

ULRR

An investigation into the effectiveness of ICT in learning for a class of adult female students case study approach.

Item Type	Thesis
Authors	Ramsey, Lucia M.
Download date	2026-06-09 08:48:19
Item License	https://creativecommons.org/licenses/by-nc-sa/1.0/
Link to Item	https://hdl.handle.net/10344/1829

**An Investigation into the Effectiveness of ICT in
Learning for a Class of Adult Female Students
A Case Study Approach**

Lucia M. Ramsey

Master of Arts in Digital Media Development for Education

University of Limerick

Supervisor: Geraldine Mc Weeney

Submitted to the University of Limerick, October 2011

Declaration

'I hereby declare that this is entirely my own work and that it has not been submitted for the award of any degree at any other university.'

Lucia Ramsey

Student ID 0627631

October 2011

Dedication

I dedicate this thesis to my wonderful children:

Ciana, Jordan and Khaelim.

*An Investigation into the Effectiveness of ICT in
Learning for a Class of Adult Female Students
A Case Study Approach*

Lucia M. Ramsey

Abstract

This paper presents a review and investigation into the effectiveness of ICT on learning. Research was conducted on an all female class of community care students in an adult education centre. In addition the effects, if any, of age or gender on the use of ICT were addressed. Based on the theories of Bandura and Vygotsky the research was carried out in a socio-constructive learning environment.

Effectiveness of ICT in learning was examined with respect to achievement, satisfaction, self-efficacy and collaboration. A comparison between learning through the use of ICT only, traditional learning only, and a blend of traditional learning combined with ICT learning was conducted.

Empirical evidence revealed that students achieve higher test scores and higher improvement through a blend of ICT and traditional learning. All students experienced satisfaction using basic ICT to learn other curriculum subjects. However students who had no previous ICT experience felt apprehensive about using ICT and exhibited lower satisfaction levels than students with previous ICT experience. Eighty nine percent of students experienced a measureable increase in self-efficacy while using ICT to learn regardless of previous ICT experience. ICT was conducive to collaborative learning when learning other topics. In contrast word processing reduced collaboration. Students perceived age, career and personal interest to have an effect on the digital divide. They did not, however, consider gender to be a major factor contributing to the digital divide.

Acknowledgements

Firstly, I would like to thank my supervisor, Ms Geraldine Mc Weeney for her patience, advice and encouragement. I deeply appreciate her faith in me and her persistence.

I would like to thank my colleagues and friends for their support and who generously proof-read this thesis.

I deeply appreciate and would like to thank the students who participated in this research.

I would like to thank my coordinator who encouraged me to do this Masters and gave me permission to conduct the research.

I would like to thank the staff at the University of Limerick for their assistance and support.

Table of Contents

CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background	1
1.2 Statement.....	2
1.3 Research Questions	2
1.4 Relevance	2
1.5 Significance.....	3
1.6 Research Methodology.....	4
1.7 Scope and Limitations.....	5
1.8 Structure	5
CHAPTER TWO.....	7
LITERATURE REVIEW.....	7
2.1 Adult Education.....	7
2.2 Adult Students.....	9
2.3 ICT and Education	10
2.4 Women and Lifelong Learning	11
2.5 Adult Learning Theories and ICT	13
2.5.1 Feminist Pedagogy.....	14
2.5.2 Constructivism to Socio-Constructivism	15
2.6 Socio-Constructivist Learning Theories and ICT	17
2.6.1 Learning Management Systems and Collaborative Learning.....	18
2.6.2 Collaboration and ICT	19
2.6.3 Self-Regulated Learning.....	20
2.7 Gender and the Digital Divide	21
2.8 Effectiveness and ICT	23
2.8.1 Achievement	24

2.8.2	Satisfaction.....	24
2.8.3	Self-efficacy.....	25
2.8.4	Collaborative Learning	27
2.9	Conclusion.....	30
CHAPTER 3.....		31
RESEARCH METHODOLOGY		ERROR! BOOKMARK NOT DEFINED.
3.1	Aims and Objectives of the Research	Error! Bookmark not defined.
3.2	Background to the Research.....	32
3.3	Research Approaches	33
3.4	Design Issues: Research Style.....	34
3.4.1	Action Research Style.....	34
3.5	Research Methodology and Rationale for Case Study.....	35
3.6	Data Collection Tools	37
3.6.1	Testing.....	38
3.6.2	Questionnaire	39
3.6.3	Observation	40
3.6.4	Group Interview and Group Discussion	41
3.7	Ethical Considerations.....	42
3.8	Analysis Techniques	42
3.8.1	Analysis Approach.....	42
3.8.2	Analysis Tools: Triangulation.....	43
3.9	Validity and Reliability	43
CHAPTER FOUR.....		44
RESEARCH FINDINGS		44
4.1	Introduction	44
4.2	Profile of Students	44
4.3	Does the use of ICT Improve Achievement?	46
4.3.1	Hypotheses Tests	50
4.4	Does the use of ICT Improve Satisfaction?	51
4.4.1	Questionnaire data on the Impact of ICT on Satisfaction.....	51
4.4.1.1	Pearson’s Correlation Coefficients for Satisfaction.....	53

4.4.2	Data from the Group Interview on the Impact of ICT on Satisfaction	56
4.4.3	Vignettes	58
4.4.4	The Impact of ICT on Satisfaction: Observations of the Message	58
	Conveying Exercise	58
4.4.5	Hypothesis Tests and Summary on Satisfaction.....	59
4.5	Does the use of ICT Improve Self-Efficacy?	60
4.5.1	Data from the Questionnaire and the Group Interview on Self-Efficacy ..	60
4.5.2	Observation of Self-Efficacy during an Anatomy Class.....	65
4.5.3	Hypothesis Tests and a Summary of Self-Efficacy	66
4.6	Does the use of ICT Improve Collaboration?.....	67
4.6.1	Questionnaire	67
4.7	Does the use of ICT contribute to the Age Divide or the Gender Divide?.....	71
CHAPTER FIVE.....		73
DISCUSSION OF RESEARCH FINDINGS.....		73
5.1	Introduction	73
5.2	Discussion by Research Question.....	73
5.2.1	Does the use of ICT in Learning Improve Student Achievement?.....	73
5.2.2	Does the use of ICT in Learning Improve Satisfaction?.....	74
5.2.3	Does the use of ICT in Learning Improve Student Self-Efficacy?.....	76
5.2.4	Does the use of ICT in Learning Improve Collaboration?	78
5.2.5	The Digital Age Divide.....	80
5.2.6	The Digital Gender Divide.....	81
5.3	Summary of Research.....	81
CHAPTER SIX		83
CONCLUSION		83
6.1	Introduction	83
6.2	The Impact of ICT on Achievement.....	83
6.3	The Impact of ICT on Learner Satisfaction.....	84
6.4	The Impact of ICT on Learner Self-Efficacy	84
6.5	The Impact of ICT on Collaboration	84
6.6	ICT, Gender and Age.....	85
6.7	Recommendations	85

6.8	Limitations.....	86
6.9	Further Research.....	86
	BIBLIOGRAPHY	87

List of Abbreviations

Abbreviation	Explanation
DfEE	Department for Education and Employment
FEU	Further Education Unit
HCA	Health Care Assistant
ICT	Information and Communications Technology
IS	Information Seeking
LLL	Lifelong Learning
OECD	Organisation for Economic Co-operation and Development
SRL	Self-Regulated Learning

List of Figures

- Figure 4.1 Age Ranges of Students
- Figure 4.2 Pre and post test results for the cell: ICT only
- Figure 4.3 Pre and post test results for the respiratory system: blended learning
- Figure 4.4 Pre and post test results for the reproductive system: traditional learning
- Figure 4.5 Post-test Marks
- Figure 4.6 Individual Improvement in Learning
- Figure 4.7 Scatter plot for satisfaction Q10, Q12, Q17, Q20
- Figure 4.8 Scatter plot for satisfaction Q11, Q16, Q18, Q19
- Figure 4.9 Scatter plot for satisfaction for Q39 and Q40
- Figure 4.10 Satisfaction levels for each question
- Figure 4.11 Satisfaction levels per question for each student
- Figure 4.12 Satisfaction levels for students with previous ICT courses
- Figure 4.13 Satisfaction levels for students with no previous ICT courses
- Figure 4.14 Self-efficacy scores per question
- Figure 4.15 Self-efficacy per question per student
- Figure 4.16 Collaboration levels per question
- Figure 4.17 Collaborative learning per question for each student
- Figure 4.18 Collaborative learning levels for students with no ICT experience
- Figure 4.19 Collaborative learning levels for students with previous ICT experience

List of Tables

Table 3.1	Research tools for each hypothesis
Table 4.1	Student profile: First nine questions on the questionnaire
Table 4.2	Summary of Results for Questions 1 to 9
Table 4.3	Table of pre-test and pos-test results
Table 4.4	Table of individual increase in marks and percentage improvement
Table 4.5	Table of highest and lowest improvement
Table 4.6	Table of questions for construct 1: Satisfaction
Table 4.7	Pearson's Linear Correlation Coefficient for construct 1: Satisfaction
Table 4.8	Student Scores for Construct 1: Satisfaction
Table 4.9	Table of scores for each question in construct 1: Satisfaction
Table 4.10	Summary of the message giving exercise
Table 4.11	Table of satisfaction levels from the message exercise and the questionnaire
Table 4.12	Questions for construct 2: Self-efficacy
Table 4.13	Student scores for construct 2: Self-efficacy
Table 4.13a	Frequency of scores for construct 2: Self-efficacy
Table 4.14	Pearson's Linear Correlation Coefficient for construct 2: Self-efficacy
Table 4.15	Self-assessed confidence compared to questionnaire
Table 4.16	Table of questions in construct 3: Collaboration
Table 4.16a	Frequency of scores for construct 3: Collaboration
Table 4.17	Student scores for construct 3: Collaboration
Table 4.18	Pearson's Linear Correlation Coefficient for Construct 3: Collaboration

List of Appendices

- Appendix A Tests
- Appendix B Questionnaire
- Appendix C Group Interview
- Appendix D Group Discussion
- Appendix E Observations Anatomy
- Appendix F Observations Report Project
- Appendix G Observations Message Conveying
- Appendix H Vignettes
- Appendix I Construct Diagrams

Chapter One

Introduction

1.1 Background

The Irish further education system faces challenges of increased demand as more and more adults look to education to improve their employability. One of the main reasons adults return to education is to obtain qualifications that will enhance their employment options (Scanlon 2008). Adult students are aware of the benefits of developing Information and Communications Technology (ICT) skills, they are also aware that a lack of ICT skills can be a disadvantage when competing for work. Further education centres should provide ICT courses to equip their students for work.

Some researchers maintain that ICT has a negative effect on learning (Wellinsky 1998) whereas others argue that ICT improves learning (Chou and Liu 2005). Current research considers that there are many aspects to successful learning. Achievement is the most fundamental aspect of learning, however satisfaction and self-efficacy are deemed important because they motivate students to embrace Lifelong Learning (LLL). The way in which ICT is integrated into the learning environment has an impact on its effectiveness.

Socio-constructive learning is ideal for adult students and integrating ICT can enhance this learning environment (Bellefeuille *et al.* 2005). However students' attitudes to ICT can affect their learning. Joiner *et al.* (2006) state that there is a gender difference in attitudes to ICT and women are more apprehensive about using ICT. In contrast Rainer *et al.* (2003) found that women had a more positive attitude to using ICT.

It is imperative that further education becomes more flexible and caters to the lifestyle of its students by providing onsite crèches and aligning its timetable with the primary school timetable to facilitate access to education for adults, particularly women.

1.2 Statement

Clark (1994) stated that it is not the medium but the pedagogy that affects learning. Chou and Liu (2005) challenge this concept maintaining that ICT has a positive affect on learning. This research investigates whether ICT has any effect on learning, with particular focus on the effect of ICT on achievement, satisfaction, self-efficacy and collaboration in a socio-constructive learning environment. This case study also explores the digital divide with respect to gender and age.

1.3 Research Questions

The purpose of this study is to investigate the effectiveness of ICT in adult education specifically within an all female class of community care students.

This study will address the following:

- Does the use of ICT in learning improve achievement?
- Does the use of ICT in learning improve satisfaction?
- Does the use of ICT in learning improve self-efficacy?
- Does the use of ICT in learning improve collaboration?
- Does age or gender have an impact on the use of ICT?

1.4 Relevance

Adult education institutions often do not consider ICT provision when planning community care courses. However due to the prolific use of ICT in the workplace and society adult education centres should be obliged to equip their students with ICT skills

An increasing aging population has resulted in an increased demand for Health Care Assistants (HCAs) now and in the foreseeable future. The Health Service Executive (HSE) and Nursing Agencies require that HCAs hold at minimum a Further Education and Training Awards Council (FETAC) Level 5 qualification in Community Care. Demand for this qualification which will become compulsory in January 2012 is growing. The increasing need to be ICT literate puts pressure on community care courses to provide opportunities for HCAs to learn or upgrade their ICT skills.

This case study focuses on a class of female adult students studying a FETAC Level 5 Award in Community Care. While this course is in its infancy it is vital that it is researched and recommendations are implemented and re-evaluated on an ongoing basis. An assessment of the effects of ICT in this course is essential to ensure that students receive optimum benefit from ICT in their learning.

There is a lot of research on the effectiveness of ICT in education in terms of achievement and satisfaction, however relatively little research has been carried out on effectiveness in terms of self-efficacy and collaboration (Piccoli 2001). This case study investigates the effectiveness of ICT in terms of achievement, satisfaction, self-efficacy and collaboration. It also investigates the digital divide with respect to gender and age. It would be very informative to investigate how this particular all female group of students perceive the gender divide as they appear to be typical of the low income, low status women on whom the digital divide has greater impact (Jackson 2003). The digital divide with respect to age is underestimated (Bellefeuille *et al.* 2005). The students in this study have an age range spanning late twenties to late fifties, they also work with older people hence their perceptions may offer a valuable insight into the issue of age and the digital divide.

1.5 Significance

This study will explore the effects of integrating ICT into a FETAC Level 5 Community Care Course. This study offers an analysis of the effects of learning

through ICT for adult community care students. It provides data for interpretation and possible further research.

This study has the potential to contribute to current research on the effects of ICT in learning which could also add to current knowledge regarding the digital divide. It may benefit educators by highlighting best practice for teaching female, adult students. It may be of particular significance to other community care teachers as it may offer insight into community care students' reactions to the use of ICT in learning.

1.6 Research Methodology

A case study approach combining both qualitative and quantitative data collection tools was deployed. A purposive and convenient sample consisted of a class of nine female community care students. Data collection tools were triangulated to ensure validity and reliability of results. Five data collection tools were utilised: tests, a questionnaire, observations, a group interview and a group discussion.

Pre-tests and post-tests compared improvement in achievement in three different learning situations:

- (i) ICT only,
- (ii) a blend of ICT and traditional learning,
- (iii) traditional learning only.

The questionnaire collected quantitative data on satisfaction, self-efficacy and collaboration while using ICT.

Three sets of observations collected data during three learning situations:

- (i) using ICT to learn other curriculum topics,
- (ii) using ICT for word processing,
- (iii) using unfamiliar ICT equipment.

The observations collected data relevant to satisfaction, self-efficacy and collaboration.

The group interview collected qualitative data about satisfaction, self-efficacy, collaboration, perceived learning and the digital divide. The group discussion collected data on women and education.

1.7 Scope and Limitations

This study was conducted in an adult education centre in an urban area of the North West of Ireland. However the participants were from a rural area. The time frame was one academic year. A class of community care students comprised the purposive and convenient sample. A case study approach was chosen, the results of this study may not be generalisable due to the small size of the sample. However there is a demand for community care courses throughout Ireland and the results may be transferable.

A case study can be subjective which makes it vulnerable to bias. A mix of quantitative and qualitative data collection tools assisted triangulation. In order to ensure effective triangulation the researcher should apply the data collection tools with rigour. Piloting the data collection tools will help minimise bias.

1.8 Structure

This study consists of six chapters. Chapter one provides background to the study, outlining the purpose of the research and its significance.

Chapter two, the Literature Review considers current research in adult education, it focuses on women in education and the impact of ICT on adult education, specifically women's education. It investigates current literature on the digital divide. It examines current views on socio-constructivist learning and on the effect of ICT in learning with regard to achievement, satisfaction, self-efficacy and collaboration.

Chapter three, the Methodology specifies why the case study approach was chosen. It gives an outline of the data collection tools deployed and how they triangulate to provide validity and reliability.

Chapter four, Research Findings, presents the results of the data collected by research question. Five data collection tools provide evidence pertinent to the six research questions.

Chapter five is a discussion of the findings in the context of the literature review.

Chapter six, Conclusion, draws evidence and argument together, identifying areas that may need further investigation. It also outlines recommendations.

Chapter Two

Literature Review

2.1 Adult Education

Lifelong learning occurs in the home, the community, at work and in educational institutions. According to the UK government's Green Paper, lifelong learning is an investment in human capital, it is good economic policy and promotes equality of opportunity (Department for Education and Employment [DfEE] 1998). The Organisation for Economic Co-operation and Development (OECD 1996) and the European Commission (2000) also maintain that lifelong learning can reduce social exclusion. However Edwards *et al.* (2002) and Gorard (2003) maintain that there is still exclusion.

Lifelong Learning (LLL) is learning throughout the entirety of one's life, from birth to death but in reality LLL is often referred to as the education of adults (Ala-Mutka *et al.* 2008). Andragogy is a term often associated with adult education. It encompasses the wider range of adult learning and life learning (Carlson 1989). Within education Knowles *et al.* (1990) states that andragogy is self-directed learning with the teacher as a guide or facilitator.

Sheridan (2007) acknowledges that as adults and children are different they should be taught differently and that andragogy is a method rather than a theory. Andragogy develops differently to pedagogy as it addresses social, financial and personal issues (Savicevic 2008). Moreover, the teaching and learning in andragogy is based on different theories and philosophies to those of pedagogy (Muirhead 2007).

According to Scanlon (2008) educational policies are based on economic needs, curriculum is based on employers' needs and students are marketable products. In fact there are five groups with a vested interest in education and their sociological,

historical, psychological and philosophical theories have influenced education today (Ernest 1991). They are the industrial trainers, the technological pragmatists, old humanists, progressive educators and public educators. These five groups influence curriculum, the funding for courses, the teaching approaches, the skills and knowledge the learner will acquire and the economic needs of society that the learner will deploy.

The industrial trainers promote authoritarian education, practical knowledge and drill and practice learning methods. This system produces students with a basic education for the future workforce.

The technological pragmatists promote knowledge and skills associated with science, technology, computers and communications. Curriculum policy is informed by employers and industry, producing a marketable student and a workforce that advances society.

The old humanists are the conservative upper classes. They promote education for the joy of learning. They advocate for a classical education with pure knowledge and produce professionals.

The progressive educators advocate a student-centred approach to education with constructivist teaching and learning. This system produces self-motivated individuals.

The public educators consider education to be political. They use education to empower students especially minority students, this produces politically aware, fully functioning members of society.

Although adults return to learning mainly for social and financial reasons (Illeris 2004), lifelong learning has a good effect on the health and psychological well-being of the individual (Bolsin 2008; Schuller *et al.* 2002). It improves their quality of life, their independence and enables them to play a more active role in society (Swan 2008; Innocent 2008).

2.2 Adult Students

It is rare to remain in the one lifelong job (Edwards *et al.* 2002) and because of the information age workers constantly need to up-skill (Aronowitz and DiFazio 1999; Scanlon 2008) and keep abreast of Information and Communications Technology (ICT).

