31: *'Deal with the frustration from the team members when we got stuck on one of the steps'*. Again, these are important experiences for the participants as these are characteristics of team work that will strengthen their experience.

Overall, the participants enjoyed the activity and expressed an interest in continuing with this type of group-based activity in programming in future semesters, as expressed in PBL26: *'I can be doing this all of the time, I don't mind'*, and PBL33 stated: *'We should keep having activities like this, it was good!'*. This finding correlates with the findings in other studies in that students do enjoy working in groups.

### 5.2.4 Feedback Analysis for PAL Activity No.1, 7<sup>th</sup> April 2016

For the first PAL activity, 6 completed forms were collected. This was the first peer learning activity that was hosted by the mentors for the purpose of encouraging group learning in the classroom. Unlike the PBL activities, the PAL sessions were informed by the learners as to what it was they wanted to revise/cover, in which the mentors created examples to engage with, but no timing was placed on these activities and the class mostly worked in groups of two, or three. The lecturer was not present for these sessions.

The feedback, although limited to 6 completed forms, was positive regarding working with others, as found in PAL1: *'Working with a team to construct the software'*, and PAL2: *'Practicing the exercises and asking for help with the mentors'* and PAL6: *'Learning with tutors and trying to solve a problem'*. All responses were positive and all relating to working with others in a group setting, and how the group positively worked towards addressing a shared goal. These responses highlight the importance of peer interaction in the process of scaffolding the learning.

Not having the teacher present in the classroom, which was a design choice, was highlighted as an issue in PBL2: *'I would love to see the teacher in the class and to solve the*

*problem for us*’ and PBL6: *‘I wish the teacher could be present and do more of this with us’*. The concept of the PAL session was to allow the students to talk more freely with their peers about their understanding, or lack of, of various programming principles, and to reduce any possible fear of saying they do not know how to do something that they may normally be afraid of saying in front of a teacher and the entire class. The mentors played a key role in facilitating the session, introducing a lecturer may have reduced the positive affect of peer discussion and engagement in what was an informal activity.

### 5.2.5 Feedback Analysis for PAL Activity No.2, 21<sup>st</sup> April 2016

For the second PAL activity, 7 completed forms were collected, one more form than the previous activity, still a lower amount than anticipated. There were positive comments relating to working with others, as captured in the ‘most important thing learned section’ of the form for PAL10: *‘Communication with others’*, and in PAL11: *‘To do things step by step and listen to the team’*. Further positive comments about the session regarding how these activities can motivate others were expressed by PAL7: *‘Realise we are not at the level we should be at and motivates us to work harder’*. These findings again reinforce the positive benefits of social interaction, in terms of learning and developing intrinsic motivation through extrinsic motivational factors. This type of activity also highlights the difference in knowledge between peers, so careful consideration is required to ensure the session is motivating and engaging for all. The mentors that facilitated the sessions were high performing programming students and acted as the More Knowledgeable Others (MKO’s) as described in Vygotsky’s (1978) work.

There were some negative comments about the activity expressed by a number of the participants. In the ‘least enjoyable part of the activity’ section within the form, PAL7 stated: *‘some of the exercises set by the tutors were too short on time’*, PAL11 stated: *‘Sometimes the group don’t know how to solve a problem’*, and PAL13 stated: *‘We didn’t finish the whole project so that was not fun’*. The participants had mixed views, including the issue of not enough time as previously highlighted, but in addition, the frustration in not knowing how to continue or finish the activity itself. This needs careful consideration as this could have a negative impact on motivation and self-efficacy if this were experienced on a regular basis.

### 5.3 Social Learning Activity Feedback – Participant Interviews

Participants were identified through their completed end of semester student engagement and self-efficacy questionnaires. There were 44 participants who completed both the start and end of semester engagement and self-efficacy questionnaires. An initial analysis took place to identify students in the treatment group who had a similar self-efficacy, or a dramatic positive or negative change to their self-efficacy score by the end of the semester. Out of the 44 participants, 15 were invited for interview. As the social learning activity feedback forms were anonymous, I could not assume that the participants who volunteered took part in the treatment activities over the semester. Table 4.7 on the next page outlines the four participant interviews that were carried out, all were audio recorded and subsequently transcribed for analysis.

**Table 4.7: Social Learning Activity Participant Interviews – (Cycle 3, May 2016)**

Interview Label	Audio Length	Word Count
Participant 1	27 minutes	3571
Participant 2	34 minutes	3658
Participant 3	31 minutes	3199
Participant 4	27 minutes	2244

The next section provides an analysis of each participant interview, and in particular, referencing specific pieces that are useful to the focus of this research, and beyond. The analysis of the interviews was based on an examination of the transcripts, in which elements relating to programming ability, peer interaction and the PBL and PAL activities were the primary focus.

### 5.3.1 Participant Interview Analysis

I asked Participant 1 to refer to the commencement of the semester, and to describe their computer programming abilities. The participant stated:

*'I had already done a degree before, so I studied very basic programming before. So, when they come to my first semester in September last year it wasn't completely new to me. I had quite a strong knowledge of what I knew and what I've what I've learned in during the first semester, but I still feel like there are a few gaps. Like I feel gaps in actually comprehending all java operations'.*

The participant went on to say that they now feel much more comfortable with programming and I asked why they now felt this way. The participant responded with technical reasons to do with understanding Java. I was careful not to prompt the participant into suggesting the social learning exercises had any benefit, however, the participant went on to say:

*'..on the other hand definitely the mentoring things that we did during the semester really helped understand Java better. I've always thought that Learning has two stages, when you are learning something, and when you are actually teaching something'.*

This participant was one of the mentors for the both the PBL and PAL activities, so I was interested in discussing this further. The participant made the following comments about their mentoring experience: *'...and then you have to be very aware of what you're saying because actually people that are going to question what I would be saying too'.* This comment is a positive finding as it refers to the positive benefits of mentoring from a cognitive perspective and facilitates the development of communication skills to an audience with varying technical skill levels.

The participant was very happy to discuss their experience as a mentor and how the role of mentor enabled further communication with peers in the class that was previously not possible due to the way it was being taught.

I asked the participant to describe their experience as a mentor and the participant stated:

*'I would really like to say is when I started first year in college in the first semester I always had this feeling like, OK I already have a degree and I really want to do this and making friends and then of feeling integrated with the rest of the group and these PAL sessions actually helped me to feel a little bit more involved and more included with the rest of the people in the classroom'.*

I did ask the participant to discuss any negative experiences they had during the mentoring process and they stated:

*'Yeah there was one particular student who wasn't actually resisting what I was saying, but somehow I felt that student was expecting me to do the work for him.....I did really think at this point you have to sit down and they start from the very beginnings and with very baby steps. And when you have a concrete question just come back to me but, but don't just say I don't know how to do anything'.*

This indicates a sense of frustration from the mentor and perhaps a misunderstanding from the students within the session, and what is expected of both parties within the process.

I asked the participant if group work, or mentoring, would be useful in other modules within the programme, the participant stated:

*'....there was a part which there were people actually willing to help me. They were willing to say OK how you're going to do the web design, and I say my design looks awful and people came to me and say OK let's sit down, maybe change the colour, what do you think about putting this here or put that there. They didn't help me with my programming, but they gave me some advice, and they put some of their time and effort on me. It was a very positive feeling when someone is helping you out'.*

This again further highlights the importance of facilitating social interaction between peers, and through a peer-support network.

Participant 2 was a mentor for the Problem Based Learning (PBL) and the Peer Assisted Learning (PAL) activities throughout the semester. I asked the participant to describe their programming ability at the start of the semester, the participant requested to go further back and stated: *'I started like the module back in September, first semester, I didn't even know what was a "Hello World" or how to print it'*, The participant when on to say:

*'...moving to this semester I started to join in much more, I really enjoyed the classes, the lecturer, the teacher and everything including the material. In the second semester things started to make more sense as I built up my knowledge, things are clearer but I'm still hoping that things will become clearer for me. It's very much day by day.'*

I questioned the participant on their perception of their ability in programming now, not referring to the mentoring programme, the participant stated:

*‘Definitely I think like I’ve become much better I am able to understand a lot of things that I couldn’t understand in the beginning. So especially with the material, the module and all of the activities that we’ve done, and in helping people, and asking people for help – everyone was helping each other and this was very good for helping my understanding’.*

This response was a positive result in that the participant referred to the treatment activities as a positive experience, and as the participant had mentioned the mentoring experience, I asked if this experience had any impact on their confidence or ability in programming:

*‘Yes, definitely. It was something that I found was very nice, people would come to me and ask me if I could help with this, or that, it was very nice to be able to help people. I would sit down with people and help resolve their issues, help them understand better – it was really enjoyable to help others. I could really see how much I’ve learned from last year’.*

This was a positive response and again highlights how social interaction encourages individual understanding, and the participant referred to benefits specifically to programming:

*‘...but working with others you’re seeing their code, you’re looking at how they have done it, and how they do it – and this is very interesting and helps me learn other ways of looking at code’.*

I asked the participant to describe the opportunities students had to work with others, or to communicate with others during their first semester of first year. The participant stated:

*‘I didn’t even know who was in the classroom, it was such a big room, and I sit just in the front, there are so many people, you don’t really talk. You make your group in the first semester, people that might be your friends, or that sit near you. You don’t really get to talk or meet other people. I never done programming before so I just trying to get my head around how does it work, I couldn’t give any support, or ask for support because I didn’t know what I was talking about’.*

This is a positive finding as it further highlights the experience of a first-year student in a large cohort, and how an individual can be isolated despite a large class size.

The participant described how mentoring enabled more communication between peers and stated:

*‘..it is always good to meet different people and like as the same way that I was helping them, and in course in the future they can help me too, maybe in a different subject I can go and ask for help and they might help me because I made new friends’.*

The participant referred to how the mentoring programme enabled them to navigate around the room and talk to their peers for the first time, even though this was the second semester, the participant stated:

*‘...maybe we just say good morning to each other some days, because we were sitting near each other, but never really talked to each other before. This was nice that I got to know him because now I can talk to him about programming things, now I sit with him and we help each other, it was such a nice thing’.*

I asked the participant if they would be willing to be a student mentor in future semesters, they stated:

*‘It’s a way of learning myself and learning to talk to other people. I am very shy to talk to lots of people together, I’m talking to you now, but in front of class I would be afraid of what I would be saying in case I got stuck, but I believe I have to learn this skill. It would be really good in an interview, I was still shy this semester as I was not sure I would be able to do the things, but now I’m more confident that I can do the things, talk to others and help them, prepare myself as well’.*

Again, this further highlights the benefits of facilitating social interaction within the classroom, and specifically, the PAL sessions where the lecturer was not present. As referred to in previous chapters, students may feel pressure to raise their hand or to question something in front of their peers with the lecturer present, in a peer support group students are more likely to discuss their current level of understanding around subject material.

The participant did mention something that was not considered before, although the PBL and PAL sessions were scheduled in-class time, some students would come to the mentors outside of class-time and seek assistance with programming, the participant stated:

*‘....there was a few times that I needed to study myself somewhere in the building, and I was doing like web design project for example and really should finish but I had so many people come to me and oh can you please help me with this code, but I just couldn’t say no to them’.*

Again, this finding refers to the importance of outlining the boundaries within and outside the PBL and PAL sessions and the specific role of the mentors.

Participant 3 was also asked to reflect on their programming ability at the start of the semester and they responded by saying: *‘...how can I figure out what the professor [is saying]... I was not really prepared for this’*. The participant struggled with English but also went on to say how the large class size presented a challenge:

*‘That’s my first challenge and the second who I was thinking about too many people in the same room ok at the first moment there’s a little but after all how can I say two maybe three months started to be ok’*.

This participant also mentioned how they struggled to attend the support classes by saying: *‘...I know you guys are doing your best and sometimes the support classes with the same time that I had to go to work and this is little complicated’*. This response further highlights how work commitments impact time for study, already highlighted in the cycle 1 and cycle 2 study behaviour questionnaires.

The participant went on to say they were now much more confident in programming, the participant described a group they had formed, which was separate from the class-based activities but made up of peers from the class. The participant described the initial idea or process as follows:

*‘I was involved with guys that were really trying to do something different, something else, to try to understand fast and to share knowledge with others. And we share what they understand in different ways, we have different ways of learning – some of us come from different places...we wanted to learn in our way too’*.

This finding is positive in that it reveals that students are forming peer learning groups, a lot of these are private and develop organically. It further highlights the need to formalise a peer learning group that affords an equal opportunity for all to engage in these types of social learning activities.

As in the previous interviews, Participant 4 was asked to describe their ability in computer programming at the start of the semester. The participant stated: *‘I just read something about it and everything was new so for me, it was a really big challenge’*. I then asked the participant how they felt about their ability now that the semester had concluded, they responded by saying: *‘I know a little but not fully confident yet to work with that, I need to study more and practice more’*.

I asked the participant if they worked in any group projects or assignments over the semester, the participant said:

*‘Of course when you have friends in class and then can help you a lot. I didn’t go to any programming support classes that were there to help the students, but I didn’t come. But I was watching some videos in YouTube and with something or internet’*.

The participant revealed they did not attend any of the PBL or PAL sessions over the course of the semester. The participant clarified this further and went on to explain that some

friends would work together in groups anyway, and that this would occur outside of class time. The participant expressed a preference for individual learning, and individual work, but did recognise the benefits of working with others by stating:

*'We had an assignment it was individual but actually we worked in group while I was in the class. It was very helpful because you talk you talk to your friends and when they couldn't help you, you could go to [lecturer] and ask him to explain to you how to figure it out, that was a really nice experience but I still really prefer to work by myself'.*

I then asked the participant what the differences were between working in a group or as an individual when studying computer programming, the participant stated:

*'...because when you have one piece of work that is shared with others sometimes you just say ok I will do this part, and another part, so you're not able to do all pieces of code. not all pieces of code because you just share with others'.*

This response perhaps highlights the frustration some students have when working in group projects in that they are not completing or are exposed to all required elements of a project, which they may feel is a disadvantage to their learning.

## **6. Summary of data collection methods**

The sections below evaluate the usefulness and effectiveness of the research tools and approaches that were used in the three action research cycles, with reference to self-regulated and social learning.

### **6.1 Effectiveness of Data Collection Techniques Used – AR Cycle 1**

The data collection techniques were effective as they were easy to deliver to the participants and results were gathered in a timely manner. Using the online survey tool was deemed more efficient than issuing and processing paper-based questionnaires. The focus group was effective in teasing out issues, but a recommendation on choosing the individuals to participate within the group, as opposed to making it voluntary and random is worthy of consideration for any future research due to the nature of peer and power influences within the group.

### **6.2 Effectiveness of Data Collection Techniques Used – AR Cycle 2**

The study behaviour structured questionnaire was used again for this Cycle, and it was the same unmodified one issued in Cycle 1. This was for comparison purposes across two different cohorts. As the tool was electronic, it was easy to issue to the participants, and they could complete it at a time and place that suited them best.



Interviews were an effective method that allowed me to explore other issues relating to their programme, such as their study behaviour, and other factors that were not originally considered. This approach was useful as it allowed individuals to open up about their personal experiences without having any potential peer influence or pressure that was observed with the focus group in Cycle 1. The semi-structured nature of the questions allowed for deeper discussion based on the participant response.

### 6.3 Effectiveness of Data Collection Techniques Used – AR Cycle 3

Cycle 3 used questionnaires, feedback forms and interviews to collect data. The questionnaire contained two parts, a student engagement questionnaire and also a programming self-efficacy questionnaire. While the outcome of the tool itself was effective, it was noted that it was time consuming for the participants to complete. If the study were to be repeated, I would recommend separating these questionnaires and issuing them on separate dates. Upon reflection, it is worth noting that some participants may have rushed towards the end of completion as their concentration and focus may have been impacted.

The social learning activity feedback forms were effective as they were short, and easy to understand and complete. However, the participants were less interested in completing the feedback form upon completing the treatment activities which should be re-examined if using a similar collection tool in the future.

Regarding interviews, a low number of participants volunteered to participate in a semi-structured interview, this low uptake was not anticipated. However, within the small number of participant interviews that were carried out, useful findings and insights emerged. It is worth noting that the use of an alternate interviewer might address the power/influence role I had had with the participants. Upon reflection, as this was the end of the semester, some participants may have felt uncomfortable participating in an interview that was based on their programming experience and ability.

## 7. Usefulness in Answering the Research Questions

This section will attempt to address the research questions for Cycle 1 and Cycle 2. The research questions are listed below, as presented in Chapter 1 (p. 5), and an analysis of the effectiveness of the methods and approaches used in answering the questions will now be discussed.

### 7.1 AR Cycle 1 and AR Cycle 2 Research Questions

Q.1: What do first year BSc in IT students identify as challenging subject areas?

**Response:** Computer programming followed by Computer Networking were the two subject areas participants identified as the most challenging in both Cycle 1 and Cycle 2. In Cycle 1, 65% (95% CI 47.9, 82.1) selected Programming with 32% (95% CI 15.3, 48.7) selecting Computer Networking in second place, and in Cycle 2 74% (95% CI 62.2, 85.8) selected Programming with 18% (95% CI 7.7, 28.3) selecting

Networking in second place. The findings correlate with informal discussions between students and faculty members.

Q.2: What are the study preferences and study challenges of first year BSc in IT students?

**Response:** The questionnaire findings in both Cycle 1 and Cycle 2 revealed the high importance of the study materials provided by the lecturers. 97% (95% CI 90.0, 100.0) of the participants in Cycle 1, and 85% (95% CI 75.4, 94.6) of the participants in Cycle 2, identified the importance of the materials provided by the lecturer as their number one method of focus in terms of the study options available.

Q.3: Do first year BSc in IT students see any benefit in the process of reflecting on learning?

**Response:** The answer to this question is derived from the written responses within the conclusion section of the reflective journal tool itself, from a focus group conducted in Cycle 1, and interviews in the Cycle 2 study.

Data from Cycle 1 suggest there needs to be a better approach in assisting students with the weekly reflective process and an element of engagement between the students and facilitator required. The students generally did seem to struggle to find the journal useful in terms of reflection but there were positives in that some students indicated that they would use a form of reflective journal in the future.

Cycle 2 attempted to address some of the issues found within the approach used in Cycle 1. The conclusions drawn from Cycle 1, and the conclusions from Cycle 2, indicate that the use of a reflective learning journal can lead to frustration for some and not an activity that can be recommended for all students. While some students did indicate benefits in using the journal, the negative comments outweighed the positive and as such, it is not a tool that can be recommended to an entire cohort.

Q.4: Do first year BSc in IT students derive any benefit from using the spreadsheet designed reflective learning journal tool?

**Response:** The tool itself seemed to have practical benefit to the participants in both studies, purely from an ease of access perspective as it was a static spreadsheet file that could be opened with or without internet access. The participants in Cycle 1 suggested the completion of the journal entries were time consuming, and in some cases, confusing. This was adjusted the reflective tool used in Cycle 2. Regardless of the tool used in both Cycle 1 and Cycle 2, the participants referred to the time-consuming nature of the activity and noted there was no reward for completing the journal. These responses require further consideration if a reflective learning journal is to be used as an approach in the focus institution in the future.

## 7.2 AR Cycle 3 Research Question

The questions and responses presented relate to social learning, student engagement and self-efficacy. Later chapters will address additional research questions for Cycle 3.

- Q.5 Are Problem Based Learning (PBL) and Peer Assisted Learning (PAL) suitable social learning approaches that can be used within a computer programming module?

**Response:** Although PBL and PAL are known methods that facilitate engagement and learning in higher education, this needed to be explored in practice as the existing approach to teaching computer programming in the research environment was individualistic and solitary, and contained no group learning or group assessment. The response considered the opinion of the module lecturer, and the participants within the study.

In the initial interview with the module lecturer, the lecturer was against group learning within programming. However, the lecturer did facilitate the PBL and PAL sessions within the programming class. Post treatment, the lecturer could clearly see the benefit of such approaches and stated that this should now be considered in future delivery of the module.

The participants, through data captured through the social learning activity feedback forms, clearly enjoyed the social learning activities and requested similar activities to continue into the future.

- Q.6 Can social learning activities encourage students to engage in individual reflection?

**Response:** To answer this question it is worth considering the actual uptake on the completion rate of the social learning activity feedback forms, although this cannot be treated as a complete accurate response to this question, it still forms part of the response. The response rate over the five social learning activity forms was generally below what was originally expected, ranging from 14% to 20% across all activities. However, through the analysis of the feedback forms the participants were reflecting on the activities and reflecting on their performance within the group, and suggested actions they would take in future activities. Naturally the participants may have reflected in their own way and using a process that is personal to them.

- Q.7 Can social learning enhance overall student engagement?

**Response:** Although this question can be better answered in Chapter 5, there is some qualitative evidence worth considering within this chapter. The computer programming lecturer indicated through the post treatment interview that the students seemed more engaged during the interventions than expected, and referred to the positive ‘real-world’ feel to the activities. This is a positive outcome, and importantly, both the participants and the module facilitator both expressed an interest in the activities and a desire for this form of activity to continue.

## 8. Conclusions and Recommendations

The conclusions and recommendations relate to the reflective learning journal interventions carried out in Cycle 1 and Cycle 2, and the social learning interventions carried out as part of Cycle 3.

### 8.1 Conclusions

Table 4.8 below presents the research methods with key learnings from the use of the self-regulated and social learning activities over the three action research cycles.

**Table 4.8: Chapter 4 Summary Conclusions**

Research Methods and Cycle	Key Learnings
Study Behaviour Questionnaire (Cycle 1 and 2) – Analysis of data acquired	<ul style="list-style-type: none"> <li>- Programming was the subject the participants identified as the most challenging.</li> <li>- Employment caused the biggest obstacle to study for the participants within the focus institution.</li> <li>- The materials provided by the lecturers were highly rated for use in self-study over other sources.</li> <li>- Video clips were very popular with participants regarding their studying practices.</li> </ul>
Reflective Learning Journal (Cycle 1 and 2) – Analysis of the data produced (text entries) within the tool itself	<ul style="list-style-type: none"> <li>- The tool itself was not specifically criticised, more so the comprehension of what was expected within the text entries.</li> <li>- The participant journal entries decreased over the semester in terms of effort and content.</li> <li>- The conclusion section within the journal contained comments stating the activity was time consuming with no obvious learning benefit.</li> </ul>
Focus Group (Cycle 1) and Interviews (Cycle 2) – Reflective learning journal evaluation	<ul style="list-style-type: none"> <li>- The group were generally positive about the concept of reflection, and understood the importance of looking back over course material for learning.</li> <li>- The group were generally negative about the process of completing journal entries on a weekly basis; they failed to see any learning benefit through reflecting this way.</li> <li>- The interviews confirmed that group learning within social settings was the preferred method of learning outside the classroom, and not using a reflective learning journal.</li> </ul>

Focus Group (Cycle 1) and Interviews (Cycle 2) – Reflective learning journal evaluation ( <i>Continued</i> )	<ul style="list-style-type: none"> <li>- Reference was made to the high quantity of continuous assessments throughout the academic semester, suggesting this is a burden in terms of finding quality time for additional study.</li> </ul>
PBL and PAL activity feedback forms (Cycle 3) – Analysis of participant feedback	<ul style="list-style-type: none"> <li>- The feedback was very positive, and the participants expressed an appetite for further social learning activities to continue.</li> <li>- Very few negative comments arose; two consistent messages pointed to a lack of time to complete the activity itself, and, to have the module lecturer available, particularly within the PAL sessions.</li> </ul>
Interview (Cycle 3) – Principal programming lecturer, pre and post-treatment	<ul style="list-style-type: none"> <li>- The pre-treatment interview revealed a strong stance against social learning / group work, and how it can negatively affect the stronger students within a class.</li> <li>- The post-treatment interview revealed a favourable outcome for introducing social learning / group work for future cohorts.</li> </ul>
Interview with participants from the treatment group, post treatment activity (Cycle 3)	<ul style="list-style-type: none"> <li>- The participation in the post-treatment interviews was low, and therefore limited data was captured, but generally the participants were positive about group learning and social learning activities.</li> <li>- The mentors involved in the social learning activities described how much they had learned themselves through the process of teaching / mentoring others.</li> <li>- The mentors had flagged something of interest and worth considering in that they were asked follow up questions from their peers outside of the scheduled PBL/PAL sessions, resulting in additional work load for the mentors.</li> </ul>

## 8.2 Further Research

The conclusions drawn from the reflective learning journal interventions in Cycle 1 and Cycle 2 reveal that while the use of a reflective learning journal is supportive to some, most participants failed to see any benefit in using it, and some found it an unnecessary distraction to the core aspects of their course. While there was an initial interest from participants to engage in reflection at the commencement of the interventions, this interest diminished as time passed and many students failed to complete all journal entries. The literature points to similar situations arising, in Barnard's (2011) reflections on learning journals in use, formative feedback on the reflective process during journal completion had a significant

effect on a few students, but had no effect on most, and in the majority of cases, students who were reflective at the end of course were naturally reflective at the start of the course.

The purpose of introducing the reflective learning journal was to encourage engagement in learning, to encourage students to create as they think about various concepts over a period of time, and for gaining insights in self-awareness (Thorpe, 2004). This is also supported through Kolb's (1984) learning cycle which suggests learning is created through the interaction of theory and experience which involves active student participation in the learning process. Ladyshevsky (2006) suggests reflective learning journals enable learners to engage with content better by examining their experiences in applying theory to practice, and Stewart et al. (2008) suggests they are advantageous as they encourage deep, not surface, learning to occur. Brown et al. (2011) and Carson and Fisher (2006) through their studies on reflective learning logs highlight their value through the essential process of writing and review to facilitate and evaluate subject knowledge transfer.

While some students did indicate benefits in using the journal, the negative comments outweighed the positive and as such, it is not a particular tool that I can recommend to all students within a class. However, further research on methods and tools for learning through reflection should be investigated, such as cloud-based interactions (Lin et al., 2014), electronic journals (Chang & Lin, 2014), and portfolios (Scott, 2010). If a new tool is to be considered, so too is the issue with work commitments as highlighted by the participants, so tools and approaches for studying and engaging in shorter periods is a factor.

Another consideration is the assessment aspect of learning journals, perhaps if there was a grade applied to the completion of a reflective learning journal the students would have the extrinsic motivating reasons to engage in reflection, and the activity itself, as supported by Zahra (2012). However, Moon (2013) warns that assessing reflective learning journals is challenging and there needs to be a decision made as to whether it is the outcome of the learning or the engagement with reflection that is being assessed.

One key learning I have taken from the experience is that I did not provide sufficient support to the participants during the reflective learning journal intervention. I should have actively engaged with the participants through the weekly log completion process. Hibertt (2012) refers to a number of stages to encourage better reflection, including stimulating critical thinking through dialogue and supporting the development of different perspectives. Moon (2013) recommends students need to be well supported to write reflectively, and with our international cohort considered, this may have contributed to the lack of engagement in the reflective learning journal intervention.

Group learning was one key area of interest that was revealed by the participants during the first two action research cycles, leading to the social learning intervention in cycle 3. PBL and PAL were the basis for the interventions, and these approaches are aligned to a student-centred approach, which Knowles (1980) suggests that adult learners come to a learning environment with a wealth of experience and have a desire to learn what they need to know in order to perform effectively. Knowles (1984) also suggests learning needs to be meaningful and centred around real-life situations and not just subject matter. Both PBL and PAL allow for these experiences which was one of the benefits of this approach, and social interaction was the desired process to facilitate learning in programming. PAL relies on social interaction between students, and so too does PBL. With peers assisting peers in learning, Lockspeiser et al (2008) points to the shorter knowledge gap between a student mentor and a student learner

and the recollection of facts and understanding for the mentor is potentially more suitable in this scenario. The knowledge gap between a lecturer and student is often much larger, as Lockspeiser (2008) suggests, which results in a reduced ability to communicate in relative terms to the students. The literature on PAL as an approach presents a mix of both positive and negative effects (Rengier et al., 2010; Tolsgaard, 2013, Patel et al., 2014;). The studies generally highlight the benefits of this approach when considering large class sizes, and the costs of hiring faculty members, there is little on the learning impact other than the positive experience itself. There are some studies that have statistically evidenced the benefits of PAL, such as Blank et al. (2013) in their study on the use of PAL with medical students with a treatment and control group. They found that those in the control group who did not receive PAL treatment achieved an average score of 57% in their module exam, while those who were taught by peers scored on average 77% in the same exam. Burke et al. (2007) found in their study on the use of PAL with medical students that those who were taught through PAL intervention had a 93% pass rate on the end of year exam in comparison to a 67% pass rate for those who did not receive the PAL treatment.

With regard to PBL and computer programming, Peng (2010) states that textbooks for computer programming courses are too abstract and obscure, which is particularly difficult for first year programming students to understand concepts, which can dampen their enthusiasm to learn. Peng suggests teachers need to consider approaches like PBL to reduce the fear of programming and to keep the classes lively and interesting. Wang (2017) found that the students who learned computer programming through PBL had higher self-efficacy than those who learned with a conventional collaborative learning approach. Şendağ and Ferhan Odabaşı (2009) conducted a study with a control and treatment group within a computer programming module. The treatment group received PBL related activities and the control group received traditional teaching approaches. The results revealed that both groups increased their knowledge between pre-test and post-test, but no group outperformed the other, but the treatment group who received the PBL related activities scored statistically higher in their critical thinking skills. Chis et al (2018) conducted a similar study with a control and treatment group on a computer programming module, using Flipped Classroom and Problem Based Learning as the treatment activities. The results revealed a 26.56% increase in the assessment results when compared to the control group score. Their results show that a combined flipped classroom and PBL approach is effective in helping weaker students to improve their skills when compared to just a flipped classroom approach. In addition, O’Kelly et al (2004) integrated PBL into an existing programming module and found similar positive results and outlined a preference to continue with PBL in subsequent semesters. The literature also suggests that PBL participants seem to have more fun (Dolmans & Schmidt, 1996) which was another factor with consideration for enhancing engagement in computer programming. Smits et al (2002) points to evidence that PBL participants rate their educational experiences higher than those who experience traditional approaches, and Sursarla et al (2003) suggest there is better retention and progression through the use of PBL.

There was a positive reaction from the participants through the use of PBL and PAL for this study, and an expression of interest in continuing with these activities in the future. The results correlate with the literature in that students were observed as more engaged and appeared to be having ‘fun’ which was noted by the programming lecturer and the student mentors when carrying out the activities. This created a positive interactive environment and a

new sense of energy emerged within the programming module. As this approach was primarily used to engage students in programming, the end of semester student engagement measurement results across both the control and treatment groups were not convincing in that both groups presented with a similar overall student engagement score. The measurement of self-efficacy in working in groups within programming was an additional aspect of this study, and this positively revealed a change in efficacy score for the treatment group which clearly indicates the PBL and PAL sessions and a positive impact on efficacy in working in groups. The end of semester treatment group average module results were slightly higher (55%) than that of the control group (49%) and treatment group module failure rate was 11% versus 19% for the control group. Caution is required on making claims that this was directly related to the PBL and PAL activities but importantly, there is no evidence that the social learning activities negatively impacted the treatment group programming performance. Further research is required to test these approaches with different cohorts and using alternative methods of delivery. This could lead to an established formalised approach to the use of social learning within the focus institution.

The next chapter will discuss the identification of a suitable tool to measure student engagement, and an analysis on its use and effectiveness in measuring engagement across the control and treatment group for Cycle 3 (2016).



# Chapter 5

## Measuring and Evaluating Student Engagement

### 1. Introduction

This chapter is a discussion on the approach used to measure student engagement, and specifically, the implementation of the student engagement measurement tool that was used in Cycle 3 (2016). The tool was applied to both the treatment and control groups to measure engagement between the start and end of a semester.

The purpose of examining student engagement was to determine if the social learning intervention activities had any impact on engagement, either positive or negative, on the control and treatment group. Student engagement is featured within the literature as a strong indicator of student success and associated with progression and retention. The concept of student engagement has its origins in the work of Pace (1980, 1984), Astin (1984), Chickering and Gamson (1987), and Kuh et al. (1991). The student engagement measurement tool that is used in Ireland is based on the engagement survey model created within the U.S. referred to as the National Survey of Student Engagement (NSSE).

The Irish Survey of Student Engagement (ISSE), as of 2015, required students to respond to more than one hundred questions relating to 14 themes. Students were asked to rate their experience of their respective higher education institution, their programme and associated support services and resources.

### 2. The Questionnaire Tool

The ISSE tool was chosen as the student engagement measurement tool for this study for two strong reasons; firstly, the tool was developed externally and constructed through a process of peer review, with its origins stemming from the well-established NSSE survey tool. Secondly, engagement data acquired through this empirical study may be useful to measure against national ISSE data from other institutions, for the purpose of identifying comparative strengths and weaknesses against public sector institutions.

The ISSE tool is only made available to public higher education institutions in Ireland. Private institutions are not invited to take part in the national study. The findings could potentially be used to measure our institutional performance against that of the public higher education institutions in a constructive and meaningful way. Findings, however, should not be

over interpreted. With regard to engagement survey instruments, Kuh (2009b) states that given the increasing diversity of college students it is inaccurate to presume that what works in one setting for certain students will have the same effects in other settings for different types of students.

The ISSE tool is provided to students in public higher education institutions (first year, and final year undergraduate, and taught graduate) each year and opens typically in February/March for a period of three weeks. Within this study, the questionnaire tool was completed twice by the participants, once in February, but also in May at the end of the semester. This was for the purpose of measuring change, if any, over the semester.

The original ISSE survey tool was launched in 2013 and the same format was used up to 2015. A revised and shortened survey was introduced in 2016. The tool used for this study was based on the 2015 ISSE survey tool format, which corresponded with the year that the data was collected. The ISSE tool contained questions relating to resources and facilities which could not have been answered by the participants within the focus institution, so these questions were removed from the modified tool to avoid unnecessary confusion. In addition, some questions within the tool were modified to make them more explicit, to ensure the participant understood what was asked and to reduce potential confusion, or frustration. This approach was carefully balanced so as not to destroy the existing qualities of the original ISSE tool. The full customised student engagement questionnaire tool that was used in the focus institution is available in Appendix F.

The modified engagement tool was piloted with four BSc in IT international students where English was not their native language. This process allowed for question modifications and to estimate the completion time for the participants. Table 5.1 below represents the 14 questionnaire themes integrated into the questionnaire tool that was completed by the research participants.

**Table 5.1: Student Engagement Questionnaire Themes**

Question No.	General Theme	Sub Questions
1	General Student Engagement	28
2	Intellectual Activities	5
3	Assessment Duration	2
4	Assessment Types	5
5	Assessment Challenge	1
6	Other related engagement	13
7	Work experience / communication	7
8	College relationships	3
9	External activities	8
10	College support for success	5
11	College support for personal/professional development	12
12	College educational experience	1
13	Programme evaluation	1
14	Satisfaction with decision to enrol at College	1

### 3. Method of Analysis

The method of analysis was adapted from the approach outlined in the *ISSE Results from 2015* report (Higher Education Authority, 2015). This approach allowed for possible comparisons between the empirical data captured through this study, and the data collated at a national level. Each question in the survey contains between 4 and 8 possible responses and these are then converted to a 100-point scale, this approach mirrors the ISSE method. To illustrate, if response 3 is selected from 4 possible responses, this converts to a score of 66.67 as in the example shown in Table 5.2 below:

**Table 5.2: Engagement Data Response Calculation Sample**

Question	Responses			
Asked questions or contributed to discussions in class, tutorials, labs or online.	Never	Sometimes	Often	Very Often
Responses transformed to 100-point scale.	0	33.33	66.67	100

This calculation method was used for comparing questions across both the control and treatment group. This allowed for the identification of questions and responses that were useful in assessing the research questions. The second method of analysis, more aligned with presentation as the calculation method is the same, is associated with Index scores. The *ISSE Results from 2015* report identified a number of indices based on contributing questions. The exact number of responses required for an Index score varies according to the index, based on psychometric testing undertaken by NSSE and AUSSE as outlined in the *ISSE Results from 2015* report. For example, eleven questions contribute to the index Academic Challenge. Six of these must be answered in order to calculate the index score. Seven questions contribute to Active Learning and four of these must be answered in order to calculate the index score. The index score is calculated from the mean of responses given, excluding non-responses. Below is a list of the Engagement and Outcome Indices, adapted from the *ISSE Results from 2015* report (Higher Education Authority, 2015):

#### Engagement Indices

- **Academic Challenge:** The extent to which expectations and assessments challenge students to learn.
- **Active Learning:** Students' efforts to actively construct knowledge
- **Student – Staff Interactions:** The level and nature of students' contact and interactions with teaching staff
- **Enriching Educational Experiences:** Students' participation in broadening educational activities
- **Supportive Learning Environment:** Students' feelings of support within the college community
- **Work Integrated Learning:** Integration of employment-focused work experiences into study

**Outcome Indices:**

- **Higher Order Thinking:** Participation in higher order forms of thinking
- **General Learning Outcomes:** Development of general competencies
- **General Development Outcomes:** Development of general forms of individual and social development
- **Career Readiness:** Preparation for participation in the professional workforce

The *ISSE Results from 2015* report (Higher Education Authority, 2015) suggests index scores provide greatest insight into the experiences of comparable cohorts over multiple datasets. For this study, I compared index scores from participant groups within my focus institution with that of other public sector institutions. The ISSE response rates in 2015 highlighted an uptake of 29.2% across the public sector institutions, in which the sample included 12,603 first year undergraduate students (Higher Education Authority, 2015).

Table 5.3 below represents the Indices and the questions that are linked to the questionnaire tool for this study (the full questionnaire can be viewed in Appendix F).

**Table 5.3: Mapping ISSE Indices to Specific Questions in the Questionnaire Tool**

ISSE Engagement Indices		Linked to Questionnaire (Appendix F)	No. of Questions
1.	Academic Challenge	1.24, 2.2, 2.3, 2.4, 2.5, 4.1, 4.3, 4.4, 4.5, 9.1, 10.1	11
2.	Active Learning	1.1, 1.3, 1.13, 1.14, 1.16, 1.17, 1.26	7
3.	Student – Staff Interactions	1.20, 1.21, 1.22, 1.23, 1.25	5
4.	Enriching Educational Experiences	1.18, 1.28, 7.2, 7.3, 7.4, 7.5, 9.3	7
5.	Supportive Learning Environment	8.1, 8.2, 8.3, 10.2, 10.4	5
6.	Work Integrated Learning	1.9, 6.4, 6.6, 7.1, 11.1	5
Outcome Indices		Linked to Question	
7.	Higher Order Thinking	2.3, 2.4, 2.5, 2.2	4
8.	General Learning Outcomes	11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8	8
9.	General Development Outcomes	11.9, 11.10, 11.11, 11.12	4
10.	Career Readiness	6.9, 6.10, 6.11, 6.12, 6.13	5
11.	Overall Satisfaction	12, 14	4

## 4. Findings and Analysis

This section will discuss a high level comparison of engagement scores across both the control and treatment group, and then present individual engagement question theme scores that were useful for this particular study, and finally conclude with a comparison with that of national data taken from the *ISSE Results from 2015* report. The scoring of all questions was performed using the 100 point scale, as shown in Table 5.2 (p.121), where the total for each question theme was averaged and compared across both the treatment and control groups. These figures are expressed as percentages for further clarity.

Table 5.4 below reveals the average question score comparison between the control and treatment group.

**Table 5.4: Student Engagement Questionnaire Results Comparison (average question theme score comparison between the control and treatment groups).**

<b>Student Engagement Questionnaire Results Comparison</b> (average question theme score comparison between the control and treatment groups)						
<b>Question Theme</b>	<b>Treatment Group</b>			<b>Control Group</b>		
	<b>Start of Semester</b>	<b>End of Semester</b>	<b>Difference</b>	<b>Start of Semester</b>	<b>End of Semester</b>	<b>Difference</b>
Q1	39.61	43.05	3.44	38.21	38.21	0.00
Q2	49.55	49.70	0.15	45.59	52.26	6.67
Q3	42.05	41.76	-0.29	31.45	36.70	5.25
Q4	25.34	28.86	3.52	18.39	22.26	3.87
Q5	73.59	70.41	-3.18	64.77	73.35	8.58
Q6	47.96	45.03	-2.93	48.06	49.79	1.74
Q7	57.22	59.58	2.35	56.68	62.79	6.11
Q8	76.88	79.53	2.65	79.23	80.28	1.05
Q9	35.49	36.74	1.25	30.71	32.94	2.23
Q10	50.61	52.73	2.12	54.19	49.03	-5.16
Q11	53.91	58.14	4.23	53.05	53.67	0.63
Q12	62.95	61.43	-1.52	60.31	53.86	-6.45
Q13	68.18	64.40	-3.78	68.82	61.29	-7.53
Q14	69.70	68.18	-1.52	65.59	61.54	-4.05

Table 5.4 represents the total average score for each group, across all fourteen question themes. For clarity, each total (Start and End of Semester) was divided by the number of the questions within each theme, please see Table 5.1 (p.120), for the questionnaire themes. The table above highlights some small to larger differences between group scores within some of the question themes. To understand these changes a deep examination of the sub-questions

within each theme is required, these results will now be presented. Out of the complete questionnaire, 16 questions and responses were identified as useful in assessing the research questions. Table 5.5 below represents the question themes and sub questions that will be further analysed.

**Table 5.5: Questions and responses identified for analysis from the student engagement questionnaire.**

<b>Question No.1: During the semester, about how often have you done each of the following?</b>	
1.1	Asked questions or contributed to discussions in class, tutorials, labs or online
1.2	Sought advice from teaching staff
1.4	Worked hard to master difficult subject content
1.8	Used student learning support services e.g. Maths support classes or Programming support classes
1.10	Included diverse perspectives (e.g. different races, religions, genders, political beliefs, etc.) in class discussions or written assignments
1.15	Put together ideas or concepts from different subject modules when completing assignments or during class discussions
1.22	Discussed ideas from your coursework or classes with teaching staff outside class
1.28	Had conversations with students who are very different to you in terms of their religious beliefs, political opinions, or personal values
<b>Question No.2: During the semester, how much has your coursework emphasised the following intellectual activities?</b>	
2.3	Organising and connecting ideas, information or experiences into new, more complex interpretations and relationships
2.4	Making judgements about the value of information, arguments or methods, (e.g. examining how others gather and interpret data and assessing the quality of their conclusions)
<b>Question No.6: During the semester, about how often have you done each of the following?</b>	
6.3	Examined the strengths and weaknesses of your own views on a topic or issue
6.5	Developed communication skills relevant to your discipline
6.7	Tried to better understand someone else's views by imagining how an issue looks from their perspective
<b>Question No.10: To what extent does your institution encourage each of the following?</b>	
10.3	Encouraging contact among students from different economic, social and ethnic/national backgrounds
<b>Question No.11: Has your experience of your institution contributed to your knowledge, skills and personal development in the following areas?</b>	
11.7	Working effectively with others
11.10	Understanding people of other racial, ethnic and national backgrounds

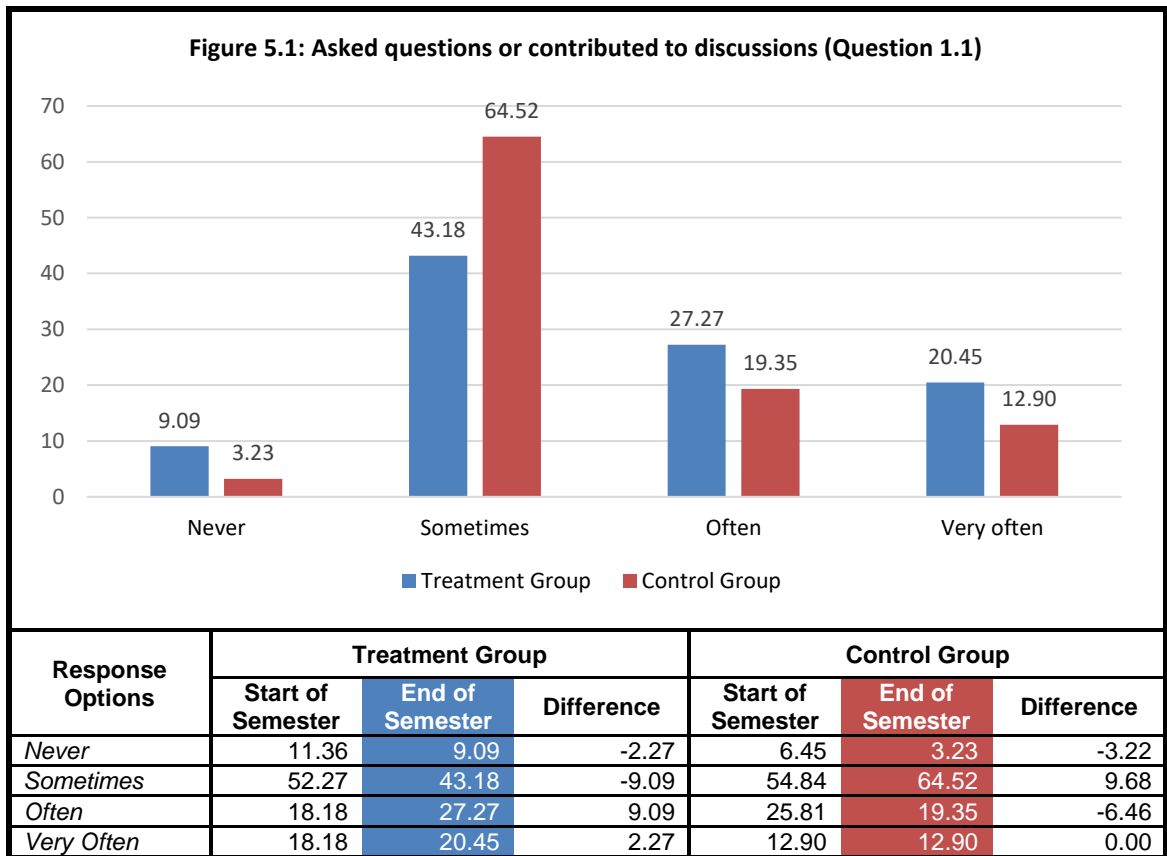
The questions identified in Table 5.5 were analysed and are expressed in both chart and table format. The charts are showing only the end of semester comparison between groups,

and not the ‘Start of Semester’ and ‘Difference’ score, this is to further highlight any changes that may have occurred over the course of the semester under examination. Each table is followed by an analysis with interpretation on its usefulness for this research investigation and beyond.

It should also be noted that no formal statistical tests were carried out within the analysis. This would have been possible if the participants’ responses were identifiable across both the start and end of semester questionnaires, but for reasons of anonymity, this was not possible and therefore the discussion presented below is purely discursive.

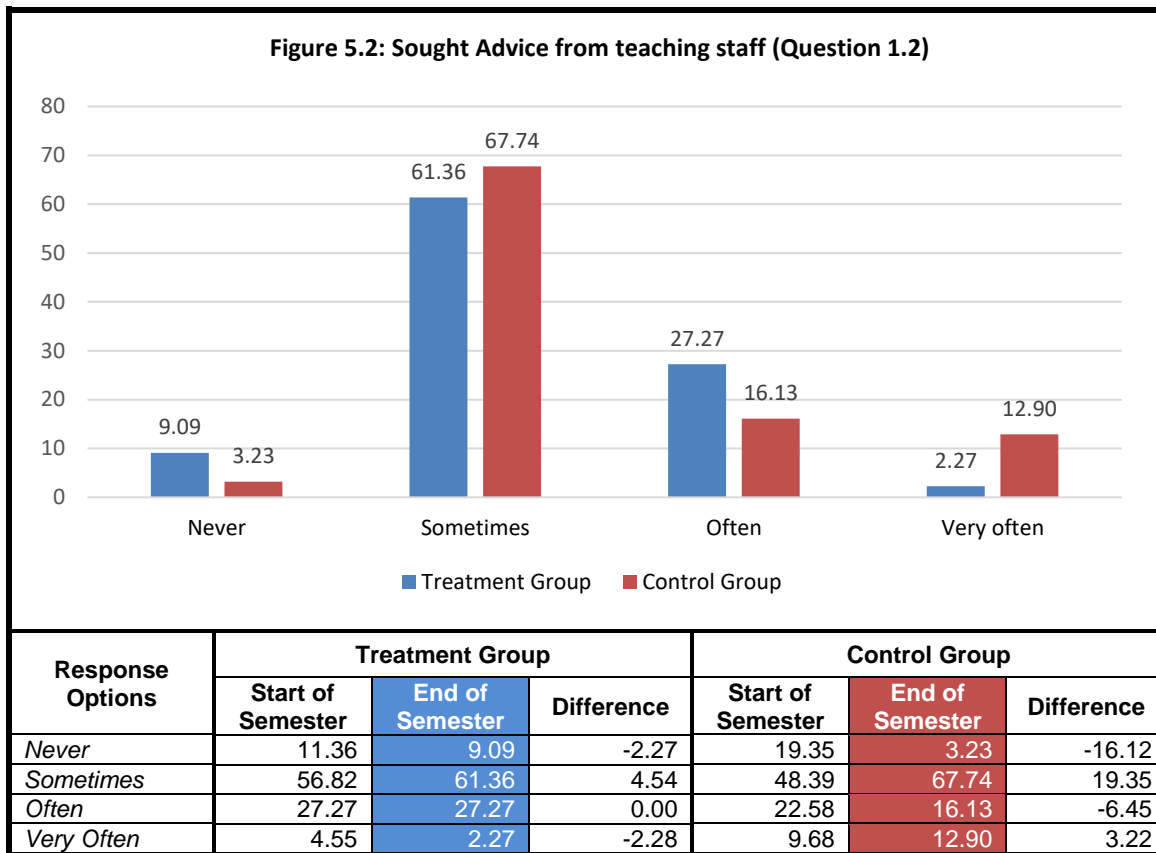
**4.1 Question No.1: During the semester about how often have you done each of the following?**

**Figure 5.1: Asked questions or contributed to discussions (Question 1.1)**  
(Figures are expressed in %)



**Analysis:** This specific question element produced a 9.09% increase in the ‘Often’ category for the treatment group with regard to asking questions and contributing to discussions in class, including the various tutorial sessions. This is an interesting finding as the control group moved from a higher percentage score of 25.81% to a lower 19.35% within the same ‘often’ category by the end of the semester. This is a positive result for the treatment group, and an indication that the intervention activities contributed to this positive score change.

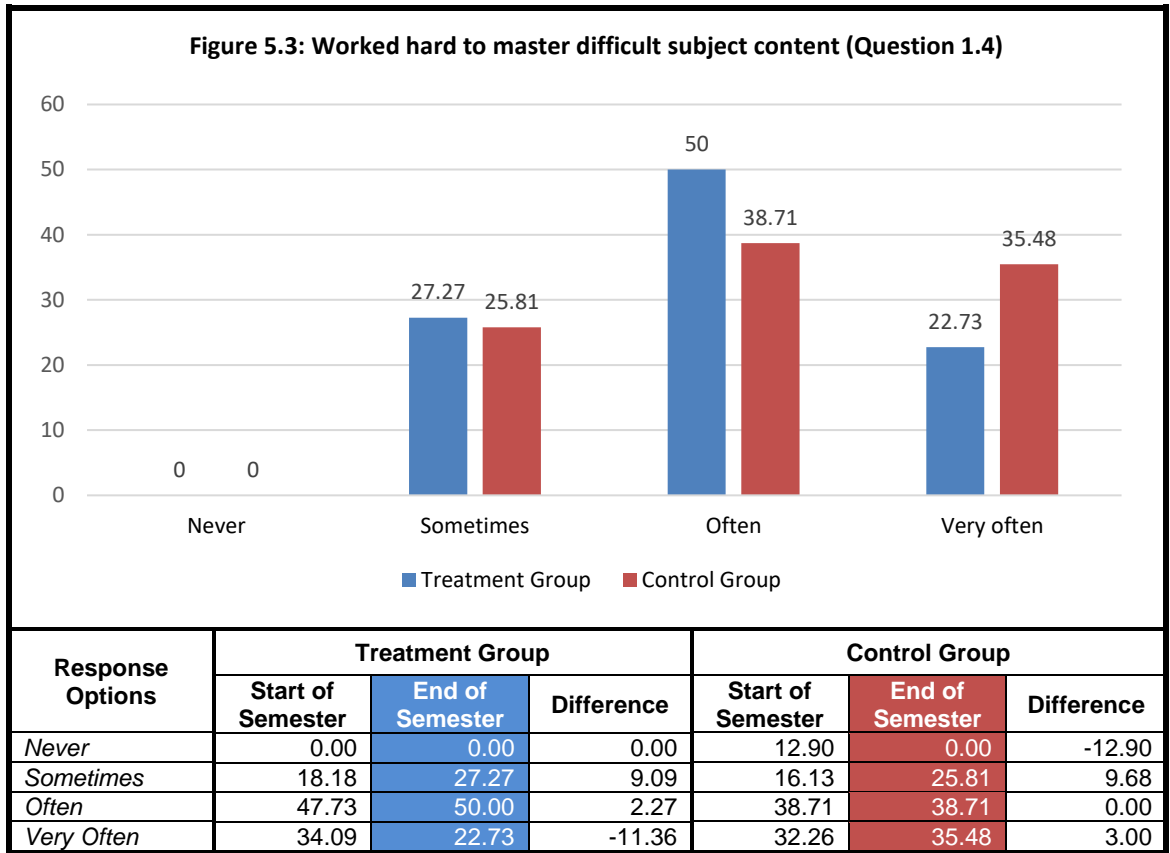
**Figure 5.2: Sought Advice from teaching staff (Question 1.2)**  
 (Figures are expressed in %)



**Analysis:** In terms of seeking advice from teaching staff, the treatment group remained on 27.27% for ‘Often’ at the end of the semester, however, the control group decreased from 22.58% to 16.13%. It must also be noted that the control group still retained a higher ‘Very often’ percentage score of 12.90% as opposed to the treatment group’s 2.27%.