Lifestyle, opportunities and attitudes are major determinants in the up-take of courses for adults (Harrison 1993). According to Scanlon (2008) motivations for adults to return to learning are for: economic reasons, enhanced qualifications, career path opportunities, networking, community work, second chance education, the opportunity to be a role model for their children and to achieve their dreams. However some of the obstacles that adults need to overcome to access education are the costs, both direct and indirect costs, for example, child minding, reduction in work hours and travel (Maguire *et al.* 1993). These costs are more inhibitive for low-income women (Park 1994). In addition the reduction in time for a social life can deter potential students (Further Education Unit (FEU) 1993). Adults have many responsibilities and need a course that will fit around their lifestyle (Park 1994).

According to Carlson (1989), Knowles was an advocate of andragogy. He believed in individualism, democracy and self-help and incorporated these ideas into his interpretation of andragogy. Muirhead (2007) claims that Knowles *et al.* (1984) made assumptions about adult students that differentiate them from children and teenage students:

- Adults want to be involved in organising and planning their learning and to use self-evaluation tests.
- Adults want to learn topics that they can directly apply to their life.
- Adults want to learn through practical, relevant problem solving rather than theory.
- They want to be able to use their previous experiences as a scaffold for learning.

Brookfield (1993) advances this thereby adding that adult students are self-motivated learners. In contrast Carlson (1989) argues that Knowles' (1984) assumptions are ungrounded and that some students need to be directed and extrinsically motivated.

Early school experiences affect an adult's attitude to education and therefore the classroom atmosphere should be non-threatening. The learner should feel that the classroom is a safe place (Fabb 1984). Fabb (1984) emphasises the importance of a good teacher-learner relationship to encourage learning. Self-evaluation tests are of great benefit to the adult learner, their strengths build confidence and self-efficacy and their weaknesses direct the learner to the next goal and challenge (Fabb 1984).

Adult students progress better if learning is reflective (Schon 1987). There are two types of reflection; 'reflection in action' and 'reflection on action'. Reflection in action occurs spontaneously as the event is unfolding. It is the ability to use previous experience and current knowledge to creatively deal with the unfolding event. Reflection on action is looking at the event with hindsight and evaluating the actions, reactions and consequences and then learning from the reflection. A journal is an effective method of reflection (Mezirow 1991).

2.3 ICT and Education

Over the past one hundred years a revolution has been occurring in education. Education is becoming more student-centred and constructivist. Emphasis is placed upon building professional relationships between teacher and student and between students. At the tail end of this revolution is technology (Norman and Sphorer 1996). While the pedagogy is not new the technology offers vast potential for new applications of the pedagogy (Norman and Sphorer 1996) and changes in education (Hui *et al.* 2007). Mulnar (1997) claims that it is no surprise that education does not keep pace with technology, science or the economy; it takes twenty to thirty years to integrate new concepts into physics and mathematics, computers have been about for seventy years. Their integration is not slow based on previous education standards.

ICT offers a wide range of learning experiences that will utilise more of the learners multiple intelligences. There has been a huge increase in on-line learning (Otte 2007, Allen and Seaman 2006). The Internet with its exponentially expanding knowledge repository, easy access and global communications network, is used in web-based courses and blended learning courses from undergraduate to doctoral level, both in specialised courses and training courses (Allen and Seaman 2006). However, according to Allen and Seaman (2006) the initial capital expenditure is a deterrent and online courses require a lot of faculty time. Moreover faculty members need to be convinced of the value of online courses. Hui *et al.* (2008) argue that web-based courses can be organised and prepared in less time than traditional courses. In support Zhang *et al.* (2004) claim that in a student centred e-learning course students can perform better than traditional classroom students.

Students who avail of online courses tend to be older, with work and family obligations (Allen and Seaman 2006). The majority of educational leaders in America believe that students who avail of online learning would not be able to avail of traditional learning and that the learning outcomes of online courses are as good as, if not better than, traditional courses (Allen and Seaman 2006).

2.4 Women and Lifelong Learning

LLL is driven by industry, commerce and global economics therefore, it is not lifelong education. Consequently only particular skills and knowledge are valued, not the skills and knowledge of working-class women (Jackson 1999). This is evident as women still have lower average earnings than men (Park 1994). Unpaid labour, while invaluable to society, is not valued in the marketplace as it is not part of the masculine definition of work (Warring 1999). The masculine definition of work rewards the single-minded focus on work in the workplace and rewards non-incremental study in education. Women are assessed on the basis that these attitudes and behaviours are the acceptable norm whilst women need the flexibility of incremental study (Stalker 2001). Hart (1997) argues that the focus on learning for profit to satisfy corporate needs should be replaced with a focus on learning for life.

It is acknowledged that lower socio-economic groups, the unemployed, women and minority groups have less access to education, especially higher education, and that women have less opportunity than men to receive on-the-job training, third level qualifications or an occupational pension (Jackson 2003). LLL could counter this imbalance (DfEE 1998). However, according to Jackson (2003) LLL does not address inequality of opportunity because it is integrated into a society which already has race, class, age and gender inequalities and therefore these inequalities are reproduced in LLL.

In the developed world factors that inhibit women's access to education include stereotyping of subject option choices in unisex schools, sexual bias in classes, teachers expecting less of girls and lower self-esteem in girls (Gokool-Ramdoos 2005).

Although there are more women than men in adult education, women must deal with gender disadvantages (Stalker 2001). Gouthro (2005) points out that while there are more women in adult education than men, at higher levels of education there are more men than women and that women have to negotiate their education around childcare and domestic responsibilities.

Women use education to progress from unpaid work at home into the paid workforce (Bird 1999). They regard education as a step towards financial independence (Tian 1996). Women also believe that they are setting a good example to their children (Gouthro 2004). However, once in the workforce women are less likely to receive in-service training than men (Jackson 2003).

Regardless of the diversity among women, their domestic situation often leaves women at a disadvantage (Gouthro 2005). Women are challenged by the responsibilities of parenthood and of being a student (Bagilhole 2002) and limited by the unequal division of housework (Davies and Carrier 1999; Sutor *et al.* 2001) and a lack of support from their partners (Gokool-Ramdoos 2005; Stalker 2001). In fact research by Gouthro (2004) suggests that single mothers experience less conflict when they decide to return to education. Educational institutions do not acknowledge the difference in experience based on gender and there is an expectation that a female student's work should not be affected by family responsibilities and, on the other

hand, woman must also show that family responsibilities are not being affected by her educational commitments (Edwards 1993).

Multitasking working class women often cannot access educational courses because the inflexible timetabling does not allow for childcare arrangements (Dearing Report 1997). According to research by Kemp (2002) predictors of attrition are life circumstances, transitions, motivation, attitudes, self-efficacy and personality. Moreover Kemp (2002) emphasises that the inability to balance work, family and marriage responsibilities is a major factor in attrition rates among women students. Often women discontinue their education due to family commitments (Gouthro 2005).

Courses should be designed to address social issues that impede women's access to education and provide a supportive environment to prevent high attrition rates among women students (Gokool-Ramdoos 2005; Gouthro 2005). Some changes are occurring; institutions are offering more flexible timetables and childcare facilities. However Bagilhole (2002) argues that these changes need to occur at policy level and more change is needed for inclusive LLL.

Although the benefits of LLL include improved economic, social, psychological and physical well-being (Jackson 2003) these benefits are not accessible to working-class women in low paid, low status jobs trapped in a cycle of lifelong earning.

2.5 Adult Learning Theories and ICT

Clark (1994) maintains that it is not the medium, but the pedagogy that produces outcomes. According to Illeris (2004) there are two basic processes in learning: the external interaction between the learner and their social, cultural and physical world and the internal psychological process. These two processes are affected by the learner's cognitive abilities, their beliefs, attitudes and emotions and their social abilities. Epistemological beliefs about knowledge and the nature of learning can affect a student's ability to learn using ICT (Jacobson and Spiro 1995).

Students' attitudes to technology mediated learning are affected by the quality of the teacher and the teacher's attitudes (Piccoli 2001; Baylor and Ritchie 2002). The teacher's concept of learning determines the teaching approach, learning strategies and learning environment and hence the learning outcomes (Gibson 2001). The effectiveness with which ICT can be used as a learning tool is highly dependent on how the teacher introduces and develops ICT (Leach and Moon 2000).

2.5.1 Feminist Pedagogy

Feminist pedagogy provides a framework which is more inclusive of women and informs gender issues in education. It rejects cultural gender roles such as women are good at literature and men are good at mathematical sciences. According to the National Institute for Women-in-Science 'Feminism promotes social, economic and political equality of men and women'.

Feminist pedagogy is rooted in alternative pedagogies and aims to create a positive learning climate for all students while acknowledging the experiences of women and connecting the class content with life experiences. It cultivates Higher Order Thinking Skills (HOTS) for both inside and outside the classroom aiming to integrate knowledge into the students' world. Feminist pedagogy is still evolving but it is not solely about pedagogy, it is also about content (Middlecamp 1999).

Feminist pedagogy offers content relevant to women's lives and women's achievements throughout history. Feminist pedagogies based on Freire (1970) accept that knowledge is not value free and therefore the origins and promoters of the knowledge should be critically examined.

It emphasises how gender imbalance is embedded in language and interactions and should be countered to produce a learning climate that does not favour one gender over the other. Furthermore feminist pedagogies hold with Freire's (1970) idea that education either conditions the younger generation into the ways of society or that it is the practice of freedom. To achieve the practice of freedom teachers can encourage critical, creative thinking.

Collaborative learning and a shift in control from the teacher to the student is also encouraged in feminist pedagogy. Active learning encourages students towards independent learning. This empowerment of students is recommended in feminist pedagogy.

One cannot separate LLL from life. This implies that the imbalance in gender power relations should be studied. A feminist approach to education would redress the gender imbalance that permeates current education (Gokool-Ramdoos 2005).

2.5.2 Constructivism to Socio-Constructivism

Constructivism has its basis in subjectivist philosophy: the individual's reality is a personal interpretation based on their experiences and cognitive abilities. It is a holistic approach in which the learner is viewed as a cognitive subject actively participating in knowledge construction by providing, manipulating and analysing information (Chuang and Tsai 2005). The learner progresses through an emerging conceptual change integrating new information with their current knowledge and then assimilating it (Jonassen 1991; Leidner and Jarvenpaa 1995).

Constructivism advocates hands on, learning by doing, discovery learning and an experiential approach. This approach has its critics; Mayer (2004) claims pure discovery is not a method of instruction, he provides evidence of the inadequacy of discovery based learning. Krischner *et al.* (2006) concur claiming that constructivism is too unguided and that beginners in particular need a mental 'schema' before they can learn by doing. Although constructivism advocates that the learner build up knowledge, guidance and support is required from the teacher to ensure learning occurs (Khine 2003). For example Ng'ambi and Johnston (2006) state that critical thinking skills, which are a result of constructivist learning, are taught by encouraging critical questioning and reflection and in this situation the teacher acts as a consultant and guide. Hmelo-Silver *et al.* (2007) argue that highly scaffolded discovery learning is effective. Hoic-Bosic *et al.* (2008) concur claiming that constructivism is the most widely accepted learning approach however, they advocate a combination of behaviourist, cognitive and constructivist approaches to learning.

According to Piaget's theory of cognitive development the task must be at the appropriate developmental stage of the student, no amount of activity will help the student grasp a concept unless the student is cognitively ready. Mayer (2004) also points out that at times students need to be cognitively active to learn rather than physically active. Hwang and Arbaugh (2009) reiterate that one should not misinterpret participation in active learning as cognitive learning.

Cobb, Wood and Yackel (1992) claim that constructivism does not place enough emphasis on the interpersonal or social aspects of teaching and learning. Vygotsky (1978) believes in a consensual reality and suggested that learners develop cognitively by interacting with others in collaborative activities such as discussions, experiments and debates. Through social discourse learners externalise their ideas to be negotiated, altered, developed and legitimised before finally internalising the evolved idea (Vygotsky 1978). This social discourse expands the learners' metacognitive activity through dissatisfaction, evaluation and the sharing and challenging of opinions, beliefs and alternative points of view (Alavi 1994).

Vygotsky maintains that the fundamental mechanism of cognitive development is social interaction, especially with others who are more intellectually advanced but still within the 'zone of proximal development' (Snowman and Biehler 2000). Through discussion and critical enquiry students construct a 'scaffolding' framework to solve problems collaboratively. Many researchers agree that learners construct knowledge during social interactions and that collaboration is essential to develop higher order thinking skills Maor (2000).

A socio-constructivist approach demands that learning is authentic and personally relevant, incorporating individual knowledge and experience, encouraging active engagement, personal autonomy and reflexivity to create shared meaning (Bellefeuille *et al.* 2005). Going one step further, situated learning is based on the concept that learning is not merely individual. Learning is deeper and more meaningful when knowledge is situated in context and culture (Leidner and Jarvenpaa 1995). This ensures a student-centred approach accommodating differences in learning styles, cultural heritage and personal values (Shen *et al.* 2008).

The type of knowledge and learning required will effect the pedagogical principle employed, demanding that the teacher progress through a series of roles from the expert transmitting knowledge to a facilitator encouraging activities and discussions to a participant in a democratic problem solving process. This depends on the student also progressing through roles from a passive recipient to a collaborator as the teacher increasingly shares control and responsibility for learning (Nilsen and Puroo 2005).

2.6 Socio-Constructivist Learning Theories and ICT

Technology has proved itself an excellent resource promoting a move away from the transmission of knowledge towards the construction of knowledge (Bellefeuille *et al.* 2005; Chuang and Tsai 2005). The teacher increasingly facilitates creation of the learning environment and of meaning and provides opportunities for learning to occur. The student is no longer a receptacle to be filled with knowledge but assumes ownership of their learning (Chuang and Tsai 2005).

The parallel growth of constructivist learning activities and technologies in schools (Goldstein and Puntambeckar 2004) has meant that schools and colleges are shifting emphasis from classroom instruction to the design and delivery of online and blended courses which allow for a wider application of constructivist principles (Bellefeuille *et al.* 2005; Lee and Tsai 2011). A valuable aspect of web-based learning is that it is self-paced and reflective, essential for constructive learning (Bellefeuille *et al.* 2005). Online communities are ideal for socio-constructive learning offering a diverse audience of people to interact with, exposing students to experiences, ideas and opinions they may not experience outside cyberspace (Reigeluth 1991).

A constructivist instructional design framework should be interactive, encouraging collaboration and embedding problems within a realistic context to maintain interest. Course designers should aim to cultivate personal autonomy and self regulated learning by scaffolding knowledge, facilitating independent learning and offering authentic learning tasks (Bellefeuille *et al.* 2005; Chuang and Tsai 2005). Yet despite these preconditions a survey carried out by Chuang and Tsai (2005) found that students, regardless of gender, considered factors such as negotiation, inquiry

learning, reflective thinking and challenge were not as important and that relevance of the learning task and ease of navigation were considered to be of paramount importance when learning through the Internet. These results concur with Maor (2000) who also established relevance and authenticity as the main preference among students for Internet mediated learning.

Shen *et al.* (2008) also suggest that relevance increases interest and deep learning. This viewpoint implies that the task should be presented in an integrated manner and not compartmentalised into separate abstract subjects.

2.6.1 Learning Management Systems and Collaborative Learning

Learning Management Systems (LMSs) like WebCT, Moodle and Sakai offer excellent user friendly communications tools for global e-learning communities (Sclater 2008). LMSs provide an e-learning platform with resources, activities and a global communications network on which educators can create and develop online courses.

Internet-based learning encourages the student's construction of knowledge and social interaction. Moodle, for example, claims to have been built for socio-constructive learning, however according to Sclater (2008) and Chaung and Tsai (2005) these powerful LMSs can be considered 'pedagogically neutral' (Sclater 2008) as they are artefacts whose utilisation depends on the intentions of the course designer. The Internet can be used to implement constructivist teaching or developed by constructivist principles or it can be used in any number of uninspiring ways, for example, a PowerPoint presentation (Sclater 2008). It is interesting that Moodle itself is a continually evolving successful global collaborative project (Sclater 2008).

The plethora of resources on the Internet allows instructors to design courses for the specific learning style, culture, background, experience and interests of their students. While searching the Internet students learn to differentiate between resources improving their Internet literacy. These LMSs and similar interactive Virtual

Learning Environments (VLEs) have resulted in the spread of constructivist curriculum design (Bellefeuille *et al.* 2005).

Bellefeuille *et al.* (2005) recommend that, due to the increasing number of adults availing of online learning, pedagogy should be re-evaluated and andragogy and online teaching and learning concepts should be incorporated into course design.

2.6.2 Collaboration and ICT

According to Alavi (1994) three factors are necessary for effective learning: a constructivist approach, collaboration and problem solving. Alavi (1994) and Johnson *et al.* (1991) maintain that collaborative learning strategies utilising ICT achieve this.

Research has revealed that collaborative learning in both face-to-face situations and online improves deep learning through enhanced understanding and students are less likely to use memorisation and rote learning (Hiltz and Goldman, 2004). However Tutty and Klein (2008) found that students studying collaboratively achieved better in traditional courses than on online courses although many researchers also comment on the potential of online courses for collaborative learning (Jeong and Joung, 2007).

According to Lee and Tsai (2011) it is now widely accepted that students will use the Internet for learning. However Rovai *et al.* (2006) point out that online courses have a higher attrition rate and lower enrolment than blended or traditional courses. A successful online learning environment should involve collaborative learning (Hiltz and Goldman, 2004), when students perceive their online experience as being part of a community working together their achievement improves (Shen *et al.* 2008). This is further reinforced by Rovai and Lucking (2003) who found that online learners lose intrinsic motivation when there is no collaborative learning as they have no sense of belonging to a community.

In online collaborative learning students have access to a wider breath of information and knowledge than in traditional learning and they get to view the subject in a

broader context (Shen *et al.* 2008). Students need to enjoy working with other students to benefit from collaborative learning.

From extensive research Shen *et al.* (2008) found that collaborative learning produced better results than traditional learning but it was noted that students do not collaborate online unless there are activities to make collaboration necessary. According to Cheng *et al.* (1991) students who work independently on distance learning courses have a higher drop out rate, at seventy eight percent, whereas those who collaborate have a drop out rate of only ten percent. However it was found that as students become more experienced with Internet-mediated courses they are more inclined to collaborate online, their Self-Regulated Learning (SRL) and Information Seeking (IS) also improves (Lee and Tsai 2011).

The narrow focus on tangible goals and test scores may ignore some of the ways students develop and grow (Draco-Severson *et al.* 2009). More emphasis is being put on students' attitudes towards ICT and the online learning experience than on achievement as these factors effect attrition and further enrolment on online courses (Ginns and Ellis 2007; Piccoli 2001).

2.6.3 Self-Regulated Learning

According to Allen and Seaman (2006) educational leaders in America believe that the main obstacle to offering online courses is that students participating in online learning need to be self-motivated, self-regulated learners. Many students are unable to direct their own learning and require support (Reeves 1993). The ability to self-motivate and organise one's learning are crucial to preventing drop-out from online courses (Artino 2008).

Internet-mediated learning offers students the opportunity to work in their own time at their own place but this also demands a high level of autonomy from the student, the student needs to be a self-regulated learner in order to be successful in on online courses (Lee and Tsai 2011). ICT can be designed to enhance learner control (Williams 1996 cited in Chou and Liu 2005) allowing the student control over pace,

path, sequence and content in a learning environment (Milheim and Martin 1991). This enables students to become independent learners, to take responsibility for their own learning and to become more motivated (Kelley and Ringstaff 2002). A student with a high level of learner control attributes their success to themselves and this increases self-efficacy (Martin and Briggs 1986 cited in Chou and Liu 2005).

Results from research (Lee and Tsai 2011) indicate that students felt that they could collaborate better and were more capable of Self-Regulated Learning (SRL) on Internet-based courses rather than in traditional courses. They also found information seeking (IS) more productive and interesting on the Internet-based courses. Blended learning offers the practical experience, engagement and instant interaction of traditional learning combined with the flexibility and almost infinite resources of Internet-mediated learning. A moderate amount of time spent working on the Internet produced higher self-efficacy and a more enjoyable collaborative learning experience (Lee and Tsai 2011). As a student attends more Internet-mediated courses their satisfaction, self-efficacy, interest in collaboration, SRL and IS improve and they also consider the courses to be of more value (Arbaugh 2004).