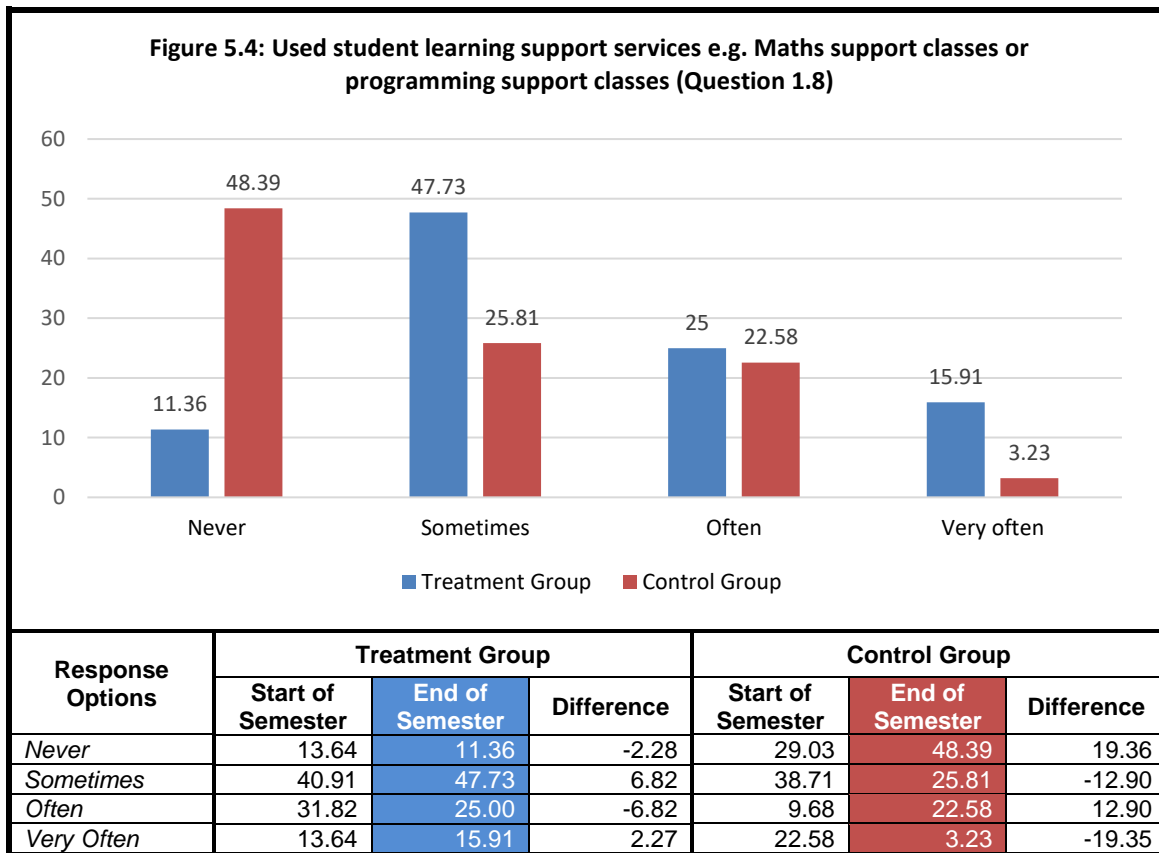


**Figure 5.3: Worked hard to master difficult subject content (Question 1.4)**  
 (Figures are expressed in %)



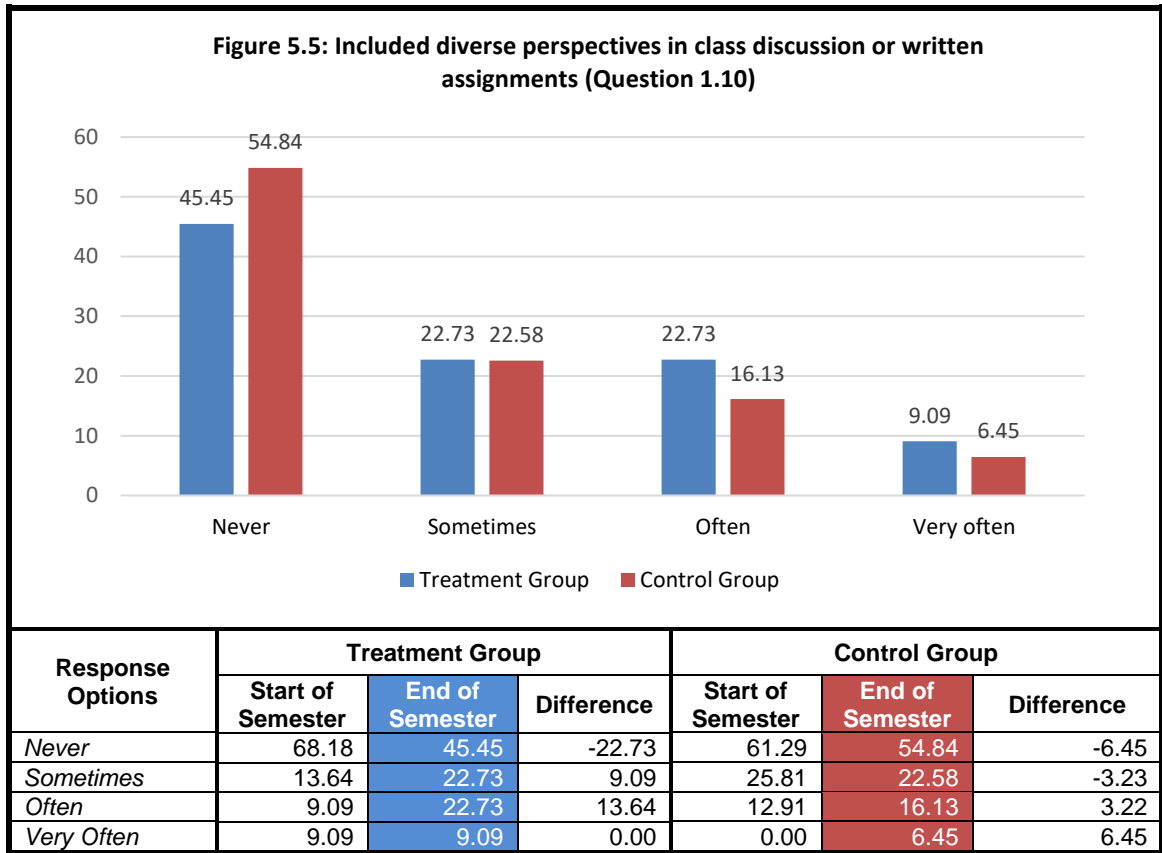
**Analysis:** In this question element, the participants rated their ability to work hard to master difficult subject content, both treatment and control groups highly rated their performance at the start of the semester within the ‘often’ and ‘very often’ categories, but a noticeable decrease within the treatment group of 11.36%, while the control group increased slightly by 3.00% by the end of the semester. This finding indicates a change in score, but with no obvious correlation with the treatment activities as the control group scored higher for this question element.

**Figure 5.4: Used student learning support services e.g. Maths support classes or programming support classes (Question 1.8) (Figures are expressed in %)**



**Analysis:** Within this question element, it was expected that the treatment group would outscore the control group as this question relates to student learning supports with a particular reference to programming. We can see that the treatment group retained a high ‘sometimes’ score and a slight increase to the ‘very often’ score category. The control group negatively moved from 29.03% to 48.39% for the ‘never’ category and a notable slide from 22.58% for ‘very often’ to 3.23% by the end of the semester. There is a strong indication that the activities provided to the treatment group may have had an impact to the scores, this does not suggest a difference in ability, but a measurement of engagement in learning support activities.

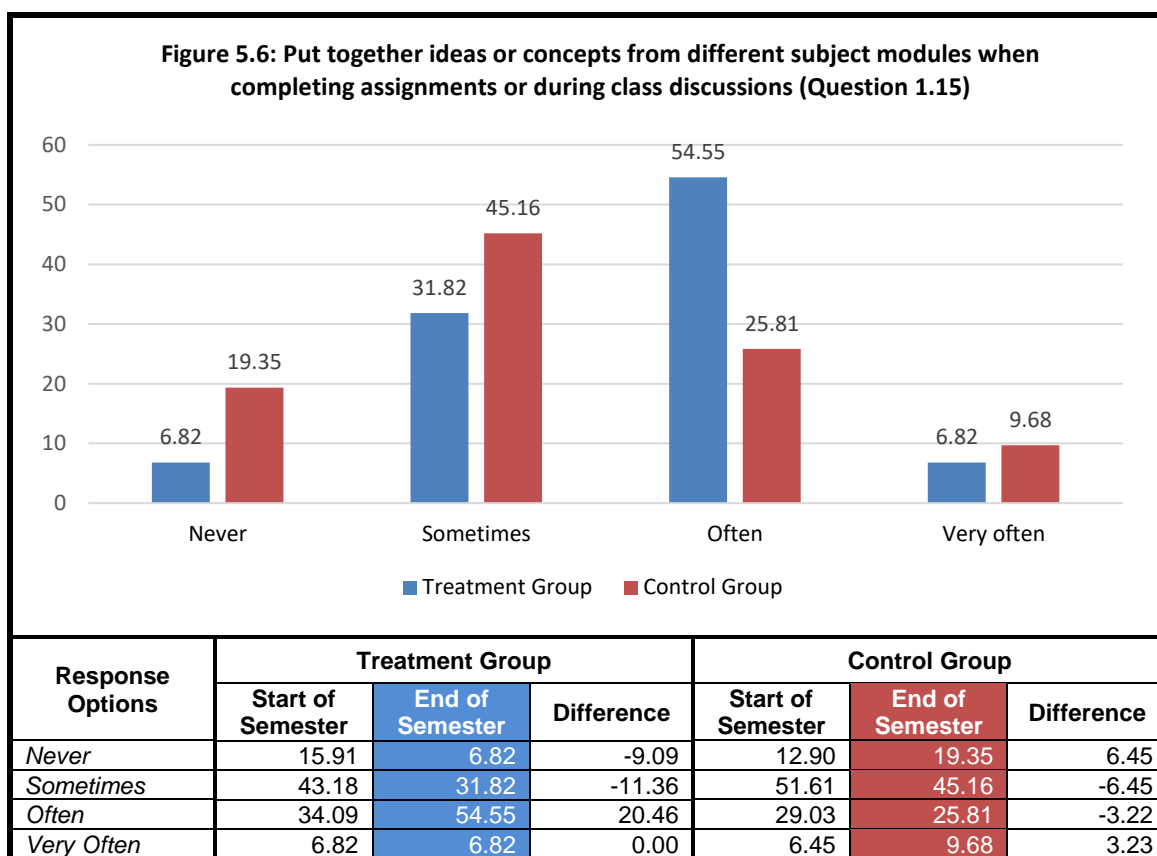
**Figure 5.5: Included diverse perspectives in class discussion or written assignments (Question 1.10)** (Figures are expressed in %)



**Analysis:** Within this question element, participants were asked to rate their class discussions that involved diverse perspectives. Interestingly, the treatment group jumped positively by 22.73% points within the ‘never’ category, and the control group slightly decreased by 6.45%. The treatment group also had a positive increase of 13.64% in the ‘often’ category. This indicates a positive change in score between the two groups, suggesting the social learning activities provided to the treatment group facilitated further discussion with their peers, allowing for diverse perspectives to be discussed during the problem solving and peer learning activities.

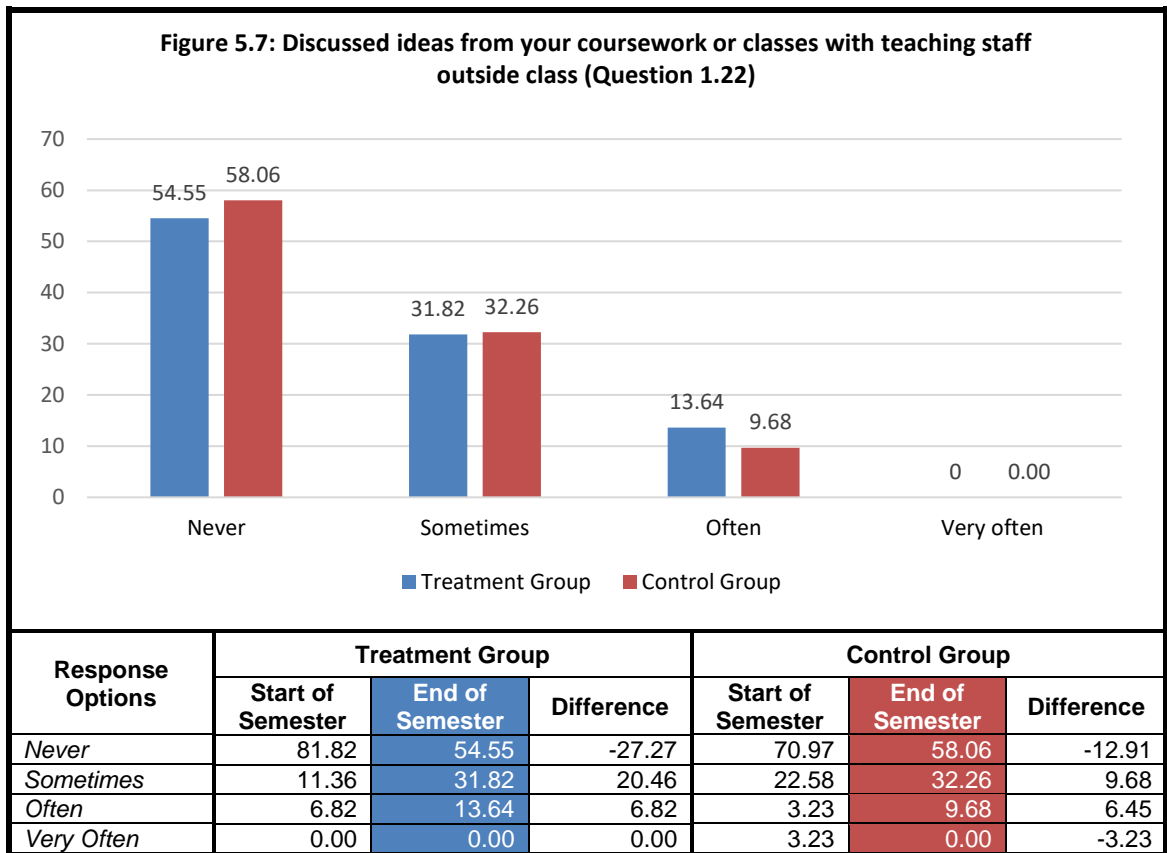
**Figure 5.6: Put together ideas or concepts from different subject modules when completing assignments or during class discussions (Question 1.15)**

(Figures are expressed in %)



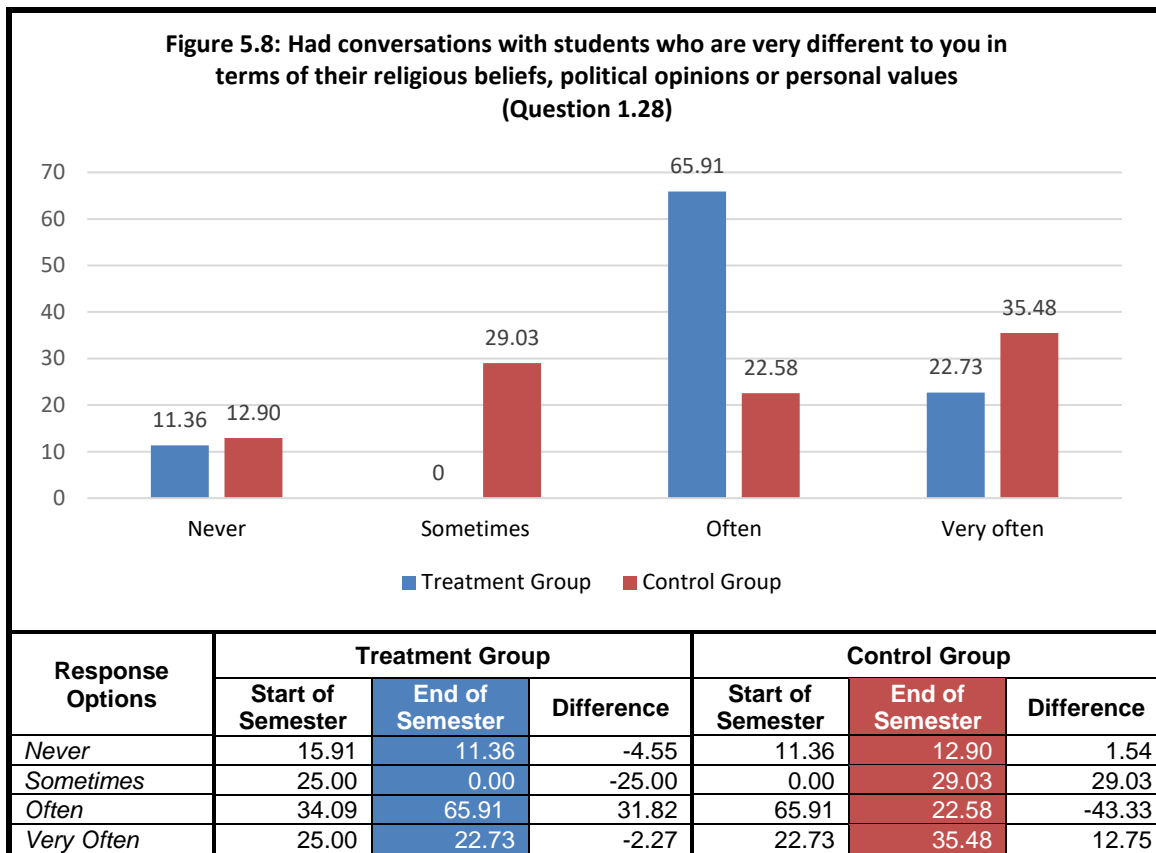
**Analysis:** The participants rated the frequency they interact, connect and use other subject matter knowledge when completing assignments, and during class discussions. Interestingly, the treatment group jumped by 20.46% points for the ‘often’ category with slight decrease for the control group by 3.22%. This is a notable increase when comparing the score category results for both groups. The PBL and PAL interventions that the treatment group received would have involved some elements of subject matter from other subjects, but not extensively, but it is a positive finding and suggestive of correlation.

**Figure 5.7: Discussed ideas from your coursework or classes with teaching staff outside class (Question 1.22)** (Figures are expressed in %)



**Analysis:** This question element asked participants to rate their interaction with teaching staff outside of class with regard to discussing ideas from coursework, both groups had scored very highly in the ‘never’ category at the start of the semester. The treatment group have clearly indicated an increase in their communication with teaching staff outside of class, and an increase of 20.46% in the ‘sometimes’ category is notable when compared to the control group score which increased by 9.68%. As the social learning activities were conducted during class, but also outside of class time, this is an indication of a positive effect influenced by the treatment interventions.

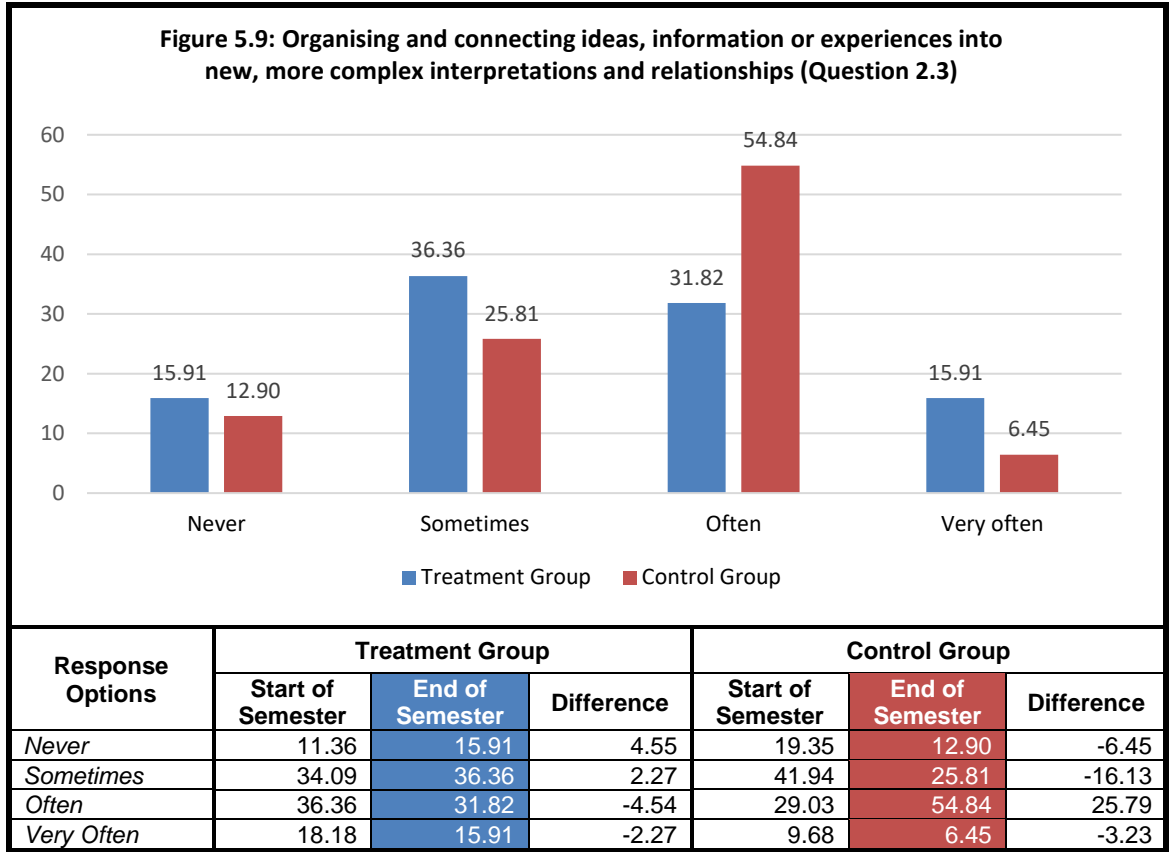
**Figure 5.8: Had conversations with students who are very different to you in terms of their religious beliefs, political opinions or personal values (Question 1.28)**  
*(Figures are expressed in %)*



**Analysis:** There is a notable difference between the treatment and control group within the ‘sometimes’ and ‘often’ categories, with the treatment group moving completely out of the ‘sometimes’ category and up to the ‘often’ category. The converse occurred with the control group, in which the score for the ‘sometimes’ category moved to 29.03% and a decrease of -43.33% within the ‘often’ category. However, there is an increase in the ‘very often’ category for the control group which is notable difference to the ‘very often’ category for the treatment group. This is an interesting finding and clearly shows a difference occurred during the semester, strongly indicating the social learning activities facilitated this impact.

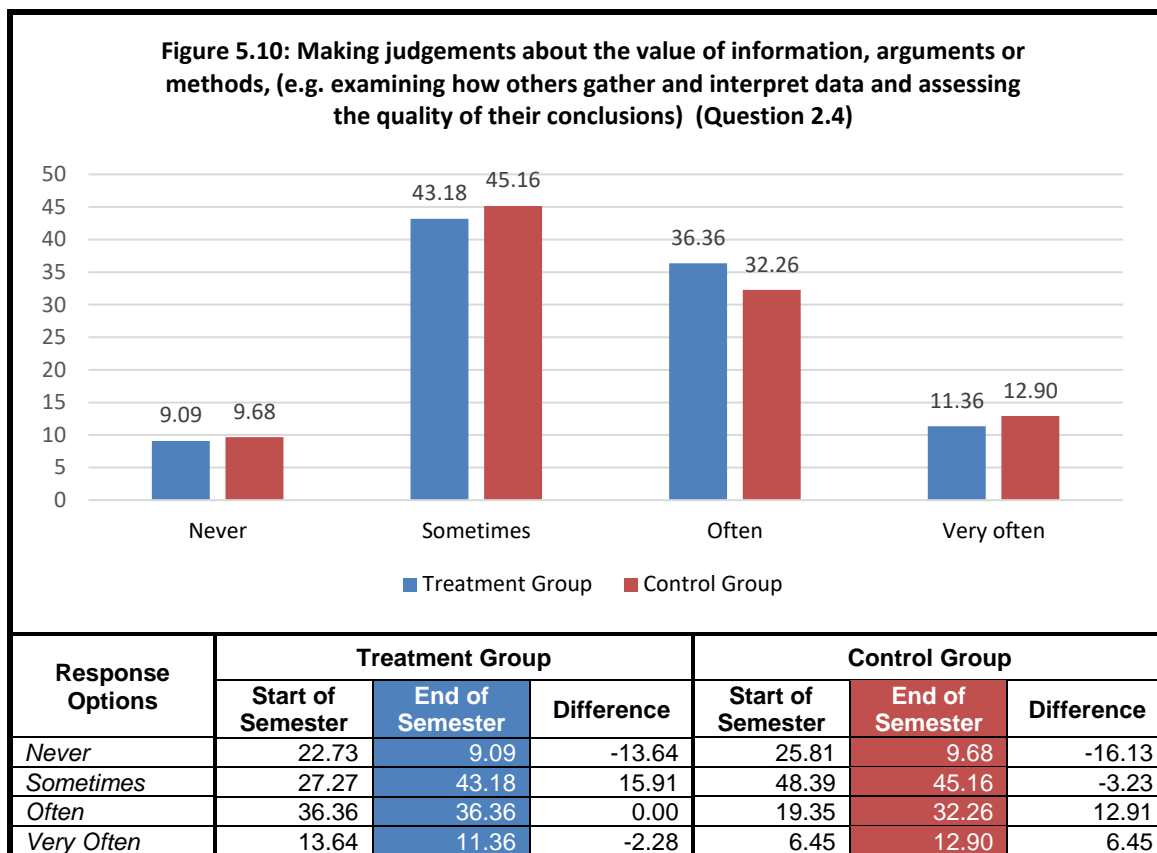
**4.2 Question No.2: During the semester, how much has your coursework emphasised the following intellectual activities?**

**Figure 5.9: Organising and connecting ideas, information or experiences into new, more complex interpretations and relationships (Question 2.3) (Figures are expressed in %)**



**Analysis:** Within this question element, the control group have notably increased to 25.79% for the ‘Often’ category with regard to organising and connecting ideas. There is a still a higher score for the treatment group within the ‘Very Often’ category, but overall, this finding suggests the social learning activities did not facilitate with ‘organising and connecting ideas’. This is an interesting finding as the treatment activities would have required the organisation and connection of ideas but yet the control group were the group who showed a notable score change.

**Figure 5.10: Making judgements about the value of information, arguments or methods, (e.g. examining how others gather and interpret data and assessing the quality of their conclusions) (Question 2.4) (Figures are expressed in %)**

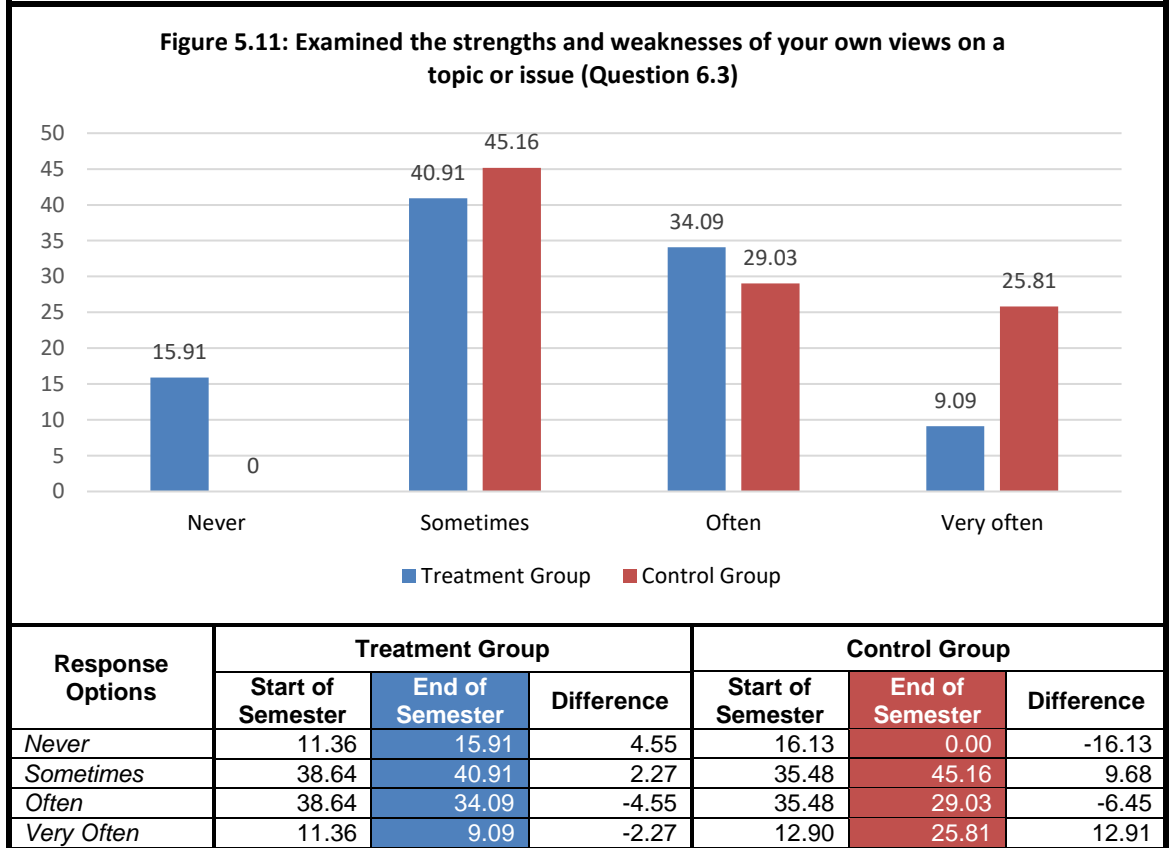


**Analysis:** Within this question element, both groups produced similar scores at the end of the semester. However, it is worth noting that the ‘sometimes’ category jumped by 15.91% for the treatment group, similar to the result for the control group. This indicates a possible impact of the social learning activities with regard to making judgements about other people’s interpretations and conclusions.



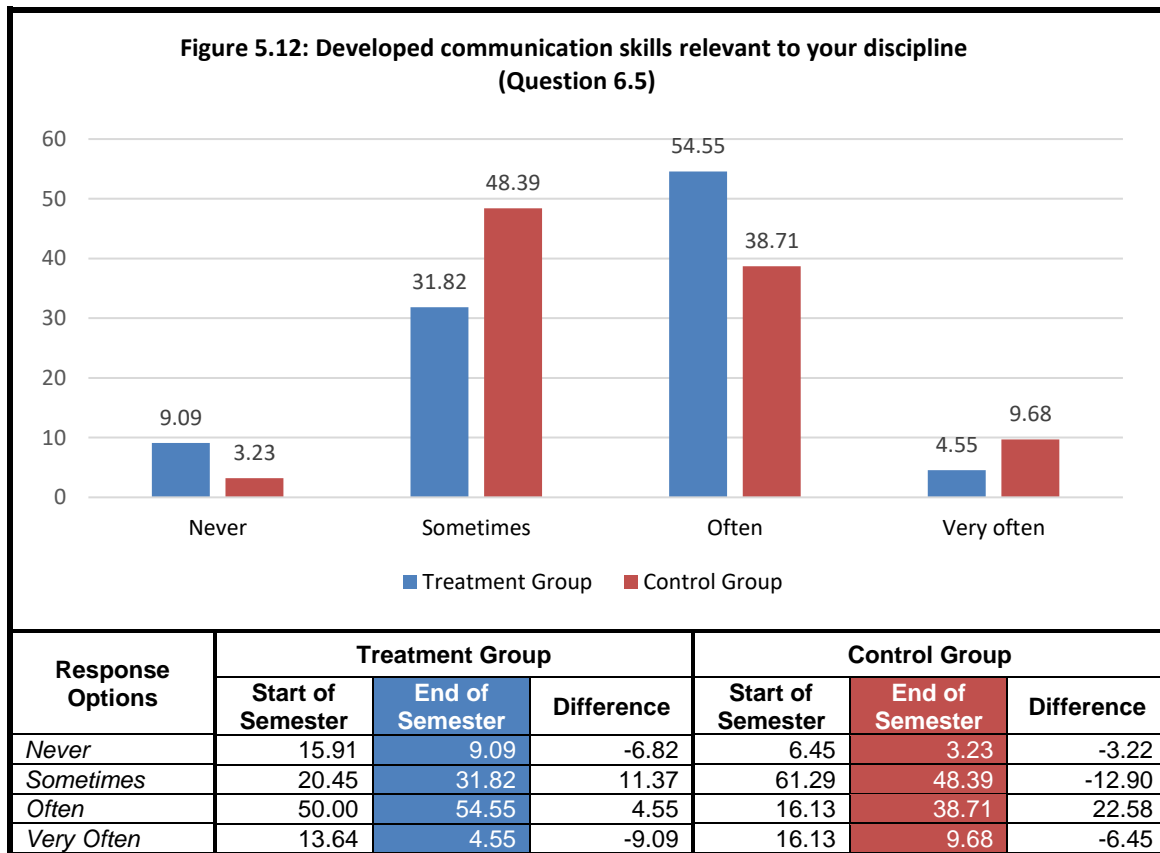
**4.3 Question No.6: During the semester, how often have you done each of the following?**

**Figure 5.11: Examined the strengths and weaknesses of your own views on a topic or issue (Question 6.3)** (Figures are expressed in %)



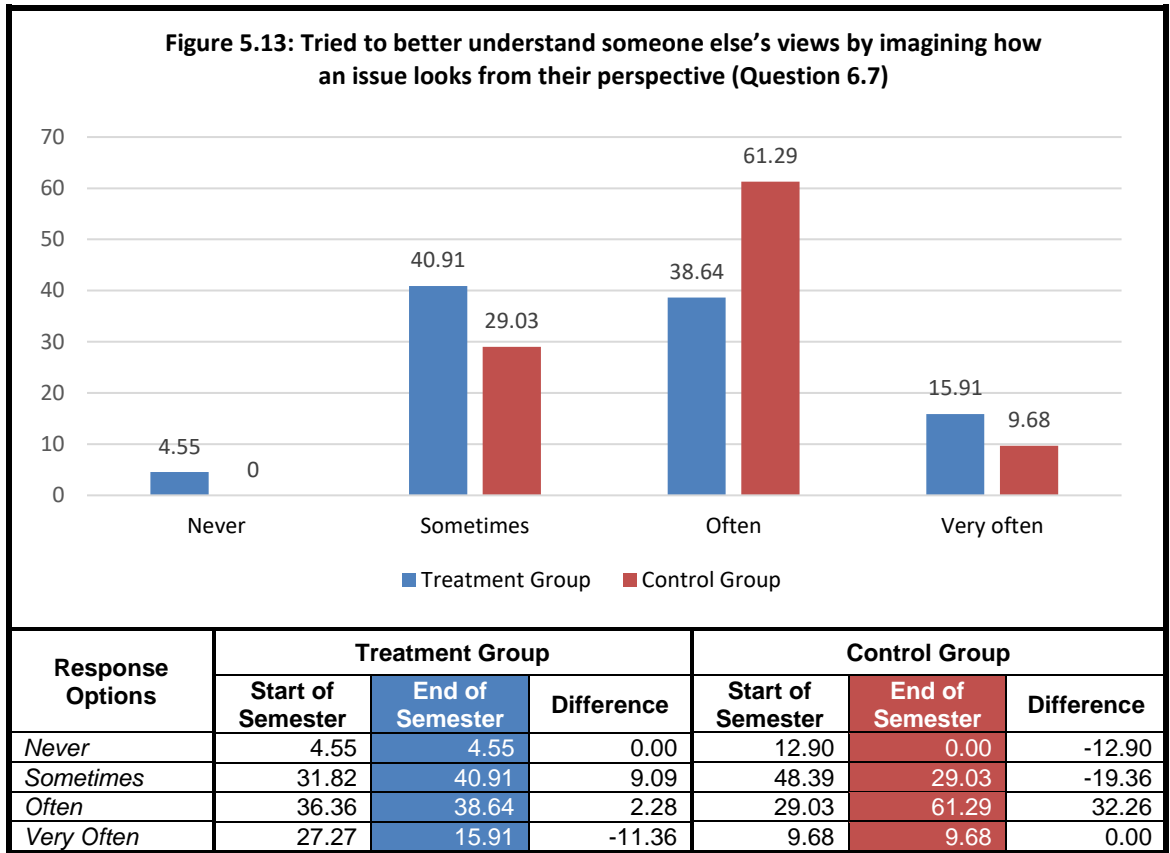
**Analysis:** The participants within the control group have positively moved up by 12.91% in the ‘very often’ category with regard to examining their strengths and weaknesses of topic views, which may be seen as a function within the social learning activities. The treatment group score suggests that the activities themselves produced very little enhancement regarding this particular question element.

**Figure 5.12: Developed communication skills relevant to your discipline (Question 6.5)** (Figures are expressed in %)



**Analysis:** Similar to the previous question, the control group score shows the most positive increase within the ‘often’ category, moving up by 22.58%. Although the treatment group have retained a high score it is still similar to the start of semester result, despite the number of social learning activities they participated in over the semester.

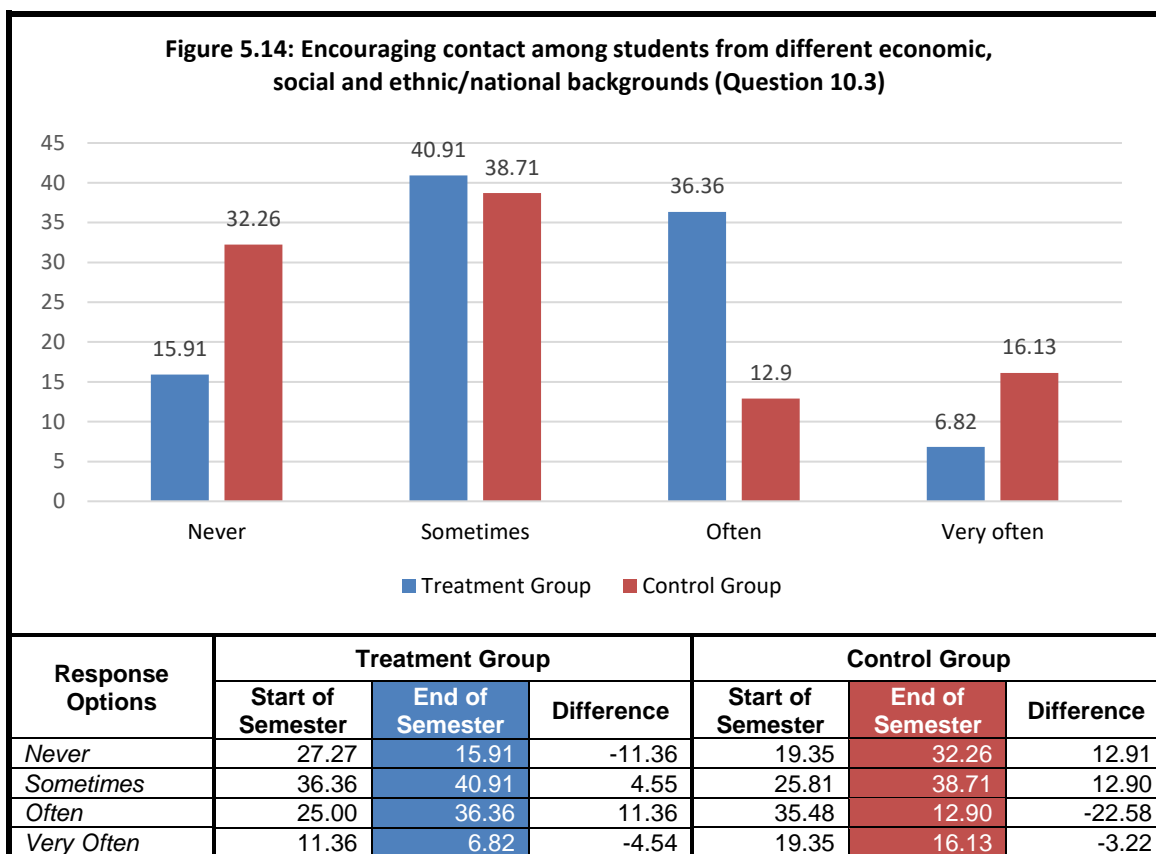
**Figure 5.13: Tried to better understand someone else’s views by imagining how an issue looks from their perspective (Question 6.7) (Figures are expressed in %)**



**Analysis:** Within this question, in which participants were required to score against their ability to understand other people’s perspectives surrounding problems, I was expecting a positive difference between the treatment and control groups. The positive finding was within the ‘often’ category for the control group, moving up by 32.26%, and clearly creating a gulf when compared to the treatment group score. This suggests the social learning activities for the treatment group had little or no impact for this question.

4.4 Question No.10: To what extent does your institution encourage of the following?

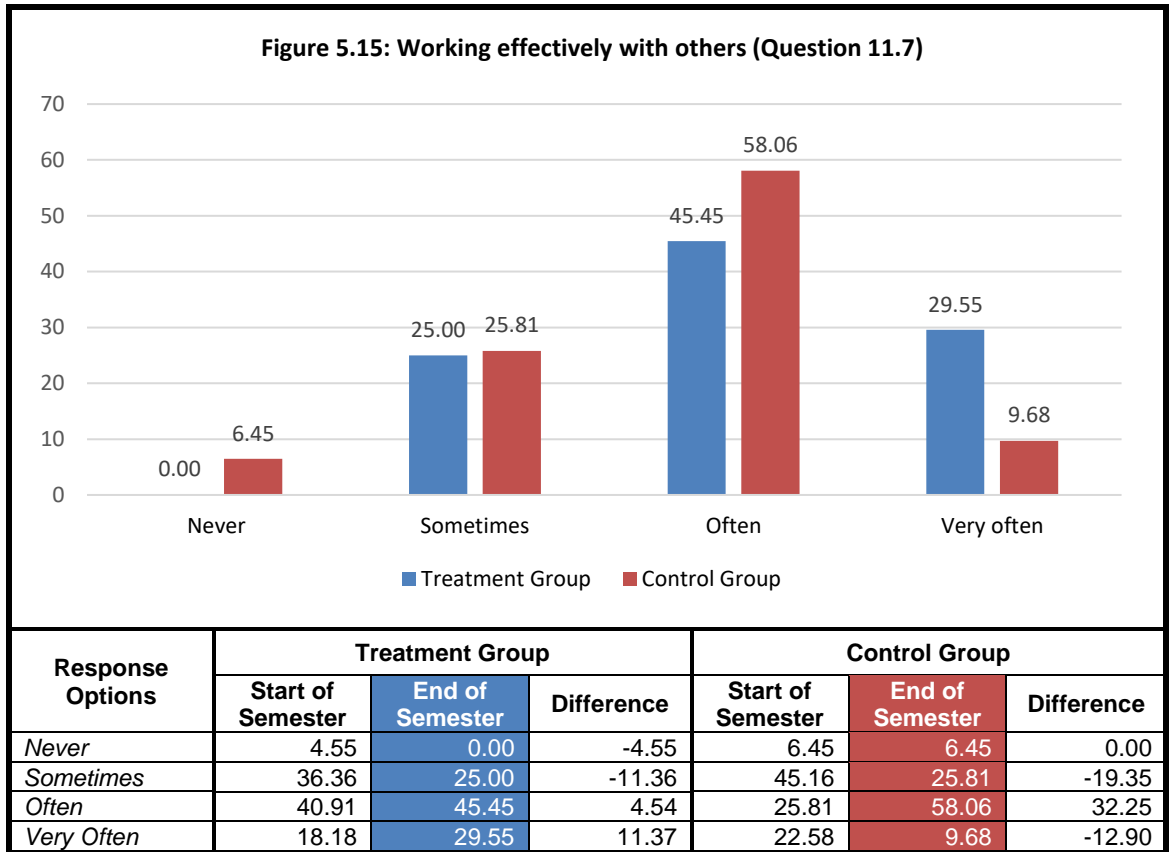
Figure 5.14: Encouraging contact among students from different economic, social and ethnic/national backgrounds (Question 10.3) (Figures are expressed in %)



**Analysis:** Within this question, the end result score within the ‘very often’ category is still higher for the control group. However, it is worth highlighting the increase of 11.36% within the ‘often’ category for the treatment group for encouraging contact with peers from different backgrounds, when compared to the control groups substantial decrease of -22.53% for the same question. This is further reflected with an increase within the ‘never’ and ‘sometimes’ category for the control group. This suggests the social learning activities contributed to this marked increase for the treatment group, and a marked decrease for the control group. This highlights that the treatment activities are visible within the data itself, and a positive endorsement of the tool.

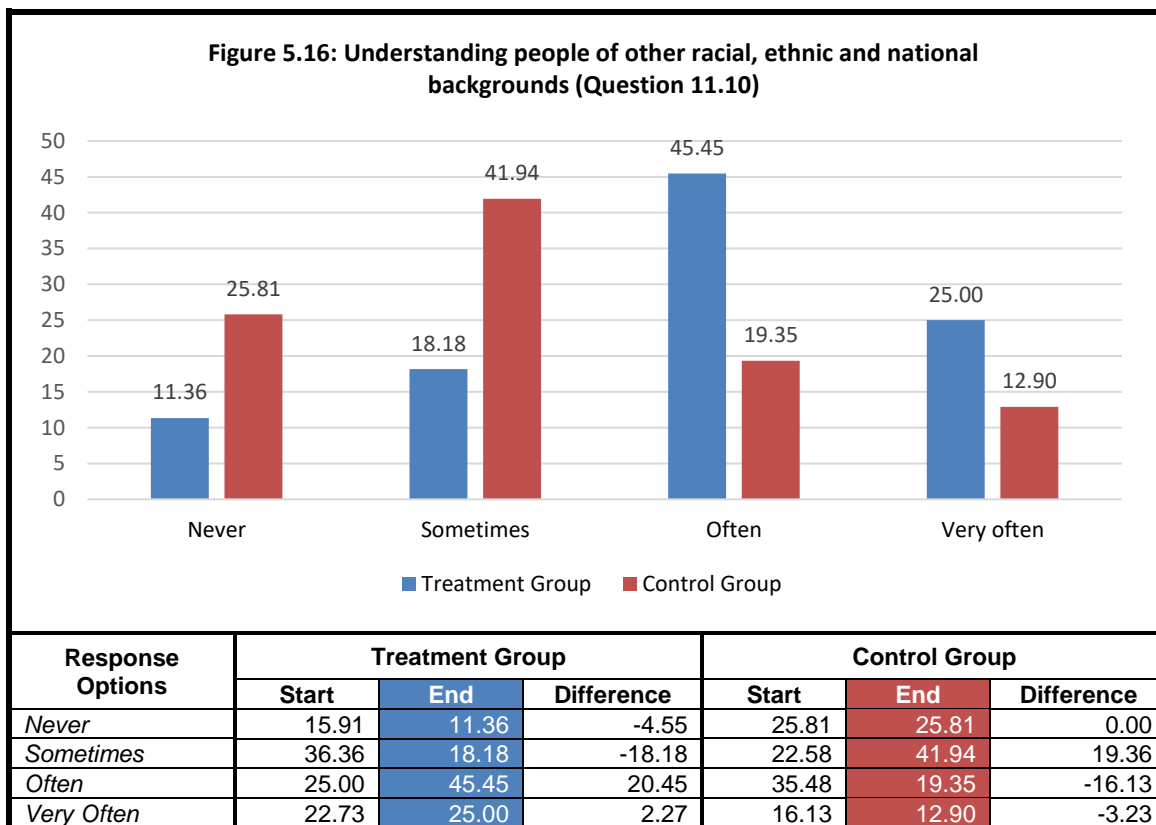
**4.5 Question No.11: Has your experience of your institution contributed to your knowledge, skills and personal development in the following areas?**

**Figure 5.15: Working effectively with others (Question 11.7)** (Figures are expressed in %)



**Analysis:** Considering the social learning activities provided to the treatment group, I was expecting a positive score regarding ‘working effectively with others’. The treatment group ‘very often’ category increased by 11.37% with the control group declining by 12.90%. This result positively indicates the social learning activities contributed to this finding as the social learning interventions required effective group work with peers.

**Figure 5.16: Understanding people of other racial, ethnic and national backgrounds (Question 11.10)** (Figures are expressed in %)



**Analysis:** This question is similar to other previous questions, which focuses on interactions with peers from different backgrounds, and the treatment group have scored highly in the ‘often’ category moving up by 20.45%, as opposed to the decrease of 16.13% for the control group. This provides strong evidence the social learning activities facilitated the positive score for the treatment group.

## 5. Comparison with National Data

This section will now compare some of the question themes from data available in the *ISSE Results from 2015* report with that of the data captured for this study. The primary purpose of conducting this comparison and analysis is to determine if the results from this study are similar, or dissimilar, to that of data captured outside of the institution. This analysis may yield new information that may be beneficial for further research, analysis and reflection. It must be noted that the data captured within the ISSE report represents cross disciplines, whereby data captured from this study is specifically computing. In addition, the sample size from the ISSE report is considerably larger which also must be taken into consideration when reviewing the analysis, and on this basis, the analysis is interpretive.

As stated in Section 3, the *ISSE Results from 2015* report (Higher Education Authority, 2015) divides up the data results into indices which represent engagement and outcomes. These indices pull questions from various question themes to make up the various indices. The tables in this section also include 95% Confidence Interval calculations to help further the

discussion and analysis. Confidence Intervals provide an upper and lower limit around a sample mean, and within this interval we can be 95% confident of the mean presented. The lower limit and upper limit around the sample mean indicate the range of values the true population mean is likely to be within. The Confidence Interval is represented as ‘95% CI’ within the tables.

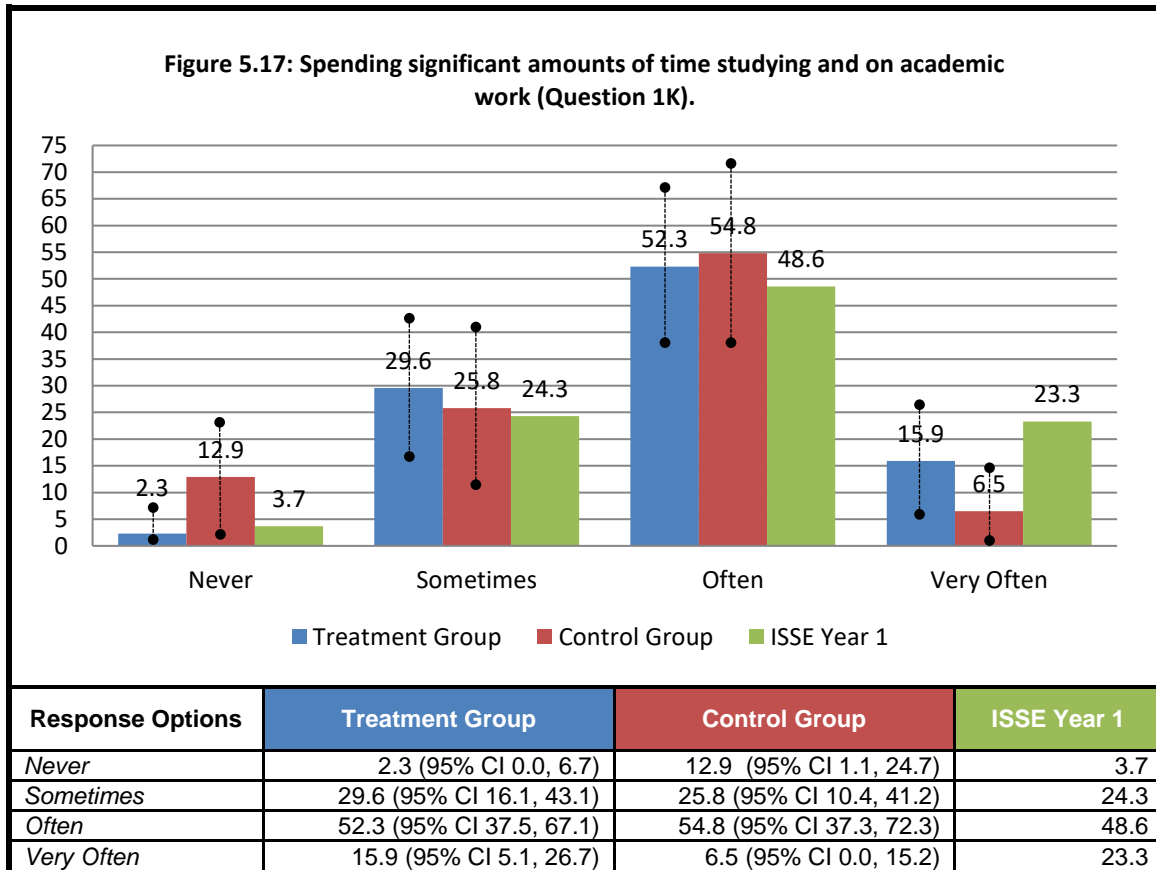
Table 5.6 below summaries the indices that will now be analysed, these particular indices were selected because of their usefulness in assessing the research questions for this study, and for providing further insight into comparison of student engagement data captured within the focus institution and that of national findings.

**Table 5.6: ISSE Indices identified for analysis and their link to the questionnaire tool**

Engagement Indices	Linked to Questionnaire (Appendix F)
Academic Challenge	1.24, 2.2, 2.3, 2.4, 2.5, 4.1, 4.3, 4.4, 4.5, 9.1, 10.1
Active Learning	1.1, 1.3, 1.13, 1.14, 1.16, 1.17, 1.26
Enriching Educational Experiences	1.18, 1.28, 7.2, 7.3, 7.4, 7.5, 9.3
Supportive Learning Environment	8.1, 8.2, 8.3, 10.2, 10.4
Work Integrated Learning	1.9, 6.4, 6.6, 7.1, 11.1
Outcome Indices	Linked to Question
General Learning Outcomes	11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8
General Development Outcomes	11.9, 11.10, 11.11, 11.12

### 5.1 Academic Challenge: The extent to which expectations and assessments challenge students to learn.

**Figure 5.17: Spending significant amounts of time studying and on academic work (Question 1K).** (Figures are expressed in %.)



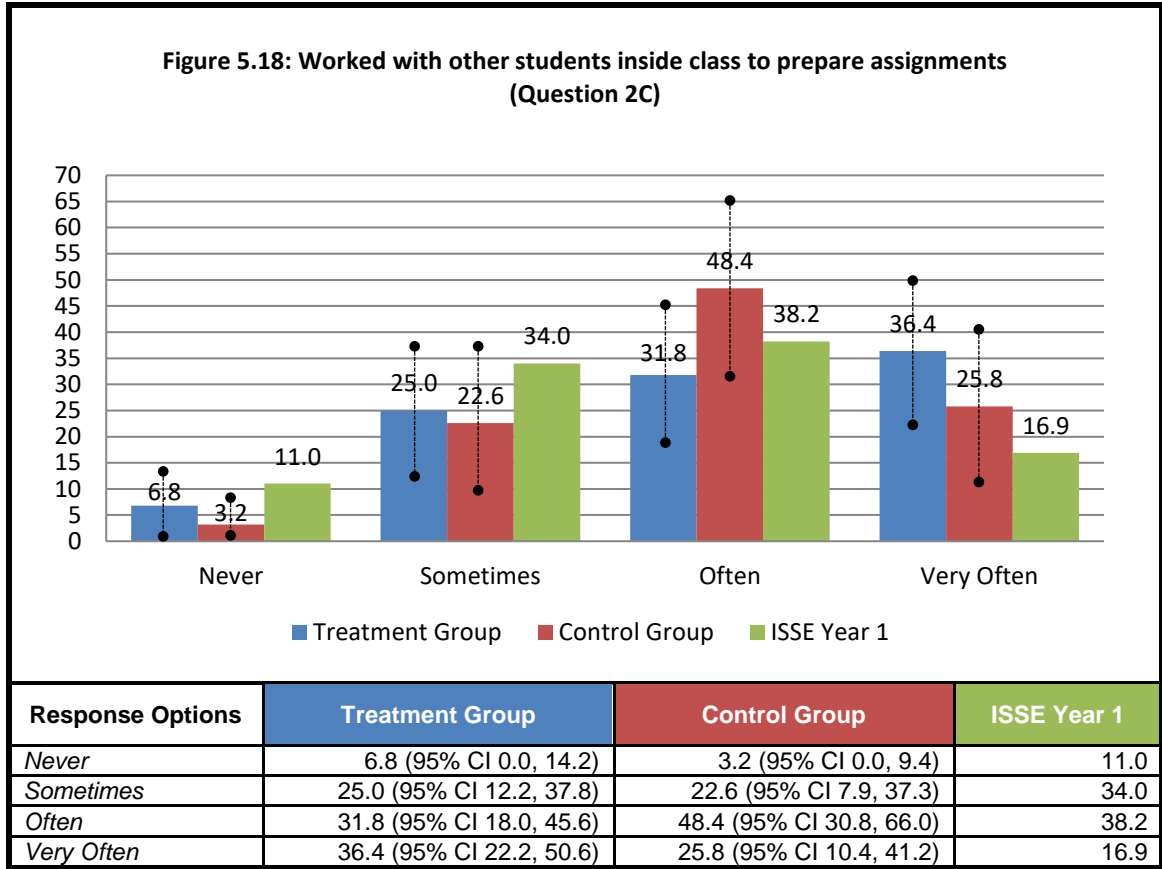
**Analysis:** This question reveals the similarity between the treatment group with that of the ISSE Year 1 results across ‘Never’, ‘Sometimes’ and ‘Often’ categories. The ‘Very Often’ category highlights a stronger ISSE group score further emphasised by the lower CI treatment group score. The control group have a higher score for the ‘Never’ category which contributes to a low score for the ‘Very Often’ category which indicates a disparity when compared to the treatment and ISSE group findings. The confidence interval scores for both the treatment and control group across the ‘sometimes’ and ‘often’ response options are similar further highlighting the ‘Never’ and ‘Very Often’ response options as the focal point in this chart. This suggests that some students in the control group are not spending significant time on studying and on academic work which may be linked to a variety of causes. These causes could be linked to potential programme disengagement due to work commitments or perhaps the students have prior discipline specific knowledge that requires less engagement.

What is worth noting is the difference between the control and treatment group scores for the ‘Never’ category, and why the control group is notably higher than that of the treatment group. This cannot be clearly attributed to anything known but still worth highlighting for further consideration.



5.2 Active Learning: Students' efforts to actively construct knowledge.

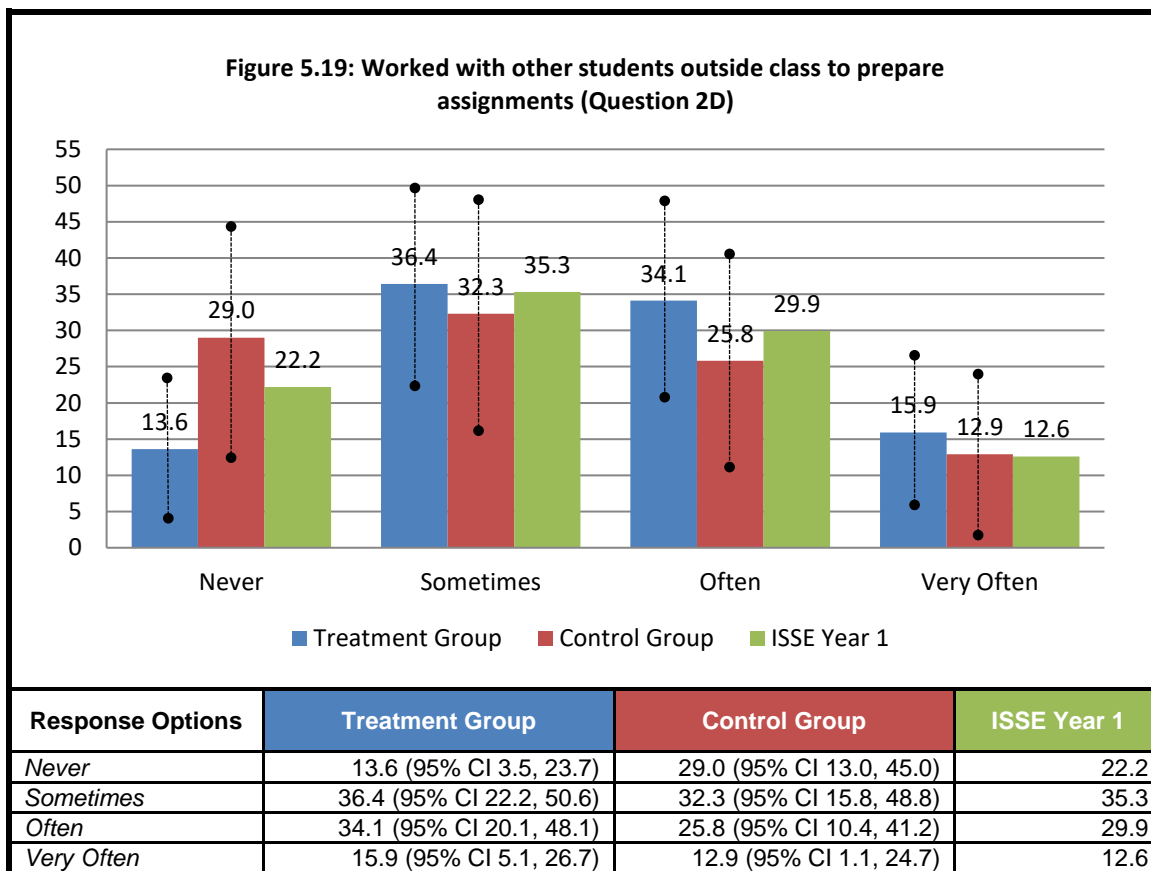
**Figure 5.18: Worked with other students inside class to prepare assignments (Question 2C)** (Figures are expressed in %)



**Analysis:** This question was selected for analysis for two reasons, firstly because it connects with social interaction, and secondly, the high point score of both the control and treatment group within the ‘Very Often’ category. The treatment group moves from a low score within the ‘Never’ category and builds to a high score within the ‘Very Often’ category. This is an interesting finding as both the control and ISSE group findings are lower when examining the ‘Very Often’ category when compared to the treatment group, but worth noting is the upper CI score for the control group. The analysis suggests the treatment group have an increased level of social interaction within class when working on assignments. It is also worth highlighting the strong ‘Often’ score for the control group with nearly 50% of the response weighting, with a corresponding strong CI lower and upper interval score, suggesting the control group engaged in positive peer interaction.

Another important finding for the focus institution is that both the treatment and control group have scored higher than the reported ISSE findings, further endorsed by a lower CI score of 22.2% for the treatment group that is greater than the reported ISSE score of 16.9%. Within the focus institution class lectures are 2.5 hours long, usually with half of this time spent on lecture, with the remaining on some type of practical activity. Within public institutions lectures are typically 1.5 hours long and labs are held separately from class time, this could be reason for the lower ISSE score for the ‘Very Often’ category.

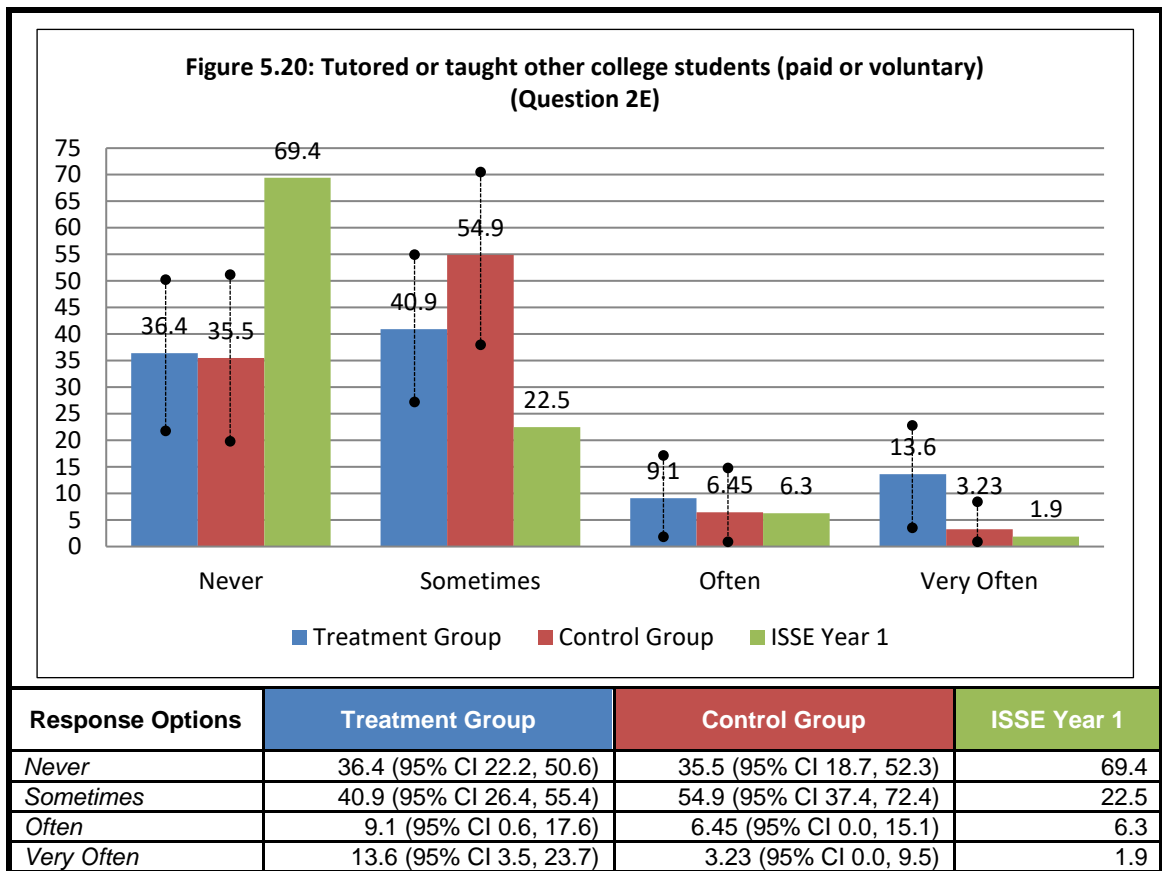
**Figure 5.19: Worked with other students outside class to prepare assignments (Question 2D)** (Figures are expressed in %)



**Analysis:** This question relates to social networking outside of class for the purpose of collaborating over assignments. The treatment group have scored higher in all three categories, ‘Sometimes’, ‘Often’ and ‘Very Often’, although marginal, it is a positive finding. The CI scores do need to be factored in when examining this result and some caution is required about making strong claims, but in support of this finding, the upper CI score for the treatment group in the ‘Sometimes’ and ‘Often’ category are also higher than the control group upper CI scores. The ‘Never’ category for the control group stands out, further highlighted by the upper CI score, which suggests lower engagement with peers outside of class for this question category.

This result indicates that the social networking that occurred within in the class positively exists outside of class particularly for the treatment group. The social networking activities may have contributed to this finding.

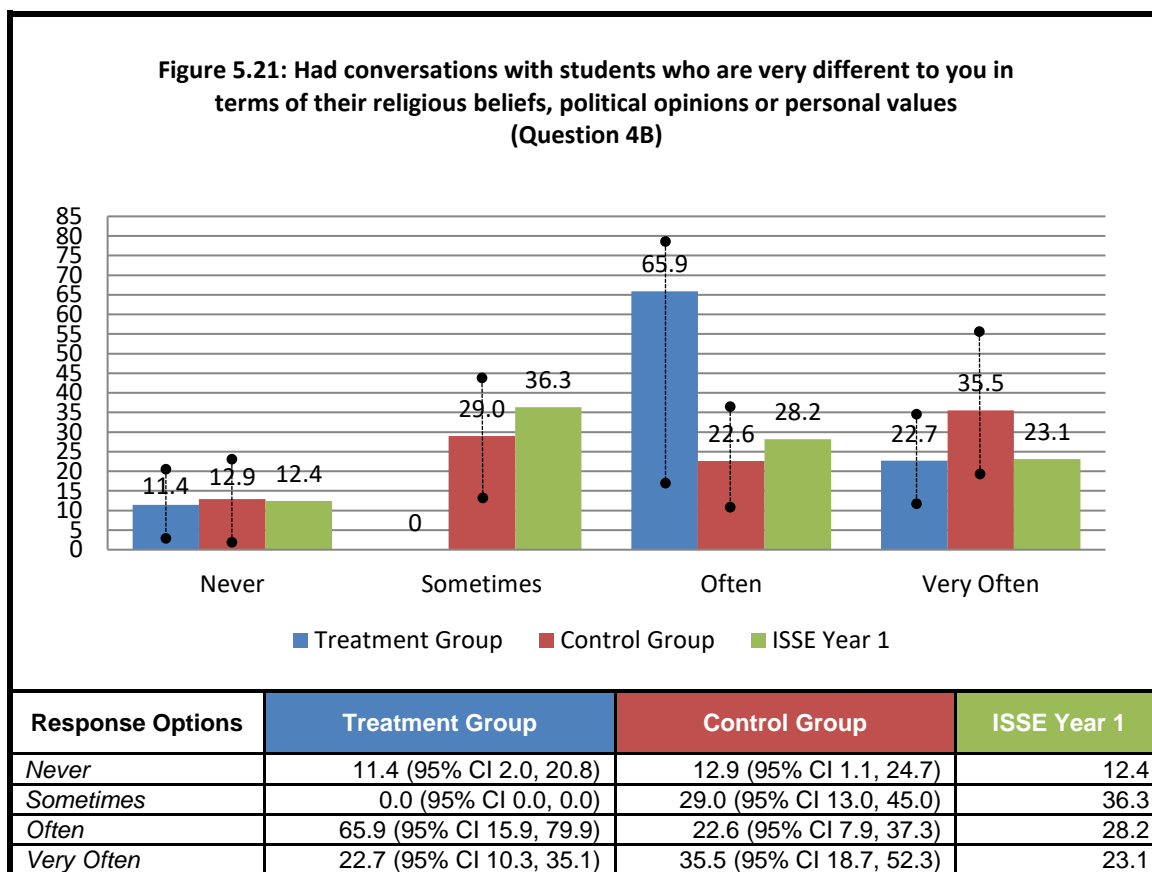
**Figure 5.20: Tutored or taught other college students (paid or voluntary) (Question 2E)** (Figures are expressed in %)



**Analysis:** The ISSE ‘Never’ response option clearly stands out within this figure when compared with that of the treatment and control groups, even when factoring in the upper CI scores. The treatment group scored higher in the ‘Often’ and ‘Very Often’ categories which may have links to the social networking activities that were carried out over the semester, and may be considered by the students as the voluntary tuition of others. Overall, this figure is encouraging when reflecting on peer learning activity across both groups.

### 5.3 Enriching Educational Experiences: Students’ participation in broadening educational activities.

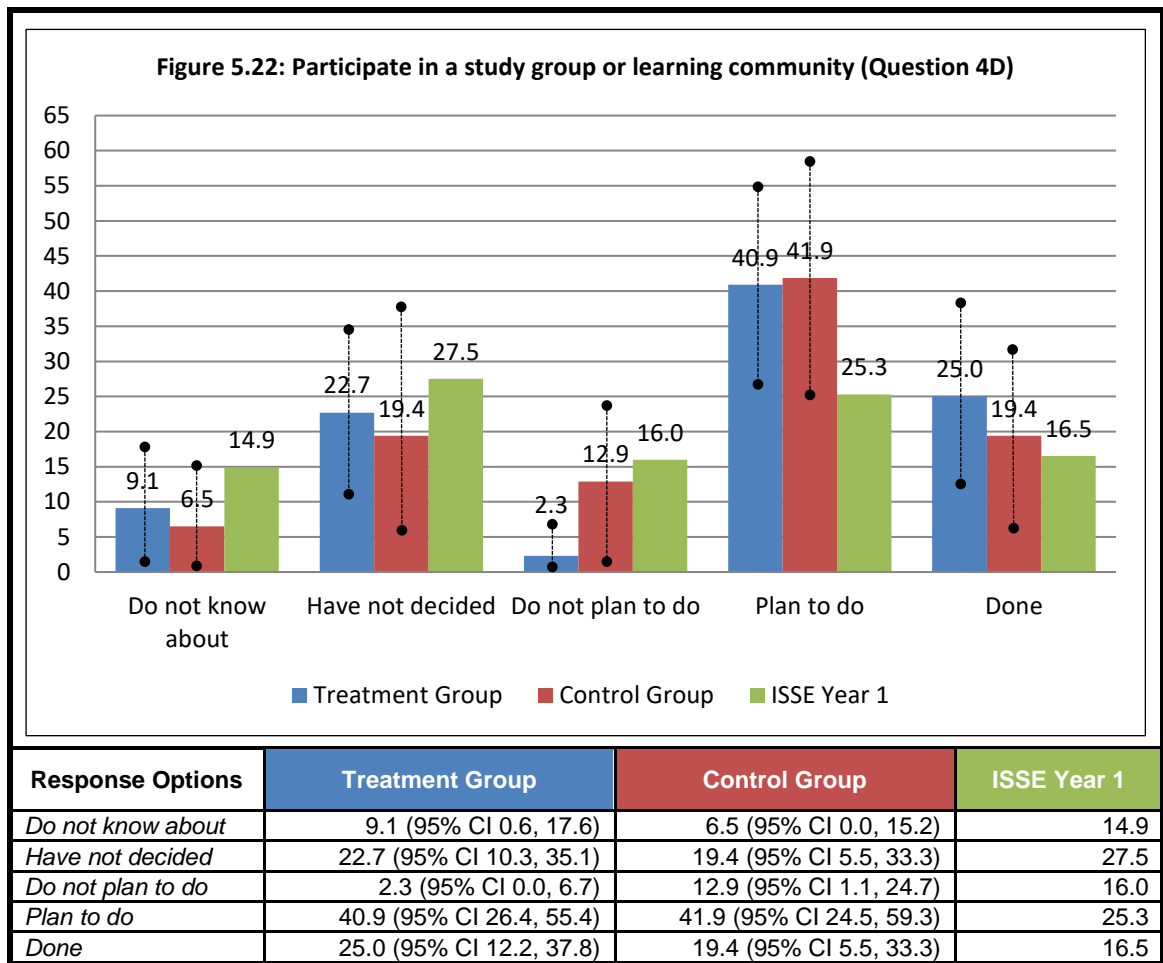
**Figure 5.21: Had conversations with students who are very different to you in terms of their religious beliefs, political opinions or personal values (Question 4B)**  
*(Figures are expressed in %)*



**Analysis:** Because of the diverse nature of the student cohorts within the focus institution, it would be expected to see positive scores in the ‘Sometimes’ and ‘Often’ categories relating to interaction between students with different religious, political opinions or personal values. The findings reveal a notable positive score for the treatment group for the ‘Often’ category when compared to that of both the control and ISSE score, with an upper CI score of 79.9% too. The social learning activities introduced throughout the semester may have contributed to this positive finding for the treatment group.

It is also worth noting the control group scored higher in the ‘Very Often’ category with a strong upper CI score when comparing against the treatment group score, despite the introduction of the social learning activities over the semester. The ISSE ‘Very Often’ score is also higher than that of the treatment group. The control group class size is smaller than that of the treatment group, perhaps there were more opportunities to interact with peers when compared to the larger class size of the treatment group. Five social learning activities were carried out over the semester for the treatment group, perhaps this can be interpreted as ‘Often’ as opposed to ‘Very Often’.

**Figure 5.22: Participate in a study group or learning community (Question 4D)**  
*(Figures are expressed in %)*

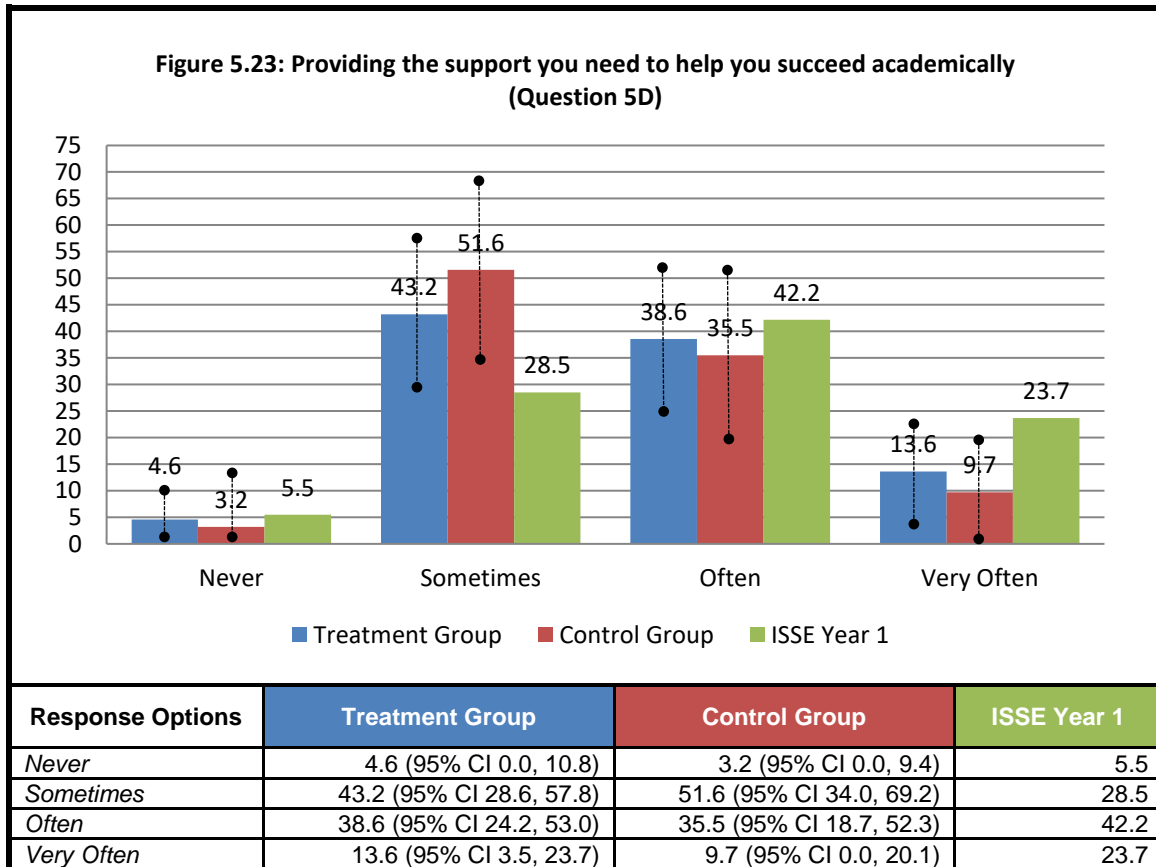


**Analysis:** This question relates to a study group or learning community, which may be considered a similar activity to that of the social learning activities that were conducted with the treatment group over the semester. Both the control and treatment groups have scored higher than that of the ISSE findings in both the ‘Plan to do’ and ‘Done’ categories, and interestingly, the treatment group scoring the highest in the ‘Done’ category.

The lower end of the CI score (26.4%) for the treatment group for the ‘Plan to do’ is higher than the reported score for the ISSE group (25.3%), which is encouraging, and the ‘Done’ lower end CI score (12.2%) is close to the reported ISSE score (16.5%), again, without the Confidence Interval scores for the ISSE group this analysis requires some caution. This finding suggests the students in the treatment group are actively planning or already have participated in a study group or a learning community. This is suggestive that the social learning activities were considered a study group or learning community by the treatment group participants.

### 5.4 Supportive Learning Environment: Students’ feeling of support in the college community.

**Figure 5.23: Providing the support you need to help you succeed academically (Question 5D)** (Figures are expressed in %)

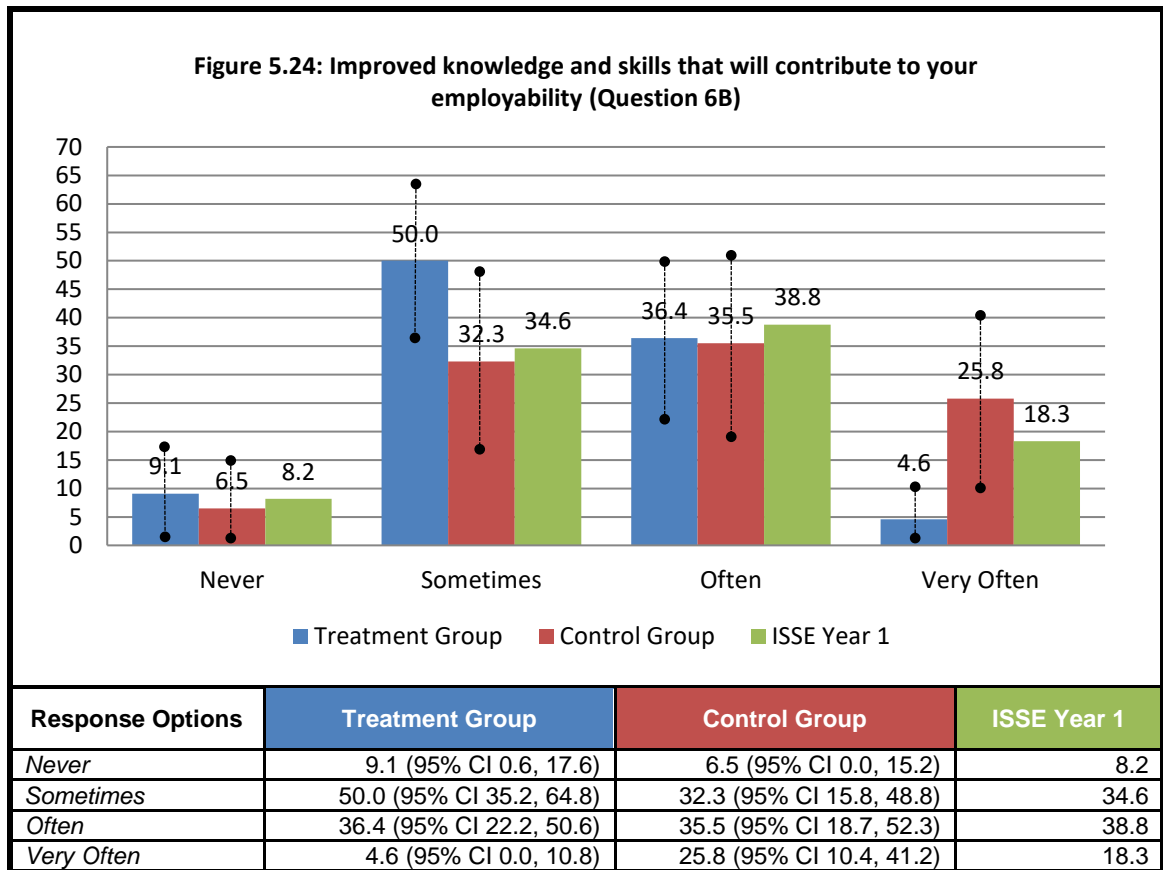


**Analysis:** The data reveals a higher score for the ISSE findings in both the ‘Often’ and the ‘Very Often’ categories. The ‘Very Often’ category score, including the lower CI scores, for both the treatment and control group is notably lower when compared to the ISSE group and this is considered a key finding in this analysis.

This finding prompts further investigation regarding the supports available within the focus institution to assist in academic development, with a clear disparity with that of the national findings.

### 5.5 Work Integrated Learning: Integration of employment-focused work experiences into study.

**Figure 5.24: Improved knowledge and skills that will contribute to your employability (Question 6B)** (Figures are expressed in %)

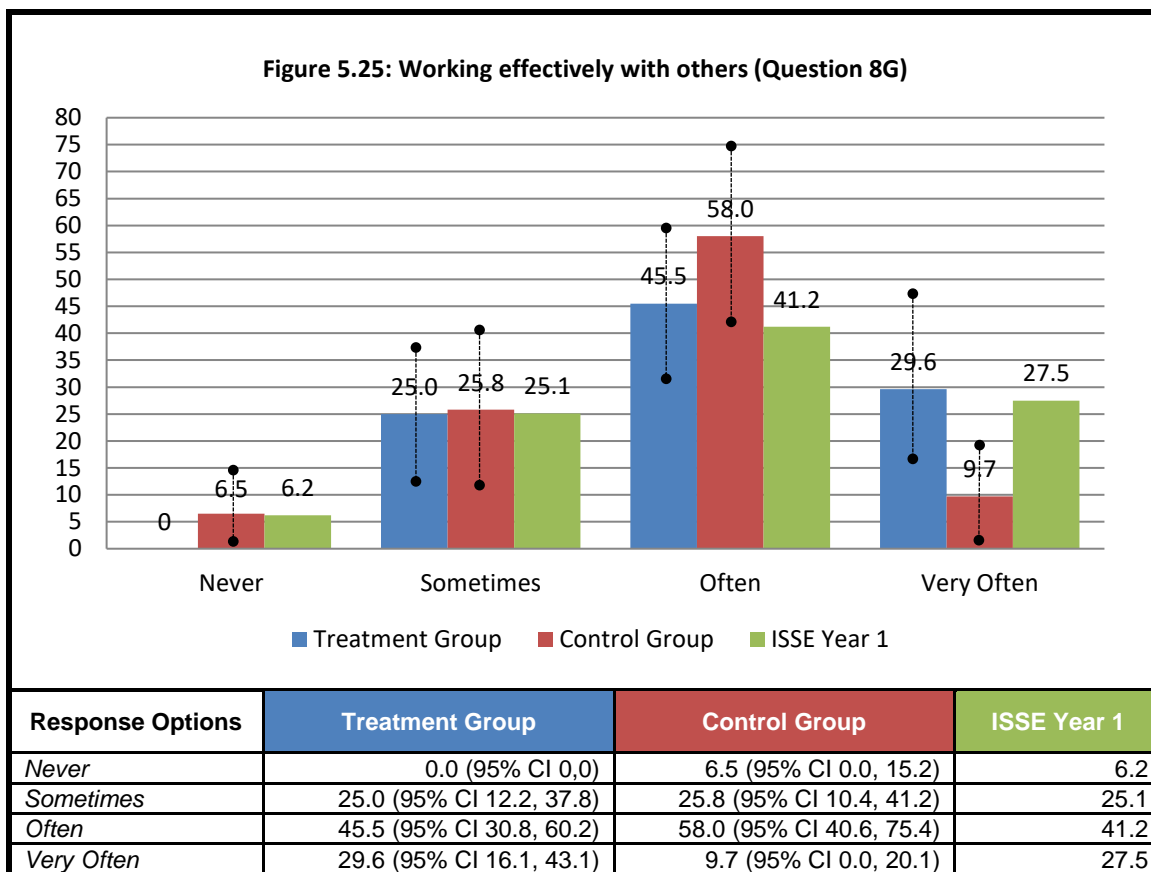


**Analysis:** This finding reveals a noteworthy difference between the control and treatment group in the ‘Very Often’ category score in relation to improving skills and knowledge contributing to employability. This positive result for the control group is further highlighted by the upper and lower CI score when comparing against the treatment group result. The disparity between scores cannot be explained but prompts further reflection, despite the treatment group scoring significantly higher in the ‘Sometimes’ category.

## 5.6 General Learning Outcomes: Development of general competencies.

**Figure 5.25: Working effectively with others (Question 8G)**

(Figures are expressed in %)



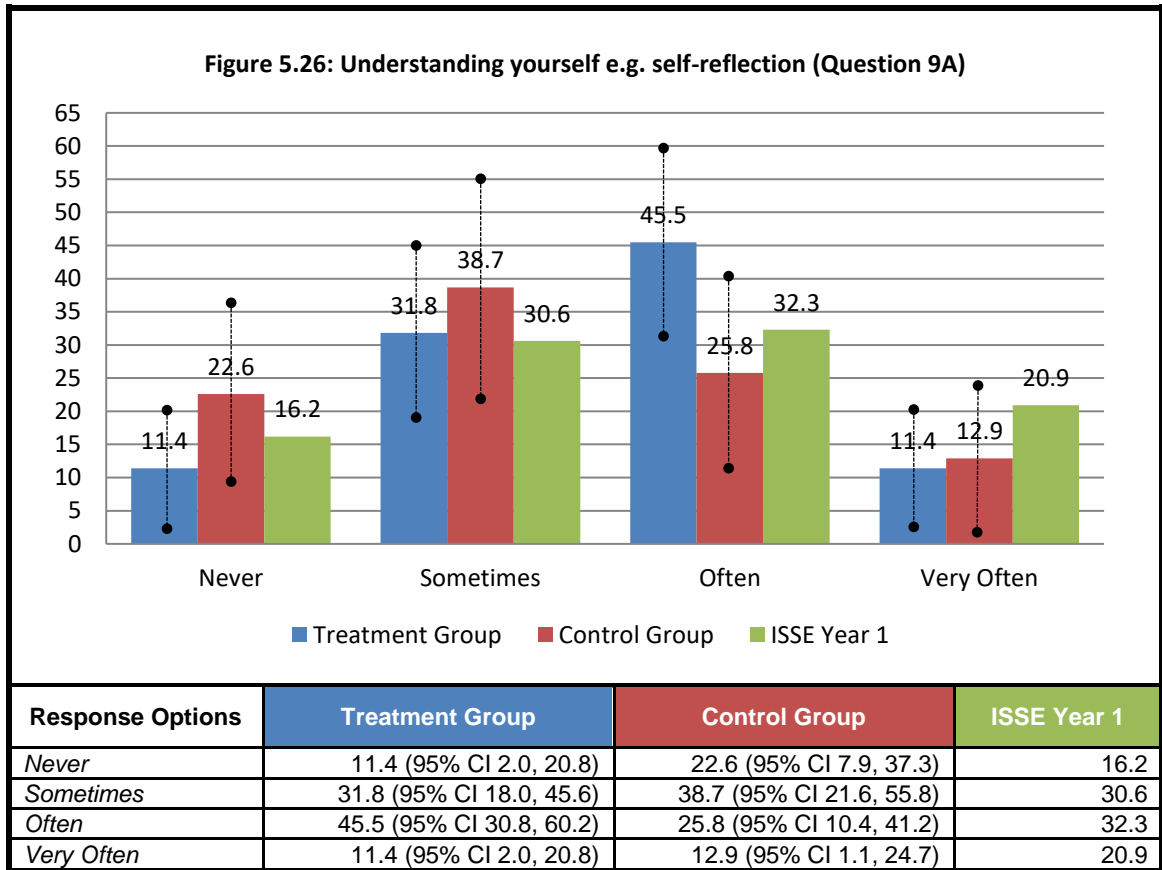
**Analysis:** This finding highlights a positive score of 29.6% for the treatment group in the ‘Very Often’ category, further supported by the positive upper CI score of 43.1%. This finding is further strengthened by comparing the treatment group lower CI score of 16.1% against the control group reported score of 9.7%. It is worth noting that the majority of participants in the control group (58%) have selected ‘Often’ for this question which suggests positive working relationships were formed with others regardless of the social learning interventions.

This result positively suggests the social learning activities may have contributed to the high score for the ‘Very Often’ category for the treatment group, particularly as this question is short and direct with less room for misinterpretation. It is also worth highlighting the similarity of scores against the ISSE results which is a positive finding for the general learning outcomes category.



### 5.7 General Development Outcomes: Development of general forms of individual and social development.

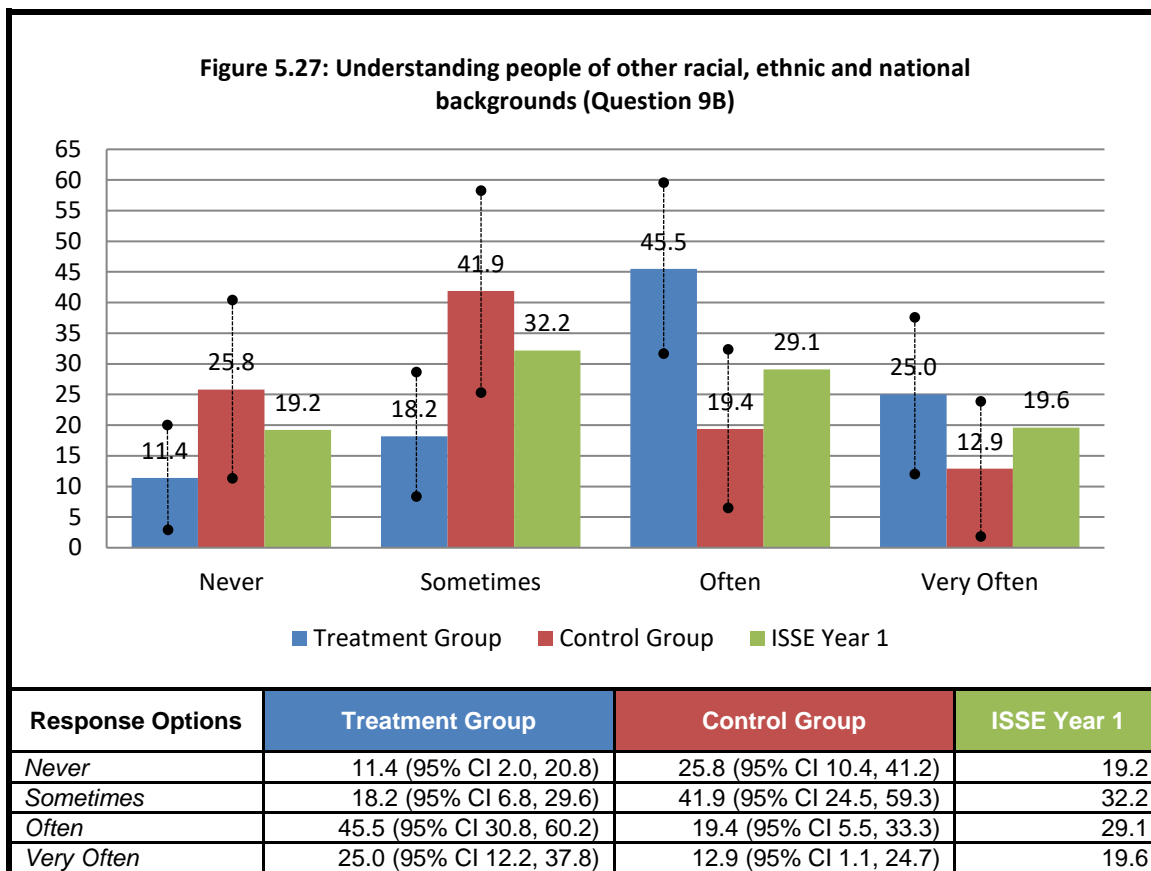
**Figure 5.26: Understanding yourself e.g. self-reflection (Question 9A)** (Figures are expressed in %)



**Analysis:** The data reveals a high score for the ISSE findings in the ‘Very Often’ category (20.9%) when compared to the lower scores for both the treatment (11.4%) and control (12.9%) group, further highlighted by the lower CI score of the treatment group (2.0%) and control group (1.1%).

When you combine both the ‘Often’ and ‘Very Often’ score categories for the treatment group and the ISSE score, the treatment group combined score is 56.9% versus the ISSE combined score of 53.2%, this finding is encouraging. The combined score for ‘Often’ and ‘Very Often’ for the control group is 38.7%, suggesting the reflection exercise that was encouraged for the treatment group at the end of each activity may have contributed to this result.

**Figure 5.27: Understanding people of other racial, ethnic and national backgrounds (Question 9B)** (Figures are expressed in %)



**Analysis:** The data reveals a higher score for the treatment group in both the ‘Often’ and ‘Very Often’ category, particularly when compared to the control group. As this question relates to understanding others with different racial, ethnic and national backgrounds, the social learning activities introduced over the semester may have contributed to this positive finding for the treatment group. Confirming this finding, the lower end CI score for the treatment group for the ‘Often’ category (30.8%) is higher the reported score for the control group (19.4%), and the lower end CI score for the treatment group ‘Very Often’ category (12.2%) is similar to that of the reported score for the control group (12.9%).

## 6. Usefulness in Answering the Research Questions

Action research cycle 3 (2016) was focused on measuring and evaluating student engagement and measuring and evaluating self-efficacy in computer programming. The relevant research questions associated with this study will now be presented together with an introductory analysis as to the usefulness of the findings in assessing these questions. The responses will be further discussed in Section 7, Conclusions and Further Research.

**Cycle 3 Research Questions:**

- Q.1 Are Problem Based Learning (PBL) and Peer Assisted Learning (PAL) suitable social learning approaches that can be used within a computer programming module?

**Response:** Chapter 4, Self-Regulated Learning and Social Learning, has already discussed the positive outcomes associated with the social learning activities experienced by the treatment group. The student engagement data findings did not reveal anything specific that would be suitable in assessing this question. It could be interpreted that the activities had a positive impact, but it would be inappropriate to draw any direct link to the PBL and PAL approaches with that of student engagement data.

- Q.2 Can social learning activities encourage students to engage in individual reflection?

**Response:** There are two specific questions in the student engagement questionnaire tool that refer to self-reflection. When comparing the results for the control and treatment groups, nothing noteworthy can be observed, except that the control group had slightly outperformed the treatment group, which is interesting as this group did not receive any of the treatment activities. At a national data comparison level, both the control and treatment groups scored lower than the national findings, further highlighting the need to facilitate students in engaging in self-reflection. To conclude this question, while individual reflection was encouraged through the social learning activities for the treatment group, the engagement score for this group was lower than the control group, and also lower than the national data findings, suggesting at this point the individual reflection element of the social learning activities needs to be enhanced.

- Q.3 Can social learning enhance overall student engagement?

**Response:** As already discussed in Chapter 4 – Self Regulated Learning and Social Learning, the participants enjoyed the activities and have a desire to continue with these exercises, as expressed through the qualitative feedback forms. However, it is difficult to determine if the activities introduced to the treatment group contributed to their overall student engagement score. When comparing the group scores at a high level, there is no obvious pattern or indication of significance other than individual question theme score fluctuations. When investigating each theme, there are sub-questions that reveal differences and there is a suggestion that the activities affected the engagement scores. What also must be factored in is that students may have engaged in other social learning activities outside of the ones introduced in the computer programming classes, this was not monitored or recorded. The safest response to this question would be to state that social learning is an approach that students seem to enjoy and some data suggests a correlation with specific aspects of student engagement, but no claim can be made that it enhances overall student engagement.

## 7. Conclusions and Further Research

The conclusions and recommendations for measuring and evaluating student engagement will now be discussed. This will be performed by examining findings from the use of the tool between the control and treatment groups, and the comparison with national data from the *ISSE Results from 2015* report (Higher Education Authority, 2015). This will be followed by recommendations and suggestions for further research.

### 7.1 Conclusions

The student engagement questionnaire tool contained 14 question themes, further subdivided into 92 questions, of which 16 questions were identified as useful for comparison between the control and treatment groups. The modified questionnaire tool, based on the ISSE tool, was primarily utilised to measure student engagement between the control and treatment groups, capturing scores at the commencement and completion of the semester. There is a strong indication that the comparison between the treatment and control group engagement scores were specifically related to the intervention activities. For this reason, questions that had a higher potential to be related to the intervention activities were identified for discussion and analysis.

Figure 5.1 (p.125) highlighted a positive increase for the treatment group with regard to asking questions or contributing to discussions, and a further positive finding was noted in Figure 5.4 (p.128) with regard to using student learning support services, including programming support classes. These results were not entirely surprising given the support activities the treatment group received, but it does further strengthen the case that the activities themselves had an impact and are evident in the data. It also is encouraging to see that students are potentially more willing to engage in discussions with their peers which may be another positive influence of introducing social learning in the classroom. With regard to discussion, it is worth noting that both the control and treatment group had scored themselves negatively with regard to including diverse perspectives in class discussions or written assignments (Figure 5.5, p.129), this is something worth reflecting on to ascertain how this can be further developed and facilitated in class.

Figure 5.6 (p.130) revealed an increase in the treatment groups' ability to put together ideas or concepts from different subject modules when completing assignments, or during class discussions. The treatment activities may have contributed to this score as students had engaged in problem investigation, group analysis and discussion. There was also a significant positive finding revealed in Figure 5.7 (p.131) whereby the treatment group had commenced the semester with a low score with regard to discussing ideas about coursework with teaching staff outside of class time. The end of semester result for the treatment group increased significantly, and more in line with the control group, this is a positive finding and the social learning activities may have contributed to this as discussions with staff post treatment was noted by relevant staff members and student mentors, who may have been interpreted as 'teaching staff' in the eyes of the participants.

Figure 5.8 (p.132) highlighted a noteworthy change in score for the treatment group with regard to having conversations with students with different religious beliefs, political opinions or personal values. Figure 5.14 (p.138) also revealed a positive increase for the treatment

group regarding their opinion of the focus institution's role in encouraging contact among students from different economic, social and ethnic/national backgrounds. The treatment group also scored higher than the control group for their rating on working effectively with others (Figure 5.15, p.139) and understanding people of other racial, ethnic and national backgrounds (Figure 5.16, p.140). The social learning activities would have facilitated a considerable amount of group discussion, and with a diverse multicultural study body, this result is a positive finding and suggests the introduction of the activities contributed to this positive impact.

Figure 5.9 (p.133) identified a positive result for the control group, in that a noteworthy change occurred over the semester with regard to organising and connecting ideas, information or experiences into new, more complex interpretations and relationships. This type of activity is related to Problem Based Learning and Peer Assisted Learning. Although the control group did not receive any of the social learning treatment activities, they moved their rating score higher by end of the semester. The treatment group still outperformed the control group in this question, but it is still worth highlighting the control group score change and suggests using caution when interpreting findings and drawing conclusions. A similar scenario occurred in Figure 5.10 (p.134) with regard to examining how others gather and interpret data and assessing the quality of their conclusions, which is also linked to the social learning activities. Both the control and treatment groups concluded the semester with similar scores, with very little difference between the results. And again, the control group revealed a more positive increase with regard to developing communication skills relevant to computing (Figure 5.12, p.136), with the treatment group showing little change at the conclusion of the semester. Figure 5.13 (p.137) revealed a noteworthy positive increase in the control groups' score relating to understanding someone else's views by imagining how an issues looks from their perspective, the data reveals an increase despite not receiving any of the social learning treatment activities. Figure 5.11 (p.135) relates to reflection, in that students were asked to examine their strengths and weaknesses of their own views on topics and issues. The treatment group score for this question was not meaningful, and if anything, had reduced upon the conclusion of the semester, however, the control group substantially outperformed the treatment group which suggests the social learning activities had no impact for this particular question theme for the treatment group.

With regard to the comparison between the control and treatment groups and the data from the *ISSE Results from 2015* report, 11 questions were identified as useful for discussion and analysis. Figure 5.18 (p.143) revealed a high score for the both the treatment and control groups, and outscoring the ISSE score, relating to working with other students inside class to prepare assignments. Both the control and treatment groups see this as a very regular activity. When it comes to preparing assignments with other students outside of class, Figure 5.19 (p.144) shows a mean even picture across the control, treatment and ISSE findings, with the control and treatment group slightly scoring higher than the national findings.

Figure 5.20 (p.145) reveals a positive difference in score between the control and treatment group and that of the ISSE findings, both the control and treatment groups have a stronger score relating to tutoring or teaching other college students than that of the ISSE data. Figure 5.21 (p.146) highlights positive results for both the control and treatment groups with regard to having conversations with students who are very different in terms of their religious beliefs, political opinions or personal views. The treatment group, in particular,

scored very highly within this question theme. The control and treatment group outperform the ISSE findings with regard to participation with a student group or learning community, as expressed in Figure 5.22 (p.147). This is a strong finding and further endorses a continuing approach to encourage study and learning group activities and the development of associated support resources.

The ISSE findings outperform both the control and treatment groups with regard to the focus institution providing the support needed to help succeed academically (Figure 5.23, p.148), the ISSE finding is considerably more positive which requires further reflection.

Figure 5.25 (p.150) highlights a high score similarity between the treatment group and the ISSE findings regarding working effectively with others. The control group scored considerably lower for this question, which may be an indicating of impact for the social learning activities introduced for the treatment group over the semester.

Figure 5.26 (p.151) relates to self-reflection and both the control and treatment groups scored lower when compared to the national findings, however, both groups are engaged in self-reflection, with the treatment group claiming to self-reflect the most often. This result indicates the importance of continuing to engage students in reflective practices and warrants further examination of what is happening in the public sector with regard to facilitating strategies for student self-reflection.