2.7 Gender and the Digital Divide

Barraket (2004) suggests that ICT could make learning more flexible and reduce the learning divide. The European Commission (2001) adds that ICT is an asset to lifelong learning. However, acknowledging the inequality in access to learning Gorard and Selwyn (2005), Selwyn *et al.* (2005) and Reynolds *et al.* (2003) argue that ICT will reinforce the inequalities in the learning divide as both the learning divide and the digital divide target the same groups: low socio-economic groups, women and minority groups.

According to Attewell (2001), Losh (2004) and Joiner *et al.* (2006) gender is the main factor contributing to the digital divide. However Korupp and Szydluk (2005), Selwyn *et al.* (2005) argue that socio-economic status affects the digital divide. Vandebroek *et al.* (2008) maintain that motivation and anxiety contribute to the digital divide and from their research Bernier and Laflamme (2005) suggest that age

is another factor that should be considered. Gorard and Selwyn (2005) argue that these factors are interrelated and that socio-economic status is mediated by gender. Cooper (2006), from his review of research, and Brosnan (1999) maintain that motivation and anxiety with regard to ICT are directly associated to gender. Although Rainer *et al.* (2003) maintain that computer anxiety has decreased for both men and women.

Korupp and Szydlik (2005) further argue that the gender gap on ICT use and ICT ownership is closing. However, according to Losh (2004) men are still using ICT more than women. In a cross-sectional survey of college students in America in 1995 and 2002 Rainer *et al.* (2003) concluded that there has been an increase in computer usage for both males and females and both sexes are taking on more computer courses in college. In agreement with Korupp and Szydlik (2005), Rainer *et al.* (2003) maintain that the gender gap in experience and types of applications used has decreased. However in agreement with Losh (2004), Rainer *et al.* (2003) found that males still exhibit higher on-line usage than females.

According to Ogletree and Williams (1990) males have more self-efficacy and confidence than females when working with ICT. However Henry and Stone (1999) recorded no gender difference in self-efficacy or confidence in their research. In a more recent study Rainer *et al.* (2003) discovered that females' attitudes to computers were in fact more positive than males' attitudes.

Research by Gokool-Ramdoo (2005) acknowledges the importance of ICT to enable access to education. She maintains that online education is the easiest method for women to access an education with minimal disruption to family life. From her research findings Gokool-Ramdoo (2005) recommends that online courses should be designed to be flexible and there should be a negotiation of deadlines. She argues that courses should aim to overcome learner isolation, to accept feedback, to be student-centred, to provide user-friendly packages and enable learner control. This will widen access to education for women and consequently for all. Vandebroek *et al.* (2008) agree emphasising that the family dynamic should be considered when designing online courses.

2.8 Effectiveness and ICT

Although ICT has an impact on education very little is known about its effectiveness on learning (Piccoli 2001). Effectiveness, historically, was measured by student achievement and satisfaction (Piccoli 2001) but there are other determinants of effectiveness such as self-efficacy (Chou and Liu 2005; DeTure 2004), emotional learning climate (Chou and Liu 2005), collaborative learning, learning community support (Wang 2003) and perceived learning effectiveness (Hui *et al.* 2007). Based on previous research, Alavi *et al.* (1995), Compeau and Higgins (1995) and Chou and Liu (2005) maintain that effectiveness can be assessed in terms of achievement, satisfaction, self-efficacy and learning climate. Research carried out by Hui *et al.* (2008) comparing effectiveness and satisfaction in traditional courses with technology-assisted courses found that there was a positive correlation of perceived effectiveness with perceived learning community support, perceived ease of learning and satisfaction. They also found a positive correlation of satisfaction with perceived learning community support and ease of learning.

Many studies maintain that the use of ICT compared to traditional learning has made ‘no significant difference’ (Russell 1983) to learning effectiveness (Aragon *et al.* 2002) and that achievement is at similar levels (Piccoli 2001, Aragon *et al.* 2002, Abraham 2002). This is confirmed by a meta-study by Bernard *et al.* (2004).

Norman and Sphorer (1996) suggest that measuring achievement only, gives very little insight into the quality of the learning experience. Although there may be no substantial difference in achievement, there may be a difference in other aspects of effectiveness; satisfaction, self-efficacy and collaborative learning. These aspects can keep a student motivated to learn and to progress to further courses (Artino 2008). Hui *et al.* (2008) concur with Norman and Sphorer (1996) adding that the nature of the knowledge to be acquired by the student moderates the effectiveness of technology-mediated learning and that the technology should match the type of knowledge to be acquired.

2.8.1 Achievement

Achievement is measured in terms of test results, methods of testing may need to be changed due to the impact of ICT on learning. Some research indicates that ICT has a negative effect on academic achievement, (Wenglinsky 1998) or an insignificant effect (Clark 1983) whereas other research argues that ICT has a positive effect on achievement (Koedinger *et al.* 1997; Chou and Liu 2005). Fjermestad and Hiltz (1999) noted that although there was little difference in achievement between e-learning and traditional classroom learning, the satisfaction levels in e-learning were very low. It was also noted by Frederickson *et al.* (2004) that students were less satisfied with the teacher delivering online courses but more satisfied with the learning community support. However Johnson *et al.* (2000), refute Frederickson *et al.* (2004) claiming that the use of ICT positively influences students' perceptions of the teacher and the course. Hoic-Bozic *et al.* (2008) concur with Johnson *et al.* (2000). Hoic-Bozic *et al.* (2008) found that students were satisfied with the teacher and achievement had improved while using ICT. They also highlighted a significant reduction in attrition rates due to student satisfaction with the teacher.

According to Kadiyala and Crynes (2000) the appropriate use of ICT combined with good pedagogy improves achievement. They also noted that technology seems to have a more profound effect on weaker students than on average or above average students.

2.8.2 Satisfaction

Hui *et al.* (2007, p. 247) define learning satisfaction "as the perception of being able to achieve success and positive feelings about achieved outcomes." The most commonly considered variable in ICT research is satisfaction and satisfaction influences the choice to engage in further courses (Artino 2008) which is of interest to research as on-line courses have a high dropout rate (Kumar *et al.* 2001). Self-efficacy, value placed on the learning activity, and perceived instructional qualities are predictors of satisfaction (Artino 2008).

In computer-mediated communication for distance learning, students derive satisfaction from a sense that the teacher has a social presence, prompt feedback is provided, there is a decent curriculum and proper course design. They also derive satisfaction by improving their ICT skills and collaborative learning (Moore 2002). Dissatisfaction stems from lack of confidence, low self-efficacy, fear of failure, loneliness, inexperience with collaborative work and subject matter that has no real-life applications (Moore 2002).

According to Hui et al. (2008) there are three major factors that predict student satisfaction: perceived learning community support, ease of learning and learning effectiveness. These factors are interdependent for example a sense of community support can make learning seem easier which increases satisfaction.

2.8.3 Self-efficacy

Self-efficacy is a person's assessment of their capabilities (Bandura 1986). According to DeTure (2004) a learner exhibits improved performance as their self-efficacy and confidence increase. Based on Bandura's (1986) social cognitive theory, self-efficacy is the individual's assessment of their capability to achieve tasks, it is an assessment of what one can do in the future, an assessment of one's potential (Chou and Liu 2005).

Self-efficacy is split into three main parts: the level of a student's expectations, the conviction and confidence they have in their belief of their capabilities and thirdly, transferability (Compeau and Higgins 1995). A student with high outcome expectations will believe they are capable of succeeding in difficult tasks whereas a student with low outcome expectations will not. A student with a high level of conviction and confidence in their self-efficacy beliefs will not be so easily deterred when facing difficult tasks, they will persevere. A student with high levels of transferable self-efficacy will not limit their capabilities to the specific task but will believe that they can transfer their skills to a wider range of tasks.

Self-efficacy has a strong influence on the success of computer training (Compeau and Higgins 1995). Self-efficacy affects decisions about which tasks to undertake, the degree of perseverance in the face of difficulties and the skills mastered while working on the task.

Encouragement from others, whose opinion the individual values, will impact on self-efficacy and outcome expectations. This is based on the idea that an individual's sense of self is strongly influenced by others' opinions of, and reactions to, the individual.

Observing others exhibiting high levels of computer use improves the student's self-efficacy, outcome expectations and learning strategies (Compeau and Higgins 1995a).

According to Compeau and Higgins' (1995) initial hypothesis, the better the support the student receives the higher the levels of self-efficacy and outcome expectation. However their study refuted this hypothesis. According to Martin and Briggs (cited in Chou and Liu 2005) attribution theory explains this outcome; if a student obtained high levels of support they would not be able to attribute their success to themselves, if, on the other hand, they attempted the challenges of the task with minimal support they could attribute their success to themselves and boost their self-efficacy. Keller (1983 cited in Chuo and Liu 2005) reinforces attribution theory maintaining that increased learner control enhances self-efficacy. Furthermore self-regulated learners benefit from increased learner control and have a higher self-efficacy for learning (Schunk 2005).

If a student has high computer self-efficacy, they are more likely to enjoy working on the computer, will use the computer more, will have higher outcome expectations and will have less anxiety working with computers. Computer self-efficacy, increased enjoyment, higher outcome expectations and increased use all reinforce each other.

2.8.4 Collaborative Learning

Draco-Severson *et al.* (2009) consider the move towards collaborative learning to be the single most important development in education this century. Austin and Baldwin (1992) define collaboration as a cooperative enterprise involving teamwork towards common objectives in which all the collaborators share responsibility for the success or failure of the endeavour.

Collaborative learning is based on socio-constructive views that people learn more effectively through social-interaction and discussion. A student's sense of belonging influences their intrinsic motivation which affects their learning behaviour and learning outcomes (Martens *et al.* 2004). Research carried out by Hui *et al.* (2008) on ICT-mediated courses revealed that collaboration can make learning seem easier and improve satisfaction levels among students. Draco-Severson *et al.* (2009) consider collaboration to be an emotional support for learning and a platform for change and growth. However Draco-Severson *et al.* (2009) also admit that some students do not want to collaborate because of their cultural background they prefer traditional learning.

Draco-Severson's (2009) study found that many women students, who were health care workers, appreciated collaboration because of the instrumental, intellectual and emotional support they received. She also noted that it took time for students to feel safe to ask each other for help. The support and sense of belonging they experienced helped maintain their persistence to learn. Draco-Severson's (2009) views are supported by Belenky *et al.* (1986) who claim that women are more inclined to collaborate and collaborative learning may be a very effective approach for women students. This has important implications for further pedagogical research.

Collaboration should provide not just increased understanding of the subject; it should improve critical thinking skills and metacognition which could lead to improved learning strategies (Alavi 1994). Smith (cited in Giljers *et al.* 2009) observed this improvement in higher order thinking skills and also a decrease in surface learning. From their research Kulik and Kulik (1979) conclude that

collaborative learning is more effective than traditional learning for problem solving. According to Cooper (1995) collaboration is one of the most effective and enjoyable methods of improving deep learning, and, according to Alavi (1994), learning satisfaction. However according to Hwang and Arbaugh's (2009) study of undergraduate students, competition rather than collaboration provided greater motivation. Furthermore a mixed ability team can also prove problematic; observations by Mugny and Doise (1978) found that in a mixed ability team the higher ability student works on their own ignoring suggestions of the low ability student thus reducing their opportunities for active engagement.

Collaborative learning begins with a shared understanding of the problem or task, followed by consensus on the goals and plans which leads to collaborative cognitive activity and socially shared cognitions (Gijlers *et al.* 2009). When students are invested in the success of the group rather than the individual they are more motivated and supportive of the efforts of the other group members (Summers *et al.* 2005). However problems occur when some students do not put in the same effort as others (Strijbos 2010). Two principles are employed to discourage this 'freeloading': individual accountability and interdependence. Individual accountability can be assessed using test scores, peer-assessment or roles. Interdependence is achieved by basing the group reward on individual achievement. This motivates students to support each other for the benefit of the group (Slavin 95).

Strijbos (2010) outlines four fundamentals for collaborative learning:

1. Learning is the acquisition of personal knowledge.
2. Learning is not solely personal knowledge but occurs within a socio-cultural context.
3. Students' understanding improves due to the building up of group knowledge as the group experience grows while working on the task.
4. The group build up a shared meaning, the individual then interprets and internalises this initial shared meaning and this new interpretation is assimilated into an emerging group meaning.

Based on the last three fundamentals Cobb *et al.* (1992) and Strijbos (2010) propose that the cognitive and social aspects of collaborative work should be looked at holistically

and may not be measured as separate entities or considered on an individual basis.

Although cognitive, motivational and social process are now being researched, assessment of collaborative learning is still predominantly based on cognitive achievement (Strijbos 2010). Draco-Severson *et al.* (2009) concur claiming that policies based on outcomes and practices based on goals and test scores may lack the foresight to empower students to develop to their full potential. Holt and Willard-Holt (2000) maintain that the assessor should interact with the student to assess their level of competency offering a pathway to improvement.

Teacher involvement in group dynamics is essential to create a collaborative learning environment. The environment must be safe to allow students to take risks and make mistakes and avoid students feeling defensive (Parente 2007). Teachers need student support to create this environment (Draco-Severson *et al.* 2009).

2.8.4.1 Communication in the Collaborative Process

The sharing of information is not enough to facilitate learning, a consensus must be reached in which students explain their stance and actively develop each others ideas (Kaartinen and Kumpulainen 2002). The data gathered from four previous studies (Gijlers 2010) and the ideas of Weinberger and Fischer (2006) identifies three types of consensus building: ‘quick consensus building’, ‘integration-oriented consensus building’ and ‘conflict-oriented consensus building’.

Quick consensus building occurs when students do not investigate the task adequately possibly to avoid conflict or to finish the task quickly and move on to something else.

Integration-orientated consensus building occurs when students develop on each others’ ideas, accept alterations to their own ideas, elaborate on their ideas and influence each others’ thinking.

Conflict orientated consensus building occurs when students offer and accept criticism, working through it to construct a better understanding of the task.

To reach consensus good communication skills are vital, skills such as the ASK-TO-THINK-TELWHY (King 1997) and the RIDE rules; Respect, Intelligent collaboration, Deciding together, and Encouragement (Saab *et al.* 2007). These skills facilitate active listening, questioning, clarifying and elaborating on explanations and can stimulate active engagement and the integration of ideas within the group (Giljers *et al.* 2009).

2.9 Conclusion

Many factors contribute to the effectiveness of ICT in adult learning. Not least of these is the fact that adults consider ICT skills beneficial for career advancement. Many adults have a pragmatic attitude to further education, and will enrol on an ICT course because they consider it a relevant life skill. This is extrinsic motivation, it may not be enough to enable an adult learner to complete the course. However a collaborative learning environment can cultivate intrinsic motivation.

Collaborative and socio-constructive learning is an ideal combination for adult students. Adult students prefer to utilise previous experience, they want to work on relevant problems and enjoy the engagement and challenge of socio-constructivist learning. Women students benefit from collaborative socio-constructivist learning as they receive intellectual and emotional support. Women are more likely to drop out of education due to family obligations and this sense of belonging may encourage them to continue their course of study.

ICT must be successfully integrated into learning to be effective. If ICT is integrated into learning to enhance collaborative learning it could potentially reduce attrition rates. This applies to online, blended or classroom courses. The applications of ICT in learning are extensive and therefore a generalisation about the effectiveness of learning through ICT cannot be made. However when factors such as the course

design, the learning environment, the learning approach and the students are taken into account the effectiveness of ICT can be deduced.

Chapter 3

Research Methodology

3.1 Aims and Objectives of the Research

The primary aim of this study is to investigate the effectiveness of ICT as a learning artefact for adult female students. Four major aspects of effectiveness are considered: achievement, satisfaction, self-efficacy and learning climate. The sample group are all female, they have an age range spanning late twenties to late fifties. They work with the elderly. The following hypotheses were tested during the research:

H1: The use of ICT in learning improves students' achievement

H2: The use of ICT in learning improves students' satisfaction with learning

H3: The use of ICT in learning improves students' self-efficacy

H4: The use of ICT in learning improves collaboration

H5: There is a digital divide with regard to gender

H6: There is a digital divide with regard to age.

Achievement is a broad term but in this research it refers to test scores.

3.2 Background to the Research

The research was carried out in an adult education and training centre. The students comprised a group of nine women who were returning to learning, they ranged in age from twenty-eight years to fifty-seven years; they left school between the ages of thirteen to seventeen years.

The students were studying for a Further Education and Training Awards Council (FETAC) Level 5 Award in Community Care. They studied eight modules in total to

achieve the award. Two modules were used for the purposes of this research; anatomy and physiology and communications. Students attended class five mornings per week and had access to the computer room at least one morning per week for one hour and thirty minutes.

Research was carried out on students learning three topics in anatomy and physiology; the cell, the respiratory system and the reproductive system. Research was also carried out on students using ICT to convey a message and while they collaborated on a report project for the communications module.

The learning was socio-constructivist and collaborative based on Edmundson's (2007) recommendation that adults prefer to learn in a non-threatening learning climate, they like to collaborate and socio-constructive learning suits them best. Koedinger *et al.* (1997) concur stating that using ICT as a learning tool is an ideal learning method to use when teaching adults as it creates a good learning climate which improves satisfaction and self-efficacy.

3.3 Research Approaches

If knowledge is regarded as objective, based on hard facts, with reality external to the individual, it demands a positivist approach to research. Positivist research is scientific, rational, empirical, quantitative and generalisable. Positivist research methods are quantitative, research instruments are mainly scientific experiment and survey.

If, however, knowledge is regarded as subjective and personal, with reality a personal interpretation, a subjective approach to research is required. Subjective research is aimed at understanding behaviour; it is interpretative and based on unique cases. Subjective research methods are qualitative; the research instruments are mainly observation, narrative and interview.

A positivist paradigm works well for investigating achievement. However this study was carried out in the natural setting of the classroom in which there were too many

uncontrolled variables therefore the positivist approach alone could not guarantee validity. As the study was investigating satisfaction and self-efficacy, both subjective issues, a subjective paradigm would also have advantages. Therefore this study employed both positivist and subjective research approaches to achieve validity.

3.4 Design Issues: Research Style

According to Cohen *et al.* (2007) the research approach chosen is determined by its *fitness for purpose*. In this research a mixed methods approach is most suitable; in this situation both qualitative and quantitative instruments may be used.

With the sample size in mind ($n=9$) and the purpose, to investigate the effectiveness of ICT in learning, and also to investigate the digital divide with regard to gender and age, a research style had to be decided upon.

Ethnographic style can be eliminated as the class do not have a common tradition or culture. Historical style can be eliminated as the study is not looking at past events. The developmental styles such as longitudinal and trend are inappropriate as they require a longer time frame than is feasible for this study. Another major research design, the ex post facto design looks at the present situation and then traces back through time for a cause. It can be eliminated because this study identifies a cause, ICT, and investigates the effect of ICT, if any. The most suitable approaches for this study are action research and case study.

3.4.1 Action Research Style

Lewin (1946) initially coined the phrase 'Action Research' describing it as a cyclical six stage process, now it is more commonly considered to be a cyclical five stage process that involves diagnosing the problem, planning action to resolve the problem, carrying out the chosen action, evaluating the consequences of the action, identifying learning and back to diagnosing (Susman and Evered 1978). This is a very pragmatic approach, gaining an understanding of a problem, creating possible solutions and the practical application of these solutions (Mumford 2001) as such action research

produces extremely significant and relevant research findings (Baskerville and Wood-Harper 1996). However from a positivist point of view action research is not rigorous enough because although it can be empirical, experimental and observational it can also be interpretive, multivariate and interventionist (Cohen *et al.* 2007).