Figure 5.27 (p.152) reveals an important finding relating to understanding people of other racial, ethnic and national backgrounds. The treatment group outperformed both the control group and the ISSE findings, and interestingly, the treatment group scored higher for both the often, and very often categories for this question theme. This suggests that the social learning activities introduced to the treatment group may have facilitated this positive outcome.

### 7.2 Further Research

While the ISSE student engagement tool was useful, it would be beneficial to research other student engagement tools in terms of their size, what they specifically measure, and the practical nature of completing them. It may also be worth considering developing a customised student engagement tool, which can be more aligned to the scope and unique context of the focus institution. Mandernach (2015) states assessing engagement in higher education remains a challenge, and the dynamic nature of engagement mandates a multi-faceted approach to assessment that captures the interactive nature of the behavioural, affective and cognitive dimensions of student engagement. While this presents a challenge, the results of this study will be used as a basis for institutional discussion on student engagement, and the direction we take next. A key consideration in this discussion is not just on the development of a tool, and its implementation, but the process of using the data reactively to enhance various aspects of student engagement within the focus institution.

Further research is also required on strategies to encourage self-reflection and self-regulation of learning, in which deficiencies were found within the institutional engagement results, and also in comparison with national data. In addition to identifying strategies, further discussion with faculty members is required to ensure a buy-in is created to implement these strategies, which can be challenging in skill-based programmes where this type of activity can be seen as an optional activity and not critical to technical skill development.

The next chapter discusses the identification, use and effectiveness of a self-efficacy in computer programming measurement tool used in Cycle 3 across the control and treatment groups. This measurement tool was used in conjunction with the treatment group interventions to determine if the PBL and PAL activities had positively affected self-efficacy in computer programming.

# Chapter 6

## Measuring and Evaluating Academic Self Efficacy

### 1. Introduction

This chapter will discuss the results of the self-efficacy questionnaire that was introduced to the control and treatment group as part of the social learning interventions in Cycle 3 (2016). The self-efficacy questionnaire was issued to participants at both the start and end of their semester, for the purpose of measuring if the social learning activities had affected any change in the treatment group's self-efficacy scores in computer programming, and in their perception of working in groups.

Albert Bandura (1986) defines self-efficacy as people's beliefs about their capability to produce desired results through their own actions. According to Bandura, people with a high sense of self-efficacy approach difficult tasks as challenges to be met, rather than threats to be avoided. Bandura outlines a number of ways in which a strong sense of self-efficacy can be developed. These can be summarised as mastery experiences, vicarious experience (observation) and social persuasion. These considerations were adapted to the social learning activities as previously discussed. Measuring self-efficacy is therefore useful to determine if the efficacy beliefs of the participants in this study had changed, and to what extent.

### 2. Measuring Self-Efficacy

There is no all-purpose measurement tool of perceived self-efficacy (Bandura, 2006). Bandura (2006) states that self-efficacy should also be distinguished from other constructs such as self-esteem, locus of control, and outcome expectancies. Perceived efficacy is a judgment of capability; self-esteem is a judgment of self-worth (Bandura, 2006). When considering measuring self-efficacy, Bandura (2006), suggests individuals record their strength of their efficacy beliefs on a 100-point scale, ranging in 10-unit intervals from 0 (Cannot do); through intermediate degrees of assurance, 50 (Moderately certain can do); to complete assurance, 100 (Highly certain can do). A simpler response format retains the same scale structure and descriptors but uses single unit intervals ranging from 0 to 10. Bandura suggests participants usually avoid the extreme positions so a scale with only a few steps may, in actual use, shrink to one or two points, therefore an efficacy scale with the 0-100 response



format is a stronger predictor of performance than one with a lower number interval scale (Bandura, 2006).

### 3. The Research Tool

With reference to Bandura's (2006) guide for constructing self-efficacy scales, a question list, or efficacy activity belief list, needed to be generated so participants could rate the strength of their belief in their ability to execute the requisite activities. As the participants for this study were in their second semester of first year, within their BSc in IT, the activity list needed to portray what was actually covered within computer programming in the first semester. To determine this, I invited four students from the treatment group for an informal discussion, this centred on the module descriptor and the general material provided by the principal programming lecturer, and what was covered in the programming labs throughout the first semester. This discussion led to an initial list of activities that the participants believed all other students should be able to provide an efficacy rating for. In addition to the activities the student volunteers generated, I added in additional activities relating to group work in programming, this was to facilitate the investigation on the effectiveness of the social learning activities introduced to the treatment group, in comparison with the control group who did not participate in any formal social learning activities. This list was labelled as the self-efficacy questionnaire, which was provided to the principal programming lecturer for accuracy review. The principal programming lecturer was satisfied that the activities suggested in the questionnaire ability list were reflective of what was covered in the first semester. This questionnaire was then piloted with 3 students from Year 2, more so to determine if the questions could be understood and were not ambiguous. The findings from this informal pilot led to the inclusion of further explanation that was placed in brackets against particular activities within the questionnaire, to further strengthen understanding of what was required.

Table 6.1 below presents the 26 questions (activities) that were included in the self-efficacy in computer programming questionnaire.

**Table 6.1: Self-Efficacy Question List**

Question No.	Question
1	Installing and setting up eclipse software
2	Creating a new project using eclipse software
3	Creating a new class using eclipse software
4	Compiling and running a program using eclipse software
5	Printing out a message to the user
6	Commenting on a program
7	Declaring new variables and defining their types (Int, Double, String)
8	Getting input from the user (Using BufferedReader)
9	Importing libraries to be used in a class
10	Creating new methods inside a class

## Chapter 6 – Measuring and Evaluating Academic Self Efficacy

11	Using conditional statements (Ifs and ELSEs)
12	Using loops (For and While)
13	Reading from a txt file
14	Displaying a message from a txt file
15	Writing to a file
16	Catching exceptions (Try and Catch)
17	Finding and correcting mistakes in my own code
18	Understand a long, complex multi-file program
19	Searching for solutions to coding problems through online forums and articles
20	Finding ways of motivating myself to program, even if the problem area is of no interest to me
21	Finding a way to concentrate on my programming assignment, even when there are many distractions around me
22	Finding ways of overcoming a programming problem while working on an assignment
23	Positively work with others in a group based programming project
24	Effectively communicate with others (with varying skill levels and abilities) while working within a group based programming project
25	Confident in presenting ideas and suggestions to a group of people while working within a group based programming project
26	Positively contribute to the solution of problems encountered while working within a group based programming project

The question list in Table 6.1 can be further categorised to assist in analysis, this is broken down as follows:

- **Question 1 to 16** = Specific programming skills
- **Question 17 to 22** = Overcoming problems when programming
- **Question 23 to 26** = Working within a group to solve programming problems

The scoring mechanism for the questions in Figure 6.1 below was adapted from Bandura's (2006) guide for constructing self-efficacy scales.

**Figure 6.1: Efficacy Scale: adapted from Bandura's guide for constructing self-efficacy scales (2006)**

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all			Moderately can do				Highly certain can do			

The full self-efficacy questionnaire issued to both the control and treatment groups is available in Appendix G - Academic Self Efficacy Questionnaire Tool.

## 4. Analysis

This section will now present the results of self-efficacy scores captured through the use of the self-efficacy questionnaire, together with an analysis and interpretation of findings. The questionnaire tool was issued to both the control and treatment groups at the commencement of their second semester, and then to both groups at the end the same semester. This was to measure if any score change had occurred, and if any claims could be made that the introduction of the social learning activities for the treatment group could be attributed to this change. To assist with the context of this analysis, Table 6.2 below is a summary of the data captured across both groups, this represents participants who completed both the start, and end of semester self-efficacy questionnaires.

**Table 6.2: Self-Efficacy Questionnaire Data Collected (2016)**

Participant Group	Size of Sampling Frame	Response Rate
Treatment Group (Group A) (Start and End of Semester Questionnaire)	90	49%
Control Group (Group B) (Start and End of Semester Questionnaire)	45	69%

Table 6.3 below is a high-level comparison between the treatment and control group averaging their start and end of semester efficacy group score using a 100 point scale. A colour has been provided to both groups, this approach is used within the charts to further assist in visualising the data that is presented.

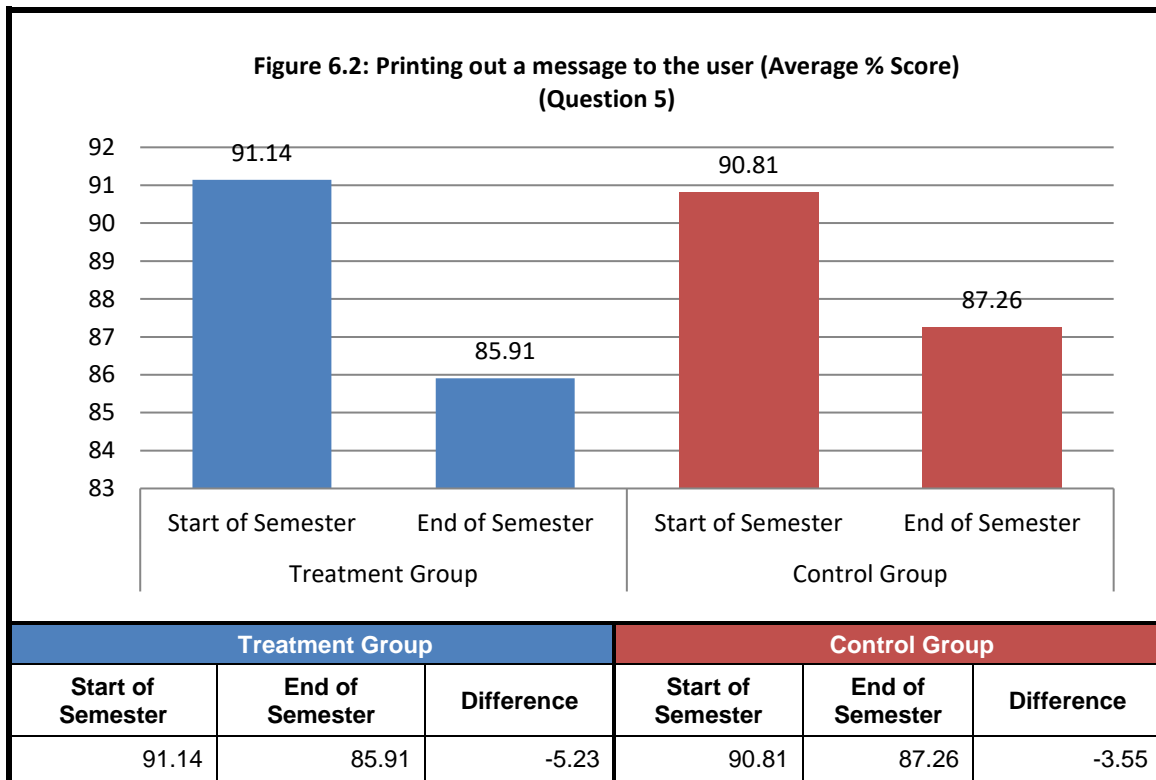
**Table 6.3: Comparing Group Average Scores – Question 1 to 26 (Totalling All Questions)**

Treatment Group			Control Group		
Start of Semester	End of Semester	Difference	Start of Semester	End of Semester	Difference
70.96	75.13	+4.17	72.01	70.86	-1.15

Table 6.3 reveals a slight increase in overall group efficacy score for the treatment group but drawing any conclusions at this point must be treated with caution. If anything, there is nothing of significance within the score difference, furthering the need to assess questions at an individual level. For the purpose of discussing responses that are useful in assessing the research questions, 10 of the 26 questions will now be presented and analysed, the figures are average scores and are expressed as percentages.

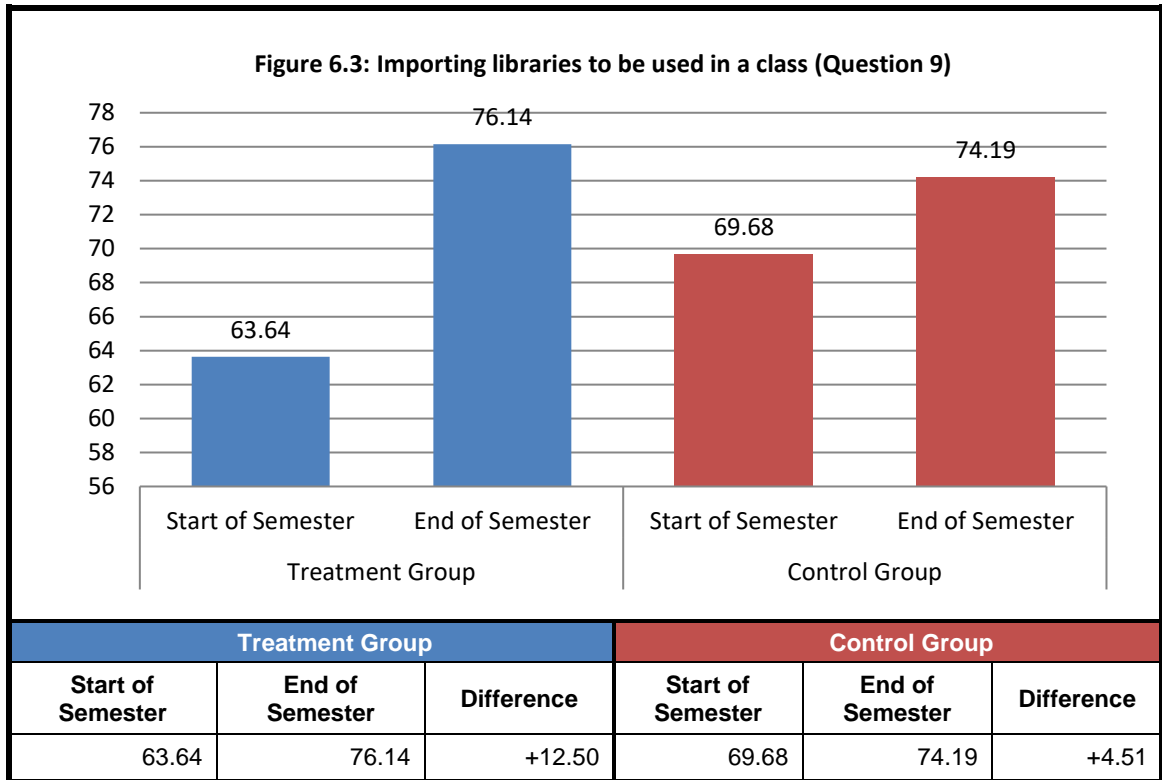
**Figure 6.2: Printing out a message to the user (Question 5)**

(Figures are expressed as %)



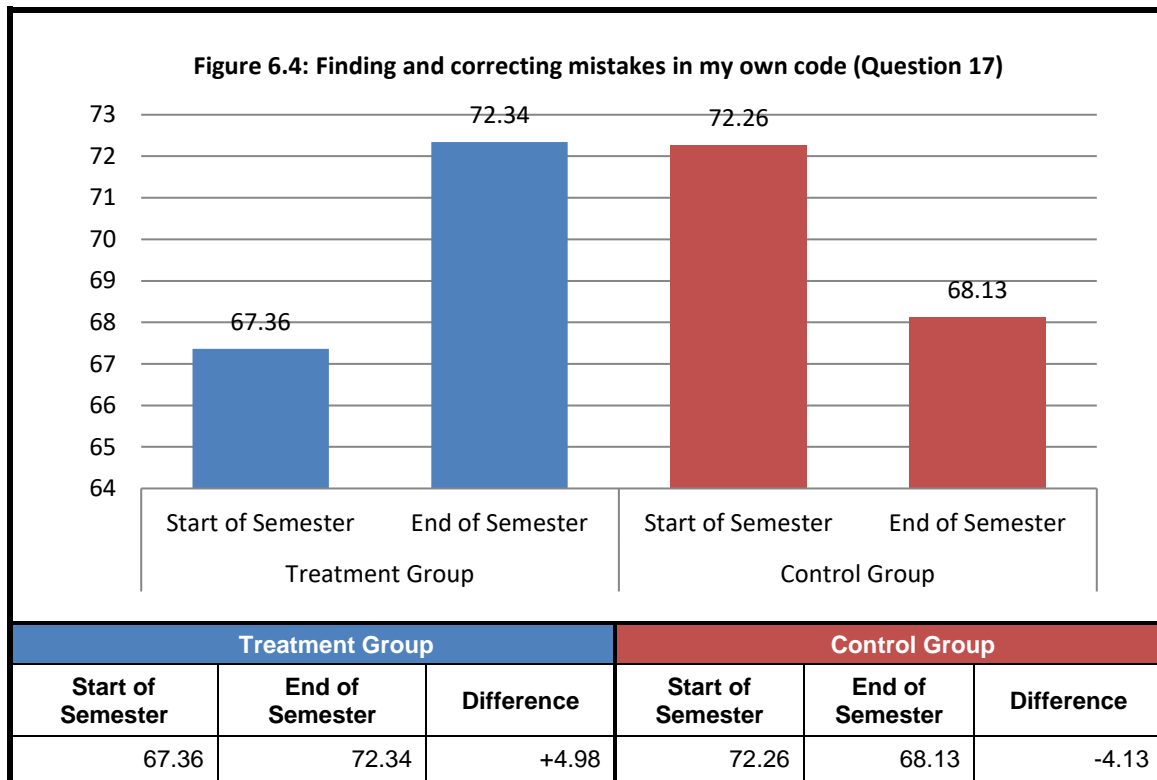
**Analysis:** This question relates to a specific computer programming skill, and what is interesting is how both the treatment and control group declined in their efficacy within this skill by the end of the semester. This decline pattern can also be found in other results, i.e. Question 14 ‘Displaying a message from a txt file’ where both groups score lower upon the completion of the semester. This finding was also found in other computer programming skill areas, perhaps an illustration of a perception of belief of a skill, and through the application of that skill a broader experience is had, causing a deeper reflection on actual ability. It may be the case that these programming skill areas are not covered sufficiently over Semester 2 of the module, potentially contributing to the lower scores. This finding requires further research.

**Figure 6.3: Importing libraries to be used in a class (Question 9)** (Figures are expressed as %)



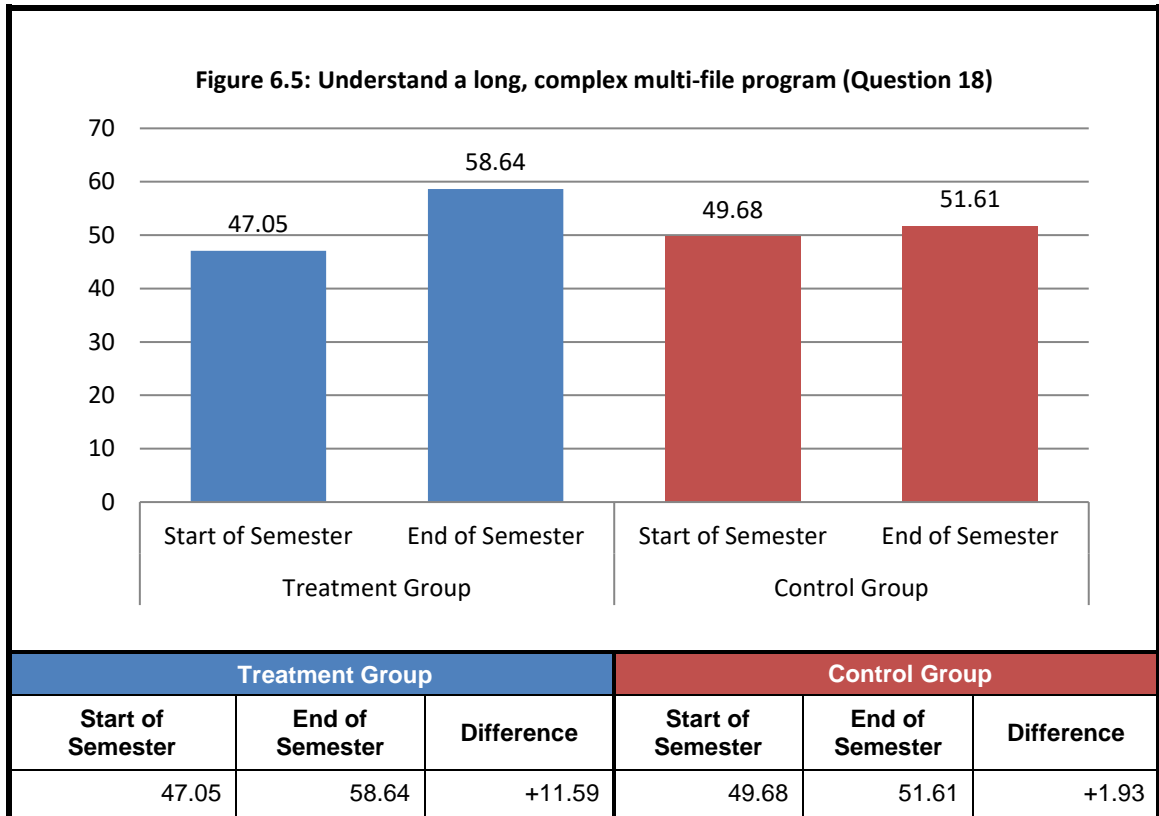
**Analysis:** This is a computer programming skill area, and both groups have increased their efficacy score by the end of the semester. What is interesting is that the treatment group started the semester with a lower efficacy score than the control group, but by the end of the semester the treatment group scored higher than the control group, the increase of 12.50% is a substantial increase. This is suggestive that the social learning activities experienced by the treatment group positively contributed to this score change.

**Figure 6.4: Finding and correcting mistakes in my own code (Question 17)** (Figures are expressed as %)



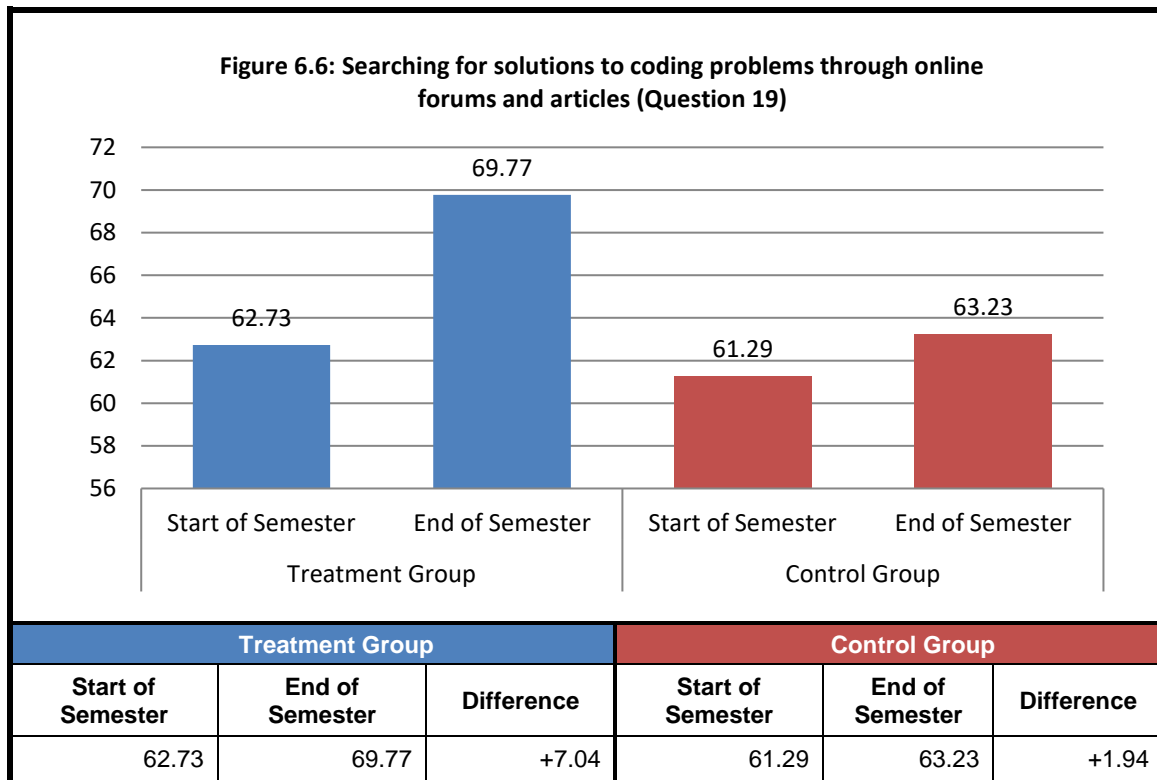
**Analysis:** This is another programming skill area, and an important one in general, as this relates to understanding and fixing coding problems. What is interesting about this finding is that the treatment group have increased their efficacy score by the end of the semester, but the control group score has dropped. This is a positive finding, although difficult to directly attribute this to the social learning activities over the semester, there is a strong suggestion that this was the result of the interventions the treatment group received.

**Figure 6.5: Understand a long, complex multi-file program (Question 18)** (Figures are expressed as %)



**Analysis:** This is another programming skill area, and like the findings in Figure 6.3 (p.163). Both groups have increased their efficacy score at the end of the semester, but the treatment group started with a lower score at the start of the semester, but substantially increased by 11.59% by the end of the semester, outperforming the control group. This skill area would have featured within the PBL activities introduced to the treatment group and suggests a strong correlation between the treatment activities and the positive score change.

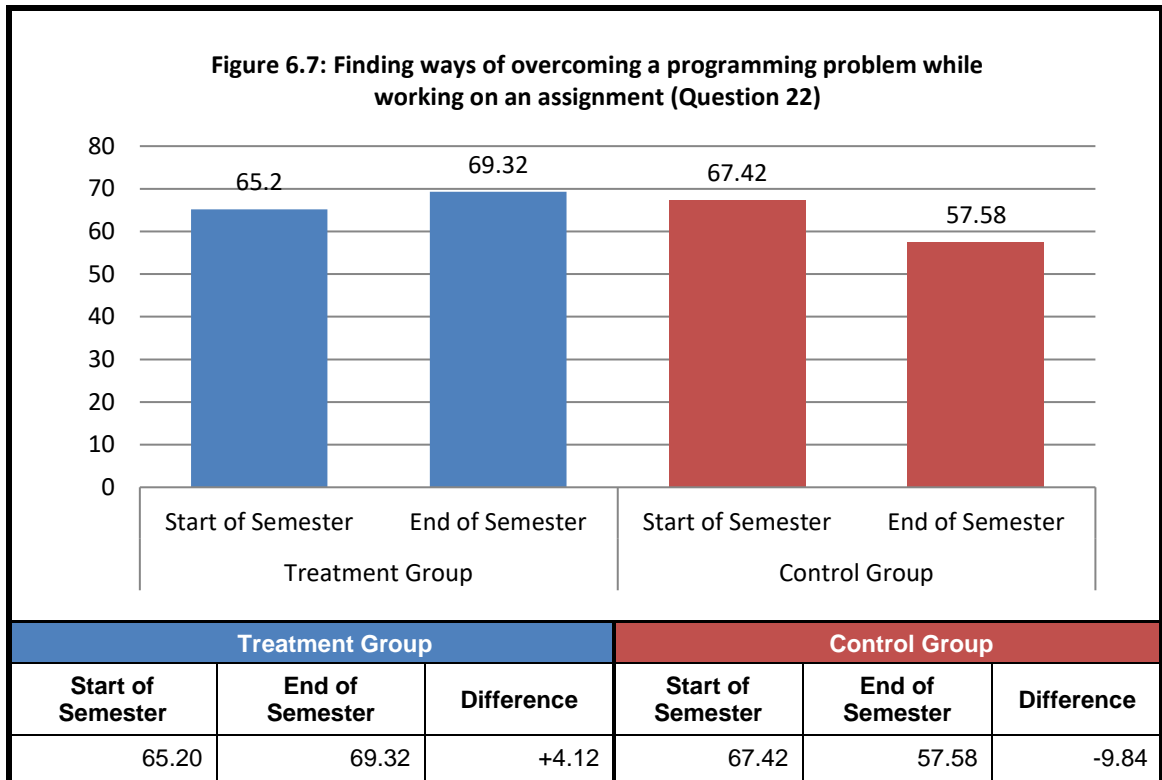
**Figure 6.6: Searching for solutions to coding problems through online forums and articles (Question 19)** (Figures are expressed as %)



**Analysis:** This communicates a general ability to source solutions to coding problems using online resources, and the treatment group have outperformed the control group by the end of the semester within this particular skill area. This would have featured within the PBL and PAL sessions introduced to the treatment group as this would have been a requirement when addressing the problems posed within the PBL activities in particular. This suggests a positive correlation between the treatment activities and the end of semester efficacy score increase.

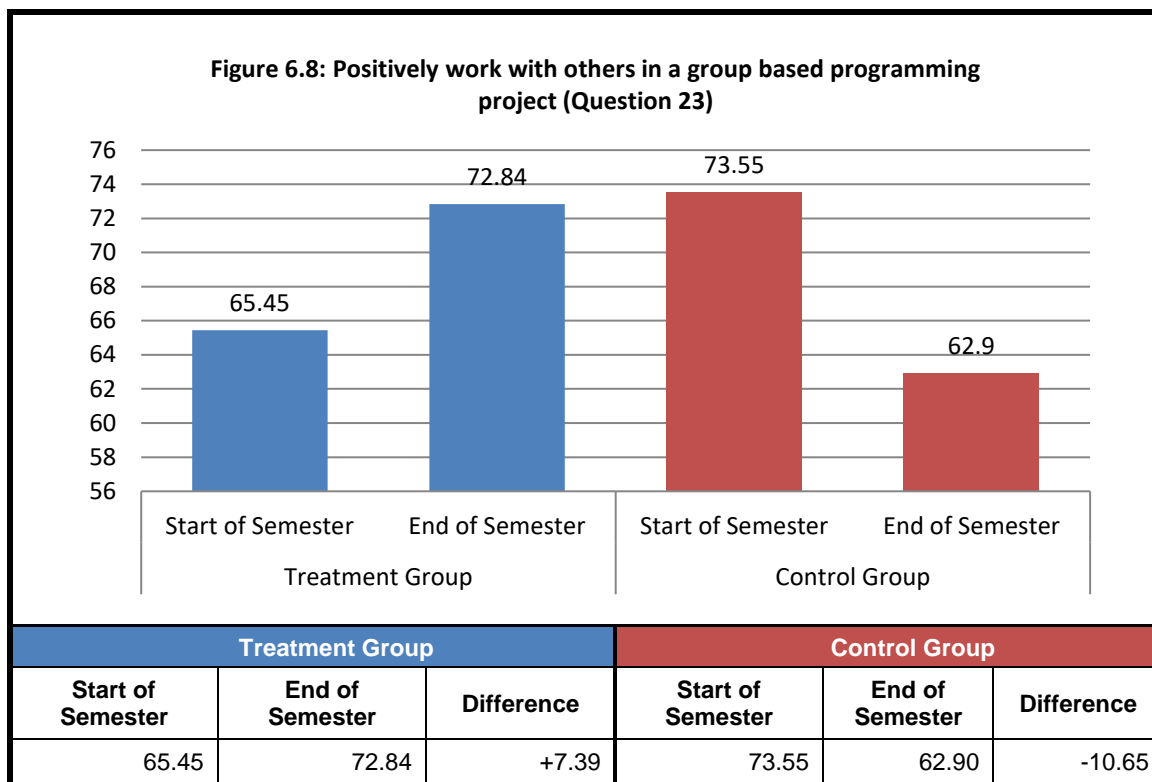


**Figure 6.7: Finding ways of overcoming a programming problem while working on an assignment (Question 22)** (Figures are expressed as %)



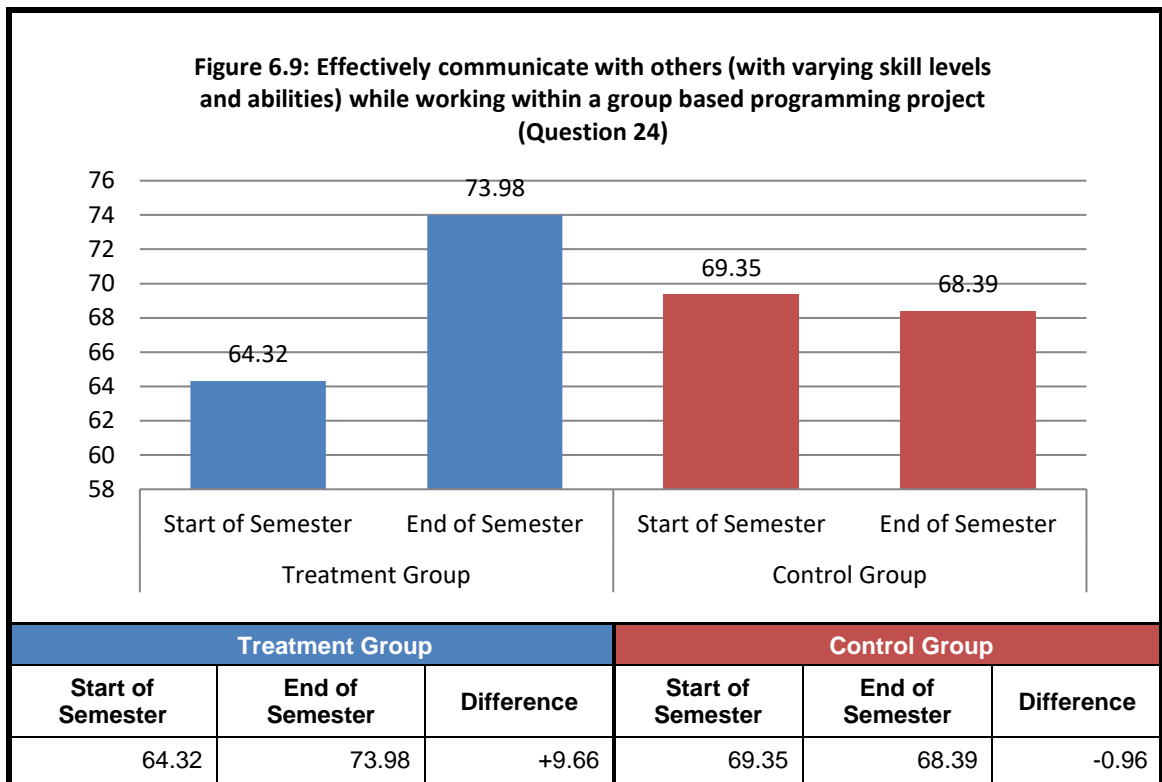
**Analysis:** This ability relates to individuals using the various supports and resources to overcome the challenges within a programming assignment. This could be perceived as working as an individual, or working within a group, which makes the analysis difficult. What is interesting is the increased score for the treatment group, and the noticeable decline for the control group, particularly as they started with a higher perceived efficacy score for this ability. The PBL and PAL activities would have required individuals to use various supports and resources to overcome problems, so there is a suggestion these activities may have positively influenced the treatment group end of semester score.

**Figure 6.8: Positively work with others in a group based programming project (Question 23)** (Figures are expressed as %)



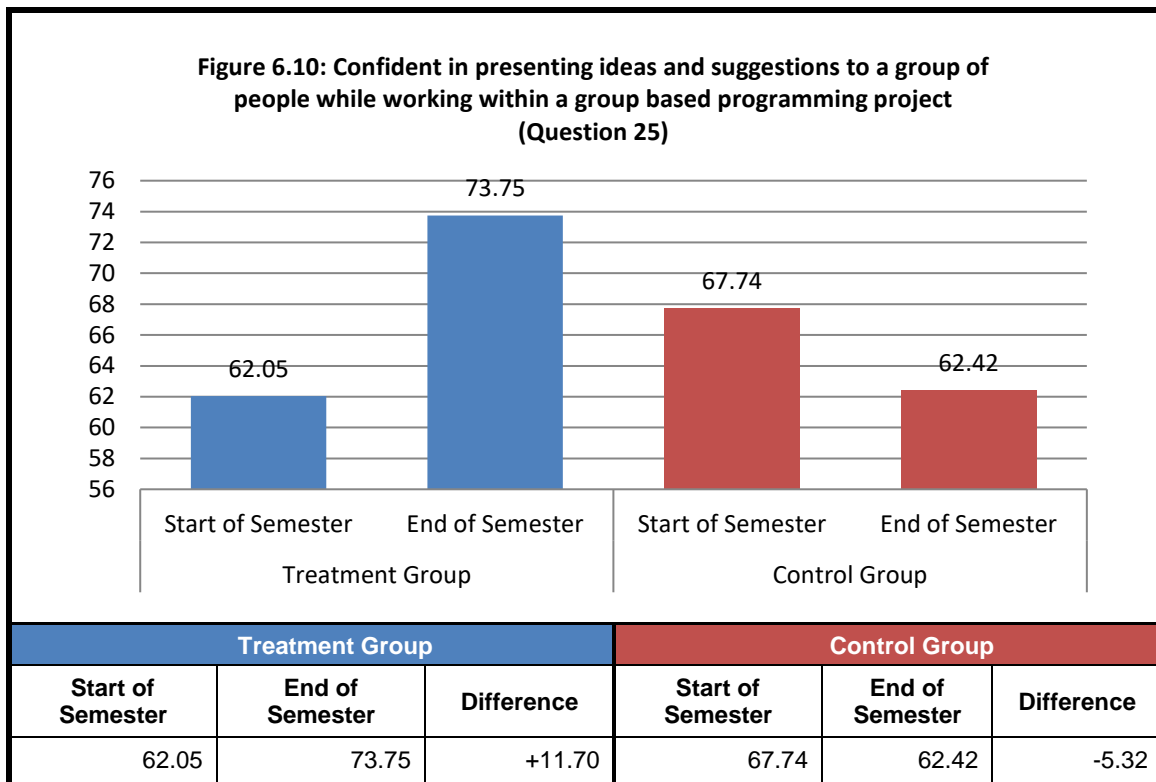
**Analysis:** This ability relates to working in a group based programming project, which was specifically covered in the PBL sessions introduced to the treatment group over the semester. This is an interesting finding in that the control group had a higher efficacy score than the treatment group at the start of the semester, but by the end of the semester we see the opposite result in that the treatment group have increased their efficacy score within this area, and the control group dropping substantially. There is a strong suggestion that the social learning activities experienced by the treatment group contributed to this positive score increase.

**Figure 6.9: Effectively communicate with others (with varying skill levels and abilities) while working within a group based programming project (Question 24)** (Figures are expressed as %)



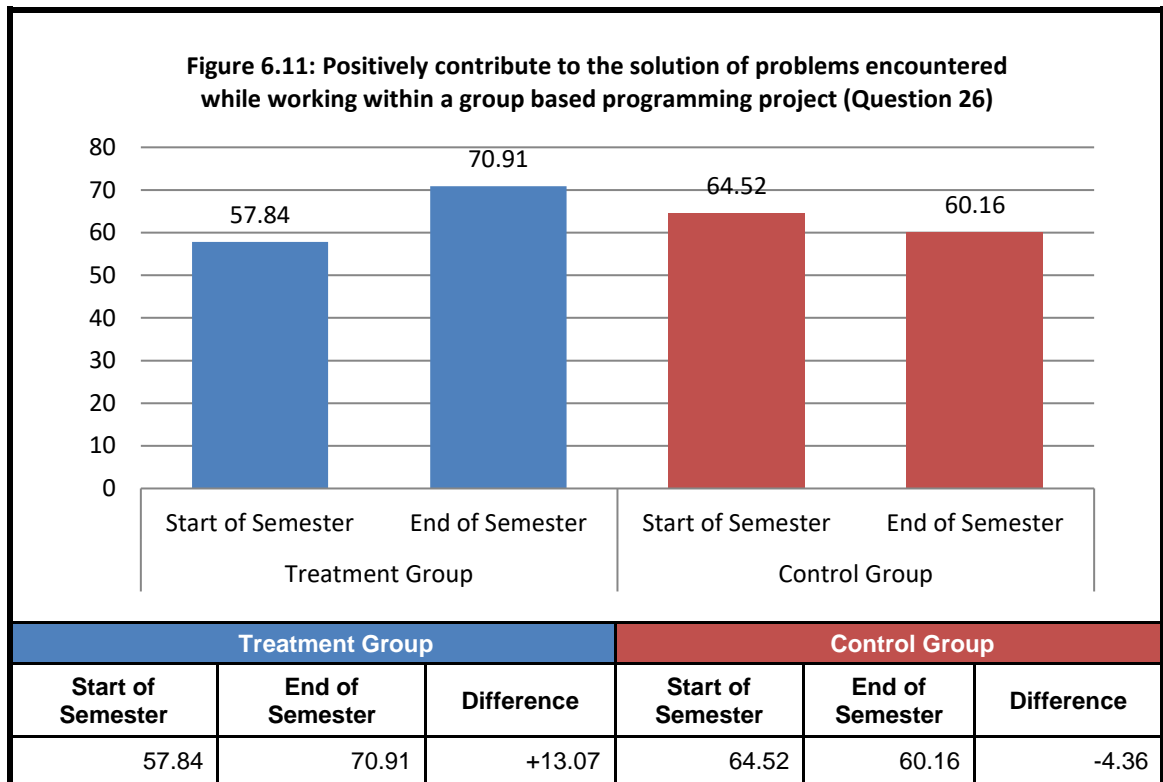
**Analysis:** This relates to communication skills while working in group based programming projects, which would have featured within the PBL sessions covered by the treatment group over the semester. Interestingly, the control group started with a higher score at the start of the semester, with a slight decrease by the end of the semester, but the treatment group started with a lower score at the start of the semester and outperformed the control group by the end of the semester with a score increase of 9.66%. This strongly indicates the PBL activities have contributed to this positive increase in efficacy score for the treatment group which further endorses the use of PBL as an effective social learning tool.

**Figure 6.10: Confident in presenting ideas and suggestions to a group of people while working within a group based programming project (Question 25)** (Figures are expressed as %)



**Analysis:** This ability relates to working in groups, and ones’ ability to put forward their own ideas and suggestions to the group. Similar to Figure 6.9 (p.169), the control group started with a higher score than the treatment group at the start of the semester, but with a decrease of 5.32% by the end of the semester. The treatment group increased their efficacy score by 11.70% by the end of the semester, clearly outperforming the control group within this ability. This ability would have been a feature of the PBL activities in that each individual had a specific role to play in the completion of the projects, so there is a strong indication that this positive finding is linked to the social learning treatment activities.

**Figure 6.11: Positively contribute to the solution of problems encountered while working within a group based programming project (Question 26)** (Figures are expressed as %)



**Analysis:** This ability is associated with working in groups and making a contribution to the solution of a problem. This would have been a requirement within the PBL activities for the treatment group, in that each member would have had a specific role to play to complete the task. Similar to Figure 6.7, 6.8, 6.9 and 6.10 (p.167 to 170), the control group started with a higher efficacy score than the treatment group, but at the end of the semester the control group had a slight drop in score. Interestingly, the treatment group substantially increased their score by 13.07% by the end of semester, clearly outperforming the control group within this particular ability area. This is another strong indication that the PBL activities experienced by the treatment group positively impacted their efficacy score.

## 5. Usefulness in Answering the Research Questions

Cycle 3 was focused on measuring and evaluating student engagement and measuring and evaluating self-efficacy in computer programming. The relevant research questions associated with this study will now be presented, and a short analysis as to the usefulness of the findings in assessing these questions. The responses below will be further discussed in Section 6, Conclusions and Further Research.

### Cycle 3 Research Questions:

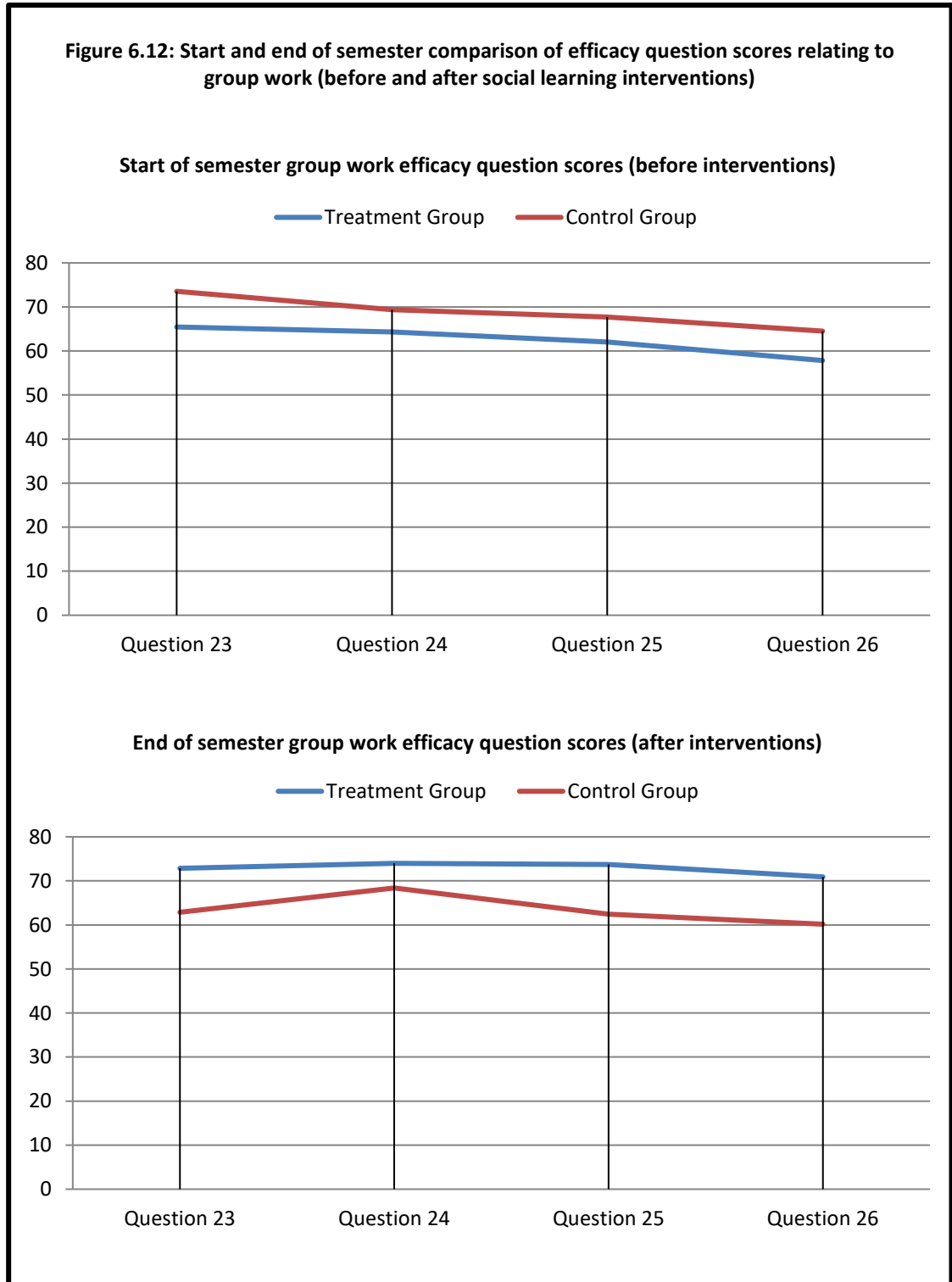
Q.1 Can social learning enhance self-efficacy in computer programming?

**Response:** The first point to consider when answering this question is the types of activities or skills that were assessed within the measurement tool itself. These elements would generally be considered as attainable at the end of the first year of a BSc in IT programme. Within the measurement tool, question 1 to 22 related to specific skills and abilities in Java based programming, while question 23 to 26 are related to working in groups to solve programming problems.

When comparing the group average scores at a high level, the treatment group scored marginally higher than the control group by the end of the study, as seen in Table 6.3 (p.161) but this is not particularly meaningful. When examining the individual questions, particularly question 1 to 22, there was very little difference between the group scores, and in many cases, both groups shared higher scores across the questions. Figure 6.2 (p.162) is an example of this, in that the control group ended the study with a higher efficacy score within this question, and both groups had declined overall. It would be inappropriate to suggest that social learning activities enhance overall self-efficacy in computer programming, however, some of the individual results indicate evidence of positive impact. Figure 6.4 (p.164) and Figure 6.5 (p.165) refer to finding and correcting mistakes in programming code and understanding long multi-file programs. The treatment group scored higher for both of these perceived abilities, which was a positive result as these activities were featured within the social learning activities. A similar positive result is also found in Figure 6.6 (p.166) where the treatment group scored higher for their perceived ability to search for solutions to coding problems online.

A noteworthy finding of this study was found when analysing the final four questions in the measurement tool, these were presented in Figure 6.8, 6.9, 6.10 and 6.11 (p.168 to 171) and relate to Questions 23 to 26 in the measurement tool. These four questions all measure the perceived ability to work within a group, with programming as the focus. The control group had a higher efficacy score than the treatment group for all four of these questions at the start of the semester, but at the end of the semester the treatment group scored higher for the same four questions when compared to the control group. This strongly suggests the use of the social learning activities for the treatment group was a factor in this score reversal. To illustrate this better Figure 6.12 (p.173) shows the reversal in efficacy score between the treatment and control group by the conclusion of the semester.

**Figure 6.12: Start and end of semester comparison of efficacy question scores relating to group work (before and after social learning interventions)**  
*(Figures are expressed as %)*



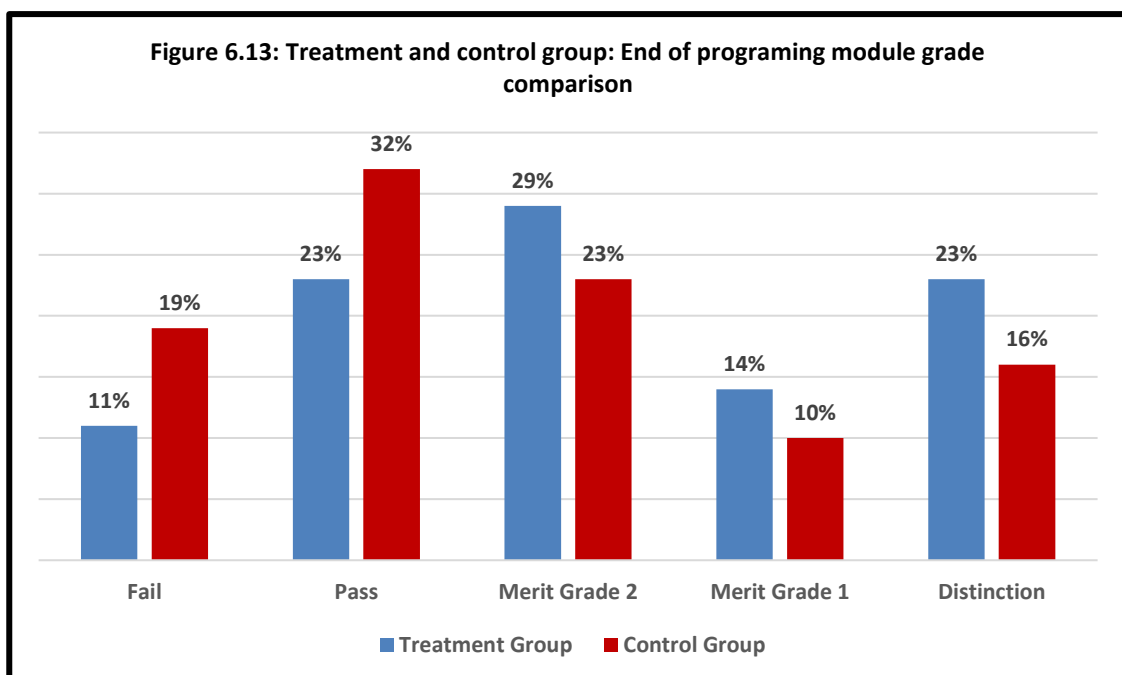
Q.2 Are social learning activities linked to better performance in computer programming?

**Response:** There is a suggestion that social learning can assist in building students’ belief in their capability to perform particular programming skills. As previously stated, Figure 6.4 (p.164) and Figure 6.5 (p.165) refer to finding and correcting mistakes in programming code and understanding long multi-file programs. The treatment group would have carried out these particular skills in the social learning activities. A similar positive result is also found in Figure 6.6 (p.166) where the treatment group scored higher for their perceived ability to search for solutions to coding problems online.

Self-efficacy is not the same as actual performance; measuring belief in capability to perform a task is different from measuring actual performance. The approach used to answer this question was to compare the treatment and control group end of semester programming module grades. The programming module under examination was a year-long module, there was no interim examination that could be used as a useful comparison to measure performance change, so the only complete analysis was to measure their final grade for the module. Figure 6.13 below presents the end of year programming module grades for both the treatment and control group. The grade classification that is used within the focus institution is as follows:

- **Distinction:** >70%
- **Merit Grade 1:** 60% to 69%
- **Merit Grade 2:** 50% to 59%
- **Pass:** 40% to 49%
- **Fail:** <40%

**Figure 6.13: Treatment and Control Group: End of Programming Module Grade Comparison**





**Analysis:** The average grade for the treatment group was 55%. The 11% failure rate, in comparison to previous years, is encouraging of the group's overall performance. In previous years the failure rate was 20% and above. There are also a higher number of distinctions in comparison to previous years, which is also reflected in Merit Grade 1 and Merit Grade 2 scores. Typically, there would have been a Pass percentage of approximately 30% and fewer distinctions. Again, there is no strong correlation that the social learning activities introduced to the treatment group contributed to these results. This study set out to examine student engagement and self-efficacy and performance was not a primary focus of the investigation. The performance results are encouraging, and further research is required to examine the performance aspects of social learning.

For the control group, the average grade was 49%. The failure rate of 19% is in line with previous years, although concerning, this would be typical of first year programming. The pass rate of 32% is also similar to previous years, as are the number of distinctions. When these results are compared to the treatment group we can see that there are noticeable differences in the Fail and Distinction categories with the treatment group outperforming the control group and with a higher average grade of 55%.

There is no direct correlation between the performance of either group or the social learning activities, other than evidence to suggest further research in this area is worthwhile. If the introduction of social learning in computer programming can enhance performance in a measurable way, then this might lead to a greater interest from various institutional stakeholders furthering the benefit of examining and supporting this area.

## 6. Conclusions and Further Research

The conclusions and recommendations for measuring and evaluating academic self-efficacy in computer programming will now be discussed. This will be performed by examining findings from the use of the tool for the comparison between the control and treatment groups. This will be followed by recommendations and further research for consideration.

### 6.1 Conclusions

The self-efficacy tool (adapted from Bandura's (2006) work on self-efficacy) contained 26 questions, in which 16 questions were related to specific skills/abilities within computer programming, 6 questions related to overcoming problems within programming assignments/projects, and 4 questions were specifically related to working in group-based programming activities. Both the control and treatment group were invited to complete the self-efficacy questionnaire at the start of the programming module in Semester 2 of Year 1. Both groups were also invited to complete the end of semester self-efficacy questionnaire tool to facilitate measuring any differences that may have occurred. The intervention activities were introduced to the treatment group over the course of the semester, while the control group received no such formal activities. It is important to point out that social learning may

have occurred informally, in that students may have formed their own study groups to facilitate learning, this may have been the case for both the control and treatment groups and therefore caution should be applied when examining findings.

The overall end of semester group comparison score revealed a small increase in self-efficacy in computer programming for the treatment group (Table 6.3 p.161) when compared to the control group, but this could not be considered overly meaningful. 10 of the 26 questions were included for analysis and discussion as these pointed to evidence of impact, and in some cases, evidence of caution when considering impact. These contradictory findings were found within the specific programming skill related questions (questions 1 to 16). This suggests that despite the social learning activity intervention, both groups perceived their self-efficacy in specific programming skill areas as similar. Towards the end of the questionnaire, 6 questions were associated with overcoming computer programming problems and the treatment group scored positively in this area. Some of these questions specifically related to the types of activities that were included in the social learning activities, which suggests a positive impact of the intervention. This can be seen in Figure 6.4, 6.5, 6.6, and 6.7 (p.164 to 167).

The strongest evidence of impact from the social learning activity intervention was found in the final 4 questions of the questionnaire (questions 23 to 26), these were associated with self-efficacy in group-based programming activities. The control group had a higher self-efficacy score for all four of these questions at the start of the semester, and by the end of the semester, the treatment group had outperformed the control group in all four questions. This is a positive result and suggests the introduction of the social learning activities contributed to this finding. This can be seen in Figure 6.8, 6.9, 6.10 and 6.11 (p.168 to 171).

With regard to measuring self-efficacy and programming performance, it is difficult to claim that the social learning activities received by the treatment group and any impact on their actual programming skill. This is because the social learning activities were only one of many possible attributes that led to the students' performance in programming. Figure 6.13 (p.174) reveals the end of semester results for the control and treatment groups, the treatment group slightly outperformed the control group, with an average score within the programming module of 55% versus 49%. The actual grade comparison was a useful exercise as it revealed that no obvious harm was caused to the treatment group because of the interventions, and in addition, no obvious harm was caused to the control group, particularly as their grades across the grading categories resembled similar results from previous cohorts.

In conclusion, no strong claim can be made that social learning activities enhance programming ability or performance, but there is supportive evidence that the introduction of social learning activities enhances the belief of capability of working in groups. So rather than linking this to performance, a conclusion can be made that introducing group work enhances the perceived ability of individuals to work in groups, which is a finding worth sharing when some may consider group work counter-productive. Another conclusion can be made that group work does not impact negatively on performance, which was suggested by the principal programming lecturer at the commencement of this study.

## 6.2 Further Research

The self-efficacy measurement approach and tool was easy to implement and proved effective in terms of drawing comparisons across groups. There are other approaches to consider, as self-efficacy is focused on a belief of capability, it may be worth considering focusing on actual performance. The purpose of conducting this study was to influence others to investigate group work and its benefits within their modules. If the findings are focused on enhanced self-efficacy rather than performance, this may be seen as drawback as there is general focus on performance-based results with higher education.

Further research is warranted on measuring self-efficacy through group work, particularly as this study was focused on social learning activities it would have been helpful to include more group based questions within the questionnaire tool. A longitudinal approach is worth considering providing a deeper evidence base for the effect of self-efficacy on performance. It would also be useful to determine which social learning strategies have a better impact on self-efficacy and performance. Problem Based Learning (PBL) and Peer Assisted Learning (PAL) were the two social learning approaches used in this study, and although they were effective, there are many more approaches that may be useful in enhancing self-efficacy, particularly in computer programming for first year undergraduate students.

The next chapter presents key reflections that occurred throughout the study, and how assumptions were challenged leading to design and development enhancements within the action research cycles.

# Chapter 7

## Reflexivity

### 1. Introduction

This chapter discusses the importance of reflexivity and how, through a process of reflection, my preconceptions and assumptions were challenged which informed the various stages of the research design and implementation.

The literature presents a number of definitions and perspectives on reflexivity, and for the purpose of this discussion, I have identified with two central theories in sociology that emphasise how meaning is socially produced through social performance, communication and interaction. The notion of reflexivity is recognised as a key attribute in ethnomethodology (Garfinkel, 1991) and symbolic interactionism (Mead, 1967). According to these theories, social life is not essentially governed by wider social forces but rather shaped by social actors reflecting and talking about their everyday actions. Reflection and talk then become interdependent: that is, they make the social world happen and shape it. Used in this context, reflexivity is a tool that exposes researchers' knowledge, talk and practice to critical analysis rather than taking these areas for granted or seeing them as representing some objective truth. The individuality of the researcher creates outcomes and reactions to experiences that are subjective, which may not represent the thoughts of others in a similar process. This simply represents the complex nature of reflexivity and how the 'self' is at the heart of the process.

### 2. Reflexivity in Practice

The importance of being reflexive is acknowledged within social science research and there is widespread recognition that the interpretation of data is a reflexive exercise through which meanings are made rather than found (Mauthner et al., 1998). Reflexivity also requires the research process itself to be critically examined. Because of this, decision making needs to be made transparent, which allows the reading audience to examine the methodological strengths and weaknesses.

While this is welcomed, this also presents a challenge in practice and the focus of this study. The problem area under examination was the difficulties students have with computer programming, and a desired outcome of this study was to engage others within the computing

faculty to consider alternative pedagogical approaches. This study was based on pragmatism and qualitative data was going to have a strong presence in the findings. If impact and change were a desired outcome of this study, then convincing others to engage in my reflections and qualitative findings was an ambitious goal given my colleagues were favourably engaged in positivism and quantitative analysis. However, it would be naïve to suggest that quantitative studies do not involve a process of reflexivity. The positivist paradigm, on which much traditional Computer Science research has been based, places great value on objectivity. The position of the researcher is that of detached, impartial observer and this has meant that researchers have often 'tended to write themselves out of the text' (Scott 1997, p. 133) in the belief that to do otherwise would somehow pollute the research. Denny (1991) argues that such objectivity is a myth as it is not possible to separate the researcher from the research. Qualitative approaches acknowledge this relationship; researchers both influence and are influenced by the process of engaging in research. A reflexive approach recognises this reciprocal relationship and seeks to make it explicit (Lamb and Huttlinger 1989). Regardless of the research discipline, individuals will bring their experiences and beliefs into their studies. The process of reflexivity in research is about respecting and understanding this subjectivity and ensuring the individual is aware of how and why it shapes the research and which path future research takes. Devine and Heath (1999) further strengthen this view as they describe the importance of being reflexive about how we interpret our data, our role in the analytical process, and the assumptions we bring to the analysis.

In an attempt to bring about change within my practice, a consideration was made regarding research methods. I accepted from the early stages of this study that my findings were going to be interpretive, and more aligned with a qualitative study. However, a mixed-methods approach was adopted as this would produce both qualitative and quantitative data. This not only served a practical purpose for the research study, but also considered my colleagues who are drawn to quantitative data presentation. The Doctorate process is one that is primarily focused on a contribution to practice, and to facilitate engagement with my peers within my institution, producing quantitative data was purposeful.

While reflexivity appears to have many positive benefits, it would be unrealistic to assume that it is unproblematic. Koch (1998) and Marcus (1998) suggest that researchers adopting a reflexive approach may be accused of self-indulgence. Scott (1997) discusses the need to guard against the process of excessively looking at the 'self' and similarly Waterman (1998) argues that it should not be viewed as an approach for all situations. Waterman (1998) suggests that too much self-examination can lead to a lack of action resulting in the objectives becoming second place. Waterman also suggests that researchers may have difficulty in understanding and developing self-awareness in reflexivity challenging the true nature of being reflexive for the purpose of self-development. But it must be said that applying an agreed and widely accepted structured approach to presenting reflexivity within research contradicts the personal nature of being reflexive. The researcher should be able to choose a presentation method that best mirrors their reflexivity, so long as their interpretations can be understood by the reading audience. Presenting reflexivity within research is a skill, and with all skills, the researcher will develop methods of presentation over time, learning from each experience. Even still, it can be difficult to be present true reflections within research if the reflective discussion reveals something that is not congruent with a potential sponsor. This was realised in the social science research work of Mauthner and Doucet (2003) in which

their deepening understanding of reflexivity and the range of personal, interpersonal and institutional influences on their research was realised through emotional and intellectual distance from their research conclusions. They describe how acquiring job security, through positions held in academia, allowed them to admit and articulate the confusions and tensions they felt and how these manifested themselves in their research. This may dispute the concept of true reflexivity at the time of research given that individuals may feel compelled to hold back some of their experiences simply because of the nature of the consequences. Reflexivity in this context becomes strategic, where the researcher is mindful of the research sponsor, and how they may react to the real and true reflections put forward by the researcher. A process of filtering the reflections throughout the research may occur.

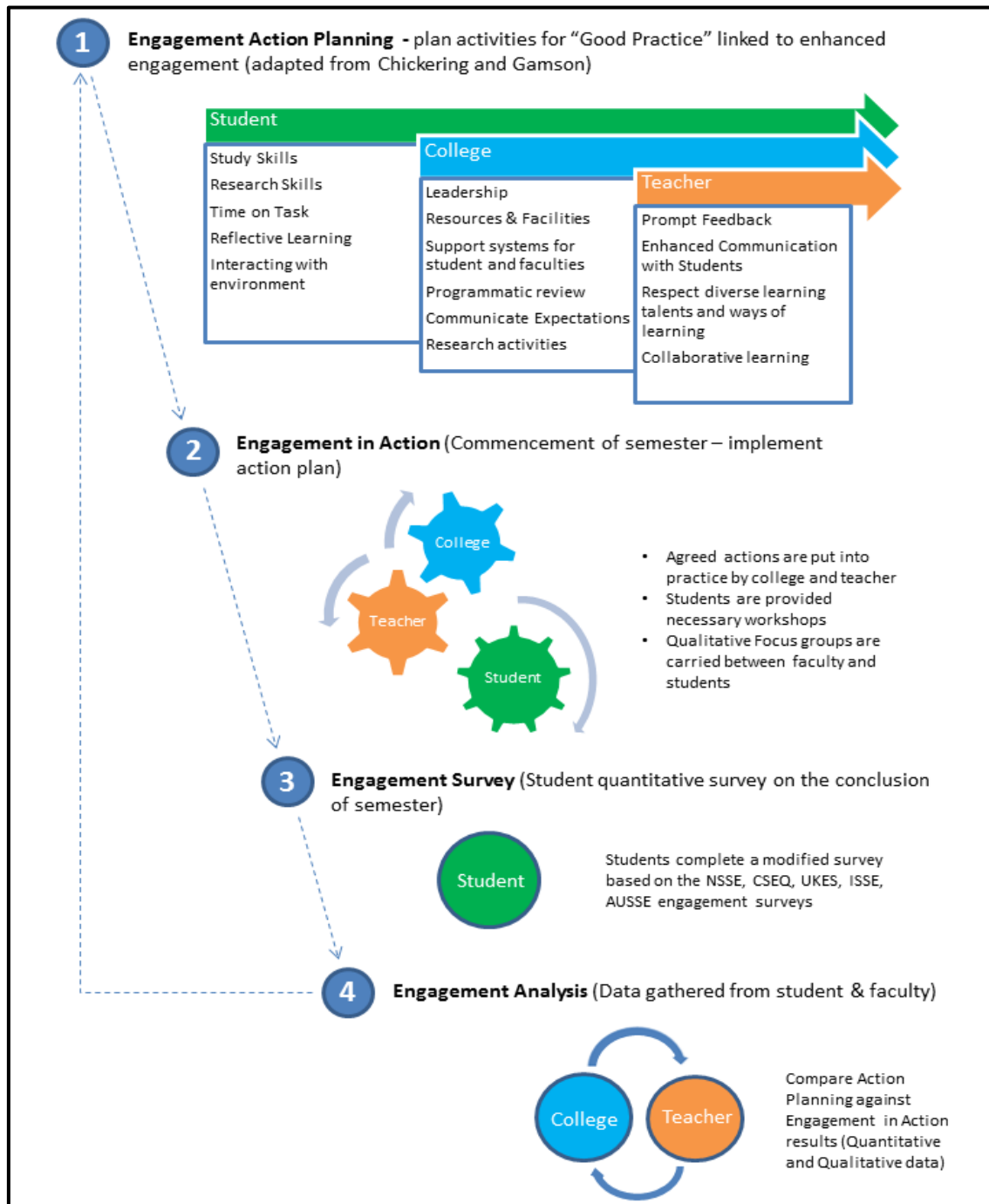
### 3. Narrowing the focus of research

Mauthner and Doucet (2003) state that reflexivity requires critical examination at all stages of the research process. This continual reflection may lead the researcher to change some aspect of their research design. The meaning making process suggests that findings are not conclusive but are exploratory and feed into continued research in a process of deeper understanding. This is a healthy and welcomed process in qualitative research, allowing new insights to be integrated rather than ignored (Lamb and Huttlinger, 1989), and respecting and understanding this subjectivity and ensuring the individual is aware of how and why it shapes the research, and a development pathway for future research.

The notion of degrees of reflexivity, as suggested by Mauthner and Doucet (2003), resonates with my own journey in empirical research. My approach to this study was to initially investigate the key challenges facing students when learning computer programming. The challenges and solutions can be presented visually, and a useful tool to achieve this is the creation of a conceptual framework. Conceptual Frameworks can be defined as a written or visual presentation that explains either graphically, or in narrative form, the main things to be studied – the key factors, concepts or variables and the presumed relationship among them (Miles and Huberman, 1994). Conceptual Frameworks were central to my research as they focused my continued attention on what I believed was central to my investigation. Throughout the study I developed a number of conceptual frameworks which represented my thinking at a particular stage. The frameworks were updated as the study progressed, each one building on the learnings from what was found through literature, or through the findings of the action research studies. The key themes within each framework were student engagement and involved action from not only the student, but the lecturers and the focus institution. As an example, the development of Conceptual Framework version 4 (Figure 7.1 p.181) was perhaps a little over ambitious, but the need for a more rigorous approach to implementing an engagement strategy, measuring it, and bringing about change was required. The model was influenced by Chickering and Gamson's (1987) Seven Principles of Good Practice in Undergraduate Education. This is a well referenced set of engagement indicators which reflect good practice in education and was a useful reference point, perhaps acting as a benchmark for my institution. The four phases identified in the Holistic Engagement Life Cycle model, as seen in Figure 7.1 (p.181), specifically incorporated methods of student engagement in Phase 1. This was a key part to the framework as getting buy-in from the

students was central to the notion of engagement. Again, through reflection, the framework was idealistic and very broad and ambitious. To setup a framework comprising of so many diverse elements would take a team of individuals requiring extensive and prolonged research. This is beyond the scope of the Doctorate process and could hamper the important introspective learning that needs to occur for a richer understanding of the problem under investigation.

**Figure 7.1: Conceptual Framework v4 (holistic engagement life cycle model)**



Reflecting on the Holistic Engagement Life Cycle Model (Figure 7.1), several obstacles emerged if the primary purpose was to bring about real change across the entire focus

institution. The academic constraints of both teacher and student would be a potential block to moving the concept further. Motivating all stakeholders to participate in a complete change programme was another. The UK government ran a continuing professional development (CPD) programme known as the *New Opportunities Fund* (NOF) between 1999 and 2003. The NOF programme of information and communications technology (ICT) training was intended to raise standards of pupils' achievements by increasing the expertise of teachers in the use of new technology (Conlon, 2004). The report concluded that the failure of NOF, which was due to multiple factors including lack of readiness of the technological resource requirements, failure to motivate teachers, inattention to the setting in which teachers work, and an underestimation of what is involved in developing appropriate knowledge and skills, was largely predictable. The failure to motivate teachers is listed as one of the key failings in this initiative and therefore cannot be underestimated when implementing a model for change, facing resistance from staff members in my research practice was a reality and needed to be considered carefully. Through reflection, the framework was too broad and ambitious and a more tangible direct path for a deeper understanding was required.

The first stage of the action research approach was exploratory, as ideas and assumptions were challenged throughout the research process, leading to new conclusions and continued research. A key skill of being reflexive is being able to accept that your research approach did not yield the results you were anticipating, and to accept this as a natural process of enquiry. Action Research Cycle 1 was a suitable study to not only test research methods, but to elicit further understanding of the perceived problem. I originally believed that the use of a reflective learning journal would have success across the classroom, success being the facilitation of learning and engagement in computer programming. The outcome of Cycle 1 did not reveal a positive finding for the use of a reflective learning journal in computer programming, the students did not perceive any benefit in using the journal. However, as a researcher, I had tested a number of research methods, including a structured questionnaire, a focus group and a reflective learning tool within this study which was a very positive learning experience. Perhaps the use of these three methods was naïve in terms of managing three methods within an initial study, particularly as I was testing these methods for the first time. Cycle 1 was completed, and data was analysed, and outcomes produced. Because it was the first Action Research Cycle there was a danger that too much reflective introspection, as Waterman (1998) suggests, would take place leading to a potential lack of focus in addressing the original investigation theme. The reflective process could have led to deeper analysis on the methods as opposed to questioning their suitability in illuminating the problem. I was mindful of this, but at the same time, was cognisant of my lack of experience in using these methods, and some questions arose about the how the research method was deployed as opposed to its suitability to the investigation. Nevertheless, the methods and subsequent results did uncover useful information in understanding the problem from the students' perspective. The students' perspective was very insightful, as previously I made assumptions as to how they viewed the world. The focus group discussion was particularly useful as it allowed me to engage with the points that were raised, while static content such as the questionnaire data and also the data from the reflective learning journal were difficult to draw conclusions that were useful in building the next steps of research.

Action Research Cycle 2 conducted between January to June 2015 followed a similar theme to Cycle 1. The research involved the use of a number of research methods, including



a Reflecting Learning Journal, a structured questionnaire and a semi-structured interview. This research piece was modified from the previous study on reflective learning journals in the following ways:

1. The Reflective Learning Journal was modified in terms of the amount of data that was required to be entered on a weekly basis, and the language was simplified. These were two key learnings from the previous study.
2. The Focus Group research method was replaced with Interviews. This was partly due to some issues experienced within the focus group in the previous study. Some of the participants had a powerful presence during the discussion which I believe led to some easily agree with what was being said, or possibly preventing them from expressing their own views. Insightful information was gleaned from the focus group discussion, and I believed that interviews would allow for a deeper examination of some of these issues with the interviewees.

In terms of tangible results, the questionnaire presented quantitative data that was very useful in comparing the results over the two years. This data was useful in determining the general study behaviour and preferences of both cohorts. From a research perspective, quantitative data may not reveal the ‘why’ aspect which is why I believed it was important to try to unpack this through the semi-structured interview method. The qualitative data revealed some interesting findings, particularly in how the participants placed key importance on the interactions with their peers, and how these interactions can be both positive and negative for the individual. The importance of peer interaction in terms of creating student engagement was not something I had deeply considered at this point. Through reflection I was able to analyse these two empirical studies and create a reflexive strategy that would allow the students’ voice be the central theme for further research, as opposed to my original agenda of the personal reflective learning journal. The reflective learning journal, in the format that was provided, did not allow for peer interaction thus reducing the potential positive benefits that peer learning can produce. These two studies allowed me to reflect on what was learned and narrow the focus.

The next phase of thinking was to build a research platform that would address the desires of the learners to engage in peer learning in a supportive collaborative environment. From a theoretical perspective, Social Learning Theory, and particularly, Social Cognitive Theory, emerged as the driving force for the next stage of research. I examined various theories and social learning delivery methods, these were modified for the research environment to ensure the lessons learned and feedback from the students was incorporated in this new approach. The process of reflexivity has allowed me to reflect on each element of the study in a constructive and practical way, ensuring that key learnings were taken and brought to the next research piece. Being reflexive also develops a willingness to change a research path when needed and provide an honest account of what was found within a study.

The progression viva process also offered an opportunity to reflect on feedback received through this engaging process. As such, issues about the necessity to include quantitative data were raised, and also the question about performance of the participants. The focus of this study was not centred on performance, i.e. students who participate in the proposed activities

do better than those that do not. I have attempted to avoid this conclusion as the focus was on engagement and self-efficacy, and not claiming that actual performance is altered by the interventions. Through reflection, I realised the importance of including a discussion on performance, as this would also highlight if any direct harm were caused to the participants in the treatment group. The final module mark comparison between the groups in Cycle 3 revealed the treatment group had slightly outperformed the control group, which if anything, indicates no obvious harm was caused to the treatment group participants through the introduction of the interventions.

#### **4. Reflections on research methods, tools and interventions**

The following reflections are based on my use of a number of research methods and tools that I used over the course of the action research cycles between 2014 to 2016. It is important to consider that while I have used known research tools, all have been modified and adapted to suit my research environment and context, and in some cases, were originally used without prior experience.

##### **4.1 Action Research**

Before considering an action research approach it is important to reflect on what specifically is being investigated and if such an approach is suitable. Typically, action research is associated with exploratory research, using qualitative or mixed methods, and based on an issue a researcher has reflected on and now wants to bring about change. It is a practical approach that usually is aligned to a professional context and can involve professional peers and participants. The approach is more deductive which may lead to a theory upon the completion of the three required action research cycles.

When considering an action research approach, consider the various models that are available. There are subtle differences which can affect the direction of the cycles. In addition, consider the time required to complete all three cycles, and the time period required between cycles. There is a considerable amount of reflection and action planning required which makes it suitable as a reflective approach, which may not be useful for a research study where time to complete is a serious constraint.

##### **4.2 Questionnaire (measuring student habits and preferences)**

For the purpose of ascertaining the participants' study habits and preferences a questionnaire tool was designed and used in both Action Research Cycle 1 and Cycle 2. The same tool was used across both studies for the purpose of comparison between cohorts and years. I had a number of perceptions about the participants and their study preferences, and this data was gathered for the purpose of confirming or challenging these perceptions. The questionnaire is available in Appendix A.

#### **Summary reflections and lessons learned:**

- During the process of designing a questionnaire, and deciding on questions, ensure that relevant stakeholders within a research study are also considered, as their input can

inform the questions selected leading to a potential greater impact. In addition, for every question that is to be included, consider why questions are specifically required, and how this will inform the research. This process assists in deciding what questions are actually useful to a research study and thus eliminating time wasting for both the researcher and participants.

- Pilot the questionnaire with a relevant audience, similar to that of the audience for the research study. This will determine if the questions are understood and ensure the time to complete is accurately stated in the participant information sheet. Within my research study my participants were predominately international learners, so this was an important process for this study. In addition, consider allocating a free entry text box into structured questionnaires to allow participants to enter a response that is not listed in the predefined selection. Consider that participants can reveal information that may not have been considered previously.

### 4.3 Focus groups

A focus group was used in Cycle 1 of the action research study. The purpose for the focus group was to explore the experience of the participants using the reflective learning journal, specifically to determine if the tool itself was useful in facilitating reflection. The focus group also allowed for a wider discussion on studying and learning, informing the next action research cycle. The focus group questions are available to view in Appendix B.

#### **Summary reflections and lessons learned:**

- Consider selecting participants for discussion groups as opposed to asking for volunteers, stratification should be considered in order to better represent the target group. This may be useful if attempting to make claims of the wider audience as criteria for making claims that a target group is representative of the larger population needs strong statistical consideration.
- Assert better control of the discussion in a focus group setting. Within my focus group, some participants tried to exert their opinions over others and this needs to be handled to allow others to speak freely without fear of reaction from others in the group.
- Be mindful when stating sample sizes, and target groups. Participants who choose not to take part within a study are still representative of the population, and may have specific reasons for not participating, which are just as worthy of investigation as those who participate. Criteria for making claims that a target group is representative of the larger population needs to be applied.

### 4.4 Interviews

Interviews were used in Cycle 2 to explore the effectiveness of the reflective learning journals, and also in Cycle 3, to explore the principal programming lecturer's position on

group learning pre and post treatment, and to explore the experiences of social learning for the participants post treatment. The semi-structured interview questions for Cycle 2 (Reflective learning journals) are available in Appendix D, the semi-structured interview questions Cycle 3 (Programming lecturer) are available in Appendix H. The interview questions for the participants post-treatment in Cycle 3 (social learning activities) are available in Appendix I.

### **Summary reflections and lessons learned:**

- Consider the power/influence a researcher may have on the research participants when it comes to conducting interviews. There was a very low uptake on request for interviews at the end of the intervention in Cycle 3. Out of sampling frame of 44, only 4 participants volunteered, this could be associated with a number of issues, but one could be the power/influence I had with this particular cohort. I would suggest considering a second interviewer who is not associated with the cohort to potentially mitigate against this issue.
- When considering the questions to use at the interview, allow for the interview to take a different direction as new learning can occur during the discussion which may be very valuable later in the research study.

### **4.5 Reflective learning journals**

Reflective learning journals were provided to participants in both Action Research Cycle 1 and Cycle 2. The tool was designed using Microsoft Excel and informed through the reflective models of Gibbs' Reflective Cycle (1998) and Schön's Reflective Model (1983). Participants were encouraged to provide a weekly log entry over the course of one semester within a computer programming module. The model for the reflective learning journal that was used Cycle 1 is available in Appendix C1, and Appendix C2 is the modified reflective learning journal that was used in Cycle 2.

### **Summary reflections and lessons learned:**

- Engage more with research participants when considering a tool that requires active participant engagement. The reflective journal exercise may have been more successful if the participants were involved in the development of the format and structure of the tool itself.
- Conducting a research study with a target group may not be beneficial to the group themselves. This needs careful consideration in future research, to avoid causing any harm to the target group, such as adding to their existing workload and causing frustration. These specific negative outcomes were experienced in this empirical study as some participants failed to see the point of completing the journal but felt obliged to complete it over the semester.

- If a journal is to be considered, a more engaged process is required to ensure both student and facilitator are communicating their experiences during the reflective process. It is not sufficient to provide a reflective journal on its own, there needs to be a follow up discussion session at regular intervals during the study. More engagement is required from the facilitator to encourage reflection and to show benefits from the process.
- The participants suggested that there should be some type of reward for completing the reflective learning journal. The students are generally focused on completing continuous marked assessments in their various subject areas and believed this research exercise had no direct benefit to them. This could be considered but so too does research ethics with regard to providing rewards for engaging in research activities.

#### 4.6 Qualitative feedback forms

Qualitative feedback forms were used to capture the experience of the participants after each of the PBL and PAL sessions in Cycle 3. The form itself was designed as a one-page sheet with open questions and a comments section. The questions were based on the activity itself, outlining the individual roles within the group activity, and what the most and least enjoyable aspects were. The form is available in Appendix E.

#### Summary reflections and lessons learned:

- A one-page paper based form was used, and the uptake on completion of these forms over the course of the five social learning activities was generally low. It is worth considering capturing feedback through other means, such as focus groups or an online tool. Although observing the groups through the activities was anecdotally positive, it is also worth considering a structured observational research method in activities such as this.
- As the forms were to be completed at the end of each activity the participants were perhaps less reluctant to complete a form when they had other external activities to do, for example, attending the next scheduled class. The form should be short with straight forward questions to answer. Perhaps rating scales would yield a better result, with the inclusion of a comments section. The form used within this study were all comment based and perhaps added to the lower than expected uptake from the participants.

#### 4.7 PBL and PAL as social learning tools

The approach used was adapted from the work of Bandura and Vygotsky, in particular, the concept of the More Knowledgeable Other (MKO), the Zone of Proximal Development (ZPD), and Social Cognitive Theory (SCT) with specific consideration for observational learning. The delivery model was Problem Based Learning (PBL) and Peer Assisted Learning (PAL). These approaches were introduced in Cycle 3 to investigate if social learning engaged

students in computer programming. There was a total of five activities hosted over the semester, which were held during the scheduled weekly computer programming class.

### **Summary reflections and lessons learned:**

- A PBL approach was customised and adapted to the research environment, and perhaps would not be considered by some researchers as a pure Problem Based Learning model. However, the model that was adapted for the research environment was effective and allowed for monitoring and adjustments throughout the research study. Adapting models to context is worth considering, so long as there is a justification for doing so.
- The adapted PBL model was limited to scope and time constraints. Consider the introduction of the full version of PBL which normally spans several weeks, or months, as students build on their knowledge while working towards a solution.
- The social learning activities could not have been introduced successfully if it were not for the student mentors that participated in the activities. The identification and selection of suitable mentors for both PBL and PAL are very important as it is these facilitators that motivate the participants throughout the activities. Although discipline knowledge is relevant to the role of being a mentor, so too are effective communication skills and an ability to have patience with varying knowledge levels. Facilitation is still required when using PBL and PAL as learning approaches and mentors should be supported throughout the process.
- As the study revealed a positive response to the social learning activities, it is worth considering the introduction of a mentoring programme within the focus institution and establishing a formal process for mentor selection and a mentor recognition scheme. In addition, formal training on social learning approaches should be considered for faculties within the focus institution with support personnel and resource availability.

## **4.8 Measuring and Evaluating Student Engagement**

A short list of recommendations will be now be presented as a series of points referring specifically to the use of a modified national student engagement tool in Cycle 3, namely the Irish Survey of Student Engagement (ISSE), and its implementation in the focus institution.

### **Summary reflections and lessons learned:**

1. The purpose of using the ISSE tool was to ensure a valid instrument was applied, and in addition, to allow for the comparison of institutional data with that at a national level. The tool contained 92 questions across 14 question themes, and while this is useful for a larger institution to acquire a broad perspective of engagement, it would be better to modify the questionnaire further to ensure its use meets with the specific requirements of investigation. There was a considerable amount of questions which

served no purpose, it would have been better to modify the questionnaire tool further so as only to capture relevant data for examination. Originally, there was a hope that interesting data may have been found through these responses, but this was not the case, if anything, the total engagement score across both the control and treatment groups was very similar. The recommendation is to consider using the ISSE tool, but consideration for modifying the tool so as only relevant questions are being posed to the participants, particularly if engagement is being measured against a form of intervention, which was the case for this study.

2. The engagement tool was introduced in Cycle 3, the final action research cycle, it may have been useful to use this tool from Cycle 1 from a longitudinal study perspective. This could assist in drawing meaningful conclusions for any interventions introduced throughout an entire study.
3. When examining student engagement data, the researcher needs to be cautious when interpreting the results and when claiming connections between activities and engagement scores. Engagement data can be influenced by not only what happens within the institution, and what is known, but also outside of the institution and what is unknown.

#### 4.9 Measuring and Evaluating Academic Self-Efficacy

A short list of recommendations will be now be presented as a series of points on the use of a questionnaire tool in Cycle 3 to measure academic self-efficacy, and specifically the approach recommended through Bandura's (2006) guide for constructing self-efficacy scales.

##### **Summary reflections and lessons learned:**

1. The design of the tool using the 100 point scale was useful, and the tool itself was easy to complete by the participants. The total average efficacy scores for both the control and treatment group at the start of the study were very similar, this is encouraging when considering the usefulness of the measurement tool itself. This suggests it is useful for carrying out efficacy research across groups. In addition, it is worth remembering that when measuring self-efficacy, the measurement is measuring ones' belief in their capability as opposed to actual performance.
2. The approach to determining which efficacy questions to include in the questionnaire should be considered carefully. Upon reflection, it may have been useful to include more group related questions within the efficacy tool to draw stronger conclusions of potential impact of the social learning activities received by the treatment group. Originally the focus was on performance within programming skill areas, but the intervention activities related to group work, and working with others to solve problems, this perhaps should have been a greater focus within the questionnaire.



3. Upon the completion of the study, a potential issue was found with regard to measuring self-efficacy and safeguards should be considered to minimise any potential motivational effects of self-assessment. Pajares and Urdan (2006, p.314) suggest self-efficacy judgements should be recorded privately without personal identification to reduce social evaluative concerns and that the self-efficacy scale is identified by code number rather than by name. Within this study, participants did identify themselves by name, but were informed that their responses would be anonymised. Pajares and Urdan (2006) also suggest that the research tool should be labelled using a nondescript title such as 'Appraisal Inventory' rather than 'Self-Efficacy', this was not the case within the tool used for this study. A more transparent approach was used in that participants were aware that the research was related to self-efficacy, and a brief discussion was held on the merits of investigating self-efficacy. Private recording of efficacy judgements may reduce evaluative concerns but it could be argued that it does not eliminate them entirely, participants may assume their private recordings will be evaluated at a later time and they may retain some evaluative concerns (Pajares and Urdan, 2006). This is also worth considering when drawing conclusions when using such a tool.

## 5. Summary

The empirical research projects I completed within all three action research cycles have revealed some interesting findings, findings that are useful to my understanding, to others within my faculty and beyond. Conducting research is a skill, and initial endeavours become a learning experience for the individual, as much as they are fact finding missions of understanding. Learning occurs from each experience, in terms of decisions made and methods used. These learnings form the basis for conducting the next research piece, in which confidence is galvanised between research methods used. This process of reflection, and reflexivity, creates a level of doubt on past research projects with regard to how objective the researcher was at the time, how the data was interpreted given the knowledge available, but at the same time, adds a silent voice of caution in conducting future research. This creates a positive platform to move forward as reflection enables the researcher to ask questions about their past research performance and enforces the need for a rigorous methodological approach for future empirical research. Therefore, reflexivity is not just focusing on the data and results; it is about carefully considering the methods and methodology. I believe this approach can be shared in practice with others to form a rich learning environment.

My research data and results were shared with faculty members and the response I received was mixed. Initially, the qualitative results were disregarded by others in my research environment, and a focus was placed on the quantitative findings. The general view from my faculty peers was that qualitative data is difficult to draw any meaningful conclusions, and this was a challenge I faced particularly after presenting my first set of results from Action Research Cycle 1 in 2014. It was through discussion that interest was raised, my ability to communicate the importance of qualitative data in highlighting and uncovering a problem was realised by interested faculty members. There was a sense of achievement on my part in accomplishing this, and as a result, other faculty members are now



engaging in qualitative research in both a formal and informal way. My ambition through the entire study was to share the results with my peers with a view to inspiring and motivating others to ask similar questions to the ones I was seeking to address, to believe in the importance of engaging students in learning, and developing academic self-efficacy. In addition to sharing my research experience and findings with faculty members within my institution, I felt it was also crucial as a research practitioner to share research with others outside of my institution. This process enabled me to reach a similarly interested audience and to test the robustness of my research approach with others. It also enabled me to network with others who had performed similar research in their environments which was very useful to compare and discuss approaches, tools and findings. Attending and presenting at conferences also allowed me to build confidence and intellect in discussing educational issues that resonate in all institutions and furthered my engagement with the sector.

The reflexivity literature, combined with the empirical research and engagement with the sector, allows for a more competent understanding of what reflection and reflexivity is. Mauthner and Doucet (2003) suggest it may be more useful to think in terms of ‘degrees of reflexivity’ and I can relate to this when looking back at my research journey. The reflections I had after completing Cycle 1 were challenged and built upon when undertaking subsequent studies. Documenting reflexivity in research allows the intended audience to orientate themselves to approaches and decisions made within the research. Barry et al. (1999) state the importance of reflexivity lies in its potential to promote honesty and transparency within the research process, with the aim being to improve quality. By detailing decisions which are taken, a clear honest and transparent audit trail is established, this being viewed as an important strategy for achieving rigour within qualitative research (Sandelowski 1986). While being reflective is an important activity for a researcher, it also carries a warning in that too much reflection can lead a researcher to be trapped within their research with excessive ‘looking within’ and an inability to create pathways to continue. Waterman (1998) suggests that too much introspection can lead to a lack of action resulting in the objectives becoming secondary to the reflexive commentary. The importance of balancing reflection with progression must be understood, and perhaps, through experience, this balancing process becomes more fluid.

To summarise, reflection and reflexivity is a continued subjective exercise assumed by a researcher, primarily seen in qualitative research, which should be presented to the audience in a rigorous, connected, relevant and truthful way. The next and final chapter, Chapter 8, will present the Conclusions, Recommendations and Further Work for this study.

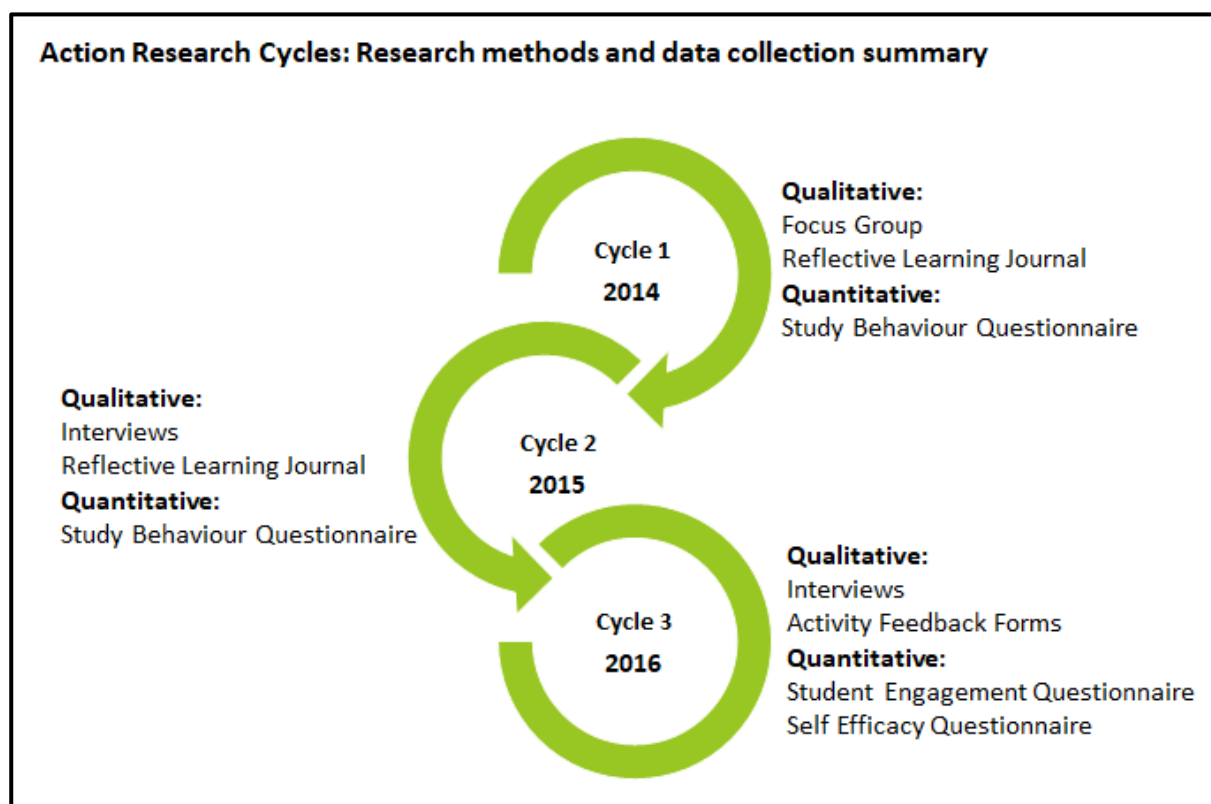
# Chapter 8

## Conclusions, Recommendations and Further Work

### 1. Introduction

This chapter will present the conclusions, recommendations, key findings, contribution to the practice of education and suggestions for further work relating to this action research study. For the purpose of connecting this discussion, Figure 8.1 below is a reminder of the research methods and data collection tools for all three cycles.

**Figure 8.1: Action Research Cycles: Research methods and data collection summary**



The conclusions are drawn from the three action research cycles between 2014 and 2016 and are further interpreted with new knowledge gained since the completion of each cycle.

## 2. Findings and Conclusions

This section is divided into four parts: conclusions from the three action research cycles, key findings, answering the research questions and my contribution to the practice of education.

### 2.1. Action Research Cycle Conclusions

The first cycle of the action research study commenced with an investigation into the study habits and preferences of first year BSc in IT programming students, combined with the use of a reflective learning journal within their second semester. This study led to the second cycle in which study habits and preferences were measured again, along with the use of a modified reflective learning journal. Action Research Cycle 3 introduced social learning using PBL and PAL as the approaches, in addition to measuring student engagement and self-efficacy.

When examining the study behaviour questionnaire used in Cycle 1 and Cycle 2, computer programming was the subject area the participants identified as the most challenging, this finding was in keeping with the general informal conversations that occurred with students within the focus institution and confirmed within the literature (Porter et al., 2013). The students were predominately international and work commitments were identified as the biggest obstacle to study time. The participants over both studies highlighted the importance of the materials provided by the lecturer and the importance of the use of video clips to assist in their learning. Participants also expressed an interest in using new methods of studying which was encouraging.

Cycle 1 and Cycle 2 introduced a reflective learning journal as a tool to facilitate engagement and learning in computer programming. This tool was inspired by the work on reflection by both Gibbs (1998) and Schön (1983). The tool was created using a spreadsheet tool, please see Appendix C1 and C2 for sample layouts of the journal. The findings from the use of the reflective learning journal in Cycle 1 was based on an analysis of the journal submissions, and a post-activity focus group discussion. It became apparent that although the uptake was high in the initial engagement in this activity, the completion rate of the journal by the end of the semester was low. Within the participant journal feedback the conclusion of its effectiveness was more negative than positive. Through the feedback and through reflection, I re-designed the reflective journal tool and incorporated additional support as suggested through the feedback and implemented a reflective learning approach for Cycle 2. I was not satisfied that the approach to reflection through a reflective learning journal tool had adequately concluded within the first action research cycle. Some of the failings of the first attempt were identified as a lack of support through the process itself, and the tool was difficult to complete. The second attempt aimed at rectifying these issues with the hope of a more positive finding. However, the findings from Cycle 2 were similar to the findings in Cycle 1, this was captured through the feedback within the journal tool itself, and also through end of semester participant interviews. The conclusion section within the journal generally contained comments that the journal exercise was not assistive in learning, and more of a task that had to be completed, similar to an assignment except with no reward. When reflecting on the use of the reflective journal tool over the two action research cycles, it

can be interpreted that the group were generally positive about the concept of reflection, and the importance of looking back over course material for learning, but were generally negative about the process of completing journal entries on a weekly basis. The participants failed to see any learning benefit reflecting in this way on a weekly basis and saw it as more of an arduous task without any obvious benefit. The interviews revealed a similar finding, but crucially confirmed that group learning was a preferred method of study outside of class time, which was a key inspiration for the development of the interventions for Cycle 3. Reference was also made to the high volume of assignments the students had to undertake, in addition to their heavy work commitments (already known Cycle 1), so an approach to bringing about learning would be useful if it occurred within classroom time itself, and not as an additional activity to be completed outside of classroom time. This would also facilitate broader engagement from the cohort, as the strategy was to facilitate engagement from those that were currently disengaged or had low self-efficacy within computer programming. Hosting activities within class time was perceived as a more practical approach to reaching as many learners as possible.

Cycle 3 was comprised of a number of quantitative and qualitative methods, those being a student engagement and self-efficacy questionnaire that was provided to participants at the start and end of their semester, participant feedback forms on the PBL and PAL activities, and interviews, with both the principal programming lecturer and from student participants. The purpose of this approach was to gather a number of data sets to determine if a connection could be made between engagement, self-efficacy and the activities themselves. Table 8.1 below provides a summary of the findings from the qualitative research methods used within Cycle 3. The most enlightening finding was that the participants enjoyed social learning activities when used within computer programming, and the principal lecturer also saw the benefits of this approach upon the conclusion of the study, this was very encouraging and sets a pathway for further research within this area.

**Table 8.1: Summary of the Findings from Qualitative Research Methods Used in Cycle 3 (2016)**

Research Methods and Study	Key Learnings
PBL and PAL activity feedback forms – Analysis of participant feedback	<ul style="list-style-type: none"> <li>- The feedback was very positive and clearly the participants have an appetite for further social learning activities.</li> <li>- Very few negative comments arose; two consistent messages were to do with allowing more time to complete the activity itself, and, to have the module lecturer available, particularly within the PAL sessions.</li> </ul>
Interview – Principal programming lecturer, pre and post-treatment	<ul style="list-style-type: none"> <li>- The pre-treatment interview revealed a strong stance against social learning / group work, and how it can negatively affect the more capable students in a class.</li> </ul>

<p>Interview – Principal programming lecturer, pre and post-treatment (<i>continued</i>)</p>	<ul style="list-style-type: none"> <li>- The post-treatment interview revealed a favourable outcome for introducing social learning / group work for future cohorts.</li> </ul>
<p>Interview with participants within the treatment group, post treatment</p>	<ul style="list-style-type: none"> <li>- The participation in the post-treatment interviews was low, and therefore limited data was produced, but generally the participants were positive about group learning and social learning activities (low participation may have occurred because of the power-influence I had within the study).</li> <li>- The mentors involved in the social learning activities interestingly described how much they had learned themselves through the process of teaching / mentoring others.</li> <li>- The mentors had flagged something of interest and worth considering – the mentors were asked follow up questions from their peers outside of the scheduled social learning activities, resulting in an additional work load for the mentors involved in the PBL and PAL sessions.</li> <li>- Social learning through study groups was again re-enforced as a preference from the participant interviews.</li> </ul>

### 2.1.1. Examining the Student Engagement Questionnaire

The student engagement questionnaire tool contained 14 question themes, further subdivided into 92 questions, of which 16 questions were identified as useful for comparison between the control and treatment groups. The modified questionnaire tool, based on the ISSE tool, was primarily utilised to measure student engagement between the control and treatment groups, capturing scores at the commencement of the semester, and scores at end of the semester. It would be inappropriate to suggest the differences between the group scores was specifically related to the intervention activities that the treatment group received between the measurement of student engagement, but the activities themselves may have contributed to some individual score changes. For this reason, questions that had a higher potential to be related to the intervention activities were identified for discussion and analysis.

There was a positive increase for the treatment group with regard to asking questions or contributing to discussions (Figure 5.1, p. 125), and a further positive finding was noted with regard to using student learning support services, including programming support classes (Figure 5.4, p.128). These results were not entirely surprising given the support activities the treatment group received, but it does further strengthen the case that the activities themselves had an impact and are evident in the data. It is also encouraging to see that students are potentially more willing to engage in discussions with their peers which may be another positive influence of introducing social learning in the classroom. With regard to discussion, it is worth noting that both the control and treatment group had scored themselves negatively

with regard to including diverse perspectives in class discussions or written assignments (Figure 5.5, p.129). This result underscores the importance of facilitating discussion through what Tinto (1997) referred to as a learning community for the purpose of allowing students to interact, to get to know each other and how they come to share the experience of learning. Carton (2006) warned this type of interaction around challenging perspectives can bring about a degree of uncertainty as students attempt maintain their own assumptions and worldviews which can be challenged in such learning communities. While this process can be considered informal, the notion of examining diverse perspectives can be formalised through suitable assessments which is worth reflecting on for classroom implementation, for example, Murray and McConachy (2018) refer to lecturers as cultural mediators who can draw cultural references from students themselves through international case studies.

There was a marked increase in the treatment groups' ability to put together ideas or concepts from different subject modules when completing assignments, or during class discussions (Figure 5.6, p.130), the treatment activities may have contributed to this score as students had engaged in problem investigation, group analysis and discussion. There was also a positive finding whereby the treatment group had commenced the semester with a low score regarding discussing ideas about coursework with teaching staff outside of class time (Figure 5.7, p.131). The end of semester result for the treatment group increased meaningfully, and more in line with the control group, this is a positive finding and the social learning activities may have contributed to this as discussions with staff post treatment activities was noted by relevant staff members and student mentors, who may have been seen as 'teaching staff' in the eyes of the participants. As the majority of participants were Brazilian, Crabtree and Sapp (2004) noted that the conception of learning for a Brazilian student is not constrained to the learning environment but represents an on-going process involving social, emotional and physical closeness between teachers and students, further reported by Santili et al. (2011) stating that Brazilian students consider learning as a process that is not limited to the classroom. The social learning treatment activities may have positively related to this learning conception.

There was also a positive change in score for the treatment group with regard to having conversations with students with different religious beliefs, political opinions or personal values (Figure 5.8, p.132). In addition, a positive increase for the treatment group regarding their opinion of the focus institution's role in encouraging contact among students from different economic, social and ethnic/national backgrounds was discovered (Figure 5.14 p.138). The treatment group also scored higher than the control group for their rating score on working effectively with others (Figure 5.15, p.139) and understanding people of other racial, ethnic and national backgrounds (Figure 5.16, p.140). The social learning activities would have facilitated a considerable amount of group discussion, and with a diverse multicultural study body, this result is a positive finding and suggests the introduction of the activities contributed to this positive impact. Christie et al. (2008) state that many mature students experience fragile identities as learners and have difficulty relating to new learning environments which further supports the development of informal and formal activities to bring about rich interaction between students. Stuart (2006) highlights the importance of social integration and it how supports student retention, progression and performance. Christie (2009) suggests further research is required to understand the dynamics of learner identify formation which is vital for understanding the first-year transition.

A noteworthy change occurred over the semester with regard to organising and connecting ideas, information or experiences into new, more complex interpretations and relationships (Figure 5.9, p.133). This type of activity is related to Problem Based Learning and Peer Assisted Learning. Although the control group did not receive any of the social learning treatment activities, they moved their rating score higher by the end of the semester. The treatment group still outperformed the control group in this question, but it is still worth noting the control group score change and suggests using caution when interpreting findings and drawing conclusions. A similar scenario occurred with regard to examining how others gather and interpret data and assessing the quality of their conclusions (Figure 5.10, p.134), which is also linked to the social learning activities. Both the control and treatment groups concluded the semester with similar scores, with very little difference between the results. And again, the control group revealed a more positive increase with regard to developing communication skills relevant to computing (Figure 5.12, p.136), with the treatment group showing little change at the conclusion of the semester. Also, worth noting is, a positive increase in the control groups' score relating to understanding someone else's views by imagining how an issues looks from their perspective (Figure 5.13, p.137), the data reveals an increase despite not receiving any of the social learning treatment activities. With regard to reflection, students were asked to examine their strengths and weaknesses of their own views on topics and issues (Figure 5.11, p.135). The treatment group score for this question was not substantially higher, and if anything, had reduced upon the conclusion of the semester. However, the control group significantly outperformed the treatment group which suggests the social learning activities had no impact for this question theme for the treatment group.

When comparing the control and treatment groups data with that of the *ISSE Results from 2015* report, 11 questions were identified as useful for discussion and analysis. Both the treatment and control groups outscored the ISSE score for the question relating to working with other students inside class to prepare assignments (Figure 5.18, p.143). Both the control and treatment groups engage in this as a regular activity, so this was not a major surprise, but confirms a positive finding in this regard. When it comes to preparing assignments with other students outside of class an even picture is presented across the control, treatment and ISSE findings, with the control and treatment group scoring marginally higher than the national findings (Figure 5.19, p.144).

There was a positive difference in score between the control and treatment group and that of the ISSE findings, both the control and treatment groups have a stronger score relating to tutoring or teaching other college students than that of the ISSE data (Figure 5.20, p.145).