Generally action research is democratic and collaborative (Susman and Evered 1978) which means all stake holders, including the participants, would be required to be actively involved in decision making. The author did not feel it appropriate to demand so much of the participants, some of them returning to education for the first time in over twenty years.

Many action researchers also use case study because it has a specific focus (Wallace 1998). Both action research and case study are vulnerable to positivist criticism of lack of credibility, validity and generalisability. Case study is more appropriate for this research because the sample size is very small and the degree of collaboration required of the students for action research is not feasible. Also time constraints would not allow the author to implement any changes and then evaluate them in a repeated cyclical process.

3.5 Research Methodology and Rationale for Case Study

The case study approach is ideal for this study because it is a holistic research approach (Dube and Pare 2003). It can give insight into complex situations and reinforce previous research (Shen 2009). Another advantage of the case study is that the methods are not limited to a specific paradigm but are chosen because they offer a solution to a particular question (Rosenberg and Yates 2007). Case study is a collection of styles, methods and data collection instruments (Adelman *et al.* 1980). Its use of both qualitative and quantitative data collection techniques makes case study a versatile approach, it is ‘strong on reality’ (Adelman *et al.* 1980) and can capture the complexity of the community care class. The potential of case study research in education is unrealised and under valued (Adelman *et al.* 1980).

According to Yin (1984) there are three types of case study: exploratory, explanatory and descriptive. This is an explanatory case study, it is the study of a particular case to illustrate a theory (Nisbet and Watt, 1984). Case study is used both for hypothesis testing and hypothesis generation (Yin 1994), in this study hypotheses were tested.

A major limitation of the case study style is that often it is not generalisable, however the author considered this research to be of a singularity; nine students, in a bounded system; time and the classroom are the boundaries (Bassey 1999; Cohen *et al.* 2007). The author is not concerned with the generalisability of the research as it is not a necessity for a case study approach (Stenhouse 1988; Bassey 1999) and the case study has the potential to be transferable should a similar situation arise.

Nisbet and Watt (1984) claim that the results of the case study style may not be easily confirmed because the situation is not replicable. However the author concurs with Adleman *et al.* (1980) and Rockhill (1982) considering the ‘reality’ of the case study of more value than the precision of positivist approaches.

To counter the criticism that the study may be selective and vulnerable to bias (Nisbet and Watt 1984) the author employed five methods of data collection: tests, questionnaire, observation, group interview and focus group discussion. This will create triangulation and provide a rich, detailed, authentic description of events. This approach had the advantage of allowing the author to investigate the issues in a real-life context and built up a profile on issues that can be reinterpreted in further research (Shen 2009).

Although selectivity can be a limitation, in this research study it was an advantage because it allowed the author more freedom to record significant events that may be overlooked in more rigid styles of research or large scale research (Shen 2009).

Case study can be carried out by a single researcher, ideal for the author, who, after considering the benefits and limitations of case study considers this approach to be most suitable.

3.6 Data Collection Tools

Five methods of data collection were used in this study; pre-tests and post-tests, questionnaire, observation, group interview and group discussion. The pre-tests and post-tests and the questionnaire are positivist and provided quantitative data, while the group interview, observation and group discussion are subjectivist and provided qualitative data. The group discussion was the last collection tool deployed to give the participants an opportunity to voice perspective at the end of the case study. **Table 3.1** below lists the research tools used and the hypotheses they addressed. These data collection tools are triangulated to enhance validity

Tools	Tests	Questionnaire	Group Interview	Group Discussion	Observation
Topics					
H1: Achievement	√		√*		
H2: Satisfaction		√	√		√
H3: Self-efficacy		√	√		√
H4: Collaboration		√	√		√
H5: Gender			√	√	
H6: Age			√	√	

Table 3.1 Research tools for each hypothesis

* Perceived achievement

A purposive and convenient sample was employed for this study; nine female students that comprise the community care class. The class was investigated in different learning situations:

- learning with ICT only: the cell and cancer
- learning with a blend of ICT and traditional learning: the respiratory system

- learning with traditional learning only: the reproductive system
- ICT combined with collaborative learning: report project
- attempting a task using ICT in an unfamiliar way: conveying a message.

The learning environment was socio-constructive and students were free to collaborate at any time. However the report project was designed specifically for collaboration and conveying a message was designed for individual work. A group interview and group discussion obtained students opinions and perceptions on learning through ICT and the digital divide.

3.6.1 Testing

This study set out to investigate whether using ICT in learning improved achievement. Testing is a powerful data collection tool; it can be used to test intelligence, aptitude, achievement, personality, stress, learning difficulties etc.

There are two types of test: parametric and non-parametric. Parametric tests are based on a large population with a standardised normal distribution curve. Non-parametric tests were employed in this case study as they are based on a small population and do not necessarily have a normal distribution. Domain-referenced tests were used in this case study as they test a representative proportion of a domain and then generalise the result to the whole domain.

The hypothesis that the use of ICT improves achievement was tested using pre-test and post-test. Three topics of the community care course were tested:

- the cell and cancer: learning with ICT only
- the respiratory system: learning with a blend of ICT and traditional learning
- the reproductive system: learning with traditional learning only

Students sat a pre-test and a post-test on each topic.

3.6.2 Questionnaire

A questionnaire was used to test if ICT improved satisfaction, self-efficacy and collaboration.

There are three main types of questionnaire: structured, semi-structured and unstructured. The purpose of a questionnaire should be clear. Questions can be either open or closed however as semi-structured interviews were also deployed a structured questionnaire was used to provide statistical data. Closed questions provide data that is easily analysed; they present a range of answers that the respondent can choose from. The researcher must ensure that the range is comprehensive enough to achieve its purpose.

Taking the approach recommended by Wilson and McLean (1994) the questionnaire was broken down into three main constructs: satisfaction, self-efficacy and collaboration. Predictors for each construct were identified and questions were designed to elicit the required data (c.f. **Figure 3.1, Appendix I**). The questions for each construct were not grouped into one section of the questionnaire because unpredictable questioning may encourage students to pause and think rather than automatically ticking a box. To check that students' answers are consistent a question in the early part of the questionnaire was rephrased in a later part of the questionnaire. On occasion some questions were asked in reverse to avoid the primacy effect (Dillman *et al.* 2003; Krosnick 1999) consequently their ordinal values were also reversed. The ordinal scores for the questionnaire are given in **Appendix B**.

Three types of questions were used: dichotomous, open questions and rating scale questions. Dichotomous questions provide nominal data, can work as a filter and demand a decision of the respondent.

Rating scales provide ordinal data, the Likert scale, devised by Rensis Likert in 1932 was employed in this study. It is important that rating scale questions are unidimensional, double negatives and leading questions should be avoided. If the range of responses in closed questions is limited it can introduce bias into the

questionnaire. To overcome the situation where the respondent may have something to say that is not covered in the range of options an ‘other, please specify’ category is added. A minimum of a five-point scale should be used because respondents have a tendency to avoid the extreme choices (Anderson and Arsenault 2001).

The questionnaire should appear simple and interesting to the respondents. This questionnaire started with easy factual questions. It then moved to closed questions that asked for opinions and attitudes as suggested by Cohen *et al.* (2007).

The questionnaires were piloted on a similar cohort of students. This ensured that questions were easily understood and that there were no ambiguities. Pilot feedback highlighted that some questions were similar and should be eliminated. Leading questions were countered by opposing leading questions.

3.6.3 Observation

Observation was employed to test if ICT improved satisfaction, self-efficacy and collaborative learning. It was also used to assess students’ attitudes to computers (Yin 2003). Three observations were carried out while students worked on

- the anatomy of the cell and cancer,
- the Report Project,
- conveying a message.

Observation is a data collection tool that allows the researcher to directly observe what is happening while it is happening. It adds another dimension to opinion and perception based data supplied by questionnaires and interviews by enabling the researcher to observe things that the participants may not be consciously aware of or reluctant to disclose in interview or questionnaire (Cohen *et al.* 2007). It checks that people actually do what they say they do. Facts, events or behaviours can be observed. The researcher needs to link the purpose of the observation with the research question to ensure that the data collected are valid indicators of the research

question. The researcher cannot observe an effect and deduce the cause nor can they observe an act and deduce the intention.

A positivist approach leads to structured observation whereas unstructured or semi-structured observations are suited to the constructivist or naturalistic approach (Mulhall 2003). A disadvantage of the unstructured or semi-structured observations is that the observer has a lot of freedom to choose what they observe, the time they carryout the observations and how they interpret it. This can lead to bias therefore unstructured and semi-structured observations were initially piloted to develop well defined, comprehensive categories for more structured observation schedules as suggested by Silverman (1987). Structured observation takes time to prepare but analysis can be quick, the categories must be discrete. However due to the restrictions of structured observation, pertinent information may not be recorded.

A structured observation was deployed for anatomy on the cell, a semi-structured observation was deployed for the conveying of a message and an unstructured observation was deployed for the report project.

There are four types of observer role: complete observer, observer-as-participant participant-as-observer and complete participant (Gold 1958). An overt role of participant -as-observer best suited this study as the researcher was also the teacher.

To ensure triangulation and enhance the validity of interpretation of observed data a questionnaire and group interview were also deployed.

3.6.4 Group Interview and Group Discussion

Group interviews are becoming more popular in educational research as they can produce a broad spectrum of responses and are less time consuming. A structured group interview was conducted to validate and elucidate responses to the questionnaire. Audio-visual recording of the interview can provide additional data on body language and tone of voice however some interviewees can find a recording intimidating therefore notes were taken during the interview (Bassey 1999).

An unstructured group discussion was carried out at the end of the case study as it offered the interviewees an opportunity to voice their opinions. The interviewer played a minimal role allowing the interaction between the group members to provide a consensus. This can empower participants and can provide unpredicted data as the participants' agenda predominates.

3.7 Ethical Considerations

The author followed ethical practices as recommended by Cohen *et al.* (2007). Official permission was obtained from the course coordinator to carry out research in the adult education centre.

All participants were adults, participation was voluntary. Consent was requested at the beginning of each data collection exercise and participants informed that they could withdraw from participation at any time without prejudice. Participants were informed about nature the purpose of the research and what would subsequently happen to the research report. Participants were given the opportunity to view and verify what they said at interviews. The data and information derived from tests, the observations and the questionnaire was also available to students.

All research data was confidential. Participants were assigned numbers to protect their identity. Participants were treated with respect and thanked for their contribution.

3.8 Analysis Techniques

3.8.1 Analysis Approach

The analysis approach was two pronged; the first was based on the research hypotheses, the second focused on the individual. The advantage of this two pronged approach was that the focus remained on the hypotheses but the individual context was not lost, affording a more holistic overview of the research. It also offered an

opportunity to check for a possible correlation between the hypotheses and the subsets of the hypotheses.

3.8.2 Analysis Tools: Triangulation

Case study research in a real-life context attempts to elicit answers from a very complex and uncontrolled environment, a single research tool has the potential to be selective and biased and does not inspire confidence. Triangulation is the use of more than one method of data collection to confirm the validity of the research (Cohen *et al.* 2007). Triangulation can give a more holistic view of the research situation. Methodological triangulation was used in this research, the methods used were quantitative: tests and questionnaires, and qualitative: observation, interview and group discussion. The concept of convergent validity (Campbell and Fiske 1959) was applied whereby different methods were used to test the same hypothesis.

3.9 Validity and Reliability

If research is invalid it is worthless and therefore validity is necessary for both quantitative and qualitative research (Brock-Utne 1996). Maxwell (1992) argues that the term ‘authenticity’ rather than ‘validity’ should be used in qualitative research. Tschundi (1988 cited in Brock-Utne 1996) claims that although qualitative and quantitative methods may be different, the criteria for validity should not be different and that fallibility of method is the main factor.

Two of the most basic types of validity are internal and external validity. Internal validity is how accurately the explanation portrays the data it is supposed to portray. External validation is how generalisable the research is.

According to Jimenez-Buedo and Miller (2010) one of the most effective ways of overcoming threats to internal or external validity is to start of with a good research design.

Chapter Four

Research Findings

4.1 Introduction

This case study explored the effectiveness of ICT in learning with respect to four factors: test scores, satisfaction, self-efficacy and collaborative learning. It also investigated women students and the digital divide. This chapter presents the data generated according to research question. Research tools utilised included questionnaire, tests, observations, group interview and a focus group. This case study is based on a community care FETAC Level 5 course that utilises ICT for learning.

4.2 Profile of Students

A combination of field observations, tests and a questionnaire were used to generate student profiles. The student profile questions from the questionnaire in **Table 4.1** (cf. **Appendix B**) combined with the results on **Table 4.2** (cf. **Appendix B**) provided a profile on each student.

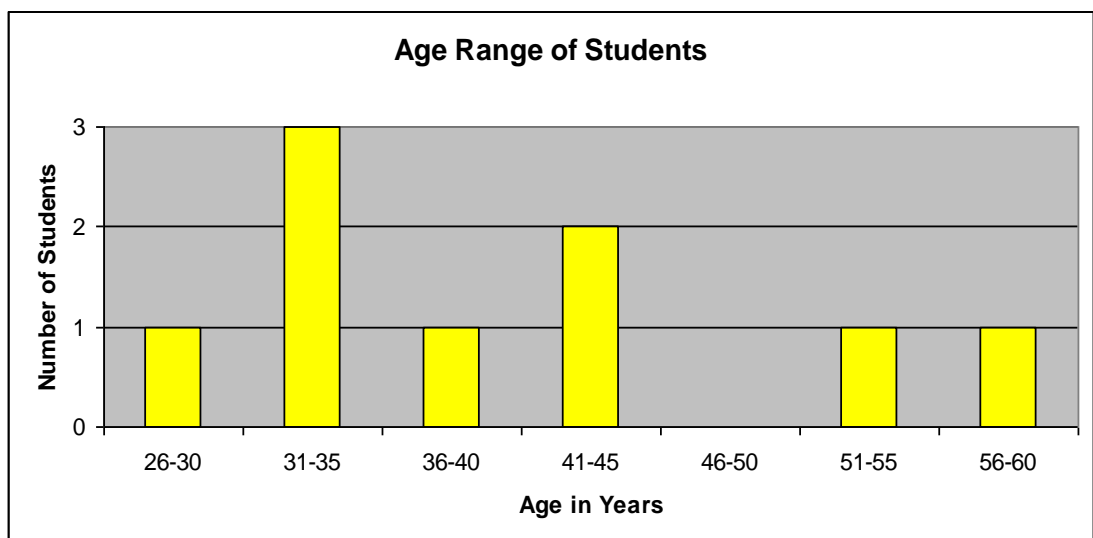


Fig. 4.1 Age Range of Students

Students' ages range from twenty eight years to fifty seven years. Students two, three, four and five have not studied ICT formally, however student two has some self-taught experience; all students have access to a computer although only three own a computer. Student five does not have access to the Internet. It should be noted that student five obtained her first computer during the community care course (cf. **Appendix H**). Students four, five and nine did not expect to use ICT on this course and students four and five were apprehensive about using ICT. All students believe that students should have access to computers in school and that ICT skills are beneficial. Students two, three, four and five think that the teacher should not use more ICT equipment. It was gleaned through conversation (cf. **Appendix H**) that students three and four believed that if the teacher used more ICT in class that they would also have to use more ICT in class. These two students had no previous ICT experience and were already on a steep learning curve with respect to ICT.

Student five dropped out of the course and missed the group interview and group discussion, she completed the tests, the questionnaire and the observations. Her feedback is worthy of comment in this study and may shed light on why students drop out.

4.3 Does the use of ICT Improve Achievement?

Achievement was ascertained through tests, perceived achievement was ascertained in the group interview. In the group interview all students agreed that the use of ICT improved learning.

A series of three pre-tests and post-tests (cf. **Appendix A**) were designed to test for achievement. Each pair of tests was based on a topic from an Anatomy and Physiology Course. All post-tests were composed of three parts; recall, knowledge and application. Learning of the cell and cancer deployed ICT only. Learning of the respiratory system deployed a blend of traditional methods and ICT. Learning of the reproductive system deployed traditional methods only.

From **Table 4.3** the highest average post test result, ninety-three percent occurred for blended learning, ICT only followed with an average mark of eighty-four percent, traditional learning exhibited the lowest average mark of eighty percent.

Line graphs showing the pre-test and post-test marks for each student in ICT only, blended learning and traditional learning respectively can be found in **Appendix A** (**Fig. 4.2, Fig. 4.3, Fig.4.4**).

	ICT ONLY			BLENDED			TRADITIONAL		
	The Cell and Cancer			Respiratory System			Reproductive System		
	Pre test	Post test	Post minus Pre	Pre test	Post test	Post minus Pre	Pre test	Post test	Post minus Pre
Student 1	30	92	62	40	100	60	70	90	20
Student 2	0	50	50	15	100	85	0	50	50
Student 3	17	90	73	10	95	85	60	85	25
Student 4	18	100	82	20	100	80	25	90	65
Student 5	6	100	94	10	90	80	30	100	70
Student 6	11	70	59	10	100	90	10	100	90
Student 7	6	73	67	10	90	80	15	50	35
Student 8	6	100	94	15	95	80	20	70	50
Student 9	18	78	60	15	70	55	30	85	55
Average	12.4	83.7	71.2	16.1	93.3	77.2	28.9	80	51.1

Table 4.3 Pre-test and Post-test results

Actual improvement must take into consideration the pre-test mark as a starting point, the maximum possible increase in mark for each individual and the actual increase in mark (cf. **Appendix A** for calculations of percentage improvement). **Table 4.4** shows the increase in marks and the percentage improvement for each student for each method. From **Table 4.4** it is evident that blended learning produced the greatest average improvement in learning at ninety-two percent, followed by learning through ICT only with an average improvement in learning of eighty-one percent, and finally traditional learning produced the lowest average improvement in learning at seventy-two percent.

	ICT Only		Blended Learning		Traditional	
	Increase in marks	Percentage Improvement	Increase in marks	Percentage Improvement	Increase in marks	Percentage Improvement
Student 1	62	88.6%	60	100%	20	66.7%
Student 2	50	50%	85	100%	50	50%
Student 3	73	87.95%	85	94%	25	62.5%
Student 4	82	100%	80	100%	65	86.7%
Student 5	94	100%	80	89%	70	100%
Student 6	59	66.3%	90	100%	90	100%
Student 7	67	71.3%	80	89%	35	41%
Student 8	94	100%	80	94%	50	62.5%
Student 9	60	73.2%	55	65%	55	78.6%
Average	71.2	81.3	77.2	92	51.1	71.9

Table 4.4 Individual increase in marks and percentage improvement

Highest Improvement

Six students achieved their highest improvement through blended learning. This is twice the success rate of ICT only learning and traditional learning. The weakest student, student two, benefitted most from blended learning.

Lowest Improvement

Six students had their lowest improvement in learning with traditional learning. Traditional learning produced the lowest improvement in learning three times more often than learning through ICT or blended learning. **Table 4.5** summarises the results on improvement.

	Highest Improvement in Learning	Lowest Improvement in Learning
Student 1	Blended	Traditional
Student 2	Blended	ICT/Traditional
Student 3	Blended	Traditional
Student 4	ICT/ Blended	Traditional
Student 5	ICT/ Traditional	Blended
Student 6	Blended/Traditional	ICT
Student 7	Blended	Traditional
Student 8	ICT	Traditional
Student 9	Traditional	Blended

Table 4.5 Highest and lowest improvement

The line graph, **Fig. 4.5**, shows the post-test marks for individual students employing the three different learning methods. Sixty seven percent of students achieved their highest mark through blended learning.