There were positive results for both the control and treatment groups with regard to having conversations with students who are very different in terms of their religious beliefs, political opinions or personal views (Figure 5.21, p.146). The treatment group, in particular, scored very highly within this question theme.

The control and treatment group outscored the ISSE findings with regard to participation with a student group or learning community (Figure 5.22, p.147). This is a strong finding and further endorses the facilitated approach in engaging in group learning activities within the focus institution. Craton (2006) suggests a better social transitioning experience can be achieved through the formation of a learning community, and for international learners who are away from their families, the importance of local social supportive relationships is

underscored as they navigate the higher education system and environment (Wilcox et al., 2005).

The ISSE findings outscored both the control and treatment groups with regard to the focus institution providing the support needed to help succeed academically (Figure 5.23, p.148), the ISSE finding is considerably higher which requires further reflection on why our cohort results are lower than the national findings. Astin's (1993) large-scale U.S. correlational study of what matters in college identified two environmental factors for bringing about a positive change in students' academic development, these two factors were interaction among students and interaction between faculty and students which further highlights the importance of institutional development work to support these important areas.

There was a high score similarity between the treatment group and the ISSE findings regarding working effectively with others (Figure 5.25, p.150), the control group scored considerable lower for this question, which is an indication of the impact of the social learning activities introduced for the treatment group over the semester.

When examining self-reflection, both the control and treatment groups scored lower when compared to the national findings (Figure 5.26, p.151), however, both groups are engaged in self-reflection, with the treatment group claiming to self-reflect more often. This result indicates the importance of continuing to engage students in reflection and warrants further examination of what strategies are used within public sector institutions to facilitate strategies for student self-reflection. One such consideration is peer and self-assessment approaches that are known to encourage reflection which assist in the development of professional and lifelong learning skills (Boud et al., 1999; Boud, 2001; Nicol & Macfarlane-Dick, 2006).

There was a noteworthy finding relating to understanding people of other racial, ethnic and national backgrounds (Figure 5.27, p.152) which is of particular importance as students that have the opportunity to interact with peers from diverse backgrounds show the greatest engagement in active thinking and growth in intellectual and academic skills (Gurin, 1999, Gurin et al., 2012). The treatment group outperformed both the control group and ISSE findings, and interestingly, the treatment group scored higher for both the often, and very often categories for this question theme. This is an indication that the social learning activities introduced to the treatment group facilitated this positive outcome.

### **2.1.2. Examining the Self-Efficacy Questionnaire**

The self-efficacy tool (adapted from Bandura's (2006) work on self-efficacy) contained 26 questions, in which 16 questions were related to specific skills/abilities within computer programming, 6 questions related to overcoming problems within programming assignments/projects, and 4 questions were specifically related to working in group-based programming activities. Both the control and treatment group were invited to complete the self-efficacy questionnaire at the start of the programming module in Semester 2 of Year 1. Both groups were also invited to complete the end of semester self-efficacy questionnaire tool to facilitate measuring any differences that may have occurred. The intervention, namely the social learning activities, was introduced to the treatment group over the course of the semester, while the control group received no such formal activities. It is important to point out that social learning may have occurred informally, in that students may have formed their



own study groups to facilitate learning, this may have been the case for both the control and treatment groups.

The overall end of semester group comparison score revealed a small increase in self-efficacy in computer programming for the treatment group (Table 6.3, p.161) when compared to the control group, but this could not be considered meaningful. 10 of the 26 questions were included for analysis and discussion as these, in some way, pointed to evidence of impact, and in some cases, evidence of caution when considering impact. These contradictory findings were found within the specific programming skill related questions (questions 1 to 16). This suggests that despite the social learning activity intervention, both groups perceived their self-efficacy in specific programming skill areas as similar. Towards the end of the questionnaire, 6 questions were associated with overcoming computer programming problems and the treatment group scored positively in this area. Some of these questions specifically related to the types of activities that were included in the social learning activities, which suggests a positive impact of the intervention (Figure 6.4, 6.5, 6.6, 6.7, p.164 to 167)

The strongest evidence of impact from the social learning activity intervention was found in the final four questions of the efficacy questionnaire (questions 23 to 26), these were associated with self-efficacy in group-based programming activities. The control group had a higher self-efficacy score for all four of these questions at the start of the semester, and by the end of the semester, the treatment group had outperformed the control group in all four questions (Figure 6.8, 6.9, 6.10, and 6.11, p.168 to 171). This is a positive result that correlates with other studies, such as the study conducted by Katinka et al. (2005) on group work skills among graduates who experienced problem-based learning within their programmes demonstrated that students were better prepared with respect to communication skills and group work.

The groups that received the treatment were formed organically and without facilitation although the literature suggests that different grouping criteria for small group formation should be applied as it affects learning performance and social behaviours of grouped members (Hooper & Hannafin, 1988; Lin et al., 2010, Webb, 1982). Robbins and Fredendall (2001) state that homogeneity is positively related to team success and motivation. Some of the literature also suggests that student characteristics such as age and gender positively affect morale, satisfaction, commitment and performance (Jehn et al., 1999) while other studies did not find any significance regarding gender participation (Howard, 2002). Takeda and Homberg's (2014) study on the effects of gender on group work process and achievement suggests that students in gender balanced groups display enhanced collaboration in group work processes due to reduced social loafing behaviour. As the intervention activities experienced by the treatment group were short in duration, this may have mitigated against social loafing behaviours. One key aspect of this study was not assessing the group activities, no grade was applied to the group or the individual so this may have allowed for a greater level of engagement as other risk factors were mitigated against. Ruiz Ulloa and Adams (2004) point to the importance of defining clear roles and goals in group sessions, which was also a feature of the intervention activities, particularly the PBL sessions. The qualitative evidence captured through the activity feedback forms also support this finding as the participants stated they enjoyed the interaction with their peers and requested similar social learning activities to continue beyond the study.

With regard to measuring self-efficacy and programming performance, it is difficult to claim that the social learning activities received by the treatment group had any impact on their actual programming skill. This is because the social learning activities were only one of many possible attributes that led to the students' performance in programming. This correlates with Schullery and Schullery's (2006) research on diversity in membership of learning groups as they found no obvious answer to whether mixed groups are an advantage, further highlighted by Sweeney et al. (2008) in their study on multicultural group work who recognise the benefits but state it is difficult to suggest that group work is better than individual work when measuring performance. When examining the end of semester computer programming grades for both the control and treatment groups, the treatment group slightly outperformed the control group, with an average score of 55% versus 49% (Figure 6.13, p.174). The actual grade comparison was a useful exercise as it revealed that no obvious harm was caused to the treatment group because of the interventions, and in addition, no obvious harm was caused to the control group, particularly as their grades across the grading categories resembled similar results from previous cohorts.

In conclusion, no strong claim can be made that social learning activities enhance computer programming ability or performance. So rather than linking this to performance, a conclusion can be made that introducing group work enhances the perceived ability of an individual to work in a group, which is a finding worth sharing when some may consider group work counter-productive. Chowdhury et al. (2002) state that students' attitudes toward group work differ and depend on their self-efficacy which can lead to higher or lower satisfaction. This endorses the role and responsibility approach to group work to ensure all members can play a part on developing their self-efficacy regardless of their ability, and Landy (1989) found that a particular group member may be satisfied with the group environment even with a lower group performance. Problem Based Learning allows for multiple role types, including technical and non-technical which also supports the development of efficacy in group work. Another conclusion can be made that group work does not impact negatively on performance, which was suggested by the principal programming lecturer at the commencement of this study, as the treatment group outperformed the control group, but of course does not count for individual cases where performance was impacted. It is worth noting that students may be apprehensive of group work as some find it intimidating (Fassinger, 1996, Fassinger & Howard et al., 2002) and because of language competence (Arkoudis & Kelly, 2016; Li, 2012) which is particularly relevant with an international student cohort.

## 2.2 Key Findings

The shortlist below represents the key findings from completing the three action research cycles between 2014 and 2016.

1. Computer Programming was identified as the most challenging subject area as evidenced in both Cycle 1 and Cycle 2 and correlates with the findings in the literature as a challenging subject and associated with high failure rates (McKinney & Denton 2004; Sloan & Troy 2008; Porter et al., 2013).

2. Participants failed to see any benefit in engaging in structured reflecting on learning and reflecting through the use of a Reflective Learning Journal. This was evidenced in both Cycle 1 and Cycle 2, although a few participants did engage in the reflective process, the majority found these activities time consuming and burdensome.
3. The use of Problem Based Learning (PBL) and Peer Assisted Learning (PAL) were useful approaches in introducing social learning in computer programming. The participants expressed their satisfaction during these activities requesting similar group learning activities to continue. The principal programming lecturer also confirmed it was an effective approach, which contrasts with the original belief that group work is counter-productive in programming.
4. The Student Engagement Questionnaire overall group comparison scores were similar, but when examining specific questions relating to the types of social learning activity experienced by the treatment group, a positive change in score was observed. The findings relate to working in diverse multicultural groups which is a key transversal skill that the IT and computing sector desire. The key findings from the engagement questionnaire are shortlisted below:
  - There was a positive change in score for the treatment group with regard to having conversations with students with different religious beliefs, political opinions or personal values (Figure 5.8, p.132). In addition, a positive increase for the treatment group regarding their opinion of the focus institution's role in encouraging contact among students from different economic, social and ethnic/national backgrounds was discovered (Figure 5.14 p.138). The treatment group also scored higher than the control group for their rating score on working effectively with others (Figure 5.15, p.139) and understanding people of other racial, ethnic and national backgrounds (Figure 5.16, p.140). This is a positive finding considering the perceived cultural challenges that can arise within a group, such as the norms of behaviour, communication and decision-making may not be agreed across all members (Shaw et al., 2015).
  - Both the control and treatment groups had a stronger score relating to tutoring or teaching other college students when compared against the ISSE data (Figure 5.20, p.145). Research shows that the tutoring process leads to positive academic, social and team skill development, and provides the opportunity of receiving immediate feedback which can lead to positive academic achievement of tutees. (Fuchs et. al., 1995; Hsiung, 2010).
  - There were positive results for both the control and treatment groups with regard to having conversations with students who are very different in terms of their religious beliefs, political opinions or personal views (Figure 5.21, p.146). The treatment group scored very highly within this question theme. This finding correlates with what Hilman (2005) described as identify formation through group discussion which Baxter and Britton (2001, p.94) describe as a 'conscious reshaping of the self'.
  - The control and treatment group outscored the ISSE findings with regard to participation with a student group or learning community (Figure 5.22, p.147). The importance of participation within a learning community has been underscored and

Dirkx (1997) states that this transformative learning process allows the student to build new meaning structures to make sense of their changing world.

- There was a high score similarity between the treatment group and the ISSE findings regarding working effectively with others (Figure 5.25, p.150), the control group scored considerable lower for this question, which is an indication of the impact of the social learning activities introduced for the treatment group over the semester. This finding correlates with the benefits of small group learning such as positive peer group integration and cohesion (Jordan et al., 2008).
  - There was a noteworthy finding relating to understanding people of other racial, ethnic and national backgrounds (Figure 5.27, p.152). The treatment group outperformed both the control group and ISSE findings. This is a positive finding as the literature presents a mixed view on mixed-culture groups as students may feel frustrated and angry when they are placed in a multicultural group (Volet & Ang., 2012; Murray & McConachy, 2018). However, other studies highlight the benefits such as personal growth by challenging stereotypes, effective communication skill development with people of varied backgrounds and fostering mutual respect through group work (Hardy & Tolhurst, 2014; Tienda, 2013; Turner, 2013).
5. The Self-Efficacy Questionnaire overall group comparison scores revealed a slight increase in efficacy for the treatment group. Upon further examination a key finding was observed when examining the group work related questions. The final 4 questions of the questionnaire (questions 23 to 26) were associated with self-efficacy in group-based programming activities. The control group had a higher self-efficacy score for all four of these questions at the start of the semester, and by the end of the semester, the treatment group had outperformed the control group in all four questions (Figure 6.8, 6.9, 6.10, 6.11, p.168 to 171). This finding strongly suggests that introducing group work enhances the perceived individual ability of working within a group, which is a finding worth sharing when some may consider group work counterproductive. In addition to efficacy development, empirical studies also emphasise that student interaction, like studying cooperatively or with peers, can lead to increased success (Howard and Smith-Goodwin, 2010; Hsiung, 2010).
  6. Introducing social learning activities in computer programming does not result in any obvious harm for high performing students. The student mentors pointed to the benefits of mentoring and how it became a learning and development process for themselves. The end of module results revealed the treatment group slightly outperformed the control group, with an average score of 55% versus 49%, further endorsing social learning as a pedagogical approach for computer programming. In a PBL study conducted by Kinnunen and Malmi (2005) over several years, group work was generally considered a positive experience and they reported that students wanted the experience of working in groups over individual work which was a major reason for students participating in their PBL studies.

### 2.3. Answering the Research Questions

This section addresses the research questions presented in Chapter 1 – Introduction (p. 5). The conclusions presented are drawn from previous chapters and are provided here for completeness.

Q.1: What do 1<sup>st</sup> year BSc in IT students identify as challenging subject areas? (Cycle 1 and Cycle 2)

**Conclusion:** Computer Programming was identified as the most challenging subject area in both Cycle 1 (65%) and Cycle 2 (74%). This correlates with my own conversations with students and faculty and with the literature review in that learning computer programming is difficult and challenging for most students and requires considerable practice (Yang et al., 2015). This challenge can also develop a sense of frustration in the student, as programming concepts can be difficult to grasp and slow to acquire. This process can lead to what Connolly et al. (2009) describe as ‘programming anxiety’.

Q.2: What are the study preferences and study challenges of 1<sup>st</sup> year BSc in IT students? (Cycle 1 and Cycle 2)

**Conclusion:** The questionnaire data in Cycle 1 and Cycle 2 revealed the high importance students place on the materials provided by the lecturers, in this case, lecture notes uploaded to our VLE (Virtual Learning Environment). Other important study preferences included materials found through internet searches, books and video clips. Regarding study challenges, work commitments had the greatest impact on study time as identified by participants in both Cycle 1 and Cycle 2. The literature highlights barriers and challenges for mature-age learners (non-traditional) when returning to higher education and some examples include the management of personal and professional responsibilities (Finnegan et al., 2014) with many already fulfilling multiple roles so acquiring the student role can be an additional pressure (Stone, 2008; Cullity, 2006).

Q.3: Do 1<sup>st</sup> year BSc in IT students see any benefit in the process of reflecting on learning? (Cycle 1 and Cycle 2)

**Conclusion:** Data from Cycle 1 and Cycle 2 clearly revealed that students struggled with the concept of structured reflection and this points to the requirement of a greater level of engagement with the participants during the weekly reflective process. The literature points to similar situations arising, in Barnard’s (2011) study the interest level was high at the beginning but diminished over time. Despite the benefits of reflective learning highlighted in the literature, such as how the process clarifies meaning resulting a change of perspective and how it can recapture and facilitate examination and evaluation of an experience (Boyd and Fales, 1983; Boud et al.; 1985), there is a clear distinction between unstructured and structured reflection, unstructured being reflection without the need to document. This study set out to introduce a structured approach to reflective learning which can be summarised as a

counter-productive and time-consuming as participants failed to see any obvious direct benefit from structured reflecting on learning. Moon (2013) states that students need to be well supported to write reflectively, and with our international cohort considered, the reflective writing process may have presented as a time-consuming challenge.

Q.4: Do 1<sup>st</sup> year BSc in IT students derive any benefit from using the spreadsheet designed reflective learning journal tool? (Cycle 1 and Cycle 2)

**Conclusion:** The tool itself seemed to be easy to use as it was a static spreadsheet file that could be opened with or without internet access. The conclusion drawn from both Cycle 1 and Cycle 2 reveal while the tool itself is practical, and easy to navigate, it is the process of completing the weekly entries that caused the greatest challenge. I cannot conclude that the tool itself was problematic through its design. The engagement in structured reflecting on learning was the primary issue for the participants in both Cycle 1 and Cycle 2.

Q.5 Are Problem Based Learning (PBL) and Peer Assisted Learning (PAL) suitable social learning approaches that can be used within a computer programming module? (Cycle 3)

**Conclusion:** Post treatment the lecturer could clearly see the benefit of such approaches and stated that this would now be considered in future iterations of the module. The approaches were easy to implement and created an engaged and lively classroom through group activity and discussion. The participants, through data captured through the social learning activity feedback forms, clearly enjoyed the social learning activities and requested similar activities to continue. The literature supports this and suggests PBL and PAL learning approaches develop positive student engagement (McDowell et al. 2002; Williams et al. 2003; Braught et al. 2011), positive collaboration and increased success (Howard and Smith-Goodwin, 2010; Hsiung, 2010), and fosters positive learning feedback between peers (Fuchs et. al., 1995; Hsiung, 2010).

There were very few negative participant experiences which further endorse these learning approaches. It must be noted that these were non-assessed activities which further facilitated the engagement of the students and assessing students in groups may create resistance to such learning activities.

Q.6 Can social learning activities encourage students to engage in individual reflection? (Cycle 3)

**Conclusion:** To answer this question it is worth considering the actual uptake on the completion rate of the social learning activity feedback forms, although this cannot be treated as a complete accurate response to this question, it still forms part of the response. The response rate over the five social learning activity forms was generally below what was originally anticipated, ranging from 14% to 20% across all activities. However, through the analysis of the feedback forms the participants were reflecting on the activities and on their performance within the group, and suggested actions they would take in future activities. Naturally some participants may have reflected in an

unstructured way and using a process that is personal to them. The importance of individual reflection while undertaking a social learning activity was highlighted by Bandura (1986) through his renaming of his original Social Learning Theory to Social Cognitive Theory, underscoring the importance of individual reflection within the process of social interaction. This can be facilitated in a structured and unstructured way which needs consideration depending on the activity context and purpose. As with the Reflective Learning Journals, the process of writing reflections in a non-native language may present as an additional challenge for international students which suggests other forms of reflection should be considered, such as audio recordings and electronic portfolios.

Q.7 Can social learning enhance overall student engagement? (Cycle 3)

**Conclusion:** Following the conclusions presented in Chapter 5, there is some qualitative evidence suggesting engagement was enhanced through the social learning activities the treatment group received. The computer programming lecturer indicated in the post treatment interview that the students seemed to be quite engaged in the activities and saw this as a new way of engaging students in programming. The lecturer went on to say that the students were engaged as they saw it as a way of acquiring experience of working in a team-based programming project similar to what occurs in the real world. As previously discussed in Chapter 4 – Self Regulated Learning and Social Learning, the participants enjoyed the activities and expressed a desire to continue with similar social learning exercises in the future. The literature highlights the positive correlation with group work and persistence and completion (Hilman, 2005) and how peers substantially influence how students spend their time and the sense they make of their experiences, including their personal happiness with college (Astin, 1993; Pascarella & Terenzini, 1991).

When examining the overall student engagement questionnaire scores across both the treatment and control groups, it is difficult to measure if the treatment activities affected the scores. Student Engagement is a broad construct and engagement ultimately requires the agency of the individual student (Krause and Coates, 2008; Hu & Kuh, 2002), the role of the institution (Kuh, 2009a), teaching staff (Astin, 1993; Quayle and Harper, 2007) and other staff, such as student affairs and academic support professionals (Kuh, 2009b). When comparing the group scores at a high level, there is no obvious pattern or indication of significance other than individual question theme score fluctuations. What also must be factored in is that students may have engaged in other social learning activities outside of the ones introduced in the computer programming classes, this was not monitored or recorded.

Q.8 Can social learning enhance self-efficacy in computer programming? (Cycle 3)

**Conclusion:** The first part to consider when addressing this question is the types of activities or skills that were assessed within the measurement tool itself. These skills would generally be considered as attainable at the end of the first year of a BSc in IT programme. Within the measurement tool, question 1 to 22 related to specific skills

and abilities in Java based programming, while question 23 to 26 focused on ability to work in groups. When comparing the group average scores at a high level, the treatment group scored marginally higher by the end of the study, as seen in Table 6.3 (p.161) and the control group had a slightly lower score. When examining the individual questions, particularly question 1 to 22, there was very little difference between the group scores, and in many cases, both groups shared higher group scores across the questions.

An important finding of this study was identified when analysing the final four questions in the self-efficacy measurement tool which all measured the perceived ability to work within a group, with programming as the focus. The control group had a higher efficacy score than the treatment group for all four of these questions at the start of the semester, but at the end of the semester the treatment group scored higher for all four of these questions when compared to the control group. This strongly suggests the use of the social learning activities for the treatment group was a factor in this score reversal. This is illustrated in Figure 6.12 (p.173). The literature points to the importance of students developing group and team-based skills in higher education institutions as they prepare for industry (Graen et al., 2006) and students themselves understand the importance of acquiring these skills as highlighted by Hodge and Lear (2011) whereby international students rated group work as the most important skill out of a list of 15 skills.

Q.9 Are social learning activities linked to better performance in computer programming? (Cycle 3)

**Conclusion:** There is a suggestion that social learning can assist in building confidence in students in their capability to perform particular programming skills, and some evidence was found in the questionnaire results to support this. Figure 6.4 (p.164) and Figure 6.5 (p.165) refer to finding and correcting mistakes in programming code and understanding long multi-file programs. The treatment group scored higher for both of these perceived abilities, which was a positive result as these skills were featured within the social learning activities. A similar positive result is also found in Figure 6.6 (p.166) where the treatment group scored higher for their perceived ability to search for solutions to coding problems online.

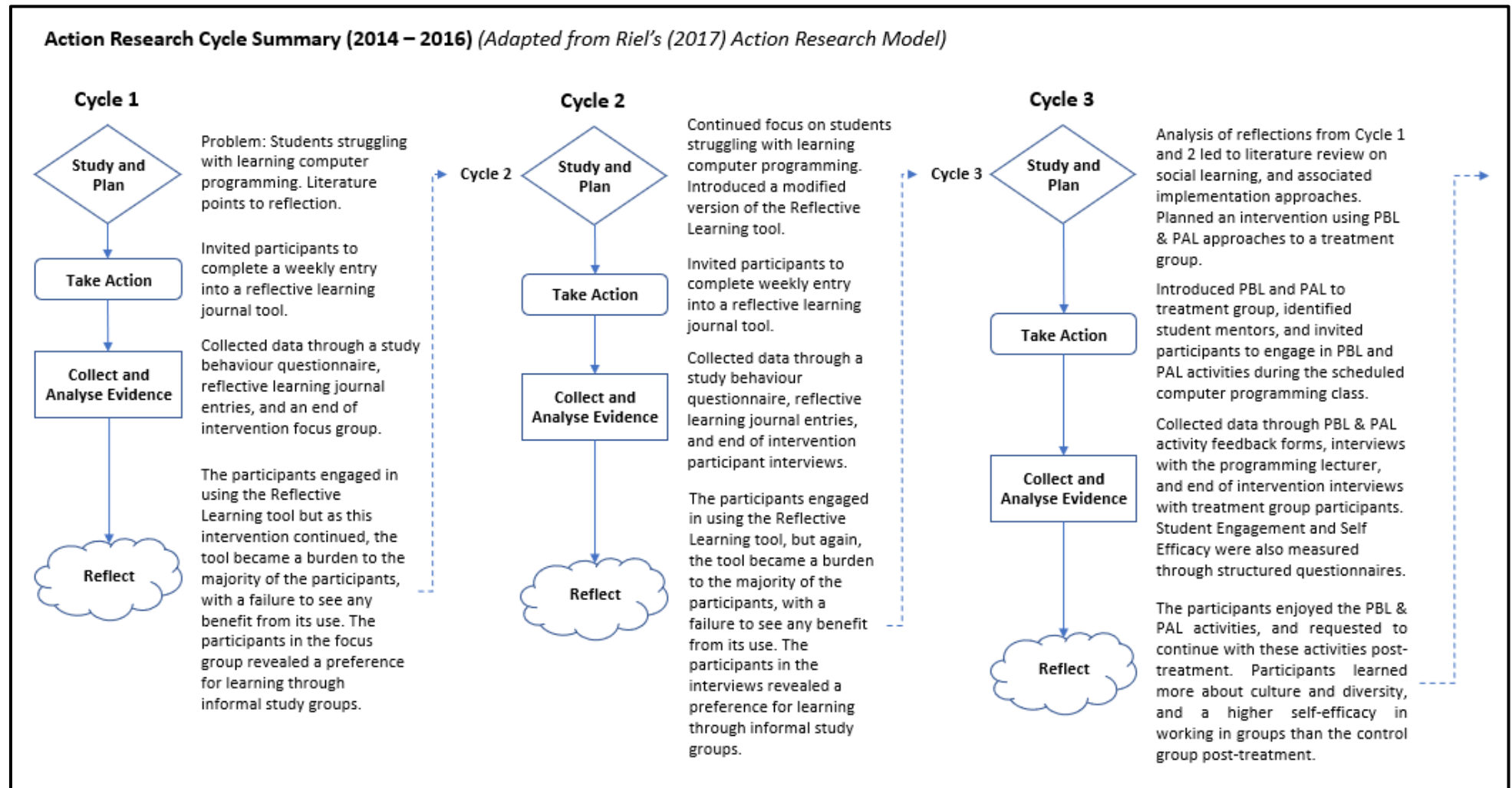
Self-efficacy is not the same as actual performance; measuring belief in capability to perform a task is different from measuring actual performance. The approach used to answer this question was to compare the treatment and control group end of semester programming module grades. The programming module under examination was a year-long module, there was no interim examination that could be used as a useful comparison to measure performance change, so the only complete analysis was to measure their final grade for the module. Figure 6.13 (p.174) presents the end of year programming grades for both the treatment and control group. The average module grades for the treatment group was 55%. The 11% failure rate, in comparison to previous years, is encouraging of the group's overall performance. In previous years the failure rate was 20% and above. There are also a higher number of distinctions in comparison to previous years, which is also reflected in Merit Grade 1 and Merit



Grade 2 scores. Typically, there would have been a Pass percentage of approximately 30% and fewer distinctions. For the control group, the average module grade was 49%. The failure rate of 19% is in line with previous years, although concerning, this would be typical of 1<sup>st</sup> year programming results. The pass rate of 32% is also similar to previous years, as are the number of distinctions. When these results are compared to the treatment group, we can see that there are noticeable differences in the Fail and Distinction categories, with the treatment group outperforming the control group, and with a higher average grade of 55%. There is no direct correlation between the performance of either group and the social learning activities, other than evidence to suggest further research in this area is worthwhile.

To facilitate the conclusion of this study, Figure 8.2 on the following page, based on Riel's (2007) Action Research Model, provides an overview and summary of each of the action research cycles carried out between 2014 and 2016. Contribution to the Practice of Education (Section 2.4) and Suggestions for Further work (Section 3) will follow this.

Figure 8.2: Action Research Cycle Summary (Adapted from Riel’s (2007) Action Research Model)



## 2.4. Contribution to the Practice of Education

I will now outline what I believe is my contribution to the practice of education over the course of this study, and how both through structured and unstructured approaches, others have engaged in the design, process and findings of this study.

I engaged with various faculty members over the course of the action research study. This engagement occurred at various stages, including the planning, design and implementation of the interventions, and the findings that were useful in the context of my institution. These discussions were useful and further informed the faculty regarding their assessment design, but also in understanding the students better regarding how their work pressures influences their level of motivation to study, and general English language difficulties. These findings were revealed in Cycle 1 which I was able to share with others to facilitate their lecture delivery within their respective modules. The engagement with faculty was two way, I experienced many occasions where faculty members referred to me with interventions they were planning which had a connection with the findings of my research, this was very encouraging and created a rich community of educational sharing within my institution.

Within many of the assignments in our computer and IT programmes, there is now a piece on reflection whereby the student submits a reflective report on their choices and decisions made during an assignment. While this is not a reflective learning journal, it addresses the importance of reflection for the student, and how this can facilitate other people's understanding within technical projects. In most technical projects there is usually a technical artefact produced, usually a working piece of software, but this does not reflect the challenges the student encountered, and the decisions they made. The inclusion of a reflective report is a positive step for not only the student, but also for faculty members in interpreting work completed by the students.

During the completion phase of this study, the focus institution formally established a Student Mentoring Academy in which students volunteer themselves to the academy in order to provide various mentoring supports. This academy was built upon the positive findings from Cycle 3 where students expressed an interest to engage in similar social learning activities in the future, which subsequently led to the development of the academy. Although still in the development stage, the initiative has proven to be of a great benefit to students. In addition to the academy, the concept of group learning has been introduced by other faculty members within their modules, the findings from this study served as a persuasive basis to consider the approach whereby previously it was not considered or seen to be of any value.

With regard to contributing to the sector, as my research knowledge now includes student engagement and the use of the Irish Survey on Student Engagement (ISSE), I have engaged with the Irish National Student Engagement Programme (NStEP) through dialogue with the Programme Director and I agreed to participate in a number of initiatives this body has planned between 2019 and 2021. Our institution will now play a role in the NStEP development strategy, in which the primary focus is to set out a vision for the development and enhancement of student engagement in Irish higher education through meaningful staff-student partnerships.

## Chapter 8 - Conclusions, Recommendations and Further Work

In addition, elements of this research were presented at a number of external conferences as outlined below:

Glanville, G. (2016). *Reflective Learning Journals in Computer Science: The Student Experience*. International Conference on Engaging Pedagogy (ICEP2016). Maynooth University, Maynooth, Co. Kildare, Ireland: Dublin, Ireland, Dec. 2, 2016.

Glanville, G. (2017). *Enhancing Student Engagement: Introducing social learning in computer programming*. International Conference on Engaging Pedagogy (ICEP2017). Griffith College, South Circular Road, Dublin 8, Ireland: Dublin.

Glanville, G. (2019). *Cultivating Academic Self-Efficacy through Supportive Social and Self-Regulated Learning Strategies for Students in Higher Education*. Postgraduate Research Students Conference. Trinity College Dublin, College Green, Dublin 2, Ireland, May 18, 2019.

I believe the discussions at these conferences was of benefit to others as they were interested in how I introduced group learning in computer programming, and the successes I had during this process. At one conference a researcher from a public University requested to email me regarding specific questions he had regarding his approach to a similar intervention, I was able to assist him with the knowledge I had acquired which facilitated his study, specifically the measurement of self-efficacy in computer programming.

Finally, within my institution we recently designed and developed an NFQ Level 9 MSc in Applied Software Development, and for the capstone project we designed it as a group project whereby students would work in teams to simulate real world practice. This approach was a departure from the traditional MSc capstone project which is usually an individual project. The visiting evaluation panel, made up of subject matter and quality assurance experts from various Universities elected by Quality and Qualifications Ireland (QQI), initially challenged this approach, but through discussion combined with research findings from this study, the focus institution were able to retain the group-based focus within the Capstone module.

### **My contribution to practice can be summarised as follows:**

1. The establishment of a Student Mentoring Academy within the focus institution.
2. Student group-based projects are now considered meaningful in programme assessment development initiatives.
3. Positive interaction with faculty members influencing actions and decisions regarding group work and the importance of reflection not previously supported.
4. Continuing Professional Development (CPD) initiated by faculty members, such as small-scale research projects, poster presentations and the consideration for embarking on educational Doctorate programmes.

5. Sharing the research with researchers outside of my institution at various educational conferences, furthering networking and collaborative opportunities.
6. Positive engagement with the National Student Engagement Programme (NStEP) and the inclusion of the focus institution in its strategic planning.

### 3. Suggestions for Further Work

This section will look at the various conclusions drawn from the study on the use of reflective learning journals in Cycle 1 and Cycle 2, and the social learning interventions (PBL and PAL) in Cycle 3.

The results from the reflective learning journal over the first two cycles of action research indicate that the use of a reflective learning journal is not an exercise that can be introduced to all students and can lead to frustration to some. While some students did indicate benefits in using the journal, the negative comments outweighed the positive and as such, it is not a tool that I will be recommending to all students within a cohort, although the participants were in favour in investigating new methods to assist in studying and learning. The importance of the self-regulation of learning through reflective learning approaches (Schön, 1983; Gibbs, 1998) is highlighted in the literature, it is the implementation, tools and approaches that should be evaluated. Some consideration should be made for international student cohorts where reflecting in a non-native language may create an additional burden on the process itself, which may cause frustration. Some suggestions include the use of portfolios for reflection, Marques et al. (2018) report a positive use of this tool for reflective learning and Koong et al. (2014) found that the use of Computer Assisted Learning (CAL) as a reflective learning strategy was very effective in enhancing learning engagement. Regardless of the approach to capture reflections, further consideration is required as reflections can include information to be shared, and information that is private and sensitive, so consideration for data privacy and security needs to be examined.

One of the common issues the participants encountered when planning for study was their work commitments, so tools and approaches for effective studying in short periods of time should be considered. As the vast majority of the participants can be described as mature-age learners, they may already have professional responsibilities that can have a negative impact on their experience (Finnegan et al., 2014) and some may have had a long break in study resulting in difficulties adapting to new learning approaches and a lack of preparedness for learning in higher education (Hardin, 2008; Burton et al., 2011). The participants also revealed the importance of online videos to assist in their learning, this should be considered by facilitators when sourcing study materials as online videos are a preference for learners as revealed in the Cycle 1 and Cycle 2 study behaviour questionnaire, and the subsequent interviews.

The student engagement and self-efficacy questionnaire measurement tools were useful in the Cycle 3. The purpose of using the ISSE (Irish Survey of Student Engagement) tool was to ensure a valid instrument was used for the study, and in addition, to allow for the comparison of institutional data with that at a national level. As a private institution, this was the first time the ISSE tool was introduced, so the benefits of benchmarking contributed to using this tool

for the research study. It is worth considering using the tool for future research, but as the tool contains a considerable quantity of questions that served no purpose for the research, future work will be based on a modified questionnaire so as only to capture relevant data for examination. It is worth considering using the tool over a longer period, which makes it a suitable tool for a longitudinal study. This will assist in drawing meaningful conclusions for any interventions introduced throughout a study. A key consideration in this discussion is not just on the development of a tool, and its implementation, but the process of using the data reactively to enhance various aspects of student engagement within the focus institution. Further research is also required on strategies to encourage self-reflection, in which deficiencies were found within the institutional engagement results, and in comparison, with national data. Student peer and self-assessment assessment strategies are identified in the literature as suitable approaches to encourage reflection (Mcfarlane-Dick, 2006) and at the same time, assist in the development of professional and lifelong learning skills (Boud et al., 1999; Boud, 2001). In addition to identifying strategies, further discussion with faculty members is required to ensure a buy-in is created to implement these strategies, which can be challenging in science-based programmes where this type of activity can be seen as an optional activity and not critical to technical skill development.

Working in groups to study outside of class time was one key area of interest that was revealed through the findings of Cycle 1 and Cycle 2, leading to the social learning interventions in the final action research cycle. PBL and PAL were introduced and there was a positive reaction from the participants and an expression of interest in continuing with these activities in the future. For the PBL activities there was no group formation strategy applied based on diversity. This strategy was to make the participants feel as comfortable as possible while engaging in the activities with peers they felt most comfortable with. However, the literature suggests that learner group composition is a fundamental issue and that different grouping criteria for small groups affects learning performance and social behaviours of grouped members (Hooper & Hannafin, 1988; Lin et al., 2010; Webb, 1982). Webb and Palinscar (1996) further support diversity in group composition by members' gender, ability and race in which they suggest facilitates positive collaborative learning. With regard to gender, Orlitzky & Benjamin's (2003) study found that mixed-gender groups outperformed more homogeneous groups and Wood's (1987) meta-analytic review suggests a tendency for mixed-gender groups to outperform same-gender groups. Takeda and Homberg (2014) found that students in gender balanced groups display enhanced collaboration in group work processes due to reduced social loafing behaviours and more equitable contributions to group work. In addition to gender, culture can affect group cohesion as international students may have a wide variety of learning experiences that are very diverse across a cohort (Shaw et al., 2007) which presents a challenge when engaging in group work activities. Despite the evidence of success in the creation of diversity and balance in groups, some literature suggests there is no straightforward answer to whether mixed groups are an advantage (Schullery & Schullery, 2006). Sweeney et al. (2008) claim that despite extensive literature the benefits of multicultural group work in performance and the development of group work skills were unclear. This research study used a hybrid PBL approach meaning the group activities were confined to one single class session as opposed to spanning weeks. This may have been a factor in the favourable outcome as the individuals did not have to work together over a long period of time which may have mitigated collaborative issues. In addition, the activities were

not assessed, either individually or on the group level, which would have reduced the potential anxiety of performance. It is recommended to consider diversity in group formation especially when requiring students to undertake a group project lasting several weeks as this may reduce negative group experiences such as social loafing and at the same time, enhance cohesion and effectiveness. It is critical that roles and responsibilities are assigned to individual members with the teacher playing a critical role through group work management and coaching (Bolton, 1999). Peer assessment should also be considered as a proven method in not only non-group related activity but also group projects. Brooks & Ammons (2003) observed a reduction in social loafing through the use of peer evaluations as both summative and formative assessment in group projects and Feichtner & Davis (1984) reported that three out of five students have the best group experience when peer-evaluation is included in the grading system. Future collaborative learning and group work research will consider diversity in group composition with the added element of peer evaluation and assessment.

The measurement of self-efficacy was easy to implement and proved effective in terms of drawing comparisons across groups. A self-efficacy tool, adapted from Bandura's (2006) work on self-efficacy, was developed to measure self-efficacy in computer programming and was made up of 26 questions, in which 16 questions were related to specific skills/abilities within computer programming, 6 questions related to overcoming problems within programming assignments/projects, and 4 questions were specifically related to working in group-based programming activities. There are other approaches to consider, as self-efficacy is focused on belief of capability, it may be worth considering focusing on actual performance. Further research is warranted on measuring self-efficacy through group work, particularly as this study was focused on social learning activities it would have been helpful to include more group-based questions within the questionnaire tool. A longitudinal approach is worth considering so as providing a deeper evidence base for the effect of self-efficacy on engagement, rather than focusing on performance itself. Problem Based Learning (PBL) and Peer Assisted Learning (PAL) were the two social learning approaches used in this study, but there are many more than may be useful in enhancing self-efficacy, particularly in computer programming for first year undergraduate students. Regarding measuring self-efficacy and programming performance, it is difficult to claim that the social learning activities received by the treatment group had any impact on their actual programming skills. This is because the social learning activities were only one of many possible attributes that led to the students' performance in programming. However, there is strong evidence that the introduction of social learning activities enhances the belief of capability of working in groups. So rather than linking this to performance, a conclusion can be made that introducing group work enhances the perceived ability of individuals to work in groups, which is a finding worth sharing when some may consider group work counter-productive. Another conclusion can be made that group work does not impact negatively on performance, which was suggested by the principal programming lecturer at the commencement of this study.

Reflecting on the problem under investigation, specifically the challenges with learning computer programming, it is important to consider why this area should be further examined and how this relates to the growing demand for graduates with programming skills. In collaboration with Investec, Enterprise Ireland compiled and published an *Export Market Watch* report (Enterprise Ireland/Investec, 2018) which draws on the insights of panels of those working in the ICT sector, to illuminate how the sector is faring now and its forecast for

the future. Multiple Enterprise Ireland client companies in the software space were surveyed and only 20% viewed the availability of labour to be good or very good at this time, with a quarter characterising it as poor or very poor. Graduates in Ireland are well regarded according to the report, but there are deficits in areas such as programming. This underscores the importance of ensuring we support and encourage our students in the development of programming skills. In addition, our predominately multi-cultural international study body is appealing to potential employers who currently recruit employees overseas (HEA, SOLAS, QQI 2015) in which employers make a conscious decision to encourage diversity and a multi-cultural aspect within the workforce.

The continued importance of supporting computer programming, team work and communication skills are also high on the priority list. Additional research revealed in the *Forecasting the Future Demand for High-Level ICT Skills in Ireland 2017-2022* report (National Skills Council, 2019, p.10), the call is made to address the demand for soft skills, “There is also increasing demand for soft skills, such as teamwork and problem-solving capabilities, which should be more of a priority for the education system”. Research in *Ireland’s National Skills Strategy 2015* report (Department of Education and Skills, 2016) discusses the importance of the development of transversal skills, and states that submissions received from stakeholders made specific reference to the importance of critical and analytical thinking, and team work skills. Giacaman and Sinnen (2018) highlight the need for hard skills (technical), but also the importance of soft skills such as teamwork and communication for industry, these skills can be developed through problem-based learning approaches in the context of computer programming.

These examples further endorse the importance of focusing on not only the technical skills of computer programming, but also the transversal skills of communication, collaboration and working in teams. The findings from this study have put forward strong evidence that the introduction of social learning in computer programming creates a rich learning environment for students, furthering their experience of working with others from diverse backgrounds, reflecting the multicultural work environments typical of the IT and computing sector.

This study set out to address the learning challenge that occurs within computer programming for 1<sup>st</sup> year BSc in IT international students. The initial approach to address this was through the use of reflective learning journals as the institution was not supportive of group learning as a valid or recommended approach. Through the use of the reflective journals a conversation of change was initiated with faculty members, interest grew in examining the problem which encouraged others to reflect on their own pedagogical approaches. This led to the introduction of social learning in computer programming, initially seen as a risk by some, but evidence of the activities quickly inspired both students and faculty members to engage in group learning. The institution has now formally recognised the importance of group learning evidenced through the introduction of the institutional student mentoring academy. Faculty are now communicating and sharing their pedagogically experiences and approaches with others within the focus institution and beyond. This study has facilitated a greater impact than anticipated, but also highlights the work yet still to do. With the institution now fully engaged in the enhancement of teaching, learning and assessment, this challenge is welcomed.

Undertaking this research study has allowed me to challenge my own perceptions of learning, and through the three action research cycles, I have identified a number of tools and



approaches that can facilitate student engagement and learning through individual and collaborative contexts. This study has put forward the case that collaborative learning and group work are effective ways to engage learners in computer programming, while enabling the learner to challenge stereotypes, engage in the values and beliefs of others, encourage knowledge sharing and develop critical group work skills. I believe there are elements and key learnings from this study that would be valuable to other researchers as they look to conduct similar research in their own practice environments. One potential publication will focus on the implementation of group work, specifically through PBL and PAL, to enhance student self-efficacy in computer programming. Other potential publications will focus on student engagement and measuring engagement, reflective learning, and experiential learning pieces such as experience of using an action research approach and conducting research as an ‘insider’.

Conference and journal publications that I am planning to submit to in 2021/2022 include:

- ACM Technical Symposium on Computer Science Education (<https://sigcse2021.sigcse.org>)
- Computing Education Practice (CEP) (<https://dl.acm.org/conference/cep>)
- Innovation and Technology in Computer Science Education (ITiCSE) (<https://iticse.acm.org/>)
- Practice and Evidence of Scholarship of Teaching and Learning in Higher Education (PESTLHE) (<http://www.pestlhe.org/index.php/pestlhe>)

## References

- Abhayawansa, S., & Fonseca, L. (2010) *Conceptions of learning and approaches to learning: A phenomenographic study of a group of overseas accounting students from Sri Lanka*. *Accounting Education: An International Journal*, 19 (5), p.527-550.
- Anaya, G. (1999) *College Impact on Student Learning: Comparing the Use of Self Reported Gains, Standardized Test Scores and College Grades*. *Research in Higher Education*. 40 (5), p. 499–526.
- Anderson, R. E., Dixon, A. L., Jones, E., Johnston, M. W., LaForge, R. W., Marshall, G. W., & Tanner, J. F. (2005) *The scholarship of teaching in sales education*. *Marketing Education Review*, 15 (2), p.1-10.
- Archer, M. (2003) *Structure, agency and the internal conversation*. Cambridge: Cambridge University Press.
- Arkoudis, S., Kelly, P. (2016) *Shifting the Narrative: International Students and Communication Skills in Higher Education*. *International Education Research Network (IERN) Research Digest* 8, February 2016. Available at: <https://www.ieaa.org.au/documents/item/664> (Accessed on 9 June 2018)
- Ashwin, P., McVitty, D. (2015) *The Meanings of Student Engagement: Implications for Policies and Practices*. A. Curaj et al. (eds), *The European Higher Education Area*, DOI 10.1007/978-3-319-20877-0\_23.
- Askham, P (2008). *Context and identity: Exploring adult learners' experiences of higher education*. *Journal of Further and Higher Education*, 32(1), p.85–97.
- Astin, A.W. (1975) *Preventing Students From Dropping Out*. San Francisco: Jossey-Bass.
- Astin, A.W. (1984) *Student involvement: A developmental theory for higher education*. *Journal of College Student Personnel*, 25, 297-307.
- Astin, A. W. (1993) *What Matters in College? Four Critical Years Revisited*. San Francisco: Jossey-Bass.
- Atkinson, J. (1967) *Handbook for interviewers: a manual for government social survey interviewing staff, describing practice and procedures on structured interviewing*. London: HMSO.
- Auster, C.J., MacRone, M. (1994) *The classroom as a negotiated social setting: An empirical study of the effects of faculty members' behavior on students' participation*. *Teaching Sociology*, 22, p.289–300.
- Azmi, S., Iahad, N.A., Ahmad, N. (2016) *Attracting Students' Engagement in Programming Courses with Gamification*. *IEEE Conference on e-Learning, e-Management and e-Services (IC3e)*. DOI: 978-1-4673-9060-6/16.

- Babbie, E. (1992) *The Practice of Social Research*. (6<sup>th</sup> edn). U.S.A: Wadsworth.
- Baird, L. L. (1976) *Using Self-Reports to Predict Student Performance*. New York: College Board.
- Baker, D. F. (2008) *Peer assessment in small groups: A comparison of methods*. *Journal of Management Education*, 32(2), p.183–209.
- Baker, T., J. Clark. (2010) *Cooperative learning – A double-edged sword: A cooperative learning model for use with diverse student groups*. *Intercultural Education* 21, no. 3: 257–68.
- Bandura, A. (1973) *Social Learning Theory*. U.S.A.: General Learning Press.
- Bandura, A. (1977a) *Self-efficacy: towards a unifying theory of behavioral change*, *Psychological Review*, 84: 191-215.
- Bandura, A. (1977b) *Self-efficacy: The Exercise of Control*. U.S.A: W.H. Freeman
- Bandura, A. (1982) *The self and mechanisms of agency*, in J. Suls (ed.) *Psychological Perspectives on the Self*. U.S.A., New Jersey: Lawrence Erlbaum Associates.
- Bandura, A. (1986) *Social Foundations of Thought and Action: Social Cognitive Theory*. U.S.A: Pearson Education.
- Bandura, A., Locke, E.A. (2003) *Negative Self-Efficacy and Goal Effects Revisited*. *Journal of Applied Psychology* 88 (2003): 87-99.
- Bandura, A., Millard, M., Peluso, E.A. and Ortman, N. (2000) *Effects of Peer Education Training on Peer Educators: Leadership, Self-Esteem, Health Knowledge and Health Behaviors*. *Journal of College Student Development*. 41 (5), p. 471–478
- Barber, P. (2002) *Researching Personally and Transpersonally: Gestalt in Action*. Guilford: University of Surrey.
- Barnard, J. (2011) *Reflection on a personal journey: learning journals in use*. *Enhancing Learning in the Social Sciences*, 3:3, 1-21, DOI: 10.11120/elss.2011.03030011
- Barry, C.A., Britten, N., Barber, N., Bradley, C. and Stevenson, F. (1999) *Using reflexivity to optimize teamwork in qualitative research*. *Qualitative Health Research*, (9), p.26-44.
- Baumann, Z. (2000) *Liquid modernity*. Cambridge: Polity Press.
- Baxter, A., & Britton, C. (2001) *Risk, identity and change: Becoming a mature student*. *International Studies in Sociology of Education*, (11), p.87–104.
- Beaubouef, T., Lucas, R., and Howatt, J., (2001) *The UNLOCK system: enhancing problem solving skills in CS-1 students*, *SIGCSE Bull.*, 33:2, 43-46.
- Beaubouef, T., Mason, J. (2005) *Why the high attrition rate for Computer Science students: some thoughts and observations*. *SIGCSE Bull.* 37, 2 (June 2005), 103-106.

## References

Becker, B.A., Glanville, G., Iwashima, R., McDonnell, C., Goslin, K. and Mooney, C. (2016) *Effective Compiler Error Message Enhancement for Novice Programming Students*. Computer Science Education, pp. 1-28, 2016.

Bensimon, E.M. (2007) *The Underestimated Significance of Practitioner Knowledge in the Scholarship of Student Success*. Review of Higher Education, 30 (4), pp. 441–469.

Bernard, B. (1997) *Girls' world or anxious times: What's really happening at school in the gender war?* Educational Review, 49(3), p.221–228.

Biggers, M., Brauer, A., and Yilmaz, T. (2008) *Student perceptions of Computer Science: a retention study comparing graduating seniors with cs leavers*, SIGCSE Bull., 40:1, 402-406.

Blaikie N. (1993) *Approaches to Social Enquiry*. Cambridge: Polity Press.

Blank, W.A., Blankenfeld, H., Vogelmann, R., Linde, K., Schneider, A. (2013) *Can near-peer medical students effectively teach a new curriculum in physical examination?* BMC Med. Educ. 13, 165. <http://dx.doi.org/10.1186/1472-6920-13-165>.

Blatchford, P., Kutnick, P., Baines, E., and Galton, M. (2003) *Toward a social pedagogy of classroom group work*. International Journal of Educational Research, 39(12), p.153-172.

Bleakley, L. (1998) *Learning as an aesthetic practice: motivation through beauty in higher education*, in S. Brown, S. Armstrong and G. Thompson (eds) *Motivating Students*. London: Kogan Page in association with the Staff and Educational Development Association (SEDA), 165-172.

Bloom, B., Krathwohl, D. (1956) *Taxonomy of Educational Objectives*. London: Longman.

Bogdan, R.C., Biklin, S.K. (1998) *Qualitative research for education: An introduction to theory and methods*. (3rd edn). Boston: Allyn and Bacon.

Bolton, M. K. (1999). *The role of coaching in student teams: A 'just-intime' approach to learning*. Journal of Management Education, 23(3), p.233-250.

Bonanno, H., Jones, J. & English, L. (1998) *Improving group satisfaction: Making groups work in a first-year undergraduate course*. Teaching in Higher Education, 3(3), p.365–382.

Boud, D., Cohen, R. & Sampson, J. (1999) *Peer learning and assessment*. Assessment & Evaluation in Higher Education, 24(4), p.413–426.

Boud, D., Cohen, R. & Sampson, J. (Eds) (2001) *Peer learning in higher education: Learning from and with each other*. London: Routledge.

Boud, D., Keogh, R. and Walker, D. (1985) *Promoting reflection in learning: a model*. New York: Nichols.

Boulton-Lewis, G., Marton, F., Lewis, D., & Wilss, L. (2000) *Learning in formal and informal contexts: conceptions and strategies of Aboriginal and Torres Strait Islander University students*. Learning and Instruction, 10 (5), p.393–414.

- Bowl, M. (2001) *Experiencing the Barriers: Non-Traditional Students Entering Higher Education*. Research Papers in Education 16 (2): p.141–160.
- Boyed, E.M and Fales A.W. (1983) *Reflective learning: Key to learning from experience*. Journal of Humanistic Psychology. 23(2): 99-117
- Boyer, K. K., Olson, J. R., Calatone, R. J., and Jackson, E. C. (2002) *Print versus electronic surveys: A comparison of two data collection methodologies*. Journal of Operations Management, 20, 357–373.
- Brought, G., Wahls, T., & Eby, L.M., (2011) *The case for pair programming in the Computer Science classroom*. ACM Transactions on Computing Education (TOCE), 11:1, p. 2.
- Brecko, B. N., and Carstens, R. (2006) *Online data collection in SITES 2006: Papers versus web surveys – Do they provide comparable results?* In Proceedings of the 2nd IEA International Research Conference. Washington, DC.
- British Educational Research Association (BERA) (2018) Ethical Guidelines for Educational Research, fourth edition, London. <https://www.bera.ac.uk/researchers-resources/publications/ethicalguidelines-for-educational-research-2018>
- Brooks, C. M. & Ammons, J. L. (2003) *Free riding in group projects and the effects of timing, frequency, and specificity of criteria in peer assessments*. Journal of Education for Business, 78(5), p.268–272.
- Brooks, R. (2005) *The construction of ‘age difference’ and the impact of age-mixing within UK further education colleges*. British Journal of Sociology of Education, 26, p.55–70.
- Brown, G., Manogue, M. (2001) *Refreshing lecturing: a guide for lecturers*. Medical Teaching, 23, p.231–244.
- Brown, S., White, S., Wakeling, L., & Naiker, M. (2015) *Approaches and study skills inventory for students (ASSIST) in an introductory course in chemistry*. Journal of University Teaching and Learning Practice, 12(3), p.1-12.
- Brown, T., McCracken, M. and O’Kane, P. (2011) *Don’t forget to write: how reflective learning journals can help to facilitate, assess and evaluate training transfer*. Human Resource Development International, Vol. 14 No. 4, pp. 465-481.
- Bruner, J.S. (1966) *Towards a Theory of Instruction*. New York: W.W. Norton.
- Bruner, J.S. (1971) *The Relevance of Education*. New York: W.W. Norton.
- Bryman, A. (2004) *Social Research Methods*. U.K.: Oxford University Press.
- Buck, G., Cordes, J. (2005) *An action research project on preparing teachers to meet the needs of underserved student populations*. Journal of Science Teacher Education, 16, p.43–64.