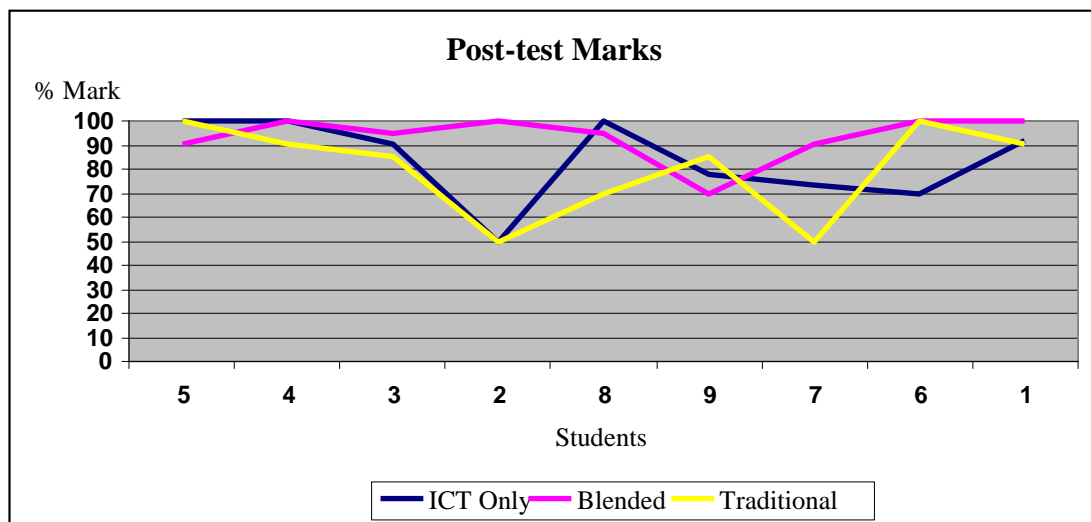


Fig. 4.5 Post-test Marks

Fig. 4.6 indicates the individual improvement for each learning method. Sixty seven percent of students achieved their biggest improvement through blended learning.

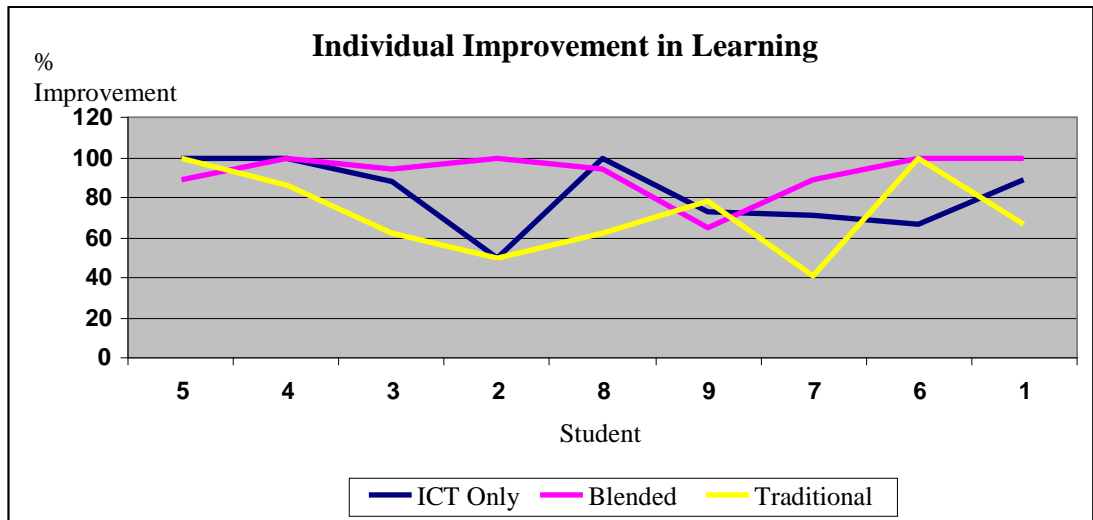


Fig. 4.6 Individual Improvement in Learning

4.3.1 Hypotheses Tests

Three hypotheses tests were carried out on the percentage improvement in results (cf. **Appendix A**). The hypothesis tests found that learning through ICT only or traditional learning does not improve achievement to the same extent as blended learning. This increases confidence in the test findings.

4.4 Does the use of ICT Improve Satisfaction?

Satisfaction is derived from the questionnaire (cf. **Appendix B**), a group interview (cf. **Appendix C**), observations during the listening exercise (cf. **Appendix G**) and observations during the class on the cell (cf. **Appendix E**).

4.4.1 Questionnaire Data on the Impact of ICT on Satisfaction

The predictors of satisfaction as suggested by Artino (2008) and Hui *et al.* (2008) were: enjoyment, perceived learning effectiveness, positive feelings, desire to continue learning, ease of learning, frequency of use and variety of uses. The construct for satisfaction was composed of eleven questions.

	Question	Predictor Tested
Q10	I enjoy working with computers in class.	Enjoyment
Q11	I prefer not to use computers in class.	Dissatisfaction
Q12	Using Computers in class improves my learning.	Perceived learning effectiveness
Q16	I feel apprehensive about using computers	Negative feelings
Q17	Using computers in class makes learning more interesting.	Positive feelings
Q18	I find using computers frustrating.	Negative feelings
Q19	I would like to learn more ICT skills.	Desire to continue learning ICT
Q20	I enjoy using ICT to learn other subjects.	Enjoyment
Q23	I think computers are easy to learn	Ease of Learning
Q39	How often do you use computers?	If a student enjoys working with ICT they are likely to use it more often.
Q40	What do you use computers for?	If a student finds ICT easy to learn they will use it for a variety of purposes.

Table 4.6 Questions for construct 1: Satisfaction

Question	10	11	12	16	17	18	19	20	23	39	40	Average
Student 1	4	5	4	5	4	5	5	4	4	5	5	4.55
Student 2	3	4	4	3	4	4	4	3	3	3	4	3.55
Student 3	4	2	4	2	4	2	3	4	4	2	3	3.09
Student 4	4	4	4	2	4	4	4	4	2	2	2	3.27
Student 5	3	3	3	1	3	2	3	4	2	2	2	2.55
Student 6	4	4	4	4	4	4	4	4	4	5	5	4.18
Student 7	5	5	4	5	5	4	4	5	4	5	5	4.64
Student 8	4	4	4	4	4	3	3	4	2	5	5	3.82
Student 9	5	4	5	4	4	4	4	4	4	4	3	4.09
Averages	4	3.9	4	3.3	4	3.6	3.8	4	3.2	3.7	3.8	3.747
Median of 1 to 5												3
Score 1: Lowest Level of Satisfaction, Score 5: Highest Level of Satisfaction												

Table 4.8 Student Scores for Construct 1: Satisfaction

Table 4.8 gives the student's ordinal scores for each question. The average of the scores for satisfaction is 3.737, this is above the median and indicates that there is a good level of satisfaction with the use of ICT in class. Student five has the lowest level of satisfaction with using ICT for learning, it is the only score below the median. Scatter plots depicting the correlation between questions within this construct are presented in **Appendix B, Fig. 4.7, Fig. 4.8** and **Fig. 4.9**. Satisfaction levels for the entire group for each question are displayed in **Fig. 4.10** these can be obtained from **Table 4.9** (cf. **Appendix B**).

4.4.1.1 Pearson's Correlation Coefficients for Satisfaction

Pearson's correlation coefficients (Remenyi *et al.* 2009) for all questions in the construct can be found in **Table 4.7 Appendix B**. There are no negative correlations in the construct for satisfaction and eighty percent of the correlations are above 0.3. Cronbach's (1951) alpha coefficient was calculated to be 0.9141 indicating that this construct is a very highly reliable instrument of data collection. There is also a high correlation (0.81) between time spent using ICT and average satisfaction levels for

each student (cf. **Table 4.8**) and also a high correlation (0.88) between the variety of ICT utilised and average satisfaction levels for each student (cf. **Table 4.8**).

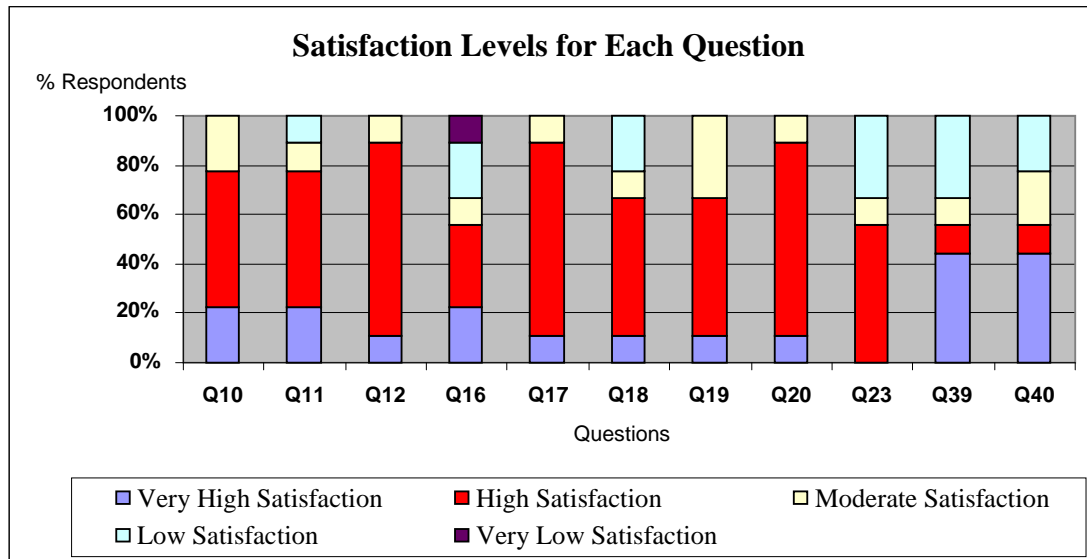


Fig. 4.10 Satisfaction levels for each question

High satisfaction and very high satisfaction constitute seventy three percent of responses. **Fig. 4.11** displays the satisfaction levels for each student for each question. The first three students, students five, four and three in each grouping in the chart have no ICT experience.

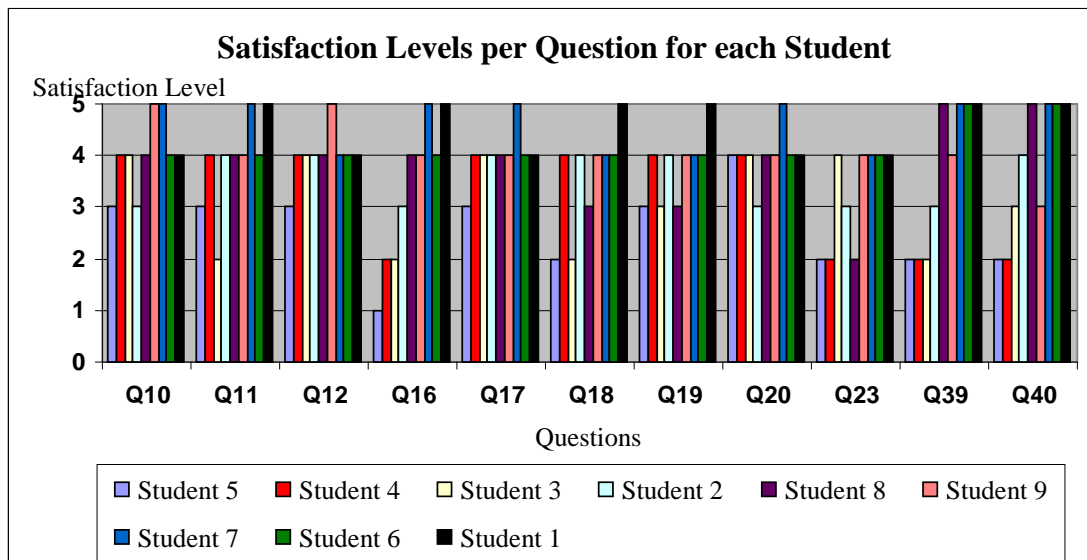


Fig. 4.11 Satisfaction levels per question for each student

It may be noted from the **Fig. 4.11** that students five, four and three do not score a satisfaction level of five in any question. From **Fig. 4.11** students with previous ICT experience use computers more often and for a wider variety of purposes. Student two has no formal ICT training although she has used ICT and acquired ICT skills.

Fig. 4.12 depicts the satisfaction levels for those students who have previously attended ICT courses. These students exhibited higher levels of satisfaction while using ICT as a learning tool in this course. A drop below the median occurred only once indicating that one student found ICT difficult to learn.

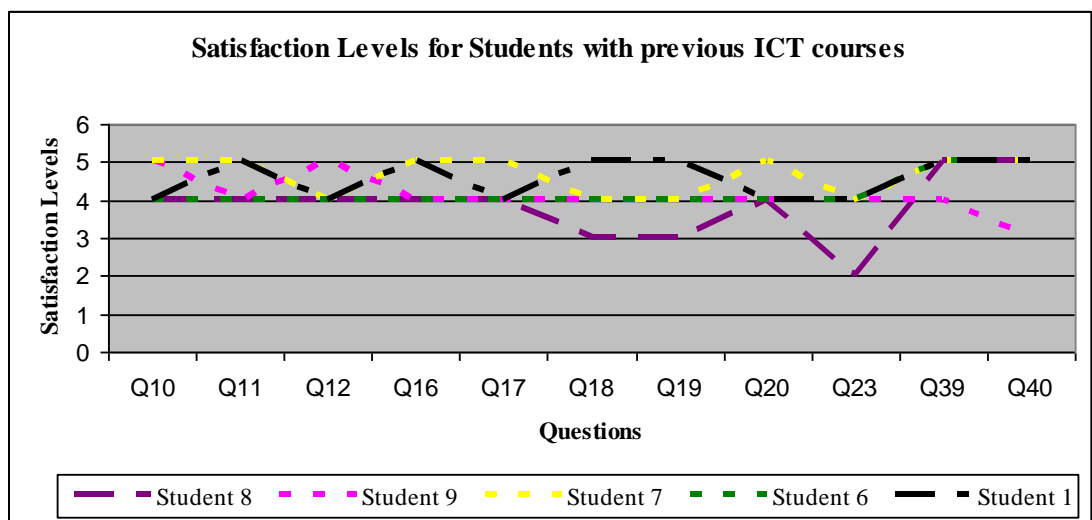


Fig. 4.12 Satisfaction Levels for students with previous ICT courses

It is feasible that student eight who previously attended an ICT course considers learning ICT difficult but now finds using her knowledge of ICT to learn other subjects satisfying.

Fig. 4.13 displays the satisfaction levels for students who have not previously attended ICT courses.

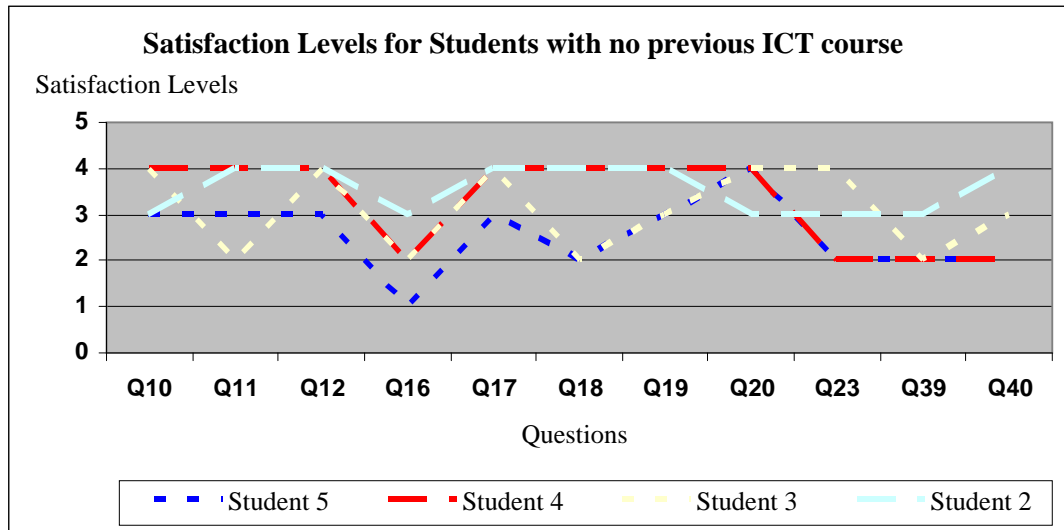


Fig. 4.13 Satisfaction levels for students with no previous ICT courses

The highest satisfaction level, level five, was not achieved by the respondents who have not previously attended an ICT course. In fact the average satisfaction levels for students who have not attended ICT courses are all lower than the average satisfaction levels of students who have attended ICT courses. Students three, four and five satisfaction levels drop below the median indicating that they feel apprehensive about using computers.

4.4.2 Data from the Group Interview on the Impact of ICT on Satisfaction

Eight of the nine initial students attended the group interview as student five dropped out of the course. The group interview covered satisfaction and some predictors of satisfaction: perceived learning effectiveness and desire to continue learning ICT. A transcript of the group interview in relation to satisfaction can be found in **Appendix C**.

During the group interview students' responses were more positive, indicating that ICT made learning more satisfying for all students except students three and four, 'more interesting, yes, but...', (Group Interview, Student four). These results parallel

the questionnaire data in relation to the overall average satisfaction levels for each student.

During the group interview all students gave positive responses in relation to ICT, they all found using ICT made anatomy and physiology more interesting and easier to understand. This supports the test results in **Table 4.3** and **Table 4.4** that ICT is beneficial for learning content knowledge. The questionnaire data also reported a positive response with an average satisfaction level of four. Higher collaboration levels were also observed while using ICT to learn anatomy and physiology.

Seven of the eight students in the group interview learnt more by using ICT than not using ICT. Those without ICT experience learnt more ICT while learning anatomy whereas those with ICT experience learnt more anatomy. Student seven added that the benefits of ICT are dependent on the content knowledge of the module. She believed that some modules lent themselves more to ICT. Student nine agreed that one can learn more by using ICT however she cautioned that there was too much information available on the Internet. Student six pointed out that they had learnt just as much content knowledge on another module in which they used no ICT. Student eight had poor attendance but managed to do study from home because the Internet afforded her access to information and to the teacher.

All students in the group interview stated that integrating ICT into learning was the best way to learn. Six of the eight students believed that they learnt more through blended learning, two students considered they learnt more using ICT only, these two students have ICT qualifications. No student considered traditional learning the best way to learn. Test results for achievement (cf. **Table 4.5**) revealed that all students with the exception of student nine performed better when using some degree of ICT in learning. Student nine performed better through traditional learning.

The desire to continue to study is considered to be a predictor of satisfaction with learning, however it became apparent in the group interview that students' reasons for embarking on an ICT course are indicative of necessity rather than satisfaction.

4.4.3 Vignettes

Although students four and nine stated that they enjoyed using ICT for learning they claimed that they would have dropped out of the course if it was compulsory to word-process their assignments because they would not be able to concentrate on the content and that it was a waste of valuable learning time.

4.4.4 The Impact of ICT on Satisfaction: Observations of the

Message Conveying Exercise

Further details of this observation can be found in **Appendix G**. While some students had ICT experience they were unfamiliar with the ICT equipment deployed in this exercise. The students had to record a voice message onto the computer using Audacity. The students wore headphones with a microphone.

Student seven had the highest satisfaction rating and was the most competent with the ICT equipment. After one attempt she was satisfied with her message. Student five required three attempts to become competent with the equipment, and four attempts to be satisfied with her message. She had the lowest satisfaction rating in the sample. Student two had the weakest performance, she is Ghanaian and is not confident speaking English.

	Satisfaction rating from message conveying	Average Satisfaction level from questionnaire	Average Self-efficacy level from questionnaire
Student 1	4	4.55	4.33
Student 2	2	3.55	3.67
Student 3	4	3.09	3.89
Student 4	4	3.27	3.89
Student 5	2	2.36	2.89
Student 6	4	4.18	4.00
Student 7	5	4.64	3.89
Student 8	4	3.82	3.56
Student 9	4	4.09	3.67

Table 4.11 Satisfaction levels from the message exercise and the questionnaire

Table 4.11 reports the satisfaction ratings on the message giving exercise, it also contains the average satisfaction levels and the average self-efficacy from the questionnaire for comparison.

There is a marked degree of correlation, 0.68, between **average satisfaction** in this listening exercise and **average satisfaction** from the questionnaire. This correlation may have been higher had the language variable been eliminated. However it indicates that these readings mutually support each other.

4.4.5 Hypothesis Tests and Summary on Satisfaction

Hypothesis Tests (cf. **Appendix B**) carried out on satisfaction levels in the questionnaire confirmed that ICT does not improve learner satisfaction for students who have not previously attended an ICT course. However ICT improves learner satisfaction for students who have previously attended an ICT course.

The hypothesis test considers the construct as a whole however from considering the results of individual questions there are situations in which the majority of students,

including those students without previous ICT experience enjoyed using ICT. Students enjoyed using ICT to learn other subjects and believe that ICT improves learning and makes learning more interesting.

Other predictors of satisfaction create the division between those students with ICT experience and those without. Students without ICT experience do not find ICT easy to learn, they are more apprehensive about using ICT, tend to get frustrated and do not use ICT frequently.

4.5 Does the use of ICT Improve Self-Efficacy?

Self-efficacy was tested using a questionnaire, a group interview and the observation of the message giving exercise. There is a marked degree of correlation, 0.64, between **satisfaction** in the listening exercise and average **self-efficacy** levels from the questionnaire indicating that these readings mutually support each other (cf. **Table 4.11** in **Section 4.4.4**)

4.5.1 Data from the Questionnaire and the Group Interview on Self-Efficacy

Nine questions in the questionnaire and question seven and question nine from the group interview are used to collate data for self-efficacy, they will be considered simultaneously.

The predictors of self-efficacy, as suggested by Compeau and Higgins (1995) and Chou and Liu (2005), investigated through the questionnaire were: self-expectation, confidence, conviction, transferability, perceived encouragement from peers, attribution, control, and a willingness to execute behaviours that produce favourable results (**Table 4.12**).

The predictors of self-efficacy investigated through the group interview were self-assessed confidence and a willingness to embark on further study in ICT.

	Question	Predictor tested
Q13	I prefer to work at my own pace	Control / Attribution
Q14	I prefer it when the teacher controls the pace of learning on individual tasks.	Control / Attribution
Q15	The harder I work the better my results will be	Attribution / Conviction / Expectation
Q22	I would improve my ICT skills if given the opportunity	Confidence/ Conviction
Q25	I am more willing to put in the effort if I believe I can succeed at the task	Willing to execute behaviours that produce favourable results
Q26	I would feel confident using ICT: If I could get help if I got stuck	Confidence / Encouragement from peers
Q27	I would feel confident using ICT : If someone helped me get started	Confidence / Encouragement from others
Q28	I would feel confident using ICT: If I did similar tasks before	Confidence / Transferability
Q29	I would not feel confident learning new computer skills	Confidence

Table 4.12 Questions for construct 2: Self-efficacy

Students' ordinal scores for self-efficacy are given in **Table 4.13**

	Q13	Q14	Q15	Q22	Q25	Q26	Q27	Q28	Q29	Average
Student 1	5	4	5	4	5	4	4	5	5	4.56
Student 2	3	3	4	3	4	4	4	4	4	3.67
Student 3	4	3	5	4	3	5	4	5	3	4.00
Student 4	4	4	5	4	5	4	4	4	2	4.00
Student 5	3	1	4	3	4	3	3	3	2	2.89
Student 6	4	3	5	4	5	4	4	3	4	4.00
Student 7	4	3	4	4	4	4	4	4	4	3.89
Student 8	5	4	4	3	4	4	4	5	5	4.22
Student 9	4	3	4	4	4	4	4	4	4	3.89
Averages	4	3.1	4.4	3.7	4.2	4	3.9	4.1	3.7	3.7937
	Median 1 to 5									3

Table 4.13 Student Scores for Construct 2: Self-efficacy

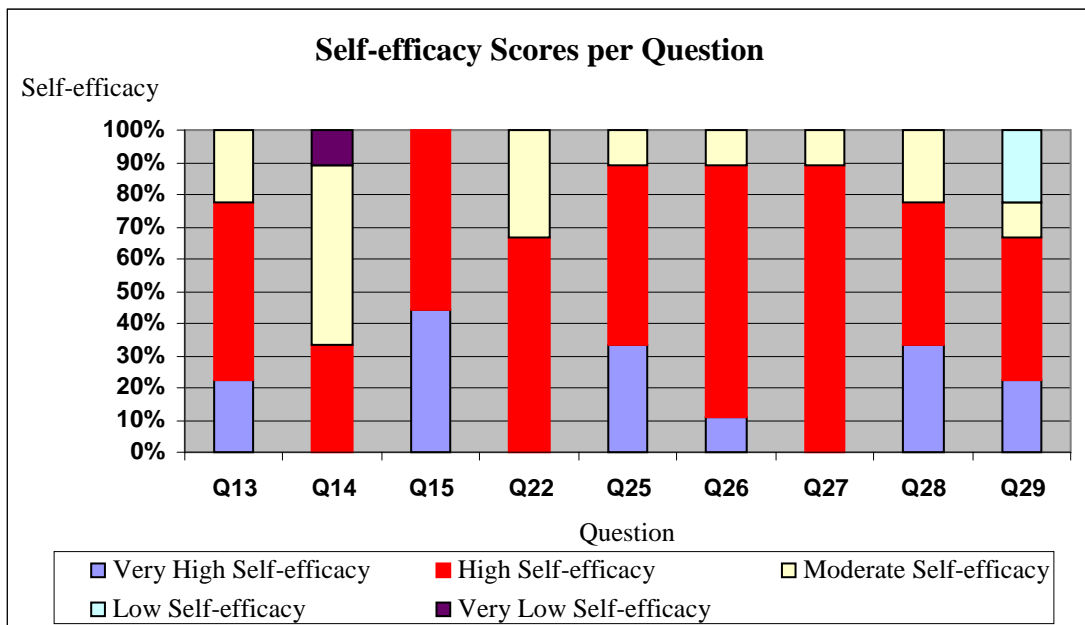


Fig. 4.14 Self-efficacy scores per question

Fig. 4.14 is a representation of the self-efficacy scores per question. High self-efficacy and very high self-efficacy occurred in seventy seven percent of answers.

Table 4.14 (cf. **Appendix B**) displays Pearson’s linear correlation between all questions in this construct. Cronbach’s (1951) Alpha coefficient is 0.94586 (cf. **Appendix B**). This indicates that this construct is a very highly reliable instrument of data collection.

The student scores for self-efficacy are above the median implying that using ICT for learning improves self-efficacy (cf. **Table 4.13**). Student five had the lowest self-efficacy level in the class; she also had the lowest satisfaction level while using ICT. In contrast self-efficacy levels for students three and four were higher than their satisfaction levels. In fact self-efficacy levels for students three and four are the third highest in the class. Students three and four are rising to the new challenge presented by ICT in learning whereas student five is struggling.

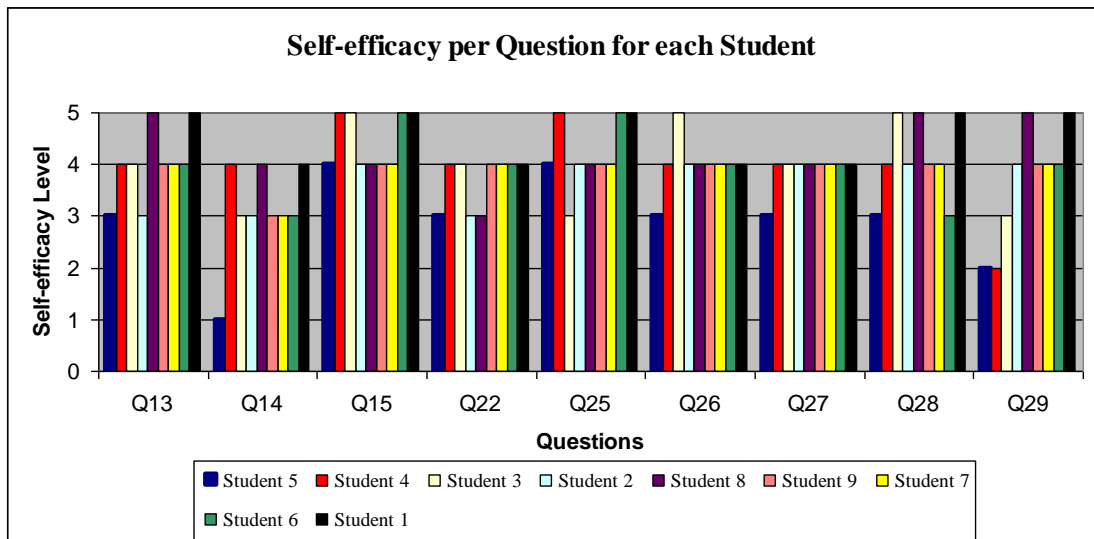


Fig. 4.15 Self-efficacy per question per student

All students with the exception of student five and student two prefer to work at their own pace. Students five and two are undecided. Student five is the only student who would prefer the teacher to control the pace of learning. Three students would prefer if the teacher did not control the pace of learning on individual tasks, the remaining students are undecided. However some students are not sure that they prefer to eliminate the teacher’s control completely.

Seven of the eight students would consider returning to education on completion of their current course to study ICT however five of those seven students would do an ICT course out of necessity rather than enjoyment. In addition all students believe ICT skills are beneficial.

All students believe hard work produces better results. All students apart from student three are more willing to work hard if they believe they can succeed, student three is undecided. It is possible student three is motivated to put in the effort regardless of the outcome because she believes ICT is a necessity.

All students would feel confident using ICT if they received the support they needed or had practiced the task before, except for student five who is unsure.

Three students expressed lower levels of confidence in relation to learning new computer skills than did the other students. The fact that these three students have no previous ICT experience may explain their responses.

Detailed transcripts in relation to confidence using ICT are presented in the group interview in **Appendix C**.

	Self-assessed Confidence rating in interview Q9 Scale 1 to 10	Confidence level in questionnaire from Q29 Scale 1 to 5	Position in class from questionnaire	Position in class from interview
Student 1	8	5	1 st	1 st or 2 nd
Student 2	5	4	2 nd to 6 th	6 th
Student 3	3	3	7 th	7 th or 8 th
Student 4	3	2	8 th	7 th or 8 th
Student 6	8	4	2 nd to 6 th	1 st or 2 nd
Student 7	7	4	2 nd to 6 th	3 rd or 4 th
Student 8	7	4	2 nd to 6 th	3 rd or 4 th
Student 9	6	4	2 nd to 6 th	5 th

Table 4.15 Self-assessed confidence compared to questionnaire

Student four also commented that her confidence level would improve under the right circumstances this reveals good self-efficacy which is confirmed in the average self-efficacy levels from the questionnaire.

The student averages for self-efficacy tally with their confidence levels while doing the message conveying exercise for all students except student seven who exhibited higher confidence with the message conveying exercise than predicted from the questionnaire.

4.5.2 Observation of Self-Efficacy during an Anatomy Class

The anatomy class was based on socio-constructivist learning theories. Three predictors of confidence were recorded in the observations during the anatomy class: firstly, the student's approach to the task was recorded as positive, neutral, anxious, animated or confident; secondly, the individual challenge level of the task and the corresponding effort invested by the student and thirdly whether a student gave or received help or reassurance. Depending on previous experience some students found

the ICT aspects of the class much easier than others. Likewise some students found the anatomy aspects of the class much easier.

In summary students three and five initially exhibited the lowest confidence levels when using ICT. However their confidence improved when they mastered the ICT skills necessary to do the anatomy quiz and the emphasis shifted from learning ICT to using ICT for learning anatomy. Students one, two, six, seven and eight, who have previous ICT experience, were initially confident. Students two, seven and nine suffered a drop in confidence due to a lack of confidence with anatomy rather than ICT as the class progressed.

4.5.3 Hypothesis Tests and a Summary of Self-Efficacy

Hypothesis tests (cf. **Appendix B**) give credence to the results on self-efficacy confirming that ICT improves the self-efficacy of the class regardless of whether a student has previous ICT experience or not. However on an individual basis ICT did not improve the self-efficacy of student five. Both the questionnaire and the observation of the student during the biology class are in agreement on this.

Student four left school early and had not attended a course in thirty years but she had high self-efficacy levels. The group interview attests to this, student four had low confidence in her current ability at ICT but she volunteered that her confidence will improve if given the opportunity. Perceived future self-confidence is current self-efficacy hence this student exhibits high self-efficacy. The results of the observation during the anatomy class confirm this indicating an improvement in self-efficacy and confidence the more she used ICT to learn. Likewise student three with no previous ICT experience exhibited a significant improvement in self-efficacy while using ICT to learn.

4.6 Does the use of ICT Improve Collaboration?

Research tools for collaboration were a questionnaire, a group interview and two observations one of the biology class and the other of the report class.

4.6.1 Questionnaire

Eleven questions in the questionnaire investigated the impact of ICT on collaboration. The predictors of collaborative learning employed in the questionnaire are: social interaction, sense of belonging, support and encouragement from peers.

Scoring for this construct is based on frequencies ranging from ‘never’ to ‘all the time’.

	Question	Predictor
Q21	I learn ICT better when collaborating with my classmates	Social interaction, socio-constructive learning
Q24	I learn ICT better when working alone	Social interaction
Q30	I ask my classmates to help me when I get stuck while using the computer	Support, sense of belonging
Q31	I help my classmates on the computer when they ask	Social interaction, support, sense of belonging
Q32	I don't like to ask my classmates for help on the computer	Social interaction, support, sense of belonging
Q33	My teacher shows me how to do things on the computer	Support
Q34	I don't like to ask my teacher for help on the computer.	Support
Q35	I prefer using ICT on my own.	Social interaction
Q36	I prefer using ICT in a team.	Social interaction
Q37	My classmates help me learn ICT	Support
Q38	My classmates encourage me to learn ICT.	Encouragement

Table 4.16 Table of questions for construct 3: Collaboration

Question	21	24	30	31	32	33	34	35	36	37	38	Average
Student 1	3	2	2	5	0	2	0	1	2	0	0	1.64
Student 2	3	4	1	3	0	2	2	4	2	2	2	2.27
Student 3	4	4	3	4	4	2	5	5	5	2	2	3.64
Student 4	4	4	2	3	3	3	3	2	2	2	3	2.82
Student 5	4	3	4	5	2	3	4	4	3	3	3	3.45
Student 6	4	3	2	2	3	2	3	3	3	2	3	2.73
Student 7	3	2	2	4	2	2	2	0	2	1	2	2.00
Student 8	4	4	3	2	2	3	3	2	2	2	3	2.73
Student 9	4	4	2	2	3	2	3	3	3	2	1	2.64
Averages	3.7	3.3	2.3	3.3	2.1	2.3	2.8	2.7	2.8	1.8	2.1	2.6465
	Median 0 to 5											2.5

Table 4.17 Student scores for construct 3: Collaborative Learning

Pearson’s linear correlation coefficients (cf. **Table 4.18 Appendix B**) for the questions in construct 3: collaboration produced sixty-nine percent of correlations above 0.3. Cronbach’s (1951) Alpha coefficient, 0.8722992, (cf. **Appendix B**) indicates that this construct is a highly reliable instrument of data collection.

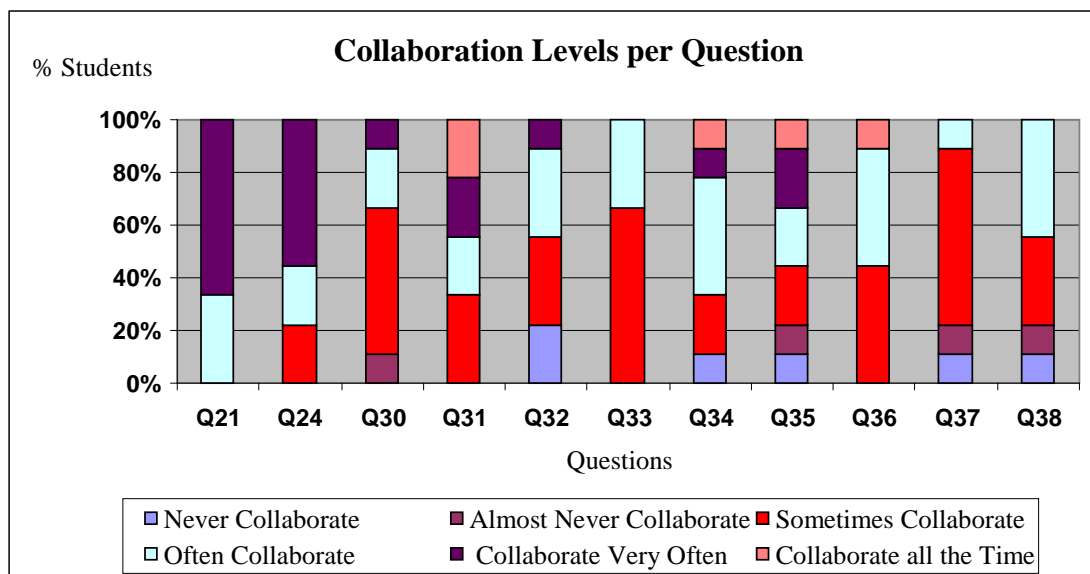


Fig. 4.16 Collaboration Levels per question

‘Sometimes collaborate’ and ‘often collaborate’ constitute sixty-six percent of the scores.

Fig. 4.17 displays the responses per question for each student, cf. **Appendix B** for detailed analysis of student responses.

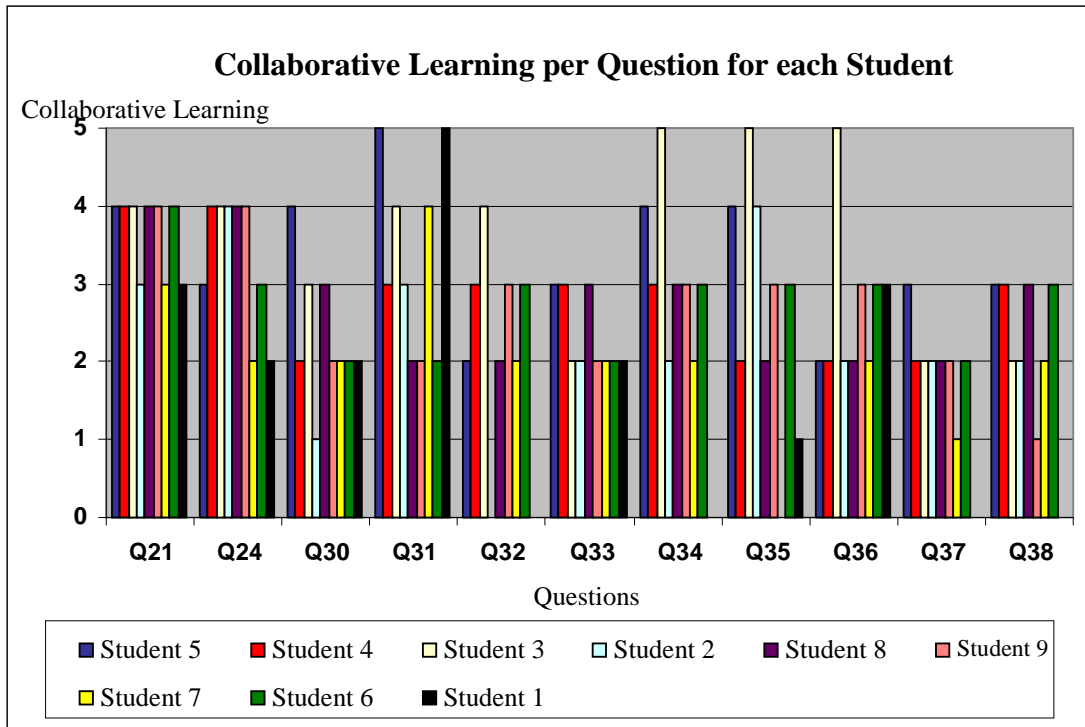


Fig. 4.17 Collaborative Learning per Question for each Student

Students believe that collaboration helps them learn ICT. The group interview confirms this; with the exception of student one, these students are open-minded and positive about team work. In the students' opinion factors such as the topic, personal knowledge of the topic and timing determine the appropriateness of team work. Furthermore the observation of students working on the non-ICT aspects of the report and on the anatomy of the cell mirrored these results.