## References

- Buckley, A. (2014) Surveying student engagement in the UK. *Advance HE*. (accessed 5<sup>th</sup> November 2019). Available at: <https://www.advance-he.ac.uk/knowledge-hub/surveying-student-engagement-uk>.
- Budaev, S. V. (1999) *Sex differences in the Big Five personality factors: Testing an evolutionary hypothesis*. *Personality and Individual Differences*, 26(5), p.801–813.
- Burant, T.J., Kirby, D. (2002) *Beyond classroom-based early field experiences: Understanding an “educative practicum” in an urban school community*. *Teaching and Teacher Education*, 18, p.561–575.
- Burke, J., Fayaz, S., Graham, K., Matthew, R., Field, M. (2007) *Peer-assisted learning in the acquisition of clinical skills: a supplementary approach to musculoskeletal system training*. *Med. Teach.* 29 (6), 577–582.
- Burnett, P. C., Pillay, H., & Dart, B. C. (2003) *The influences of conceptions of learning and learner self-conception high school students’ approaches to learning*. *School Psychology International*, 24, (1), p.54–66.
- Burton, K., Lloyd, M.G., Griffiths, C. (2011) *Barriers to Learning for Mature Students Studying HE in an FE College*. *Journal of Further and Higher Education*, 35 (1): p.25–36.
- Byram, M. Nichols, A., Stevens, D. (2001) *Introduction In developing Intercultural Competence in Practice*. Byram, M., Nichols, A., Stevens, D., Eds.; *Multilingual Matters*: Clevedon, UK, pp. 1–8.
- Cano, F., & Cardelle-Elawar, M. (2004) *An integrated analysis of secondary school students’ conceptions and beliefs about learning*. *European Journal of Psychology of Education*, 19, (2), p.167-187.
- Cantwell, R., Grayson, R. (2002) *Individual differences among enabling students: A comparison across three enabling programmes*. *Journal of Further and Higher Education*, 26(4), p.293–306.
- Carey, J. W. (1993) *Linking qualitative and quantitative methods: Integrating cultural factors into public health*. *Qualitative Health Research* 3, pp 298-3 18.
- Carini M. R., Kuh D. K., Klein, S. P. (2006) *Student Engagement and Student Learning: Testing the Linkages*. *Research in Higher Education*, Vol. 47, No.1 February 2006.
- Carli, L. L. (2001) *Gender and social influence*. *Journal of social Issues*, 57(4), p.725–741.
- Carr, W. and Kemmis, S. (1986) *Becoming Critical*. U.K.: Falmer Press.
- Carson, L., Fisher, K. (2006) *Raising the bar on criticality: student’s critical reflection in an internship program*. *Organizational Behaviour Teaching Society*, Vol. 30 No. 5, pp. 700-723.
- Caspersen, M. E. and Bennedsen, J. (2007) *Instructional design of a programming course: a learning theoretic approach*. In *Proceedings of the third international workshop on Computing education research*, pages 111–122. ACM.

- Castaneda, R. H. (2008). *The graduate experience: living and studying abroad (a case study)*. *Relieve (Electronic Journal of Educational Research)*, 10 (2), p.2-16
- Cathcart, A., Dixon-Dawson, J., Hall, R. (2006) *Reluctant hosts and disappointed guests? Examining expectations and enhancing experiences of cross-cultural group work on postgraduate business programmes*. *International Journal of Management Education* 5, no. 1: 13–22
- Cattani, G., Ferriani, S., Mariani, M., & Mengoli, S. (2013) *Tackling the ‘Galácticos’ effect: Team familiarity and the performance of star-studded projects*. *Industrial and Corporate Change*, 22(6), p.1629-1662
- Chandra, P. (2012) *Marxism, Homi Bhabha and the omissions of postcolonial theory*. *Critique Journal of Socialist Theory*, 40 (2), p.199–214.
- Chang, M.M., Lin, M.C. (2014) *The effect of reflective learning e-journals on reading comprehension and communication in language learning*. *Computers and Education*, Vol. 71, pp. 124-132.
- Chapman, K. J., Meuter, M., Toy, D. & Wright, L. (2006) *Can’t we pick our own groups? The influence of group selection method on group dynamics and outcomes*. *Journal of Management Education*, 30(4), p.557–569.
- Chapman, K. J. & Van Auken, S. (2001) *Creating positive group project experiences: An examination of the role of the instructor on students’ perceptions of group projects*. *Journal of Marketing Education*, 23(2), p.117–127.
- Chemers, M.M., Hu, L., Garcia, B.F. (2001) *Academic Self-Efficacy and First-Year College Student Performance and Adjustment*. *Journal of Educational Psychology* 2001, Vol.93, No.1, 55-64.
- Cheng, W., Warren, M. (2000) *Making a difference: Using peers to assess individual students’ contributions to a group project*. *Teaching in Higher Education*, 5(2), p.243–255.
- Chickering, A.W. & Gamson, Z.F. (1987) *Seven Principles for Good Practice in Undergraduate Education*. *AAHE Bulletin*. 39 (7), pp. 3–7
- Chickering, A.W. & Reisser, L. (1993) *Education and identity*. (2nd edn) San Francisco: Jossey-Bass.
- Chin, C., & Brown, D. E. (2000) *Learning in science. A comparison of deep and surface approaches*. *Journal of Research in Science Teaching*, 37 (2), p.109–138.
- Chis, A. E., Moldovan, A.N., Murphy, L., Pathak, P., & Muntean, C. H. (2018) *Investigating Flipped Classroom and Problem-based Learning in a Programming Module for Computing Conversion Course*. *Educational Technology & Society*, 21 (4), 232–247.
- Chodorow, N. J. (1995) *Gender as a personal and cultural construction*. *Signs: Journal of Women in Culture and Society*, 20(3), p.516–544.

## References

Chowdhury, S., Endres, M., and Lains, T.W. (2002) *Preparing students for success in team work environments: The importance of building confidence*. *Journal of Managerial Issues*, 14(3), p.346-359

Christie, H. (2009) *Emotional Journeys: Young People and Transitions to University*. *British Journal of Sociology of Education*, 30 (2), p.123–136.

Christie, H., Munro, M. & Wager, F. (2005) *Day Students' in Higher Education: Widening Access Students and Successful Transitions to University Life*. *International Studies in Sociology of Education*, 15 (1), p.3–30.

Christie, H., Tett, L., Cree, V. E., Hounsell, J., & McCune, V. (2008) *'A real rollercoaster of confidence and emotions': Learning to be a university student*. *Studies in Higher Education*, 33, p.567–581.

Cieslik, M. (2006) *Reflexivity, learning identities and adult basic skills in the United Kingdom*. *British Journal of Sociology of Education*, 27 (2), p.237–250.

Clark, C., Medina, C. (2000) *How reading and writing literacy narrative affect pre-service teachers' understandings of literacy, pedagogy, and multiculturalism*. *Journal of Teacher Education*, 51, p.63–76.

Clayton, J., Crozier, G. & Reay, D. (2009) *Home and Away: Risk, Familiarity and the Multiple Geographies of the Higher Education Experience*. *International Studies in Sociology of Education*, 19 (3–4), p.157–174.

Coates, H. (2005) *The Value of Student Engagement for Higher Education Quality Assurance*. *Quality in Higher Education*. 11 (1), pp. 25–36.

Coates, H. (2007) *A Model of Online and General Campus-Based Student Engagement*. *Assessment and Evaluation in Higher Education*. 32 (2), pp. 121–141.

Coghlan, D., Brannick, T. (2005) *Doing Action Research in Your Own Organization*, 2nd edn. London, UK: Sage Publications.

Cohen, L., Manion, L. and Morrison, K. (2007) *Research Methods in Education*. (6<sup>th</sup> edn). London: Routledge Falmer.

Collini, S. (2013) *Sold Out*. *London Review of Books*. Vol.35 (20), 3-12.

Comfort, P. (2011) *The effect of peer tutoring on academic achievement during practical assessments in applied sports science students*, *Innovations in Education and Teaching International*, 48(2), 207-211.

Conlon, T. (2004) *A Failure of Delivery: The United Kingdom's New Opportunities Fund programme of teacher training in information and communications technology*. *Journal of In-service Education*, Volume 30, Number 1. Scotland: University of Edinburgh

Connolly, C., & Murphy, E. (2005) *Retention Initiatives for ICT-Based Courses*. 35th ASEE/IEEE Frontiers in Education Conference, Indianapolis, IN., 19th-22nd October 2005.



- Connolly, C., Murphy, E., Moore, S. (2009) *Programming Anxiety Amongst Computing Students - A Key in the Retention Debate?* IEEE Transactions on Education, Vol.52, No.1, p.52-56, February 2009.
- Corno, L., Mandinach, E. (1983) *The role of cognitive engagement in classroom learning and motivation*. Educational Psychologist, 18, 88-100.
- Corno, L., Rohrkemper, M. (1985) *The intrinsic motivation to learn in classrooms*. In C. Ames and R. Ames (Eds.), Research on motivation: Vol. 2. The classroom milieu (pp. 53-90). New York: Academic Press.
- Costa., P. T. Jr, Terracciano, A. & McCraem, R. R. (2001) *Gender differences in personality traits across cultures: Robust and surprising findings*. Journal of Personality and Social Psychology, 81 (2), p.322–331.
- Cotton, K. (2001) *Developing Employability Skills*. Northwest Regional Educational Research Laboratory. Portland: Education Northwest.
- Coull, N. J. (2008) *SNOOPIE: development of a learning support tool for novice programmers within a conceptual framework*. Ph.D. thesis, University of St Andrews.
- Crabtree, R. D. & Sapp, D. A. (2004) *Your culture, my classroom, whose pedagogy? Negotiating effective teaching and learning in Brazil*. Journal of Studies in International Education, 8(1), p.105-132.
- Craig, J. M. & Sherif, C. W. (1986) *The effectiveness of men and women in problem-solving groups as a function of group gender composition*. Sex Roles, 14(7/8), p.453–466.
- Cranton, P. (2006) *Understanding and promoting transformative learning. A guide for educators of adults, 2<sup>nd</sup> edition*. San Francisco: Jossey-Bass.
- Crawford, M., MacLeod, M. (1990) *Gender in the college classroom: an assessment of the 'chilly climate' for women*. Sex Roles, 23, p.101–122.
- Crenshaw, T.L., Chambers, E.W., Metcalf, H., and Thakkar, U. (2008) *A case study of retention practices at the University of Illinois at Urbana-Champaign*. SIGCSE Bull., 40:1, 412-416.
- Creswell, J. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. (3rd edn). U.S.A.: Sage Publications.
- Creswell, J.W. (2014) *Research design: qualitative, quantitative, and mixed methods approaches*. (4<sup>th</sup> edn). U.S.A: Sage Publications.
- Creswell, J.W. & Miller, G.A. (1997) *Research Methodologies and Doctoral Process*. New Directions for Higher Education, no.99. U.S.A.: Wiley.
- Creswell, J.W. & Plano Clark, V. L. (2007) *Designing and conducting mixed methods research*. Thousand Oaks, CA: SAGE.

## References

- Crossan, B., Field, J., Gallacher, J., & Merrill, B. (2003) *Understanding participation in learning for non-traditional adult learners: Learning careers and the construction of learning identities*. *British Journal of Sociology of Education*, 24, p.55–67.
- Cruce, T., Wolniak, G.C., Seifert, T.A. and Pascarella, E.T. (2006) *Impacts of Good Practices on Cognitive Development, Learning Orientations, and Graduate Degree Plans during the First Year of College*. *Journal of College Student Development*. 47 (4), p. 365–383.
- Cullity, M. (2005) *Putting the nature of alternative entry programmes for mature students on the agenda: Programme characteristics that encourage or inhibit mature student learning*. Paper to HERDSA Conference, Higher education in a changing world, University of Sydney, 3–6 July 2005.
- Cullity, M. (2006) *Challenges in understanding and assisting mature-age students who participate in alternative entry programs*. *Australian Journal of Adult Learning*, 46(2), p.175–201.
- Cuseo, J. (2007) *The empirical case against large class size: Adverse effects on the teaching, learning, and retention of first-year students*. *Journal of Faculty Development*, 21(1), pp. 1-22.
- Darab, S. (2004) *Time and study*. *Australian Journal of Adult Learning*, 44(3), p. 325–353.
- David, M. E. (2011) *Overview of Researching Global Higher Education: Challenge, Change or Crisis?* *Contemporary Social Science*, 6 (2), p.147–163.
- De Vita, G. (2000) *Inclusive approaches to effective communication and active participation in the multicultural classroom*. *Active Learning in Higher Education*, 1, p.168–180.
- Deci, E. and Ryan, R. (1987) *The support of autonomy and the control of behaviour*. *Journal of Personality and Social Psychology*, 53(6): 1024-37.
- Delors Commission. (1998) *Learning: The treasure within. Report to UNESCO from the International Commission on Education in the 21st century*. Paris: United Nations. Educational, Scientific and Cultural Organisation.
- Denny, E. (1991) *Feminist research methods in nursing*. *Senior Nurse* 11(6), 38-40.
- Denny, P., Luxton-Reilly, A., Carpenter, D. (2014) *Enhancing syntax error messages appears ineffectual*. In *Proceedings of the 2014 conference on Innovation and technology in Computer Science education*, pages 273–278. ACM.
- Denscombe, M. (2006) *Web based questionnaires and the mode effect. An evaluation based on item non-response rates and data contents of near-identical questionnaires delivered in different modes*. *Social Science Computer Review*, 24, 246-254.
- Denscombe, M. (2008) *Communities of practice*. *Journal of Mixed Methods Research*, 2, 270-283.
- Department of Education and Science. (2008) *Department of Education and Science Annual Report 2008*. Dublin: Department of Education and Science.

- Department of Education and Skills. (2002) *Young People and ICT (online)*. (accessed 15th August 2017). Available at: [http://www.heai.ie/sites/default/files/a\\_study\\_of\\_progression\\_in\\_irish\\_higher\\_education\\_institutions\\_2010-11-2011-12\\_0.pdf](http://www.heai.ie/sites/default/files/a_study_of_progression_in_irish_higher_education_institutions_2010-11-2011-12_0.pdf).
- Department of Education and Skills. (2011) *National Strategy for Education to 2030: Report of the Strategy Group*. Dublin: Department of Education and Skills.
- Department of Education and Skills. (2014) *ICT Skills Action Plan: Government, Education and Industry working together to make Ireland a global leader in ICT talent*. Dublin: Department of Education and Skills.
- Department of Education and Skills. (2016) *Ireland's National Skills Strategy 2025*. Dublin: Department of Education and Skills.
- Dervin, F. (2011) *A plea for change in research on intercultural discourses: A 'liquid' approach to the study of the acculturation of Chinese students*. *Journal of Multiculturalism*, 6, p.37–52.
- Devine, F., S. Heath. (1999) *Sociological Research Methods in Context*. Basingstoke: Macmillan.
- Dewey, J. (1966) *Democracy and Education: An Introduction to the Philosophy of Education*. New York: Free Press.
- Dirkx, J. (1997) *Nurturing soul in adult learning*. *New Directions for Adult and Continuing Education*, 74, p.79–88.
- Dolmans, D., Schmidt, H.G. (1996) *The advantages of problem-based curricula*. *Postgraduate Medical Journal*. 72, 535-538.
- Druskat, V. U. & Wolff, S. B. (1999) *Effects and timing of developmental peer appraisals in self managing work groups*. *Journal of Applied Psychology*, 84(1), p.58–74.
- Durkheim, E. (1956) *Education and Sociology*. New York: Free Press.
- Eagle, L. & Brennan, R. (2007) *Are students customers? TQM and marketing perspectives*. *Quality and Assurance in Education*. Vol. 15(1), 44-60.
- Eagly, A. H. (1987) *Sex differences in social behavior: A social-role interpretation*. Hillsdale, New Jersey: Erlbaum.
- Ecclestone, K. (2007) *An identity crisis? Using concepts of 'Identity', 'Agency' and 'Structure' in the education of adults: editorial*. *Studies in the Education of Adults*, 39 (2), p.121–131.
- Edmunds, S., Brown, G. (2010) *Effective small group learning: AMEE Guide No 48*. *Medical Teaching*, 32, p.715–726.
- Education Commission of the States. (1995) *Making quality count in undergraduate education*. Denver, CO: Education Commission of the States.

## References

- Elliot, J. (1991) *Action Research for Educational Change*. Buckingham: Open University Press.
- Elliott, C.J., Reynolds, M. (2014) *Participative pedagogies, group work and the international classroom: an account of students' and tutors' experiences*. *Studies in Higher Education*, Vol. 39, No.2, p.307-320.
- Emelo, R. (2013) *Engage passive learners*. *Chief Learning Officer*, 12 (1), p. 30-33.
- Engstrom, C., Tinto, V. (2008) *Access without Support is Not Opportunity*. *Change* 40 (1): p.46–50. doi:10.3200/CHNG.40.1.46-50.
- ENQA. (2005) *Standards and guidelines for quality assurance in the European higher education area*. European Association for Quality Assurance in Higher Education. (online) [http://www.enqa.eu/wp-content/uploads/2013/06/ESG\\_3edition-2.pdf](http://www.enqa.eu/wp-content/uploads/2013/06/ESG_3edition-2.pdf) (accessed 15th August 2017).
- Enterprise Ireland/Investec (2018) *Export Market Watch Report*. Ireland: Enterprise Ireland.
- Ethington, C. (2000) *Influences of the normative environment of peer groups on community college students' perceptions of growth and development*. *Research in Higher Education*, 41, p.703–722.
- Ettington, D. R., Camp, R. (2002). *Facilitating transfer of skills between group projects and work teams*. *Journal of Management Education*, 26(4), p.356-380.
- Ewell, P.T. & Jones, D.P. (1996) *Indicators of "Good Practice" in Undergraduate Education: A Handbook for Development and Implementation*. Boulder, CO: National Center for Higher Education Management Systems.
- Falls, I., Bahhouth, V., Chuang, C.M., and Bahhouth, J. (2014) *Factors Influencing Students' Perceptions of Online Teamwork*. *SAGE Open*, 1–9.
- Fantini, A., Tirmizi, A. (2006) *Exploring and Assessing Intercultural Competence: A Construct Proposal*. World Learning Publications. Paper 1. 2006. Available at: [http://digitalcollections.sit.edu/worldlearning\\_publications/1](http://digitalcollections.sit.edu/worldlearning_publications/1) (Accessed on 16 April 2020).
- Fassinger, P.A. (1996) *Professors' and students' perceptions of why students participate in class*. *Teaching Sociology*, 24, p.25–33.
- Faust, D. F., & Courtenay, B. C. (2002) *Interaction in the intergenerational freshman class: What matters*. *Educational Gerontology*, 28, p.401–422.
- Feichtner, S. B. & Davis, E. A. (1984) *Why some groups fail: A survey of students' experiences with learning groups*. *Journal of Management Education*, 9(4), p.58–73.
- Feingold, A. (1994) *Gender differences in personality: A meta-analysis*. *Psychological Bulletin*, 116 (3), p.429–456.

- Fellenz, M. (2006) *Toward fairness in assessing student group work: A protocol for peer evaluation of individual contributions*. *Journal of Management Education*, 30(4), p.570–591.
- Fidalgo-Neto, A. A., Tornaghi, A. J., Meirelles, R. M., Berçot, F. F., Xavier, L.L., Castro, M. F., & Alves, L. A. (2009) *The use of computers in Brazilian primary and secondary schools*. *Computers & Education*, 53 (3), p.677-685.
- Fine, E., Handelsman, J. (2010) *Benefits and Challenges of Diversity in Academic Settings. Women in Science and Engineering Leadership Institute*. University of Wisconsin-Madison, 2010. Available at: <https://diversity.ucdavis.edu/sites/g/files/dgvnsk731/files/inline-files/Fine%20and%20Handelsman%2C%20Benefits%20and%20Challenges%20of%20Diversity.pdf> (Accessed 25 May 2020).
- Finnegan, F., Merrill, B. (2017) *We're as Good as Anybody Else: A Comparative Study of Working-Class University Students' Experiences in England and Ireland*. *British Journal of Sociology and Education* 38 (3): p.307–324. doi: 10.1080/01425692.2015.1081054.
- Finnegan, F., Merrill, B., Thunborg, C. (2014) *Student Voices on Inequalities in European Higher Education: Challenges for Theory, Policy and Practice in a Time of Change*. Abingdon: Routledge.
- Fowler, F. (2002) *Survey Research Methods*. Applied Social Research Methods Series: Volume I. (3<sup>rd</sup> edn). London: Sage Publications.
- Fredricks, J.A., Blumenfeld, P.C. and Paris, A.H. (2004) *School Engagement: Potential of the Concept, State of the Evidence*. *Review of Educational Research*. 74 (1), pp. 59–109.
- Freire, P. (1972) *Pedagogy of the Oppressed*. London: Penguin.
- Frobel, P., Marchington, M. (2005) *Team working structures and worker perceptions: A cross national study in pharmaceuticals*. *The International Journal of Human Resource Management*, 16(2), p.256-276
- Fruchtner, R. (2001). *Dimensions of teamwork education*. *International Journal of Engineering Education*, 17(6), p.426-430.
- Frykholm, J.A. (1997) *A stacked deck: Addressing issues of equity with pre-service teachers*. *Equity Excellence in Education*, 30, p.50–58.
- Fuchs, L.S., Fuchs, D., Phillips, N.B., Hamlett, C. L., Karns, K. (1995) *Acquisition and transfer effects of classwide peer-assisted learning strategies in mathematics for students with varying learning histories*, *School Psychology Review*, 24, 604-620.
- Gagné, R.M. and Medsker, K.L. (1996) *The Conditions of Learning: Training Applications*. Fort Worth: Harcourt Brace College Publishers.
- Gallacher, J., Crossan, B., Field, J., & Merrill, B. (2002) *Learning careers and the social space: Exploring the fragile identities of adult returners in the new further education*. *International Journal of Lifelong Education*, 21, p.493–509.

## References

- Gammie, E. & Matson, M. (2007) *Group assessment at final degree level: An evaluation*. Accounting Education: an international journal, 16(2), p.185–206.
- Garfinkel, H. (1991) *Studies in ethnomethodology*. London: Wiley.
- George, D. (2007) *Market overreach: the student as customer*. The Journal of Socioeconomics. Vol. 36, 965-977.
- Giacaman, N., Sinnen, O. (2018) *Preparing the software engineer for a modern multi-core world*. J. Parallel Distrib. Comput. Vol.118 (2018) p.247-263. Elsevier Ltd.
- Gibbs, A. (1997) *Focus Groups: Social Research Update no. 19*. (Department of Sociology, University of Surrey), [Online], Available: <http://sru.soc.surrey.ac.uk/SRU19.html> [accessed 24<sup>th</sup> August 2015).
- Gibbs, G. (1998) *Learning by Doing: A guide to Learning and Teaching Methods*. London: Further Education Unit.
- Gill, M. G., Ashton, P. T., and Algina, J. (2004) *Changing preservice teachers' epistemological beliefs about teaching and learning in mathematics: An intervention study*. Contemporary Educational Psychology, 29(2), 164-185.
- Gillham, B. (2000) *Developing a Questionnaire. Real World Research*. London: Continuum.
- Ginns, P.; Kitay, J. Prosser, M. (2008) *Developing conceptions of teaching and the scholarship of teaching through a Graduate Certificate of Higher Education*. International Journal of Academic Development, 13, p.75–85.
- Gist, M.E., Mitchell, T.R. (1992) *Self-efficacy: A theoretical analysis of its determinants and malleability*. Academy of Management Review, 17(2), p.182-211.
- Glanville, G., McDonagh, P., Becker, B. (2013) *Efforts in Outreach Programmes to Inform Secondary Students on Studying ICT at Third Level: Providing a Realistic Experience in Coursework and Accredited Assessment*. International Conference on Engaging Pedagogy (ICEP2013). Institute of Technology (IT Sligo): Sligo, Ireland, 6th December 2013.
- Goffman, E. (1959) *The Presentation of Self in Everyday Life*. Anchor Books: New York, USA.
- Goffman, E. (1963) *Stigma: Notes on the Management of Spoiled Identity*. New York: Simon & Schuster.
- Gomez, M.L. (1996) *Prospective teachers' perspectives on teaching "other people's children"*. In Currents of Reform in Preservice Teacher Education. Zeichner, K., Melnick, S., Gomez, M.L., Eds.. Teachers College Press: New York, USA, p. 109–132.
- Gonsalves, A., Seiler, G., Salter, D.E. (2011) *Rethinking resources and hybridity*. Cultural Studies of Science Education, 6 (2), p.389–399.
- Goold, A., Augar, N., and Farmer, J. (2006) *Learning in virtual teams: Exploring the student experience*. Journal of Information Technology Education, 5, 477-490.

- Gottschall, H., García-Bayonas, M. (2008). *Student attitudes towards group work among undergraduates in business administration, education and mathematics*. Educational Research Quarterly, 32(1), p.3-28.
- Graen, G. B., Hui, C. & Taylor, E. A. (2006) *Experience-based learning about LMX leadership and fairness in project teams: A dyadic directional approach*. Academy of Management Learning & Education, 5(4), p.448–460.
- Gressgård, L.J. (2011). *Virtual team collaboration and innovation in organizations*. Team Performance Management: An International Journal, 17 (1/2), p.102-119.
- Griffiths, V. (2011) *Career changers and fast-track induction: Teacher perspectives on their early professional development*. Teacher Development, 15(1), p.19-35.
- Grundy, S. (1982) *Three modes of action research*. Curriculum Perspectives, 2 (3), pp.23-34.
- Gubba, E.G. (1990) *The alternative paradigm dialog*. In E.G. Guba (Ed.), *The Paradigm dialog* (pp. 17-30). Newbury Park CA: Sage Publications.
- Guba, E.G., Lincoln, Y.S. (1994) *Competing paradigms in qualitative research*. In N.K. Denzin and Y.S. Lincoln (Eds), *Handbook of qualitative research* (pp. 105-117). U.S.A.: Sage Publications.
- Gudykunst, W., Lee, C. (2003) *Cross-Cultural and Intercultural Communication*. Sage Publications: Thousand Oaks, CA, USA.
- Gurin, P. (1999) *Selections from The Compelling Need for Diversity in Higher Education*. Expert Reports in Defense of the University of Michigan. Equity Excellence Education, 32, p.36–62.
- Gurin, P., Dey, E., Hurtado, S., & Gurin, G. (2002) *Diversity and higher education: Theory and impact on education outcomes*. Harvard Educational Review, 72(3), p.330-367.
- Guzdial, M. (2011) *Predictions on future CSI languages*. <https://computinged.wordpress.com/2011/01/24/predictions-on-future-cs1-languages>.
- Guzzo, R.A., and Dickson, M.V. (1996) *Teams in organizations: Recent research on performance and effectiveness*. Annual Review of Psychology, 47, p.301-338.
- Haigh, M.J. (2002) *Internationalisation of the curriculum: Designing inclusive education for a small world*. Journal of Geography of Higher Education 26, no. 1: 49–66.
- Hamir, S., Maion, S., Tice, S., and Wideman, A. (2015) *Constructivism in Education*. Available at: <http://constructivism512.weebly.com>. (Accessed 27th February 2018).
- Hammersley, M., Treseder, P. (2007) *Identity as an analytic problem: Who's who in 'Pro-ana' websites?* Qualitative research, 7 (3), p.283–300.
- Harden RM, Laidlaw JM. (2012) *Essential Skills for a Medical Teacher: An Introduction to Teaching and Learning in Medicine*. Edinburgh, Scotland: Churchill Livingstone.

## References

Hardin, C. J. (2008) *Adult Students in Higher Education: A Portrait of Transitions*. *New Directions for Higher Education* (144): p.49–57. doi:10.1002/he.325.

Hardy, C., & Tolhurst, D. (2014) *Epistemological beliefs and cultural diversity matters in management education and learning: A critical review and future directions*. *Learning & Education*. 13(2), p.265-289.

Harper, S.R. and Quaye, S.J. (2007) *Student Organizations as Venues for Black Identity Expression and Development among African American Male Student Leaders*. *Journal of College Student Development*. 48 (2), pp. 133–159

Harper, S.R. and Quaye, S.J. (2009) *Beyond Sameness, with Engagement and Outcomes for All*. In: *Student Engagement in Higher Education*. New York and London: Routledge, pp. 1–15.

Hausmann, R., Hwang, J., Rodrik, D. (2007) *What You Export Matters*. *Journal of Economic Growth* (12)1: 1-15.

HEA, SOLAS, QQI. (2015) *National Employer Survey: Employers' Views on Irish Further and Higher Education and Training Outcomes*. Dublin: Higher Education Authority.

Heath, S., Fuller, A., Johnston, B. (2010) *Young People, Social Capital and Network-based Educational Decision-making*. *British Journal of Sociology of Education*, 31 (4), p.395–411.

HEFCE (2008) *Tender for a Study into Student Engagement*. Bristol: Higher Education Funding Council for England.

Henneman, E.A., Lee, J.L., & Cohen, J.I. (1995) *Collaboration: A concept analysis*. *Journal of Advanced Nursing*, 21, p.103-109.

Hernandez, S. A. (2002) *Team learning in a marketing principles course: Cooperative structures that facilitate active learning and higher level thinking*. *Journal of Marketing Education*, 24(1), p.73–85.

Herzberg, F., Mausner, B. and Snyderman, B.B. (1959) *The Motivation to Work*. (2nd edn). New Jersey: John Wiley.

Hibbert, P. (2012) *Approaching reflexivity through reflection: issues for critical management education*. *Journal of Management Education*, Vol. 37 No. 6, pp. 803-827.

Higher Education Authority (HEA). (2014) *A Study of Progression in Irish Higher Education Institutions 2010/11 to 2011/12*. Higher Education Authority (HEA): Dublin.

Higher Education Authority (HEA). (2015) *The Irish Survey of Student Engagement (ISSE): Results from 2015*. Higher Education Authority (HEA): Dublin.

Hillman, K. (2005) *The first year experience: The transition from secondary school to university and TAFE in Australia*. Camberwell: Australian Council for Education Research.



- Hodge, K.A., Lear, J.L. (2011) *Employment skills for 21st century workplace: the gap between faculty and student perceptions*. Journal of Career and Technical Education, 26(2), p.26-41.
- Hofstede, G. (1984) *Culture's Consequences*. Sage: London, UK.
- Hofstede, G. (1986) *Cultural differences in teaching and learning*. International Journal of Intercultural Relations, 10(3), p.301-320.
- Hong, Y. Y., & Salili, F. (2000) *Challenges ahead for research on Chinese students' learning motivation in the new millennium*. Journal of Psychology in Chinese Societies, 1(2), p.1-12.
- Hooper, S., & Hannafin M. J. (1988) *Cooperative CBI: The effects of heterogeneous versus homogeneous group on the learning of progressively complex concepts*. Journal of Educational Computing Research, 4(4), p.413-424.
- Howard, J.R., Baird, R. (2000) *The consolidation of responsibility and students' definitions of situation in the mixed-aged college classroom*. Journal of Higher Education, 71, p.700–721.
- Howard, J.R., James, G.H., Taylor, D.R. (2002) *The consolidation of responsibility in the mixed-age college classroom*. Teaching Sociology, 30, p.214–234.
- Howard, L.A., and Smith-Goodwin, E.A. (2010) *Student-to-student mentoring for retention: both groups benefit*. Athletic Therapy Today, 15(3), 14-17.
- Hsiung, C.M. (2010) *Identification of dysfunctional cooperative learning teams based on students' academic achievement*, Journal of Engineering Education, 99(1), 45-54
- Hsu, Y. C. (2003) *Evaluation theory in problem-based learning approach*. Papers Presented at the National Convention of the Association for Educational Communications and Technology, Houston, TX.
- Hu, S., Kuh, G.D. (2002) *Being (Dis)engaged in educationally purposeful activities: the influences of student and institutional characteristics*. Research in Higher Education, Vol. 43, No.5. Human Sciences Press, Inc.
- Jacobs, J. A., & Berkowitz-King, R. (2002) *Age and college completion: A life-history analysis of women aged 15–44*. Sociology of Education, 75, p.211–230.
- James, D. (1995) *Mature studentship in higher education: Beyond a 'species' approach*. British Journal of Sociology of Education, 16, p.451–466.
- Jehn, K. A., Northcraft, G. B. & Neale, M. A. (1999) *Why differences make a difference: A field study of diversity, conflict, and performance in workgroups*. Administrative Science Quarterly, 44(4), p.741–763.
- Johnson, C. B. & Smith, F. I. (1997) *Assessment of a complex peer evaluation instrument for team learning and group processes*. Accounting Education (JAI), 2(1), p.21–40.

## References

- Johnson, D. W. & Johnson, R. T. (1998) *Cooperative learning and social; interdependence theory*. In R. S. Tindale et al. (Eds.), *Theory and research on small groups* (p. 9–35). New York: Plenum Press.
- Johnson, D. W. & Johnson, R. T. (1999) *Making cooperative learning work*. *Theory into Practice*, 38 (2), p.67–73.
- Johnson, D. W. & Johnson, R. T. (1999) *Learning together and along: Cooperative, competitive, and individualistic learning (5th ed.)*. Boston, MA: Allyn & Bacon.
- Jones, M. E. (2008) *International students' cross-cultural experiences of learning*. *International Journal of Asian Pacific Studies*, 4 (2), p.39-71.
- Jordan, A., Carlile, O., Stack, A. (2008) *Approaches to Learning: A guide for teachers*. England: Open University Press.
- Kasworm, C. E. (2010) *Adult Learners in a Research University: Negotiating Undergraduate Student Identity*. *Adult Education Quarterly*, 60 (2), p.143–160.
- Katinka, J. A. H. P., van Eijs, P. W. L.J., Boshuizen, H. P. A., van der Vleuten, C. P. M., and Scherpbier A.J. J. A. (2005) *General competencies of problem-based learning (PBL) and non-PBL graduate*. *Medical Education*, 39(4), p.394–401.
- Kavanagh, M. H., Drennan, L. (2008) *What skills and attributes does an accounting graduate need? Evidence from student perceptions and employer expectations*. *Accounting & Finance*, 48, p.279–300.
- Kemmis, S. & McTaggart, R. (2000) *Participatory action research*. In N. K. Denzin and Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 567-607). Thousand Oaks, CA: Sage.
- Keppel, G., and Wickens, T.D. (2003) *Design and analysis: A researcher's handbook, (4<sup>th</sup> ed.)*. Englewood Cliffs, NJ: Prentice Hall.
- Kinnunen, P., Malmi, L. (2005) *Problems in Problem-Based Learning - Experiences, Analysis and Lessons Learned on an Introductory Programming Course*. *Informatics in Education*, 2005, Vol.4, No.2, 193-214.
- Knaak, S. (2004) *On the reconceptualizing of gender: Implications for research design*. *Sociological Inquiry*, 74(3), p.302–317.
- Knowles, M.S. (1980) *The Modern Practice of Adult Education. From Pedagogy to Andragogy*. 2nd edn. Follet, Chicago, IL.
- Knowles, M.S. (1984) *Andragogy in Action: Applying Modern Principles of Adult Learning*. Jossey-Bass Inc.: San Francisco, CA.
- Koch, T. (1998) *Story telling: is it really research?* *Journal of Advanced Nursing* 28, 1182-1190.

- Kolb, D.A. (1984) *Experiential Learning: Experience as the Source of Learning and Development*. Prentice-Hall, Englewood Cliffs, NJ.
- Koong, C.S, Yang, T.I., Chao-Chin, W., Han-Tai, Li., Chien-Chao, T. (2014) *An investigation into the effectiveness of different reflective learning strategies for learning operational software*. *Computers & Education*, Vol. 72 (2014), p.167-186. Elsevier.
- Koshy, V. (2009) *Action Research for Improving Education Practice: A Step-by-Step Guide*. London: Sage Publications.
- Krauss, S. E. (2005) *Research paradigms and meaning making: A primer*. *The Qualitative Report*, 10(4), pp. 758-770. [Online], Available: <http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=1831andcontext=tqr> [accessed 20<sup>th</sup> August 2015].
- Kuh, G.D. (1993) *In their Own Words: What Students Learn Outside the Classroom*. *American Educational Research Journal*. 30 (2), pp. 277–304.
- Kuh, G.D. (1995) *The Other Curriculum: Out-of-class Experiences Associated with Student Learning and Personal Development*. *Journal of Higher Education*. 66 (2), pp. 123–155.
- Kuh, G.D. (2000) *Understanding campus environments*. In: Barr, M.J., and Desler, M. (eds.), *Handbook on Student Affairs Administration* (2nd ed.), Jossey-Bass, San Francisco, pp. 50-72.
- Kuh, G. D. (2001) *Assessing What Really Matters to Student Learning: Inside the National Survey of Student Engagement*. *Change*, 2001, 33(3), 10–17, 66.
- Kuh, G. D. (2003) *What we're learning about student engagement from NSSE*. *Change* 35(2): 24--32.
- Kuh, G. D. (2009a) *The National Survey of Student Engagement: Conceptual and Empirical Foundations*. *New Directions for Institutional Research*, no.141. DOI: 10.1002/ir.283. Wiley Periodicals Inc.
- Kuh, G.D. (2009b) *What Student Affairs Professionals Need to Know about Student Engagement*. *Journal of College Student Development*. 50 (6), pp. 683–706.
- Kuh, G.D. (2009c) *Afterword*. In: Harper, S.R. and Quaye, S.J. (eds.) *Student Engagement in Higher Education*. New York and London: Routledge, pp. 313–318.
- Kuh, G.D. & Vesper, N. (1997a) *A comparison of student experiences with good practices in undergraduate education between 1990 and 1994*. *The Review of Higher Education* 21, 43–61.
- Kuh, G.D., and Vesper, N. (2001) *Do computers enhance or detract from student learning?* *Research in Higher Education*, 42, 87-102.

## References

- Kuh, G.D., Douglas, K.B., Lund, J.P. and Ramin-Gyurnek, J. (1994) *Student learning outside the classroom: Transcending artificial boundaries*. ASHE-ERIC Higher Education Report No.8, The George Washington University, School of Education and Human Development, Washington, DC.
- Kuh, G.D., Kinzie, J., Buckley, J.A., Bridges, B.K. and Hayek, J.C. (2007) *Piecing Together the Student Success Puzzle: Research, Propositions, and Recommendations*. ASHE Higher Education Report, Vol 32, No 5. San Francisco: Jossey-Bass.
- Kuh, G.D., Kinzie, J., Schuh, J.H. and Whitt, E.J. (2005) *Never Let It Rest: Lessons about Student Success from High-Performing Colleges and Universities*. *Change: The Magazine of Higher Learning*. 37 (4), pp. 44–51.
- Kuh, G.D., Pace, C.R. and Vesper, N. (1997) *The Development of Process Indicators to Estimate Student Gains Associated with Good Practice in Undergraduate Education*. *Research in Higher Education*. 38 (4), pp. 435–454.
- Kuh, G.D., Schuh, J.S., Whitt, E.J. (1991) *Involving colleges: Successful approaches to fostering student learning and personal development outside the classroom*. San Francisco: Jossey-Bass.
- Ladyshewsky, R. (2006) *Extending the boundaries of learning in management education: an integrative approach for promoting transfer of training into the practice environment*. HERDSA Conference Proceedings, Perth, pp. 175-183.
- Lamb, G.S. and Huttlinger, K. (1989) *Reflexivity in nursing research*. *Western Journal of Nursing Research* 11, 765-772.
- Landy, F. (1989). *Psychology of Work Behavior*. Pacific Grove, CA: Brooks/Cole
- Lave, J., Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Leathwood, C., & O'Connell, P. (2003) 'It's a struggle': *The construction of the 'new student' in higher education*. *Journal of Education Policy*, 18, p.597–615.
- Lee, E., & Kramer, R. (2013) *Out with the old, in with the new? Habitus and social mobility at selective colleges*. *Sociology of Education*, 86, p.18–35.
- Lehmann, W. (2013) *Habitus transformation and hidden injuries: Successful working-class university students*. *Sociology of Education*, 87, p.1–15.
- Leki, I. (1992) *Understanding ESL Writers: A Guide for Teachers*. Boynton/Cook Publishers: Portsmouth, NH, USA.
- LePine, J.A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E., and Saul, J.R. (2008) *A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships with team effectiveness criteria*. *Personnel Psychology*, 61(2), p.273–307.
- Li, J. (2012) *Cultural Foundations of Learning: East & West*. Cambridge University Press: Cambridge, UK.

- Lin, Y. T., Huang, Y. M., & Cheng, S.C. (2010) *An automatic group composition system for composing collaborative learning groups using enhanced particle swarm optimization*. *Computers & Education*, 55(4), p.1483-1493.
- Lin, Y.T., Wen, M.L., Jou, M. and Wu, D.W. (2014) *A cloud-based learning environment for developing student reflection abilities*. *Computers in Human Behavior*, Vol. 32 No. 2, pp. 244-252.
- Lockspeiser, T., O'Sullivan, P., Teherani, A., Muller, J. (2008) *Understanding the experience of being taught by peers: the value of social and cognitive congruence*. *Adv. Health Sci. Educ.* 13 (3), 361–372.
- Lorber, J. (1996) *Beyond the binaries: Depolarizing the categories of sex, sexuality, and gender*. *Sociological Inquiry*, 66(2), p.143–159.
- Lubell, K. M., and Vetter, J. B. (2006) *Suicide and youth violence prevention: The promise of an integrated approach*. *Aggression and Violent Behavior*, 11(2), 167- 175.
- Mallman, M., & Lee, H. (2016) *Stigmatised learners: Mature-age students negotiating university culture*. *British Journal of Sociology of Education*, 37, p.684–701.
- Mandernach, J.B. (2015) *Assessment of Student Engagement in Higher Education: A Synthesis of Literature and Assessment Tools*. *International Journal of Learning, Teaching and Educational Research*, Vol 12, No.2, pp. 1-14, June 2015.
- Manfreda, K.L. (2008) *Web surveys versus other survey modes: A meta-analysis comparing response rates*. *International journal of market research*, 50, 79-104.
- Marcus, G.E. (1998) *What comes (just) after 'post'? The case of ethnography*. In *The Landscape of Qualitative Research. Theories and Issues*. Sage, London, pp. 383-406.
- Marshall, D., Summers, M., & Woolnough, B. (1999) *Students' conceptions of learning in an Engineering context*. *Higher Education*, 38 (3), p.291-309.
- Marton, F. (1981) *Phenomenography: Describing conceptions of the world around us*. *Instructional Science*, 10 (2), p.177–200.
- Maruyama, G., Moreno, J.F., Gudeman, R.W., & Marin, P. (2002) *Does diversity make a difference? Three research studies on diversity in college classrooms*. Washington, DC: American Council on Education.
- Mason, J. (1996). *Qualitative Researching*. London: Sage.
- Mauthner, N., Doucet, A. (2003) *Reflexive Accounts and Accounts of Reflexivity in Qualitative Data Analysis*. *Sociology* 37(3); pp. 413-431.
- Mauthner, N., Parry, O., and Backett-Milburn, K. (1998) *The Data are out There, or are They? Implications for Archiving and Revisiting Qualitative Data*. *Sociology* 32: 733–45.

## References

- Maxwell, J.A. (2013) *Qualitative research design: an interactive approach*. (3<sup>rd</sup> edn.) U.S.A.: Sage Publications.
- Maxwell, J. A. & Loomis, D. (2002) *Mixed methods design: An alternative approach*. In A. Tashakkori and C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioural research* (pp. 241-271). Thousand Oaks, CA: Sage.
- Maznevski, M. L. (1994) *Understanding our differences: Performance in decision-making groups with diverse members*. *Human Relations*, 47(5), p.531–552.
- McCorkle, D. E., Reardon, J., Alexander, J. F., Kling, N. D., Harris, R. C. & Iyer, R. V. (1999) *Undergraduate marketing students, group projects, and teamwork: The good, the bad, and the ugly?* *Journal of Marketing Education*, 21(2), p.106–117.
- McCracken, M., Almstrum, V., Diaz, D., Guzdial, M., Hagan, D., Kolikant, Y. B.-D., Laxer, C., Thomas, L., Utting, I., and Wilusz, T. (2001) *A multi-national, multi-institutional study of assessment of programming skills of first-year cs students*. *ACM SIGCSE Bulletin*, 33(4), 125–180
- McCune, V., Hounsell, J., Christie, H., Cree, V.E., & Tett, L. (2011) *Mature and younger students' reasons for making the transition from further education into higher education*. *Teaching in Higher Education*, 15(6), p.691-702.
- McDowell, C., Werner, L., Bullock, H., and Fernald, J., (2002) *The Effect of Pair Programming On Performance in an Introductory Programming Programme*. In ACM Special Interest Group of Computer Science Educators, 2002, Kentucky, USA.
- McKernan, J. (1991) *Curriculum Action Research. A handbook of methods and resources for the reflective practitioner*. London: Kogan Page.
- McKinney, D. and Denton, L.F. (2004) *Houston, we have a problem: there's a leak in the CSI affective oxygen tank*. *SIGCSE Bull.*,36:1, 236-239.
- McLean, M. (2001) *Can we relate conceptions of learning to student academic achievement?* *Teaching in Higher Education*, 6, p.399-413.
- McLeod, P. L., Lobel, S. A. & Cox, Jr, T. H. (1996) *Ethnic diversity and creativity in small groups*. *Small Group Research*, 27(2), p.248–264.
- McNabb D.E. (2004) *Research Methods for Political Science: Quantitative and Qualitative Methods*. London: M.E. Shar.
- Mead, G.H. (1967) *Mind, self and society*. Chicago: Chicago University Press.
- Mercer, J. (2007) *The challenges of insider research in educational institutions: wielding a double-edged sword and resolving delicate dilemmas*. *Oxford Review of Education*, Vol 33, Issue 1, pp. 1-17.
- Merrill, B. (2012) *Learning to Become an Adult Student: Experiences in a UK University*. *International Journal of Continuing Education and Lifelong Learning* 5 (1): p.21–42

- Merrill, B. (2014) *Determined to stay or determined to leave? A tale of learner identities, biographies and adult students in higher education*. *Studies in Higher Education*, Advance online publication, 40, p.1859–1871.
- Merton, R. (1968) *Social Theory and Social Structure*. New York: Free Press.
- Merton, R. (1972) *Insiders and outsiders; a chapter in the sociology of knowledge*. *American Journal of Sociology*, 78 (July), 9–47.
- Meyer, J. (2000) Using qualitative methods in health related action research. *British Medical Journal*, 320: 178-181.
- Miles, M. B., and Huberman, M. A. (1994) *Qualitative Data Analysis: An Expanded Sourcebook*, (2<sup>nd</sup> ed.). Beverley Hills: Sage.
- Miller, N. E., and Dollard, J. (1941) *Social Learning and Imitation*. New Haven: Yale University Press.
- Milliken, F. J. & Martins, L. L. (1996) *Searching for common threads: Understanding the multiple effects of diversity in organizational groups*. *Academy of Management Review*, 21(2), p.402–433.
- Mills, G.E., Butroyd, R. (2017) *Action Research: A Guide for the Teacher Researcher* (6<sup>th</sup> ed.). Pearson Education Ltd.: U.K.
- Molyneux, J. (2001) *Interprofessional teamworking: what makes teams work well?* *Journal of Interprofessional Care*, 15, p.29-35
- Moon, J. (2013) *A Handbook of Reflective and Experiential Learning: Theory and Practice*. Routledge Farmer, New York, NY.
- Moore, P.J., Harrington, M. (2016) *Fractionating English language proficiency: Policy and practice in Australian higher education*. *Current Issues in Language Planning*, 17, p.385–404.
- Morgan, D.L. (1996) Focus Group. *Annual Review of Sociology*, Vol. 22, pp. 129-152. *Annual Reviews*: U.S.A.
- Morgan, D.L. & Scannell, A.U. (1998) *Planning focus groups*. London: Sage Publications.
- Moser, C.A. and Kalton, G. (1971) *Survey methods in social investigation*. (2<sup>nd</sup> edn). London: Heinemann Educational.
- Munford, R., Sanders, J. (2003) *Action research*. In C. Davidson and M. Tollich (Eds), *Social science research in New Zealand* (2<sup>nd</sup> ed., pp. 263-274). Auckland, New Zealand: Pearson Education.
- Murray, N. (2015) *Dealing with diversity in higher education: Awareness-raising and a linguistic perspective on teachers' intercultural competence*. *International Journal of Academic Development*, 21, p.66–77.

## References

- Murray, N., McConachy, T. (2018) *Participation' in the internationalized higher education classroom: An academic staff perspective*. Journal of International Intercultural Communication, 11, p.254–270.
- Nancarrow, S. A., Booth, A., Ariss, S., Smith, T., Enderby, P. & Roots, A. (2013). *Ten principles of good interdisciplinary team work*. Human Resources for Health, p.11-19.
- National Forum. (2015a) *Reaching out: Student drop-out*. Briefing Paper 2. Dublin: National Forum.
- National Forum. (2015b) *Student non-completion on ICT programmes*. Briefing Paper 1. Dublin: National Forum.
- National Forum. (2015c) *Transition from second level and further education to higher education*. Dublin: National Forum.
- National Forum. (2015d) *Why students leave: Findings from qualitative research into student non-completion in higher education in Ireland*. Dublin: National Forum.
- National Forum. (2016) *Transition from Further Education and Training to Higher Education*. Dublin: National Forum.
- National Qualifications Authority Ireland (NQAI) (2005) *Principles and Operational Guidelines for the Recognition of Prior Learning in Further and Higher Education and Training*. Dublin: NQAI
- National Skills Council, Expert Group on Future Skills Needs (2019) *Forecasting the Future Demand for High-Level ICT Skills in Ireland, 2017-2022*. Ireland: EGFSN.
- National Survey of Student Engagement (NSSE) (2007) *Experiences that Matter: Enhancing Student Learning and Success*. Bloomington, IN: Indiana Center for Postsecondary Research.
- Nicol, D. (2010) *The foundation for graduate attributes: Developing self-regulation through self and peer assessment*. Available at: [https://ewds.strath.ac.uk/REAP/public/Papers/DN\\_The%20foundation%20for%20Graduate%20Attributes.pdf](https://ewds.strath.ac.uk/REAP/public/Papers/DN_The%20foundation%20for%20Graduate%20Attributes.pdf) (Accessed 24 May 2020).
- Nicol, D., Macfarlane-Dick, D. (2006) *Formative assessment and self-regulated learning: A model and seven principles of good feedback practice*. Studies in Higher Education, 31(2), p.199–218.
- O'Boyle, N. (2014) *Front row friendships: Relational dialectics and identity negotiations by mature students at university*. Communication Education, 63, p.169–191.
- O'Donnell, V. L., & J. Tobbell. 2007. *The Transition of Adult Students to Higher Education: Legitimate Peripheral Participation in a Community of Practice?* Adult Education Quarterly 57, (4), p.312–328.
- O'Shea, S. (2013) *Transitions and turning points: Exploring how first-in-family female students story their transition to university and student identity formation*. International Journal of Qualitative Studies in Education, 27, p.135–158.



- O'Doherty, T. (2001) *Computers and Curriculum - Difficulties and Dichotomies*. Dublin: National Council for Curriculum and Assessment.
- Office for Standards in Education, Children's Services and Skills (2011) *Annual Report and Accounts 2010-11*. London: The Stationery Office.
- O'Kelly, J., Mooney, A., Bergin, S.; Gaughran, P., Ghent, J. (2004). *An Overview of the Integration of Problem Based Learning into an existing Computer Science Programming Module*. Pleasure by Learning, Association for Computing Machinery (ACM).
- Oppenheim, A.N. (1992) *Questionnaire design, interviewing, and attitude Measurement*. London; Printer Publishers.
- Orlitzky, M. & Benjamin, J. D. (2003) *The effects of sex composition on small-group performance in a business school case competition*. *Academy of Management Learning and Education*, 2(2), p.128–138.
- Orsini, L. (2013) *Why programming is the core skill of the 21st century*. <http://readwrite.com/2013/05/31/programming-core-skill-21st-century>
- Osborne, M., Marks, A., & Turner, E. (2004) *Becoming a mature student: How adult applicants weigh the advantages and disadvantages of higher education*. *Higher Education*, 48, p.291–315.
- Pace, C.R. (1980) *Measuring the Quality of Student Effort*. *Current Issues in Higher Education*. 2, pp. 10–16.
- Pace, C.R. (1984) *Measuring the Quality of College Student Experiences. An Account of the Development and Use of the College Student Experience Questionnaire*. Los Angeles, CA: Higher Education Research Institute.
- Pace, C.R. (1990) *The Undergraduates: A Report of their Activities and College Experiences in the 1980s*. Los Angeles, CA: Center for the Study of Evaluation, UCLA Graduate School of Education
- Pace, C.R. (1995) *From Good Practices to Good Products: Relating Good Practices in Undergraduate Education to Student Achievement*. Paper presented at the 35th Association for Institutional Research Annual Forum. Boston, 28–31 May.
- Paechter, C. (2007) *Being boys, being girls: learning masculinities and femininities*. Abingdon: McGraw Hill.
- Pajares, F., and Urdan, T. (Eds.) (2006) *Self-efficacy and adolescence*. Greenwich, CT: Information Age.
- Parkin, P. (2009) *Managing Change in Healthcare using Action Research*. London: Sage Publications.