However, although it is evident that students consider collaboration beneficial to learning, responses to the questionnaire reveal that students could receive more encouragement from their peers to learn ICT. Data from the questionnaire also indicates that students are more willing to give help than to ask for help.

Students tend to collaborate more often when using ICT to learn other topics rather than when learning ICT. This is corroborated in the group interview; students identified the Internet quiz as very conducive to collaborative work. They also considered surfing the Internet for research and using ICT to learn other topics

conducive to collaboration but that word-processing for the report was not conducive to collaboration. Observations on the report exercise showed a drop in collaboration during the word-processing exercise and an increase in collaboration was noted during the quiz on the anatomy of the cell.

Data from the questionnaire highlighted that student one had little desire to collaborate. Student seven also had a low collaboration level; she stated during the group interview that working alone on computers is faster but admitted that she also liked to work in a team. Her collaborative work during the class on the anatomy of the cell revealed her predisposition to collaboration.

Data collected from the questionnaire and during observations on the biology of the cell indicates that the three students who have no ICT experience are more inclined to collaborate while learning and working with ICT. This was confirmed in the group interview; students acknowledged that those students who are not computer literate prefer working in a team as it is less stressful and more fun.

While student five had the lowest level of ICT experience, lowest satisfaction and lowest self-efficacy levels she was the most inclined to collaborate when using ICT.

4.7 Does the use of ICT contribute to the Age Divide or the Gender Divide?

Data on the age divide and the gender divide were collected during the group interview (cf. **Appendix C**) and the group discussion (cf. **Appendix D**) and as vignettes (cf. **Appendix H**)

To students in this case study the question of a digital gender divide is less important than a digital age divide. They believe that using ICT comes naturally to the younger generation: that the younger generation learn ICT from each other by using it socially. They did not acknowledge outside influences such as education impinging on the younger generation causing a gender divide. They recognised a younger generation whose use of ICT is driven predominantly by individual interest rather than gender. However these students considered that gender may influence the specific aspects of ICT that a young person is more likely to use. They also point out that career and personal interest affect one's competency with ICT.

Student eight, the most mature student in this case study, in the fifty-five to sixty years age group, commented that many mature adults are unfamiliar with ICT and the challenge of using ICT is daunting (cf. **Appendix H**). She recommended collaborative learning with the guidance of a teacher to motivate students to explore and learn. This student maintained that competency in ICT will enable the older generation to work and become more socially active in their community. She stated that more effort is required to encourage the mature population to use ICT. The other students agreed that more mature people need to do a course to learn the ICT skills that seem to come naturally to the younger generation.

During the group discussion students revealed that they did not realise the workload involved in the community care course. They emphasised the need to be organised to fulfil the demands of study, family life and work. One student declared that she could not have completed the course without the support of family and the time to study. Others stated that they could not wait until everything in their life was conducive to study as it might not happen. It was evident that these students had a lot of

responsibilities and maintaining a delicate balance was essential to their successfully completing the course. Collaborative learning helped build the supportive relationships these women needed to achieve success in this community care course.

Chapter Five

Discussion of Research Findings

5.1 Introduction

This study has explored the impact of ICT on four aspects of female learning: achievement, satisfaction, self-efficacy and collaboration. This chapter discusses the results of the research within the context of the literature review. This discussion is presented by research question.

5.2 Discussion by Research Question

5.2.1 Does the use of ICT in Learning Improve Student Achievement?

As the prolific growth in online learning continues many researchers postulate that a mixture of ICT and traditional learning will prove most successful (Hwang and Arbaugh 2009, Allen *et al.* 2007). The findings of this study support this view; not only did blended learning produce the highest average post-test results it also produced the highest average improvement. Sixty seven percent of students achieved their highest improvement through blended learning. Blended learning had twice the success rate of traditional learning or learning through ICT only. Current research findings corroborate these results; Hoic-Bozic (2009), Ellis *et al.* (2006) and Chou and Liu (2005) found that blended learning generated higher improvement in academic achievement than traditional learning and had a lower attrition rate than online learning. Students in this case study perceived ICT to enhance learning. In fact in this study traditional learning produced the lowest success rate.

Hui *et al.* (2008) while agreeing that ICT may have beneficial effects on achievement further added that the target knowledge has a moderating effect. Comments from

students six and seven reinforce this point as they also believe that the nature of the knowledge is a pertinent factor in the value of using ICT in learning. This implies that ICT, although beneficial, may not be appropriate for all topics unless blended with other learning approaches.

Kadiyala and Crynes (2000) in an overview of seven hundred and sixty studies concluded that the use of blended learning had greatest effect with the weakest students. This study mirrors that conclusion, the weakest student in this study, student two, achieved her highest improvement from blended learning rather than traditional learning or learning through ICT only.

Contrary to Clark (1994) it is evident from these results that different learning mediums do actually effect achievement. Blended learning had twice the success rate compared to learning through ICT only or traditional learning only.

5.2.2 Does the use of ICT in Learning Improve Satisfaction?

A study by Moore (2002) found that students with ICT experience derive extra satisfaction from improving their ICT skills when attending ICT-mediated courses. This case study produced similar results, as students with previous ICT experience perceived higher satisfaction levels when using ICT for learning. Furthermore the students displayed an improvement in attitude towards both the topic and ICT when using ICT to learn. Kadiyala and Crynes (2000) reported similar results. Student eight, who previously attended ICT courses, considered ICT difficult to learn, however she found that using her knowledge of ICT to learn other subjects satisfying. Students with previous ICT experience exhibited higher satisfaction levels than students with no ICT experience. This is in agreement with the views of Arbaugh (2004) who found that as students attend more technology-mediated courses their satisfaction levels improve.

Students with no ICT experience were apprehensive about using ICT and this contributed to their lower satisfaction levels relative to the class. The author concurs with Sun *et al.* (2006) on this issue as this case study demonstrated that increased

learner computer anxiety is a major contributing factor to decreased satisfaction levels. It is worth highlighting however that computer anxiety does not predict achievement as these students' performances were comparable to others in the class. This finding is in agreement with Kernan and Howard (1990) who found that computer anxiety, provided not excessive, has no effect on course grade. However Sun *et al.* (2008) recommend a basic computer course to alleviate anxiety and improve satisfaction.

The anatomy and physiology classes satisfied Kadiyala and Crynes' (2000) premise that if the method of utilising ICT matched the knowledge type, the experience level of the students and objectives of the class student satisfaction with ICT in learning could be maximised. This proved to be true; in the group interview students unanimously agreed that they derived satisfaction using ICT to learn anatomy and physiology. The ICT skills required were minimal and as students became more familiar with this small skill set their anxiety decreased. In these circumstances student concentration shifted from mastering ICT to using ICT to learn and their interest and satisfaction improved.

Other predictors of satisfaction created the division in satisfaction levels between those students with ICT experience and those without. Students without ICT experience do not find ICT easy to learn, they were more apprehensive about using ICT, they tended to get frustrated and did not use ICT often.

One student mentioned that she found there was too much information on the Internet. According to Azevedo and Cromley (2008) she highlighted a common problem for students who are changing from traditional learning to Internet-mediated searching. Some students may need teacher support to initially differentiate between valuable sources and inappropriate sources (Reeves 1993). As the student becomes more familiar with the Internet their information seeking (IS) practices improve, their ICT usage increases and the variety of ICT applications they employ expands (Kadiyala and Crynes 2000). In agreement with theorists students on this case study demonstrated increased usage and deployed a greater variety of ICT applications as they gained experience in ICT.

Ala-Mutka *et al.* (2008) maintain that ICT can be frustrating if a student has to concentrate on the tool as well as the content. These very sentiments were conveyed by students in this study who claimed that they were happy with the ICT employed during the course however had they been required to do more word-processing they would have dropped out of the course. They elaborated that they would not be able to think about the content if they also had to type and considered word-processing a waste of valuable time when there was so much to learn.

Scanlon (2008) found that one of the main motivators for students to return to learning was to up-skill for employment purposes. This study reflects these comments, seventy one percent of these students stated that they would do an ICT course in the future because it is a necessity, only twenty nine percent stated they would do a further ICT course for interest or enjoyment. The majority of these students are extrinsically motivated to study ICT, Carlson (1989) had similar results. According to Martens *et al.* (2004) extrinsically motivated students work as hard and achieve as well as intrinsically motivated students. This case study confirms that if their learning has practical relevance adults will be motivated to put in the effort to succeed.

During the group interview all students concurred that they found using ICT made anatomy and physiology more interesting and easier to understand. These results triangulate with the test results (cf. **Table 4.3**) and the related 'enjoyment' question in the questionnaire. Not only did ICT improve understanding of anatomy and physiology, it also promoted collaboration during the anatomy and physiology class.

5.2.3 Does the use of ICT in Learning Improve Student Self-Efficacy?

According to the questionnaire the use of ICT improved the self-efficacy of eighty nine percent of the class regardless of whether a student had previous ICT experience or not. Kambouri *et al.* (2006) adds credence to this as they found that adult students experience a boost in confidence when using ICT. Adults learn the skills of working with ICT as well as learning the objectives of the class.

Two of the three students with no previous ICT experience displayed a marked improvement in self-efficacy while using ICT, these students also exhibited satisfaction while deploying edutainment aspects of ICT for example interactive quizzes and animations. In alignment with Kambouri *et al.* (2006) these students commented that they also learned ICT while deploying ICT to learn anatomy and physiology. Student five was the only student who experienced low self-efficacy while using ICT to learn other topics, she also experienced the lowest satisfaction levels, the highest anxiety levels and dropped out of the course. Brosnan (1999) reported the same inverse relationship; low self-efficacy predicts high anxiety about using ICT. According to Campbell (2004) as a student gains more experience with ICT their anxiety decreases and their self-efficacy improves. Consequently Campbell (2004) recommends supportive training to reduce anxiety while using ICT.

Student four had no ICT experience, she left school early and had not attended a course in thirty years but she had high self-efficacy levels. Student four had low confidence in her present ability at ICT however she volunteered that her confidence would improve with practice, an excellent sign of high self-efficacy.

From this study it became apparent that students reached a stage when facing a new task in which they either rose to the challenge, which improved their self-efficacy immensely or they were overwhelmed by the challenge, and experienced defeat. The student who dropped out was as competent as the other two students but she was the most anxious student in the class. This gives rise to the question: what are the factors that make one student strive to succeed while another student recoils in defeat? From this study self-efficacy, satisfaction and anxiety are possible factors affecting a student's approach to the challenge of using ICT in learning. Based on Brosnan's (1999) premise that low self-efficacy predicts high computer anxiety and Kemp's (2002) finding that low self-efficacy is a contributing factor in attrition rates among women students, it is the author's opinion that student five's lack of confidence and low self-efficacy beliefs fed her anxiety and caused her to drop out. Ala-Mutka *et al.* (2008) confirm that a lack of confidence in one's ability to learn can prevent adults from returning to learning and cause them to drop out before completing courses.

Findings in this study concur with Muirhead's beliefs (2007) that adults like to control the pace of their own learning. In this case study seventy eight percent of students prefer to work on individual tasks at their own pace, however they are reluctant to allow the teacher to completely disassociate from input into the timing of class tasks. This reluctance was unexpected but on considering the background of the students: two students educated in Africa, one student educated in Slovakia and three students who were experiencing education for the first time in thirty years, one could consider that possibly these students needed reassurance from the teacher that their timing was on target. These students may need reassurance until success at individual tasks builds their self-confidence. This is in agreement with Krichner *et al.* (2006) who argue that students need teacher support while Kadiyala and Crynes (2000) also maintain that the teacher is a determining factor in learning through ICT. It is encouraging to note that as students become more familiar with ICT their SRL improves (Lee and Tsai 2011).

Seventy one percent of students in this study emphasised that their reason for continuing to study ICT was not enjoyment but necessity. They saw a practical need for ICT and therefore were willing to study it. According to Ala-Mutka *et al.* (2008) usefulness of the learning directly impacts adult motivation to learn. Numerous studies agree that adult students prefer to learn topics that they can directly apply to their life, adults consider relevance of the learning to be of paramount importance (Chuang and Tsai 2005). Hwang and Arbaugh (2009) further argue that education should match the needs of the learner. The students in this case study corroborate these theories; they believed that hard work would produce better results and thus were motivated to invest the effort to acquire ICT skills which they considered to be beneficial life skills.

5.2.4 Does the use of ICT in Learning Improve Collaboration?

According to Hennessy *et al.* (2005) and Draco-Severson (2009) collaborative learning is a major pedagogical development in education. However, results of studies on the benefits of collaboration and ICT in the learning process are inconclusive (Kreijns, Kirschner, and Jochems, 2003). Lee and Tsai (2011) argue that

this is possibly because the range of applications of ICT is so extensive and there are many forms of collaboration. Tutty and Klein (2008) specify that the nature of the task is a determining factor in whether ICT promotes collaboration or not. This study concurs: students collaborated to a large extent when deploying ICT to learn other subjects; they collaborated in groups of two or three students and collaborated between groups. Students with no ICT experience were more anxious to collaborate and teamed up with students with previous ICT experience. Realising that they had peer support alleviated student anxiety. This finding is in agreement with McInnerney and Roberts (2004) who found that when ICT is utilised collaboratively it promotes peer-support and a sense of community. However word-processing was conducive to limited collaboration, one student typed while another dictated and proof-read, other students in the group were not engaged.

Collaboration may be a very effective learning approach for women students as women are more inclined to collaborate (Belenky *et al.* 1986). Draco-Severson *et al.* (2009) added that women students are inclined to collaborate because of the practical, intellectual and emotional support they receive. In support of these theorists, students in this case study quoted motivation, learning from others, fun and stress reduction as benefits of collaborative work. All but one student agreed that collaboration enhances learning. However the students did point out that there should also be a time for individual work. This is no surprise as many theorists maintain that adult students benefit from personal reflection (Mezirow 1991).

Draco-Severson *et al.* (2009) also noted that it took time for students to feel safe enough to ask each other for help which mirrored the reluctance of students in this case study to ask for help; they felt more comfortable giving help rather than seeking help. Student one epitomises this phenomenon, she is very willing to give help, this was triangulated in the questionnaire and in observations but she had no desire to collaborate. There could be many reasons for this; Kreijns *et al.* (2003) suggest that as collaboration is based on social interaction, trust and respect need to be cultivated within the group dynamic. In the author's opinion student one preferred to learn alone or directly through the teacher, although she was willing to help other students if they needed help. Sometimes a student prefers traditional teaching possibly due to

their cultural background and they find collaborative learning frustrating (Draco-Severson *et al.* 2009).

Students in this case study have spent from five years to thirty years in the workforce and all but one are strongly motivated to collaborate rather than compete. Their collaborative behaviour supports the views of Hwang and Arbaugh (2005) that people with experience in the workforce appreciate the benefits of collaboration and are more inclined to collaborate rather than compete with each other.

5.2.5 The Digital Age Divide

Czaja *et al.* (2006) reflect findings from this case study suggesting that there is still a digital divide with regard to age. Czaja *et al.* (2006) also highlight that computer anxiety among older people, especially women, inhibits their use of ICT. According to a study by Ellis and Allaire (1999) there is a direct link between older people and anxiety. Older people have difficulty integrating ICT into their lives, Rogers *et al.* (1998) claim that older people anticipate many problems when considering utilising ICT and they also need more time to learn ICT. Student eight expressed this quite succinctly explaining that older adults are unfamiliar with ICT and find it daunting. Findings from this case study suggest that older adults may need to do an ICT course to learn skills that come naturally to the younger generation. Ala-Mutka *et al.* (2008) reiterate that older adults may need to put in a greater effort to master ICT. Campbell (2004) agrees emphasising that ICT courses for older adults should also aim to reduce computer anxiety.

In agreement with Parente (2007) one student recommended collaborative learning with the guidance of a teacher to motivate older adults to explore and learn. Parente (2007) further adds that a non-threatening environment that permits risk taking and failure will encourage collaboration.

Mc Connatha (2002) points out that competency in ICT will afford older adults greater independence, new confidence and the opportunity to set and achieve new goals. This parallels the benefits of ICT to older people stated by student eight. Ala-

Mutka *et al.* (2008) express the students' opinion that more effort is required to encourage older adults to use ICT.

5.2.6 The Digital Gender Divide

In contrast to Attewell (2001), Losh (2004) and Joiner *et al.* (2006) students in this case study did not acknowledge gender as a major factor contributing to the digital divide. Aligned with Bernier and Laflamme (2005) students maintain that age is the decisive factor in the digital divide. These students do not perceive themselves as part of a gender digital divide. However they indicated that career and personal interest affect one's competency with ICT.

Bagilhole (2002) and Sutor *et al.* (2001) argue that women have to balance a range of responsibilities: student, mother, housekeeper and worker. The multitasking women in this case study were balancing all these responsibilities and like Kemp (2002) they understood the importance of being organised to preserve this delicate balance and succeed. Student three declared that she would not have been able to complete the course without the support she received from her family. This highlights a point made by Gouthro (2005) that women who return to learning find it challenging to keep up their studies if their domestic situation is not favourable.

Eight of the nine women who started the Community Care course completed it. They are now qualified health care assistants. Their work will be both emotionally and physically demanding and satisfying. They will receive minimum wages. The course is open to both men and women.

5.3 Summary of Research

The use of ICT in learning improved achievement, blended learning in particular proved to be most successful. ICT improved satisfaction in learning other subjects for students who had previous experience in ICT, however students with no ICT experience did not experience enhanced satisfaction levels. Using ICT to learn other subjects improved the self-efficacy of eighty nine percent of students. In particular it

is encouraging to note that two of the three students with no ICT experience exhibited a marked improvement in self-efficacy. The use of ICT promoted collaboration in quizzes and Internet research, however using ICT for word-processing detracted from collaboration. This research established that students in this case study believed that older adults found it more difficult to adapt to ICT. Finally female students balance many responsibilities, and family commitments can compromise their learning.

Chapter Six

Conclusion

6.1 Introduction

The ubiquitous use of ICT in the workplace imposes an obligation on adult education to ensure that adult students have every opportunity to learn new or up skill their current ICT skills. This research has revealed that adult students are very aware of the benefits of ICT skills for work, socialisation and to enable them to participate more fully in society. Adult education should address the needs of these students (Hwang and Arbaugh 2009).

This research explored the impact of ICT on collaboration, achievement, satisfaction, and self-efficacy in learning for a group of women returning to education to study community care. It further investigated if these students perceived a digital divide with respect to age or gender.

6.2 The Impact of ICT on Achievement

Evidence from this research combined with the literature reviewed point to the use of ICT in learning as a positive step forward for education. A blend of ICT combined with traditional learning produced a marked improvement in achievement compared with traditional learning alone or learning through ICT alone. It is worth noting that all students in this case study believed that the use of ICT enhanced learning. It must be noted however that the curriculum knowledge and the learner's competency with ICT have a mediating effect on the extent to which ICT should be used.

6.3 The Impact of ICT on Learner Satisfaction

Using ICT to learn other subjects enhances the learning satisfaction of students with previous ICT experience. These students enjoy using their ICT skills to learn other subject material, this validates the relevancy of the ICT they have learnt and gives students an opportunity to improve their skills. However, students with no previous ICT experience perceived no improvement in satisfaction levels or a drop in satisfaction levels when utilising ICT to learn other subject material. Some of these students approached the new challenge of using ICT with apprehension. Anxiety does not appear to have a detrimental effect on achievement, however it is detrimental to satisfaction and can inhibit a student from continuing a course of further study. Ensuring the relevancy of the subject matter and ease of use of ICT positively influence a students' satisfaction with learning.