## References

Parry, G. (2010) *Differentiation, Competition and Policies for Widening Participation*. In *Improving Learning by Widening Participation in Higher Education*, edited by Miriam David, 31–46. London: Routledge.

Pascarella, E.T. (2001) *Identifying Excellence in Undergraduate Education Are We Even Close?*, *Change: The Magazine of Higher Learning*, 33:3, 18–23, DOI: 10.1080/00091380109601796.

Pascarella, E.T. & Terenzini, P.T. (1991) *How College Affects Students: Finding and Insights from Twenty Years of Research*. San Francisco, Cal.: Jossey-Bass.

Pascarella, E.T. & Terenzini, P.T. (2005) *How College Affects Students: A Third Decade of Research* (Vol. 2). San Francisco: Jossey-Bass.

Pascarella, E.T., Duby, P.D., Terenzini, P.T. and Iverson, B.K. (1983) *Student-Faculty Relationships and Freshman Year Intellectual Growth in a Nonresidential Setting*. *Journal of College Student Development*. 24 (5), pp. 395–402.

Patel, J., Rosentsveyg, J., Gabbur, N., Marquez, S. (2014) *Clay modeling for pelvic anatomy review for third-year medical and physician assistant students*. *Obstet. Gynecol.* 123, 19S–20S.

Paulus, T. M., Bichelmeyer, B., Malopinsky, L., Pereira, M. & Rastogi, P. (2005) *Power distance and group dynamics of an international project team: A case study*. *Teaching in Higher Education*, 10(1), p.43–55.

Peng, W. (2010) *Practice and experience in the application of problem-based learning in computer programming course*. *Proceedings of the IEEE 2010 International Conference on Educational and Information Technology*. DOI: 10.1109/ICEIT.2010.5607778.

Peslak, A.R. (2005). *Emotions and team projects and processes*. *Team Performance Management*, 11(7/8), p.251-262.

Petress, K. (2008) *What is meant by “active learning”?* *Education*, 128 (4), p.566-569.

Pfaff, E., Huddleston, P. (2003) *Does it matter if I hate teamwork? What impacts student attitudes toward teamwork*. *Journal of Marketing Education*, 25(1), p.37–45.

Pike, G.R. (1999) *The Effects of Residential Learning Communities and Traditional Residential Living Arrangements on Educational Gains during the First Year of College*. *Journal of College Student Development*. 40 (3), pp. 269–284

Pike, G.R. (2000) *The Influence of Fraternity or Sorority Membership on Students' College Experiences and Cognitive Development*. *Research in Higher Education*. 41 (1), pp. 117–139

Pike, G.R., Schroeder, C.C. and Berry, T.R. (1997) *Enhancing the Educational Impact of Residence Halls: The Relationship between Residential Learning Communities and First Year College Experiences and Persistence*. *Journal of College Student Development*. 38 (6), pp. 609–621.

- Pineda, R.C., Barger, B., & Lerner, L.D. (2009) *Exploring differences in student perceptions of teamwork: The case of U.S. and Lithuanian Students*. *Journal of International Business and Cultural Studies*, 1, p.50-58.
- Pintrich, R. P, De Groot, V. E. (1990) *Motivational and Self-Regulated Learning Components of Classroom Academic Performance*. *Journal of Educational Psychology*, Vol.82, No.1, 33-40.
- Pohlmann, J. T. (1974) *A description of effective college teaching in five disciplines as measured by student ratings*. *Research in Higher Education* 4(4): 335-346.
- Porter, L., Guzdial, M., McDowell, C., Simon, B. (2013) *Success in introductory programming: What works?* *Communications of the ACM*, 58(8), 34-36.
- Preedy, M., Riches, C. (1988) *Practitioner research in school management: an analysis of research studies undertaken for an Open University course*. J. Nias & S. Groundwater-Smith (Eds) *The enquiring teacher: supporting and sustaining teacher research* (Lewes, Falmer Press).
- Probyn, E. (2005) *Blush: Faces of Shame*. Minneapolis: University of Minnesota Press.
- Purdie, N., Hattie, J., & Douglas, G. (1996) *Student conceptions of learning and their use of self-regulated learning strategies: A cross-cultural comparison*. *Journal of Educational Psychology*, 88 (1), p.87-100.
- Quaye, S.J. and Harper, S.R. (2007) *Faculty Accountability for Culturally-Inclusive Pedagogy and Curricula*. *Liberal Education*. 93 (3), pp. 32–39.
- Quinn, L., Vorster, J. (2004) *Transforming teachers' conceptions of teaching and learning in a postgraduate certificate in higher education and training course*. *South African Journal of Higher Education*, 18, p.364–381.
- Reason, P. & Bradbury, H. (2001) *Introduction: Inquiry and participation in Search of a world Worthy of Human Aspiration*. In P.reason and H. Bradbury (eds.) *Handbook of Action research: Participative Inquiry and Practice*. London, Sage.
- Reason, R., Terenzini, P., and Domingo, R. (2006) *First Things First: Developing Academic Competence in the First Year of College*. *Research in Higher Education*, 47(2), 149-175. <http://dx.doi.org/10.1007/s11162-005-8884-4>.
- Reay, D. (2002) *Class, Authenticity and the Transition to Higher Education for Mature Students*. *The Sociological Review*, 50 (3), p.398–418.
- Reay, D. (2003) *A risky business? Mature working-class women students and access to higher education*. *Gender and Education*, 15, p.301–317.
- Reay, D., Crozier, G., Clayton, J. (2009) *Strangers in paradise: working class students in elite universities*. *Sociology*, 43 (6), p.1103–1121.
- Reay, D., Crozier, G., Clayton, J. (2010) *'Fitting In' or 'Standing Out': Working-class Students in UK Higher Education*. *British Educational Research Journal*, 36 (1), p.107–124.

## References

- Rengier, F., Rauch, P.J., Partovi, S., Kirsch, J., Nawrotzki, R. (2010) *A three-day anatomy revision course taught by senior peers effectively prepares junior students for their national anatomy exam*. *Ann. Anat.* 192 (6), 396–399.
- Reynolds, A. L., & Constantine, M. G. (2007) *Cultural adjustment difficulties and career development of international students*. *Journal of Career Assessment*, 15 (3), p.338- 350.
- Riel, M. (2007). *Understanding Action Research*. Center for Collaborative Action Research, Pepperdine University: California. (Online) Available at: <http://cadres.pepperdine.edu/ccar/define.html>.
- Riesman, D. (1998) *On Higher Education: The Academic Enterprise in an Era of Rising Student Consumerism*. New Brunswick, NJ: Transactions Publishers.
- Robbins, T. L. & Fredendall, L. D. (2001) *Correlates of team success in higher education*. *Journal of Social Psychology*, 141(1), p.135–136.
- Robinson, S. (2006) *Reflecting on the ‘international group working experience’: A study of two MBA programmes*. *International Journal of Management Education* 5, no. 2: 3–14.
- Robson, C. (2002) *Real world research: a resource for social scientists and practitioner-researchers*. (2<sup>nd</sup> edn). Oxford, UK: Madden.
- Roseneil, S. (1993) *Greenham Revisited: Researching Myself and My Sisters*, in D. Hobbs and T. May (eds) *Interpreting the Field: Accounts of Ethnography*, pp. 177–208. Oxford: Clarendon Press.
- Rotter, J.B. (1954) *Social learning and clinical psychology*. University of Michigan: Johnson Reprint Corporation.
- Rotter, J.B. (1966) *Generalized expectancies of internal versus external control of reinforcements*. *Psychological Monographs*. 80 (whole no. 609).
- Ruiz Ulloa, B. C., Adams, S. G. (2004) *Attitude toward teamwork and effective teaming*. *Team Performance Management*, 10(7/8), p.145-151.
- Sackett, P. R., DuBois, C. L. & Noe, A. W. (1991) *Tokenism in performance evaluation: The effects of work group representation on male–female and White–Black differences in performance ratings*. *Journal of Applied Psychology*, 76(2), p.263–267.
- Sagor, R. (2000) *Guiding School Improvement with Action Research*. U.S.A.: ASCD Publications.
- Saldana, A. (2009) *The Coding Manual for Qualitative Researchers*. Sage Publications: London.
- Salvatore, S. & Pagano, P. (2005) *Issues of Cultural Analysis*. *Culture and Psychology*, 11(2), 159–180. <https://doi.org/10.1177/1354067X05052349>

- Sandelowski, M. (1986) *The problem of rigor in qualitative research*. *Advances in Nursing Science* 8(3), 27-37.
- Santilli, V., Miller, A. N., & Katt, J. (2011) *A comparison of the relationship between instructor nonverbal immediacy and teacher credibility in Brazilian and U.S. classrooms*. *Communication Research Reports*, 28(3), p.266–274.
- Saunders, M., Lewis, P., Thornhill, A. (2009) *Research Methods for Business Students*. (5<sup>th</sup> edn). England: Pearson Education.
- Scala, M. A. (1996) *Going back to school: Participation motives and experiences of older adults in an undergraduate classroom*, *Educational Gerontology*, Vol. 22, No. 8, pp.747-773
- Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*. Basics Books: New York.
- Schullery, N.M. & Schullery, S.E. (2006) *Are heterogeneous or homogeneous groups more beneficial to students?* *Journal of Management Education* 30, no. 4: 542–56
- Scollon, R. & Scollon, S. (2001) *Intercultural Communication, a Discourse Approach*. Blackwell Publishing: Malden, MA, USA.
- Scott, D. (1997) *The researcher's personal responses as a source of insight in the research process*. *Nursing Inquiry* 4, 130-134.
- Scott, S.G. (2010) *Enhancing reflection skills through learning portfolios: an empirical test*. *Journal of Management Education*, Vol. 34 No. 3, pp. 430-457.
- Seels, B. & Glasgow, Z. (1997) *Making Instructional Design Decisions*. Columbus, OH: Prentice Merrill.
- Şendağ, S. & Ferhan Odabaşı, H. (2009) *Effects of an online problem based learning course on content knowledge acquisition and critical thinking skills*. *Computers & Education*, 53(1), 132-141. Elsevier Ltd
- Shadish, W.R., Cook, T.D. & Campbell, D.T. (2002) *Experimental and quasi-experimental designs for generalised causal inference*. Boston, MA: Houghton Mifflin.
- Shah, S. (2004) *The researcher/interviewer in intercultural context: a social intruder!* *British Educational Research Journal*, 30(4), 549–575.
- Shaw, J., Mitchel, C., Del Fabbro, L. (2015) *Group Work: Facilitating the Learning of International and Domestic Undergraduate Nursing Students*. *Education for Health*, Vol. 28, No. 2, pp. 124-129.
- Shaw, J., Moore, P., Gandhidasan, S. (2007) *Educational acculturation and academic integrity; outcomes of an intervention subject for international postgraduate public health students*. *J Acad Lang Learn* 2007;1:A55-66.

## References

- Sheridan, V., & Dunne, S. (2012) *The bigger picture: Undergraduate voices reflecting on academic transition in an Irish university*. *Innovations in Education & Teaching International*, 49(3), p.237-247.
- Shulman, L. S. (2002) *Making differences: A table of learning*. *Change* 34(6): 36-45.
- Siegfried, R. M., Chays, D., Miceli, N., Siegfried, J. (2012) *Whatever happened to Richard Reids list of first programming languages?* *Information Systems Education Journal*, 10(4), 24.
- Simpson, C. (2017) *Language, relationships and skills in mixed nationality Active Learning classrooms*. *Students in Higher Education*, 42, p.611–622.
- Skinner, B.F. (1969) *Contingencies of reinforcement: a theoretical analysis*. Appleton-Century-Crofts.
- Sloan, R.H. and Troy, P., (2008) *CS 0.5: a better approach to introductory Computer Science for majors*. *SIGCSE Bull.*,40:1, 271-275. <http://coweb.cc.gatech.edu/mediaComp-teach/uploads/12/UIC-report.pdf>
- Smits, P.B.A., Verbeek, J.H.A.M., De Buissonje, C.D. (2002) *Problem based learning in continuing medical education: a review of controlled evaluation studies*. *British Medical Journal*. 324, 153-156.
- Sormunen-Jones, C., Chalupa, M. R. & Charles, T. A. (2000) *The dynamics of gender impact on group achievement*. *Delta Pi Epsilon Journal*, 42(3), p.154–170.
- Spencer-Oatey, H.; Dauber, D. The gains and pains of mixed national group work at university. *J. Multiling. Multicult. Dev.* 2016, 38, 219–236.
- Stanford Encyclopedia of Philosophy (2015) *Relativism*. [Online], Available at: <https://plato.stanford.edu/entries/relativism/#StrVsWeaRel>. [Accessed 16<sup>th</sup> April 2015]
- Stark, E. M., Shaw, J. D. & Duffy, M. K. (2007) *Preference for group work, winning orientation, and social loafing behavior in groups*. *Group & Organization Management*, 32(6), p.699–723.
- Steinart, Y., Snell, L. (1999) *Interactive lecturing: strategies for increasing participation in large group presentations*. *Medical Teaching*, 21, p.37–42.
- Stevenson, J., & Clegg, S. (2012) *My past is a double edge sword: Temporality and reflexivity in mature learners*. *Studies in Continuing Education*, 35, p.17–29.
- Stewart, J., Keegan, A. and Stevens, P. (2008) *Postgraduate education to support organisation change: a reflection on reflection*. *Journal of European Industrial Training*, Vol. 32 No. 5, pp. 347-358.
- Stokes, N. (2010) *Secondary school students visit Google on completion of UCD Computer Science module*. [Online] Available at: <http://www.csi.ucd.ie/news/secondary-school-students-visit-googlecompletion-ucd-computer-science-module> [Accessed 22 August 2013].

- Stone, C. (2008) *Listening to individual voices and stories—the mature-age student experience*. Australian Journal of Adult Learning, 48(2): p.263–290.
- Straker, J. (2016) *International student participation in higher education: Changing the focus from “international students” to “participation”*. Journal of Students in International Education, 20, p.299–318.
- Strauss, A., Corbin, J.M. (1990) *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Sage Publications, Inc, Los Angeles, CA.
- Stuart, M. (2006) *My friends made all the difference: Getting into and succeeding at university for first-generation entrants*. Journal of Access Policy and Practice, 3, p.162–184.
- Sursock A. and Smidt, H. (2010) *Trends 2010: A decade of change in European Higher Education*. European University Association: Brussels.
- Susarla, S.M., Medina-Martinez, N., Howell, T.H., Karimbux, N.Y. (2003) *Problem Based Learning: effects on standard outcomes*. Journal of Dental Education. 67 (9), 1003-1010.
- Sweeney, A., Weaven, S., Herington, C. (2008) *Multicultural influences on group learning: A qualitative higher education study*. Assessment & Evaluation in Higher Education 33, no. 2: 119–32
- Tajfel, H. (1974) *Social identity and intergroup behaviour*. Social Science Information, Vol 13, Issue 2, pp. 65-93.
- Takeda S., Homberg, F. (2014) *The effects of gender on group work process and achievement: an analysis through self- and peer-assessment*. British Educational Research Journal, 40 (2), p.373-396.
- Tangney, J. P., Baumeister, R. F., and Boone, A. L. (2004) *High self-control predicts good adjustment, less pathology, better grades, and interpersonal success*. Journal of Personality, 72, 271-324. doi: 10.1111/j.0022-3506.2004.00263.x
- Tarricone, P., Luca, J. (2002) *Employees, teamwork and social interdependence—a formula for successful business?* Team Performance Management: An International Journal, 8(3/4), p.54–59.
- Taylor, J. (2011) *The intimate insider: negotiating the ethics of friendship when doing insider research*. Qualitative Research, Vol 11, Issue 1, pp. 03-22.
- Taylor, K. (2000) *Teaching with developmental intention*. In J Mezirow & Associates (eds.), Learning as transformation: Critical perspectives on a theory in progress, San Francisco: Jossey-Bass: p.151–180.
- Telch, M.J., Bandura, A., Vinciguerra, P., Argas, A. and Stout, A. L. (1982) *Social demand for consistency and congruence between self-efficacy and performance*. Behaviour Therapy, 13(5), 694-701.

## References

- Terenzini, P.T., Pascarella, E.T., Blimling, G.S. (1999) *Students' out-of-class experiences and their influence on learning and cognitive development: A literature review*. Journal of College Student Development, 40, p.610–623.
- Terveen, L., McDonald, D. (2005) *Social matching: A framework and research agenda*. ACM Transactions on Computer Human Interaction, 12(3), p.401-434.
- Thaman, R. G., Dhillon, S. K., Saggar, S., Gupta, M. P., & Kaur, H. (2013) *Promoting active learning in respiratory physiology - positive student perception and improved outcomes*. National Journal of Physiology, Pharmacy and Pharmacology. 3(1), p.27-34.
- The Complete University Guide. (2017) *Dropout rates fall at English universities*. Available at: <https://www.thecompleteuniversityguide.co.uk/news/dropout-rates-fall-at-english-universities/>. (Accessed 19th July 2017).
- Thomas, R.L. (1993) *Cross-age and peer tutoring*. ERIC Digest, Bloomington, INN, ERIC Clearinghouse on Reading and Communication Skills.
- Thorpe, K. (2004) *Reflective learning journals: from concept to practice*. Reflective Practice, Vol. 5 No. 3, pp. 327-343.
- Tienda, M. (2013) *Diversity and Inclusion: Promoting integration in higher education*. Educational Researcher, 42 (9), p.467 – 475.
- Tinto, V. (1993) *Leaving College: Rethinking the Causes and Cures of Student Attrition*. (2<sup>nd</sup> edn). Chicago: University of Chicago Press.
- Tinto, V. (1997) *Classrooms as communities: Exploring the educational character of student persistence*. Journal of Higher Education, 68(6), p.599–624.
- Tinto, V. (2000) *What we have learned about the impact of learning communities on students?* Assessment Update 12(2): 1–2, 12.
- Tolsgaard, M.G. (2013) *Clinical skills training in undergraduate medical education using a student-centered approach*. Dan. Med. J. 60 (8), B4690.
- Tones, M., Fraser, J., Elder, R., & White, K.M. (2009) *Supporting mature-aged students from a low socioeconomic background*. Higher Education, 58, p.505-529.
- Trochim, W. M.K. (2006) *The Qualitative - Quantitative Debate*. Social Research Methods. [Online], Available: <http://www.socialresearchmethods.net/kb/qualdeb.php> [accessed 17<sup>th</sup> August 2017].
- Tross, S.A., Harper, J.P., Osherr, L.W. and Kneidinger, L.M. (2000) *Not Just the Usual Cast of Characteristics: Using Personality to Predict College Performance and Retention*. Journal of College Student Development. 41 (3), pp. 325–336.
- Trowler, V. (2010). Student engagement literature review. York: Higher Education Academy.
- Tsai, C. (2009) *Conceptions of learning science among high school students in Taiwan: a phenomenographic analysis*. International Journal of Science Education, 26 (4).



- Tsai, C., & Kuo, P. (2008) *Cram school students' conceptions of learning and learning science in Taiwan*. *International Journal of Science Education*, 30(3), p.353-375.
- Tsui, A. (1996) *Reticence and anxiety in second language learning*. In *Voices from the Language Classroom*; Bailey, K., Nunan, D., Eds.; Cambridge University Press: Cambridge, UK, p. 145–167.
- Turk, C.L., Heimberg, R.G., Orsillo, S.M. (1998) *An investigation of gender differences in social phobia*. *Journal of Anxiety Disorders*, 12, p.209–223.
- Turner, C. S. (2013) *Advancing diversity in higher education*. *Journal of Diversity in Higher Education*, 6 (3) p.155-157.
- Vaughn, S., Schumm, J.S. and Sinagub, J. (1996) *Focus group interviews in education and psychology*. London: Sage Publications.
- Vermunt, J. D., & Vermetten, Y. J. (2004) *Patterns in student learning: Relationships between learning strategies, conceptions of learning, and learning orientations*. *Educational Psychology Review*, 16(4), p.359-384.
- Volet, S.E., Ang, G. (2012) *Culturally mixed groups on international campuses: An opportunity for inter-cultural learning*. *Higher Education Research and Development*, 31, p.23–37.
- Vygotsky, L.S. (1962) *Thought and Language*. Cambridge, MA: MIT Press.
- Vygotsky, L.S. (1978) *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Waller, R. (2006) *'I don't feel like "a student", I feel like "me"': The over-simplification of mature learners' experience(s)*. *Research in Post-Compulsory Education*, 11, p.115–130.
- Wang, X.M. (2017) *A problem posing-based practicing strategy for facilitating students' computer programming skills in the team-based learning mode*. *Educational technology research and development*. 65, Issue 6, pp. 1655-1671.
- Warrington, M., Younger, M. & Williams, J. (2000) *Student attitudes, image and the gender gap*. *British Educational Research Journal*, 26(3), p.393–407.
- Waterman, H. (1998) *Embracing ambiguities and valuing ourselves: issues of validity in action research*. *Journal of Advanced Nursing* 28, 101-105.
- Watson, W.E., Kumar, K. & Michaelsen, L. K. (1993) *Cultural diversity's impact on interaction process and performance: Comparing homogeneous and diverse task groups*. *Academy of Management Journal*, 36(3), p.590–602.
- Webb, N. M. (1982) *Student Interaction and learning in small groups*. *Review of Educational Research*, 52(3), p.421-455.

## References

- Webb, N. M., & Palincsar, A. S. (1996) *Group processes in the classroom*. In D. Berliner & R. Calfee (Eds.), *Handbook of Educational Psychology* (p. 841–873.), New York: Macmillan.
- Wilcox, P., Winn, S., Fyvie-Gauld, M. (2005) *'It Was Nothing to Do with the University, It Was Just the People': The Role of Social Support in the First-year Experience of Higher Education*. *Studies in Higher Education*, 30 (6), p.707–722.
- Williams, L., McDowell, C., Nagappan, L., Fernald, J., and Werner, L. (2003) *Building pair programming knowledge through a family of experiments*. *Proceedings International Symposium on Experimental Software Engineering*, Rome, Italy, 2003, IEEE CS Press, 143-153.
- Wilson, E., & Deaney, R. (2010) *Changing career and changing identify: How do teacher career changers exercise agency in identify construction?* *Social Psychology of Education*, 13, p.169-183.
- Wilton, L., & Constantine, M.G. (2003) *Length of residence, cultural adjustment, difficulties and psychological distress symptoms in Asian and Latin American international college students*. *Journal of College Counseling*, 6, p.177-186.
- Wolfe, K. (2006) *Active Learning*. *Journal of Teaching in Travel and Tourism*. 6(1), p.77-82
- Wong, F.K.Y., Kember, D., Chung, L.Y.F., and Yan, L. (1995) *Assessing the level of student reflection from reflective journals*. *Journal of Advanced Nursing*. 22: 48-57.
- Woodfield, R., Jessop, D. & McMillan, L. (2006) *Gender differences in undergraduate attendance rates*. *Studies in Higher Education*, 31(1), p.1–22.
- Yang, T., Chen, S. Y., & Hwang, G. (2015) *The influences of a two-tier test strategy on student learning: A lag sequential analysis approach*. *Computers & Education*, Vol. 82, p.366–377.
- Youdell, D. (2012) *Fabricating 'Pacific Islander': pedagogies of expropriation, return and resistance and other lessons from a 'Multicultural Day'*. *Race ethnicity and education*, 15 (2), p.141–155.
- Young, I. M. (1994) *Gender as seriality: Thinking about women as a social collective*. *Signs: Journal of Women in Culture and Society*, 19(3), p.713–738.
- Zahra, A. (2012). *Learning journal leading to authentic learning in a hospitality context*. *Journal of Teaching in Travel and Tourism*, Special Issues: Making it Authentic: Critical Reflections on Learning and Teaching in Tourism, Hospitality and Events Higher Education, Vol. 12 No. 3, pp. 277-294.
- Zhao, C.M., and Kuh, G.D., (2004) *Adding Value: Learning Communities and Student Engagement*. *Research in Higher Education*,45:2, 115-138.

## List of Tables

Table 2.1: Examples of motivational orientations (adapted from Deci and Ryan, 1987) .....	17
Table 2.2: The relationship between motivational and self-regulated components .....	18
Table 3.1: Types of experimental designs considered for empirical studies.....	53
Table 3.2: Experimental Designs selected for AR Cycles (2014-2016).....	54
Table 3.3: The use of questionnaires within action research cycles (2014-2016).....	57
Table 3.4: The use of interview as a data collection tool within all AR cycles .....	58
Table 3.5: Focus Group Approach for Empirical Research Studies.....	59
Table 3.6: Qualitative feedback tools used within all action research cycles (2014-2016) ....	60
Table 3.7: Considered threats to internal and external validity .....	63
Table 3.8: AR Cycle 1 – Data Collection (January to June 2014) .....	68
Table 3.9: AR Cycle 2 – Data Collection (January to June 2015) .....	71
Table 3.10: AR Cycle 3 – Data Collection (January to June 2016) .....	76
Table 4.1: Interpreting the completion of the reflective journals .....	87
Table 4.2: Interview Raw Data (June 2015).....	91
Table 4.3: Codes used to analyse interviews.....	92
Table 4.4: Principal Programming Lecturer Interviews .....	97
Table 4.5: Social Learning Activity Feedback Forms – Data Acquired .....	100
Table 4.6: Social Learning Activity Feedback Form Structure.....	100
Table 4.7: Social Learning Activity Participant Interviews (Cycle 3, May 2016).....	105
Table 4.8: Chapter 4 Summary Conclusions .....	114
Table 5.1: Student Engagement Questionnaire Themes.....	120
Table 5.2: Engagement Data Response Calculation Sample.....	121
Table 5.3: Mapping ISSE Indices to Specific Questions in the Questionnaire Tool.....	122
Table 5.4: Student Engagement Questionnaire Results Comparison .....	123
Table 5.5: Questions and responses identified for analysis from the student engagement questionnaire.....	124

List of Tables

Table 5.6: ISSE Indices identified for analysis and their link to the questionnaire tool.....141

Table 6.1: Self-efficacy questionnaire question list.....159

Table 6.2: Self-efficacy questionnaire data collected (2016) .....161

Table 6.3: Comparing Group Avg. Scores – Question 1 to 26 (Totalling All Questions).....161

Table 8.1: Summary of the Findings from Qualitative Research Methods Used in Cycle 3 (2016).....194

## List of Figures

Figure 1.1: Action Research Cycles (2014 to 2016) .....	4
Figure 1.2: Relationship between Chapters 4, 5 and 6 and Action Research Cycles .....	7
Figure 2.1: Conceptual Framework: Enhancing Student Engagement (adapted from Bandura's Reciprocal Determinism Model (1986)).....	39
Figure 2.2: Gibbs Reflective Cycle (1998).....	41
Figure 2.3: Schön's reflection-in-action/Reflection-on-action model (1983).....	42
Figure 3.1: Pragmatic Methodology (Visual Representation).....	51
Figure 3.2: Action Research Model: The Iterative Process.....	52
Figure 3.3: Summary of the research methods and data collection tools for all action research cycles (2014-2016) .....	55
Figure 4.1: Summary of Action Research Cycle 1 .....	80
Figure 4.2: Summary of Action Research Cycle 2.....	82
Figure 4.3: Summary of Action Research Cycle 3.....	85
Figure 5.1: Asked questions or contributed to discussions (Question 1.1) .....	125
Figure 5.2: Sought Advice from teaching staff (Question 1.2) .....	126
Figure 5.3: Worked hard to master difficult subject content (Question 1.4).....	127
Figure 5.4: Used student learning support services e.g. Maths support classes or programming support classes (Question 1.8).....	128
Figure 5.5: Included diverse perspectives in class discussion or written assignments (Question 1.10) .....	129
Figure 5.6: Put together ideas or concepts from different subject modules when completing assignments or during class discussions (Question 1.15).....	130
Figure 5.7: Discussed ideas from your coursework or classes with teaching staff outside class (Question 1.22).....	131
Figure 5.8: Had conversations with students who are very different to you in terms of their religious beliefs, political opinions or personal values (Question 1.28) .....	132
Figure 5.9: Organising and connecting ideas, information or experiences into new, more complex interpretations and relationships (Question 2.3).....	133

## List of Figures

Figure 5.10: Making judgements about the value of information, arguments or methods, (e.g. examining how others gather and interpret data and assessing the quality of their conclusions) (Question 2.4).....	134
Figure 5.11: Examined the strengths and weaknesses of your own views on a topic or issue (Question 6.3).....	135
Figure 5.12: Developed communication skills relevant to your discipline (Question 6.5) ....	136
Figure 5.13: Tried to better understand someone else’s views by imagining how an issue looks from their perspective (Question 6.7).....	137
Figure 5.14: Encouraging contact among students from different economic, social and ethnic/national backgrounds (Question 10.3) .....	138
Figure 5.15: Working effectively with others (Question 11.7).....	139
Figure 5.16: Understanding people of other racial, ethnic and national backgrounds (Question 11.10).....	140
Figure 5.17: Spending significant amounts of time studying and on academic work (Question 1K).....	142
Figure 5.18: Worked with other students inside class to prepare assignments (Question 2C).....	143
Figure 5.19: Worked with other students outside class to prepare assignments (Question 2D).....	144
Figure 5.20: Tutored or taught other college students (paid or voluntary) (Question 2E) .....	145
Figure 5.21: Had conversations with students who are very different to you in terms of their religious beliefs, political opinions or personal values (Question 4B) .....	146
Figure 5.22: Participate in a study group or learning community (Question 4D) .....	147
Figure 5.23: Providing the support you need to help you succeed academically (Question 5D).....	148
Figure 5.24: Improved knowledge and skills that will contribute to your employability (Question 6B).....	149
Figure 5.25: Working effectively with others (Question 8G).....	150
Figure 5.26: Understanding yourself e.g. self-reflection (Question 9A) .....	151
Figure 5.27: Understanding people of other racial, ethnic and national backgrounds (Question 9B).....	152
Figure 6.1: Efficacy Scale: adapted from Bandura’s guide for constructing self-efficacy scales (2006).....	160
Figure 6.2: Printing out a message to the user (Question 5).....	162

Figure 6.3: Importing libraries to be used in a class (Question 9).....	163
Figure 6.4: Finding and correcting mistakes in my own code (Question 17) .....	164
Figure 6.5: Understand a long, complex multi-file program (Question 18).....	165
Figure 6.6: Searching for solutions to coding problems through online forums and articles (Question 19).....	166
Figure 6.7: Finding ways of overcoming a programming problem while working on an assignment (Question 22) .....	167
Figure 6.8: Positively work with others in a group based programming project (Question 23).....	168
Figure 6.9: Effectively communicate with others (with varying skill levels and abilities) while working within a group based programming project (Question 24) .....	169
Figure 6.10: Confident in presenting ideas and suggestions to a group of people while working within a group based programming project (Question 25) .....	170
Figure 6.11: Positively contribute to the solution of problems encountered while working within a group based programming project (Question 26).....	171
Figure 6.12: Start and end of semester comparison of efficacy question scores relating to group work (before and after social learning interventions) .....	173
Figure 6.13: Treatment and Control Group: End of Programming Module Grade Comparison .....	174
Figure 7.1: Conceptual Framework v4 (holistic engagement life cycle model) .....	181
Figure 8.1: Action Research Cycles: Research methods and data collection summary.....	192
Figure 8.2: Action Research Cycle Summary .....	208

## Appendices

### Appendix A – Study Behaviour Questionnaire Tool (Cycle 1 and 2)

**1. What is your gender?**

Male  Female

**2. What is your age?**

18 - 24  25 - 30  31 - 40  40+

**3. How would you rate your current level of motivation to study outside of class time?**

No motivation  Very little motivation  Sometimes motivated  Highly motivated

**4. Do your lecturers motivate you to study outside of class time?**

Never  Sometimes  Always  Don't know

**5. Please select the method, or methods, you use when you self-study:**

- I read the materials provided by the lecturer
- I read books and information I find on the internet
- I write up my own short notes based on the material that was handed out by the lecturer
- I study with my friends
- I look at video clips related to the subject area
- I use other methods that are not listed here
- I don't do any study

**6. Please select the reasons why you may find it difficult to study outside of class time:**

- I am not motivated to study
- I am too busy with work
- The notes are difficult to read and understand
- I have a very busy social life
- I don't know
- Other reasons

**7. Do you think using a new method of self-study would be helpful?**

No  Maybe  Yes  Don't know

**8. Do you study additional material (books, videos, magazines etc.) that are not covered in class by the lecturer?**

No  Sometimes  Yes  Don't know

**9. How much time per subject do you put aside for self-study in a week?**

None  0 - 1 hour  1 - 2 hours  2 - 3 Hours  3 hours or more

**10. Please select the subject area, or areas, you are currently having difficulties understanding:**

- Programming
- Networking
- Creative Digital Media / Web Design
- Computer Architecture
- None of the Above



## Appendix B – End of Semester Focus Group Questions. (Reflective Learning) (Cycle 1)

### Questions for Focus Group on Reflective Learning Journal

Thursday 7<sup>th</sup> August 2014

**QUESTION 1: Do you do any study outside of class time? If so, which methods do you use? Which works best for you?**

Researcher comments:

**QUESTION 2: Which subject areas do you tend to study more for? Are these subjects more difficult or just more interesting to you?**

Researcher comments:

**QUESTION 3: Are you using the Reflective Journal? How often are you updating it?**

Researcher comments:

**QUESTION 4: What do you think about the field headings? What would you change?**

Researcher comments:

**QUESTION 5: Is it helping you to remember? Have you updated the content on previous entries?**

Researcher comments:

**QUESTION 6: Would you use the reflective journal, or a similar journal, in the future?**

Researcher comments:

## Appendix C1 – Reflective Learning Journal v1 (Cycle 1)

### Microsoft Excel Based Tool (Screenshot)

Week 1 - Reflection on Learning		Date:
<b>Description of Task / Lecture</b> <i>What happened?</i>	The lecturer asked us to perform the same task that he went through during the class - this was to perform a loop in Java which we had to do on our own laptops	
<b>Feelings</b> <i>What were you feeling?</i>	At first I didn't think I could do this so I was a little nervous, during the task I wasn't as nervous as I remembered some of the things that I did last semester. I was happy during the task and didn't feel frustrated.	
<b>Evaluation</b> <i>What was good/bad?</i>	The end result was good, I'm not 100% sure if I did this correctly though! There is probably a quicker way of doing this but I think the way the lecturer explained it was the easiest, but perhaps the slowest way.	
<b>Analysis</b> <i>What sense could you make of the situation?</i>	This task, I think, could be useful in a larger program, I'm not sure though as it wasn't explained by the lecturer. It was just an example that we had to follow.	
<b>Conclusion</b> <i>What else could you have done?</i>	I think I could have done a little research online to make sure I understand the basic concept and perhaps this research would enable me to understand why the loop program would be useful in a larger program. I'm happy enough with how I completed the task.	
<b>Action Plan</b> <i>What could you do next time?</i>	<p>Perform additional research just to gain a bit of confidence in what I am doing. While I can do the task without any major difficulty I don't really understand why or how this would be used in bigger programs.</p> <p>Also, the next time, as the lecturer is working through the example I might write down some of the steps and I will also ask some questions, if I have the confidence to do so!</p>	

Navigation: Personal Info | **Sample Entry** | Week 1 | Week 2 | Week 3 | Week 4 | Week 5

## Appendix C2 – Reflective Learning Journal v2 (Cycle 2)

### Microsoft Excel Based Tool (Screenshot)

Reflection on Learning		Date:	n/a
<b>Description of Task / Lecture</b> <i>What happened?</i>	The lecturer asked us to perform the same task that he went through during the class - this was to perform a loop in Java which we had to do on our own laptops		
<b>Feelings</b> <i>What were you feeling?</i>	At first I didn't think I could do this so I was a little nervous, during the task I wasn't as nervous as I remembered some of the things that I did last semester. I was happy during the task and didn't feel frustrated.		
<b>Evaluation</b> <i>What was good/bad?</i>	The end result was good, I'm not 100% sure if I did this correctly though! There is probably a quicker way of doing this but I think the way the lecturer explained it was the easiest, but perhaps the slowest way.		
<b>Action Plan</b> <i>Are you going to do any further research or practical activity?</i>	Perform additional research just to gain a bit of confidence in what I am doing. While I can do the task without any major difficulty I don't really understand why or how this would be used in bigger programs.  Also, the next time, as the lecturer is working through the example I might write down some of the steps and I will also ask some questions, if I have the confidence to do so!		

Navigation: < > ... **Sample Entry** | Entry 1 | Entry 2 | Entry 3 | Entry 4 | Entry 5 | Entry 6 | Entry 7

## Appendix D – End of Semester Interview Questions (Reflective Learning) (Cycle 2)

### Empirical Research – Semi-Structured Interview Questions

6<sup>th</sup> May 2015

**QUESTION 1: Do you do any study outside of class time? If so, which methods do you use? Which works best for you?**

Researcher comments:

**QUESTION 2: Which subject areas do you tend to study more for? Why are these subjects difficult?**

Researcher comments:

**QUESTION 3: Are you using the Reflective Journal? How often are you updating it?**

Researcher comments:

**QUESTION 4: What do you think about the field headings? What would you change?**

Researcher comments:

**QUESTION 5: Is it helping you to remember? Have you updated the content on previous entries?**

Researcher comments:

**QUESTION 6: What would you recommend to give to students to encourage them to study?**

Researcher comments:

**QUESTION 7: Would you use the reflective journal, or a similar journal, in the future?**

Researcher comments:

## Appendix E – Social Learning Individual Feedback Form (Cycle 3)

### PBL Activity – Reflective Feedback [2016]

<b>Student Name:</b>	
----------------------	--

<b>About YOU in this Activity</b>	
<b>What was your role?</b>	
<b>What is the most important thing you learned?</b>	
<b>What do you wish you had spent more time on?</b>	
<b>What part of the activity did you do your best work on?</b>	

<b>About the Activity:</b>	
<b>What was the MOST enjoyable part of this activity:</b>	
<b>What was the LEAST enjoyable part of this activity:</b>	

<b>Do you have any other comments (positive or negative) on your experience with this activity?</b>

## Appendix F – Student Engagement Questionnaire Tool (Cycle 3)

# Student Engagement Questionnaire

(UH Ethics Protocol Reference: cEDU/PGT/UH/02163)

### Context:

This questionnaire is divided into two parts. Part A is specifically related to Student Engagement, and Part B is specifically related to your own belief in your capabilities in Computer Programming. Part A contains 14 questions with multiple parts, and Part B requires you to rate your current belief in your own programming ability against 26 items. Although you are asked to include your name identifying you within this questionnaire, any identifiable information will be removed from any write-up in the final thesis. Please refer to the participant information sheet if you have any concerns about this research project.

It will take you approximately 30 minutes to complete this questionnaire, additional time will be included if you require it.

Thank you once again for your participation in this research study.  
Graham Glanville

### Your Personal Details:

<b>First Name:</b>	
<b>Last Name:</b>	
<b>Student Number:</b>	
<b>Email Address:</b>	

## Part A – Student Engagement

Please tick ONE box (☑) from each item presented.

**Question 1: During your first academic semester (September to December 2015), about how often have you done each of the following?**

	Never	Sometimes	Often	Very Often
1.1 Asked questions or contributed to discussions in class, tutorials, labs or online	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Sought advice from teaching staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Made a class or online presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Worked hard to master difficult subject content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 Prepared two or more drafts of an assignment before submitting it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6 Used library resources at CCT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.7 Worked on an assignment that required using ideas or information from various sources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.8 Used student learning support services e.g. Maths support classes or Programming support classes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.9 Combined academic learning with workplace experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.10 Included diverse perspectives (e.g. different races, religions, genders, political beliefs, etc.) in class discussions or written assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.11 Attended class without completing the required preparation work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.12 Kept up to date with your studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.13 Worked with other students <b>inside</b> class to prepare assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.14 Worked with other students <b>outside</b> class to prepare assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.15 Put together ideas or concepts from different subject modules when completing assignments or during class discussions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Question 1 continued on the next page*

## Appendices

		Never	Sometimes	Often	Very Often
1.16	Tutored or taught other college students (paid or voluntary)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.17	Participated in a community-based project (e.g. volunteering) as part of your course	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.18	Used Moodle to discuss or complete an assignment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.19	Used email or an online forum to communicate with teaching staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.20	Discussed your grades or assignments with teaching staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.21	Talked about your career plans with teaching staff or career advisors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.22	Discussed ideas from your coursework or classes with teaching staff outside class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.23	Received timely written or oral feedback from teachers on your academic performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.24	Worked harder than you thought you could to meet a teacher's standards or expectations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.25	Worked with teaching staff on activities other than coursework (e.g. committees, orientation, student organisations etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.26	Discussed ideas from your coursework with others outside class (e.g. students, family members, co-workers, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.27	Had conversations with students of a different ethnicity/nationality than your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.28	Had conversations with students who are very different to you in terms of their religious beliefs, political opinions or personal values	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 2: During your first academic semester (September to December 2015), how much has your coursework emphasised the following intellectual activities?**

		Very Little	Some	Quite a bit	Very much
2.1	<b>Memorising</b> facts, ideas or methods from your subjects and coursework so you can repeat them in pretty much the same form	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Question 2 continued on the next page*



## Appendices

		Very Little	Some	Quite a bit	Very much
2.2	<b>Analysing</b> the basic elements of an idea, problem, experience or theory, such as examining a particular case or situation in depth and considering its components	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3	<b>Organising</b> and connecting ideas, information or experiences into new, more complex interpretations and relationships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4	<b>Making judgements</b> about the value of information, arguments or methods, (e.g. examining how others gather and interpret data and assessing the quality of their conclusions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5	<b>Applying</b> theories or concepts to practical problems or in new situations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 3: In a typical week, how many exercises, lab reports, problem sets, and tutorial questions do you complete?**

		None	1-2	3-4	5	7+
3.1	Number of pieces of work that take one hour or less to complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	Number of pieces of work that take more than one hour to complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 4: During your first academic semester (September to December 2015), approximately how many:**

		None	1-4	5-10	11-19	20+
4.1	Assigned books or journal articles relating to subject matter have you read?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	Books or journal articles (not assigned) for personal enjoyment or academic enrichment have you read?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3	Assignments of fewer than 1,000 words or equivalent have you completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4	Assignments of between 1,000 and 5,000 words or equivalent have you completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5	Assignments of more than 5,000 words or equivalent have you completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendices

**Question 5: Tick the box below that best represents the extent to which your assessments during the current academic year have challenged you to do your best work?**

<b>Very Little</b>				<b>Very Much</b>		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7

**Question 6: During your first academic semester (September to December 2015), about how often have you done each of the following?**

		Never	Sometimes	Often	Very Often
6.1	Attended an art exhibition, play, dance, music, theatre or other performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2	Exercised or participated in physical fitness activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3	Examined the strengths and weaknesses of your own views on a topic or issue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4	Improved knowledge and skills that will contribute to your employability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.5	Developed communication skills relevant to your discipline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.6	Explored how to apply your learning in the workplace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.7	Tried to better understand someone else's views by imagining how an issue looks from their perspective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.8	Learned something that changed the way you understand an issue or concept	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.9	Spent time keeping your CV up-to date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.10	Thought about how to present yourself to potential employers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.11	Explored where to look for jobs relevant to your interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.12	Used social networking to source information on job opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.13	Set career development goals and plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendices

**Question 7: Which of the following have you done, or do you plan to do, before you graduate from CCT?**

	Do not know about	Have not decided	Do not plan to do	Plan to do	Done
7.1 Industry placement or work experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2 Community service or volunteer work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3 Participate in a study group or learning community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.4 Study a foreign language	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.5 Independent study e.g. outside your course	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.6 Consult a college careers service for advice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.7 Hold a leadership position in a college group or the community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 8: Which of these boxes best represent the quality of your relationships with people at CCT?**

### 8.1 Relationships with other students

Unfriendly,  
unsupportive,  
sense of not belonging

Friendly,  
supportive,  
sense of belonging

1       2       3       4       5       6       7

### 8.2 Relationships with teaching staff

Unavailable,  
unhelpful, and  
unsympathetic

Available,  
helpful, and  
sympathetic

1       2       3       4       5       6       7

### 8.3 Relationships with administrative staff

Unavailable,  
inconsiderate,  
rigid

Available,  
considerate,  
flexible

1       2       3       4       5       6       7

## Appendices

### Question 9: Approximately how many hours do you spend in a typical seven-day week doing each of the following?

9.1 Preparing for class (e.g. studying, reading, writing, doing homework or lab work, analysing data, rehearsing and other academic activities)

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.2 Working for pay outside of CCT

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.3 Participating in extracurricular activities (e.g. organisations, campus publications, student associations, clubs and societies, sports, etc.)

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.4 Relaxing and socialising (e.g. watching TV, partying, etc.)

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.5 Managing personal business (e.g. housework, shopping, exercise, health needs, etc.)

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.6 Travelling to CCT (e.g. cycling, walking, taking the bus etc.)

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.7 Being at CCT, including time spent in class

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

9.8 Being at CCT, excluding time spent in class

None       1- 5       6 - 10       11 - 15       16 - 20       21 - 25       25 - 30       30+

## Appendices

### Question 10: To what extent does CCT encourage each of the following?

		Never	Sometimes	Often	Very Often
10.1	Spending significant amounts of time studying and on academic work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2	Providing the support you need to help you succeed academically	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3	Encouraging contact among students from different economic, social and ethnic/national backgrounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.4	Helping you cope with your non-academic responsibilities (e.g. work, family, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.5	Using computers in academic work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Question 11: Has your experience at CCT contributed to your knowledge, skills and personal development in the following areas?

		Never	Sometimes	Often	Very Often
11.1	Acquiring job-related or work-related knowledge and skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.2	Writing clearly and effectively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.3	Speaking clearly and effectively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.4	Thinking critically and analytically	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.5	Analysing quantitative problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.6	Using computing and information technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.7	Working effectively with others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.8	Learning effectively on your own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.9	Understanding yourself e.g. self-reflection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.10	Understanding people of other racial, ethnic and national backgrounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.11	Solving complex, real-world problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.12	Developing a personal code of values and ethics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendices

**Question 12: Overall, how would you evaluate your entire educational experience at CCT?**

Poor	Fair	Good	Excellent
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 13: Overall, how dissatisfied or satisfied are you with your programme of study?**

Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Question 14: If you could start all over again, would you register again in CCT?**

Definitely no	Probably no	Probably yes	Definitely yes
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Part A is now complete**

## Appendix G – Academic Self Efficacy Questionnaire Tool (2016)

# Student Self Efficacy Questionnaire

(UH Ethics Protocol Reference: cEDU/PGT/UH/02163)

### Context:

This questionnaire is divided into two parts. Part A is specifically related to Student Engagement, and Part B is specifically related to your own belief in your capabilities in Computer Programming. Part A contains 14 questions with multiple parts, and Part B requires you to rate your current belief in your own programming ability against 26 items.

Although you are asked to include your name identifying you within this questionnaire, any identifiable information will be removed from any write-up in the final thesis. Please refer to the participant information sheet if you have any concerns about this research project.

It will take you approximately 30 minutes to complete this questionnaire, additional time will be included if you require it.

Thank you once again for your time and effort.  
Graham Glanville

### Your Personal Details:

<b>First Name:</b>	
<b>Last Name:</b>	
<b>Student Number:</b>	
<b>Email Address:</b>	

## Part B – Computer Programming

---

A number of items related to computer programming are presented below. Please rate your degree of confidence with each item by recording a number from 0 to 100 using the scale given below:

0          10        20        30        40        50        60        70        80        90        100  
 Cannot do at all    Moderately can do    Highly certain can do

1	Installing and setting up eclipse software	
2	Creating a new project using eclipse software	
3	Creating a new class using eclipse software	
4	Compiling and running a program using eclipse software	
5	Printing out a message to the user	
6	Commenting on a program	
7	Declaring new variables and defining their types (Int, Double, String)	
8	Getting input from the user (Using BufferedReader)	
9	Importing libraries to be used in a class	
10	Creating new methods inside a class	
11	Using conditional statements (Ifs and ELSEs)	
12	Using loops (For and While)	
13	Reading from a txt file	
14	Displaying a message from a txt file	
15	Writing to a file	
16	Catching exceptions (Try and Catch)	
17	Finding and correcting mistakes in my own code	
18	Understand a long, complex multi-file program	
19	Searching for solutions to coding problems through online forums and articles	
20	Finding ways of motivating myself to program, even if the problem area is of no interest to me	
21	Finding a way to concentrate on my programming assignment, even when there are many distractions around me	
22	Finding ways of overcoming a programming problem while working on an assignment	
23	Positively work with others in a group based programming project	
24	Effectively communicate with others (with varying skill levels and abilities) while working within in a group based programming project	
25	Confident in presenting ideas and suggestions to a group of people while working within a group based programming project	
26	Positively contribute to the solution of problems encountered while working within a group based programming project	



## Appendix H – Start and End of Semester Interview Questions (Programming Lecturer) (Cycle 3)

### January 2016 – Start of Semester Interview Questions (principal programming lecturer)

<b>QUESTION 1:</b> How long have you been teaching computer programming?
<b>QUESTION 2:</b> What methods do you use to teach students computer programming?
<b>QUESTION 3:</b> Do you believe computer programming is a difficult subject to learn, when compared to other subjects like networking, for example?
<b>QUESTION 4:</b> Do you use group-based work within your classes? (assessment related or for learning purposes)
<b>QUESTION 5:</b> Have you ever come across Problem Based Learning in computer programming?
<b>QUESTION 6:</b> Would you consider experimenting with Problem Based Learning in this semester within your classes?
<b>QUESTION 7:</b> Do you have any other suggestions as to how we could, as an institution, facilitate learning computer programming?

### June 2016 – End of Semester Interview Questions (principal programming lecturer)

<b>QUESTION 1:</b> Thinking back on our interview at the start of the semester, I discussed the PBL / group learning approach to programming, what were your initial thoughts when I discussed this with you?
<b>QUESTION 2:</b> What was your experience/feelings/observations when we introduced Problem Based Learning within your classes this semester?
<b>QUESTION 3:</b> With regard to the mentors selected to facilitate the PBL sessions, do you believe these individuals were the right people for the job?
<b>QUESTION 4:</b> What was your experience/feelings/observations when we introduced Peer Assisted Learning within your classes this semester?

Appendices

<b>QUESTION 5:</b> Because one group were invited to participate in the group learning activities, do you feel that one group were more engaged in programming than the other?
<b>QUESTION 6:</b> Do you think introducing group related work in computer programming can harm students in any particular way?
<b>QUESTION 7:</b> In comparison to other years that you've taught computer programming at CCT, do you think these current students are any different than other students you have taught before?
<b>QUESTION 8:</b> Let's say we hired a new computer programming teacher in September, what advice would you give him/her in how they should approach teaching computer programming at CCT?

## Appendix I – End of Semester Interview Questions (Social Learning – Treatment Group) (Cycle 3)

### Empirical Research – Semi-Structured Interview Questions

May 2016

**QUESTION 1:** How did you feel about your programming ability at the start of the semester?

**QUESTION 2:** How do you feel about your programming ability now?

**QUESTION 3:** Did you work in groups regarding programming assignments / studying in the first semester?

**QUESTION 4:** Did you participate in the PBL / PAL sessions in this semester? What was your experience?

**QUESTION 5:** Would you like to participate in further PBL / PAL sessions from September?

**QUESTION 6:** What is the difference, in your opinion, between working on your own to solve problems, and working in groups?

**QUESTION 7:** Any recommendations to help teach programming?

**QUESTION 8:** Do you think you increased your overall confidence in computer programming?

**QUESTION 9:** Do you think you increased your overall confidence in working in groups regarding programming projects?

**End of Thesis**