6.4 The Impact of ICT on Learner Self-Efficacy

The use of ICT in learning had a very positive effect on self-efficacy for eighty-nine percent of students. While it may be disappointing that the use of ICT did not improve the self-efficacy of all students, it is important that educators do not assume that using ICT will automatically improve self-efficacy. Other factors need to be in place to ensure optimal results with regard to satisfaction and self-efficacy while utilising ICT. Learning with ICT can allow students to work at their own pace, however the teacher should be aware that students with low self-efficacy will require guidance and reassurance. Low self-efficacy in learning can affect attrition rates (Kemp 2002).

6.5 The Impact of ICT on Collaboration

Adult students benefit from both collaboration and self-reflection, therefore both should be incorporated into classroom learning. Collaborative learning can be successfully integrated into a socio-constructivist class. Female students and students who have experience in the workforce are particularly receptive to collaborative learning. ICT was observed to be conducive to collaboration when students were

conducting Internet research or working on quizzes, however word-processing reduced collaboration. Students perceived the combination of collaborative learning while utilising ICT, enhanced interest and satisfaction, and for the majority it also enhanced self-efficacy. The peer-support students gave and received helped reduce stress and could reduce attrition rates in adult education. However teachers should be aware that not all students perceive collaboration as a viable learning method and may need to consider alternatives.

6.6 ICT, Gender and Age

In this case study students perceived that the digital divide had a greater impact on age rather than gender. Many older adults find adapting to ICT problematic and cannot avail of the benefits to their quality of life that competency with ICT could provide. Computer anxiety cannot be underestimated among women and older adults and adult education institutions should expend more effort in addressing this issue. Gookool-Ramdoos (2005), Gouthro (2005) and Park (1999) claim that adults have many responsibilities and courses should be designed to accommodate their lifestyle and to address social issues that impede women's access to further education. Issues of childcare, travel, timetabling of courses and non-incremental qualifications can deter female students.

6.7 Recommendations

ICT should be integrated into the learning of other subjects as ICT improves achievement and adult students expect ICT to be as pervasive in education as it is in their every day life. Teachers should consider using ICT and collaboration in socio-constructivist classes.

A basic ICT course for adults initially returning to learning would alleviate ICT anxiety, promote self-efficacy and enhance satisfaction in further learning (Campbell 2004).

Adult education institutions should address issues that inhibit female students from returning to learning, such as providing on site childcare, flexibility with time-tabling, offering incremental qualifications and communicating with students via ICT.

ICT courses should be designed specifically to address the needs of the older adult cohort to enable them to embrace ICT to enhance the quality of their lifestyle and reduce their anxiety about using ICT.

6.8 Limitations

The findings in this case study cannot be generalised as it investigated a small, convenience sample of female students participating in a community care course. This study focused on learning only from a student's perspective.

6.9 Further Research

A follow up investigation with the same participants could shed further light on the long term value of ICT in learning for adults.

Similar research conducted on other classes of community care students throughout the country with reference to the research on pedagogy and ICT could build an archive of material to profile community care students and assess their needs.

Further research on the converse questions would extend this case study. An investigation into whether students with high self-efficacy, competency and satisfaction in learning increases the usage and variety of ICT applications may be worthwhile.

In addition it would be worthwhile to find out if there is a gender preference or an age preference for utilising different types of ICT.

BIBLIOGRAPHY

Abraham, T. (2002) 'Evaluating the virtual management information systems (MIS) classroom', *Journal of Information Systems Education*, 13, 125–133.

Adelman, C., Jenkins, D., Kemmis S. (1980) 'Rethinking case study: notes from the second Cambridge conference', *Cambridge Journal of Education*, 6(3), 139-150.

Ala-Mutka, K., Malanoski, N., Punie, Y., Cabrera, M. (2008) 'Active Aging and the Potential of ICT for Learning', *JRC Scientific and Technical Reports*.

Alavi, M. (1994) 'Computer-Mediated Collaborative Learning: An Empirical Evaluation', *MIS Quarterly*, 18(2), 159-174.

Alavi, M., Dufner, D. (2004) 'Technology-mediated collaborative learning: A research perspective' in Hiltz, S., Goldman, R., eds., *Learning Together Online: Research on Asynchronous Learning Networks*, Mahwah, NJ: Lawrence Erlbaum.

Albirini, A. (2007) 'The Crisis of Educational Technology, and the Prospect of reinventing Education', *Educational Technology and Society*, 10(1), 227-236.

Allen M., Bourhis J., Burrell N., Mabry, E. (2007) 'Comparing student satisfaction with distance education to traditional classrooms in higher education: a meta-analysis', *American Journal of Distance Education*, 16, 83–97.

Alonzo, F., Lopez, G., Manrique, D., Vines, M. (2005) 'An Instructional Model for web-based e-learning education with a blended learning process approach', *British Journal of Educational Technology*, 36(2), 217-235.

Andersen, G., Arsenault, N. (2001) *Fundamentals of Educational Research*. London: Routledge Falmer.

Aragon, S., Johnson, S., Shaik, N. (2002) 'The influence of learning style preferences on student success in online versus face-to-face environments', *American Journal of Distance Education*, 16, 227–244.

Arbaugh, J. B. (2004) 'Learning to learn online: A study of perceptual changes between multiple online course experiences', *Internet and Higher Education*, 7, 169–182.

Aronowitz, S., DiFazio, W. (1999) 'New knowledge work' in Ahier, J., Esland, G. eds., *Education, training and the future of work: social, political and economic contexts of policy development*, London: Routledge, 76-96.

Arrighi, B., Maume, J. (2000) 'Workplace subordination and men's avoidance of housework', *Journal of Family Issues*, 21(4), 464–487.

Artino, A., (2008) 'Motivational Beliefs and Perceptions of Instructional Quality: Predicting Satisfaction with online training', *Journal of Computer Assisted Learning*, 260-270.

Askt, G. (1996) *Effectiveness of Mediated Learning*, Borough of Manhattan Community College (CUNY), Tom Hale of California Polytechnic State University.

Attewell, P. (2001) 'Comment: The First and Second Digital Divides', *Sociology of Education*, 74(3), 252-259

Ayres, P. (2006) 'Impact of reducing intrinsic cognitive load on learning in a mathematical domain', *Applied Cognitive Psychology*, 20, 287–298.

Azevedo, R., Cromley, J. G. (2004) 'Does training on self-regulated learning facilitate students' learning with hypermedia?', *Journal of Educational Psychology*, 96(3), 523–535.

Bagilhole, B. (2002) 'Challenging equal opportunities: changing and adapting male hegemony in academia', *British Journal of Sociology of Education*, 23 (1), 19–33.

Bandura, A. (1978) 'Reflections on Self-efficacy' in Rachman S. ed., *Advances in Behavioral Research and Therapy* (1), Oxford, England: Pergamon Press, 237-269.

Bandura, A. (1986) *Social Foundations of Thought and Action*, Englewood Cliffs, NJ: Prentice Hall.

Barraket, J. (2004) E-learning and access. 'Getting behind the hype' in Osborne, M., Gallacher, J., Crossan, B. (eds.) *Researching Widening Access to Lifelong Learning Learning: Issues and Approaches in International Research*, New York: Routledge, 91–102.

Baskerville, R., Wood-Harper A. (1996) 'A critical perspective on action research as a method for information systems research', *Journal of Information Technology*, 11, 235-246.

Bassey, M. (1981) 'Pedagogic research: on the relative merits of the search for generalisation and study of single events', *Oxford Review of Education*, 7(1): 73-93

Bassey, M. (1999) *Case Study Research in Educational Settings*, Buckingham: Open University Press.

Baylor, A., Ritchie, D. (2002) 'What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms?', *Computers and Education* 39, 395-414.

Begley, C. (1996) 'Using triangulation in nursing research', *Journal of Advanced Nursing*. 24(1), 122-128.

Belenky, M., Clinaiy, B., Goldberger. N., Tarule, J. (1986) *Women's ways of knowing: The development of self, voice, and mind*, New York. NY: Basic Books.

Bell, J. (1993) *Doing Your Research Project*, Buckingham: Open University Press.

Bellefeuille, G., Martin, R., Buck, M. (2005) 'From Pedagogy to Technagogy in Social Work Education: A Constructivist Approach to Instructional Design in an Online, Competency-Based Child Welfare Practice Course', *Child & Youth Care Forum*, 34(5).

Benbasat, I., Goldstein, D., Mead, M. (1987) 'The Case Research Strategy in Studies of Information Systems', *MIS Quarterly*, 11(3), 369-385.

Bernard, R., Abrami P., Lou Y., Borokhovski E., Wade A., Wozney L. (2004) 'How does distance education compare with classroom instruction? A meta-analysis of empirical literature', *Review of Educational Research*, 74, 379-439.

Bernier, C., LaFlamme, S. (2005) 'Usages d'Internet selon le genre et l'age une double differenciation', *CRSA, RCSA*, 42(3), 301-323.

Beier, M., Ackerman, P. (2005) 'Age, ability, and the role of knowledge on the acquisition of new domain knowledge: Promising results in a real-world learning environment', *Psychology and Aging*, 20, 341-355.

Bhushan, P., (2008) 'Connecting or Dividing? Examining female learners' information and communications technology access and use in open and distance learning', *Open Learning* 23(2), 131-138.

Bird, E. (1999) 'Lifelines and life lines: re-training for women returning to higher level occupations – policy and practice in the UK', *International Journal of Lifelong Education*, 18(3), 203-216.

Blundell, S., (1992) 'Gender and the curriculum of adult education', *International Journal of Lifelong Education*, 11 (2), 199-216.

Bolsin, R. (2008) 'Where do we go from here?', *Adults Learning*, Nov., 9-11.

Bødker S., Graves P. (2000) 'Design for learning in use', *Scandinavian Journal of Information Systems*, 12, 61–80.

Bosworth, K., Hamilton, S. (1994) *Collaborative learning: Underlying processes and effective techniques*, San Francisco, CA: Jossey-Bass.

Brock-Utne, B. (1996) 'Reliability and Validity in Qualitative Research within Education in Africa', *International Review of Education* 42(6), 605-621.

Broos, A. (2005) 'Gender and Information and Communication Technologies (ICT) Anxiety: Male Self-Assurance and Female Hesitation', *Cyberpsychology and Behaviour*, 8(1).

Brosnan, M. J. (1999) 'Modeling technophobia: A case for word processing', *Computers in Human Behavior*, 15, 105–121.

Burrell, G., Morgan, G. (1979) *Sociological Paradigms and Organisational Analysis*, London: Heinemann Educational.

Busch, T. (1995) 'Gender differences in self-efficacy and attitudes toward computers', *Journal of Educational Computing Research*, 12, 147-158.

Caffarella, R. (1996) 'What women have taught us about teaching adults', *Journal of Staff Development*, 17(4), 40-45.

Callahan, J., Kiker, D., Cross, T. (2003) 'Does method matter? A meta-analysis of the effects of training method on older learner training performance', *Journal of Management*, 29, 663–680.

Campbell, D.T., Fiske, D.W. (1959) 'Convergent and Discriminant Validation by the Multivariate-Multimethod Matrix', *Psychological Bulletin* 56, 81-105.

Campbell, R. (2004) 'Older women and the Internet', *Journal of Women and Aging*, 16, 161–174.

Carlson, R. (1989) 'Malcolm Knowles: Apostle of Andragogy', *Vitae scholasticae*, 8(1), 217.

Casey D., Houghton P. (2010) 'Clarifying case study research: examples from practice' *Nurse Researcher*, 17(3) 41-51.

Cavanaugh, M., Milcovich, G., Tang, J. (2000) 'The Human and Technical Dimensions of Multimedia Distance Learning (MDL): A Study of MDL Effectiveness in a Global Human Resource Management Class', *Working Paper, Cornell University*.

Cavaye, A. (1996) 'Case Study Research: A Multi-Faceted Research Approach for I S', *Information Systems Journal*, 6, 227-242.

Chaffin, A., Harlow, S. (2005) 'Cognitive Learning Applied to Older Adult Learners and Technology', *Educational Gerontology*, 31(4), 301-329.

Chappell, C. (1996) 'Quality and competency based education and training' in *The Literacy Equation* Red Hill, Australia: Queensland Council for Adult Literacy, 71-79.

Cheng, H., Lehman, L., Armstrong, P. (1991) 'Comparison of performance and attitude in traditional and computer conferencing classes', *American Journal of Distance Education*, 5(3), 51-64.

Chou S., Liu C. (2005) 'Learning effectiveness in a web-based virtual learning environment: a learner control perspective', *Journal of Computer Assisted Learning*, 21, 65-76.

Chuang, S., Tsai, C. (2005) 'Preferences toward the constructivist Internet-based learning environments among high school students in Taiwan', *Computers in Human Behavior*, 21, 255-272.

Clark, A. (2008) 'Where do we go from here?', *Adults Learning*, Nov., 11-12.

- Clark, D. (2003) *Blended Learning: White Paper*, Brighton UK: Epic Group.
- Clark, R. (1983) 'Reconsidering research on learning from media', *Review of Educational Research*, 43, 445–459.
- Clark, R. (1994) 'Media Will Never Influence Learning', *Educational Technology Research and Development*, 42(2), 21-29.
- Cobb, P., Yackel, E., Wood, T. (1991) 'Interaction and learning in mathematics classroom situations', *Educational Studies in Mathematics*, 23, 99-122.
- Cobb, P., Yackel, E., Wood, T. (1992) 'A constructivist alternative to the representational view of mind in mathematics education', *Journal for Research in Mathematics Education*, 23(1), 2-33.
- Cobb, P., Yackel, E. (1996) 'Constructivist, emergent, and sociocultural perspectives in the context of developmental research', *Educational Psychologist*, 3(4), 175–190.
- Cohen, V. (2001) 'Learning styles and technology in ninthgrade high school population', *Journal of Research on Computing in Education*, 33, 355–366.
- Cohen, L, Manion, L., Morrison, K. (2007), *Research Methods in Education*, 5th edn. London and New York: Routledge.
- Collins, A. (1991) 'Cognitive Apprenticeship and Instructional Technology', in Idol L., Jones B. eds., *Educational Values and Cognitive Instruction: Implications for Reform*, Hillsdale, NJ: Erlbaum, 121-138.
- Collins, B. (1995) 'Anticipating the Impact of Multimedia in Education: Lessons from the Literature', *Computers in Adult Education and Training* 2(2), 36-149.
- Comings. J., Sum, A., Uvin, J. (2000) *New skills for a new economy: Adult education key role in sustaining economic growth and expanding opportunity*. Boston, MA: Massachusetts Institute for a New Commonwealth.

- Compeau, D., Higgins, C. (1995a) 'Application of Social Cognitive Theory to Training for Computer Skills', *Information Systems Research*, 6(2), 118-143.
- Compeau, D., Higgins, C. (1995b) 'Computer Self-Efficacy: Development of a Measure and Initial Test', *MIS Quarterly*, 19(2), 189-211.
- Cooper, J. (1995) 'Cooperative learning and critical thinking', *Teaching of Psychology*, 22, 7-9.
- Cooper, J. (2006) 'The Digital Divide: the special case of gender', *Journal of Computer Assisted Learning*, 22, 320-334.
- Cox, R., Pascall, G. (1994) 'Individualism, self-evaluation and self-fulfilment in the experience of mature women students', *International Journal of Lifelong Education*, 13(2), 159-173.
- Cronbach, L., (1951) 'Coefficient alpha and the internal structure of tests', *Psychometrika*, 16(13), 297-334.
- Cuban, L. (1986) *Teachers and Machines: The Classroom Use of Technology Since 1920*, New York: Teachers College Press.
- Cuban, L. (1999) 'The Technology Puzzle' *Education Week*. August 4.
- Czaja, S., Charness, N., Fisk, A., Hertzog, C., Nair, S., Rogers, W., Sharit, J. (2006) 'Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE)', *Psychology and aging*, 21(2), 333-352.
- Dagger, D., Wade, V., Conlon, O. (2005) 'Personalisation for all: Making Adaptive Course Composition Easy', *Educational Technology and Society*, 8(3), 9-25.
- Davies, L., Carrier, P. (1999) 'The importance of power relations for the division of household labour', *Canadian Journal of Sociology*, 24(1), 35-51.

Department for Education and Skills (2001) *Skills for Social Inclusion and the Knowledge Economy: towards a shared vision*, London: HMSO.

Department of Health (2001) *Working Together, Learning Together* London: HMSO.

DeTure, M. (2004) 'Cognitive Style and Self-efficacy: Predicting Student Success in Online Distance Education', *The American Journal of Distance Education*, 18(1), 21-38.

De Vries, E., Lund, K. Baker, M. (2002) 'Computer-mediated epistemic dialogue: explanation and argumentation as vehicles for understanding scientific notions' *The Journal of the Learning Sciences* 11, 63–103.

Draco-Severson, E., Cuban, S., Daloz, K. (2009) 'I Got Your Back: Looking Closely at Women Learners' Collaboration and Leadership in Three Studies', *Adult Basic Education and Literacy Journal* 3(3).

Dubé, L., Paré, G. (2003) 'Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations', *MIS Quarterly*, 27(4), Dec., 597-636.

Dunn R., Dunn K., Price G. (1979) *Learning Style Inventory*, Lawrence, KS: Price Systems.

Edmundson, P. (2007) 'Helping Adults Learn', *Journal of teaching in Addiction*, 6(1) 59-70.

Edwards, R., Ranson, S., Strain, M. (2002) 'Reflexivity: towards a theory of lifelong learning', *International Journal of Lifelong Education* 21(6), 525-536.

Ellis, E., Allaire, A. (1999) 'Modeling computer interest in older adults: The role of age, education, computer knowledge, and computer anxiety', *Human Factors*, 41, 345–355.

Ellis, R., Goodyear, P., Prosser, M., O'Hara, A. (2006) 'How and what university students learn through online and face-to-face discussion: conceptions, intentions and approaches', *Journal of Computer Assisted Learning* 22, 244–256.

Ernest, P. (1991) *The Philosophy of Mathematics Education*, New York: Falmer Press.

Ernest, P. (2005) *Education, philosophy and science of Science, Technology, and Society*. Oxford: Oxford University Press.

Evans, C. (2008) 'The effectiveness of m-learning in the form of podcast revision lectures in higher education', *Computers & Education*, 50(2), 491-498.

Evers, F., Rush, J., Berdrow, R., Berdrow, I. (1998) *The bases of competence: Skills for lifelong learning and employability*, San Francisco, CA: Jossey-Bass.

Fabb, W. (1984) 'Principles of Adult Education. Consultants need to be educators. How do they do it?', *Australian Alcohol/Drug Review*, 3(1), 65-67.

Fagan, G. (1991) 'Local struggles: women in the home and critical feminist pedagogy in Ireland', *Journal of Education*, 173 (1), 65–75.

FEU (1993) '*Paying Their Way: The Experiences of Adult Learners in Vocational Education and Training in FE Colleges*', London: Further Education Unit.

Fjermestad, J., Hiltz, S. (1999) 'An Assessment of Group Support Systems Experimental Research: Methodology and Results', *Journal of Management Information Systems*, 15(3), 7-149.

Forrester, K., Payne, J., Ward, K. (1995) 'Lifelong education and the workplace: a critical analysis', *International Journal of Lifelong Education*, 14, 292–305.

Freire, P. (1970) *Pedagogy of the Oppressed*, New York: Seabury.

Frederickson N., Reed, Clifford, V. (2004) 'Evaluating web-supported learning versus lecture-based teaching: a quantitative and qualitative perspective', *Higher Education* 50, 645–664.

Garrison, D., Vaughan, N. (2008) *Blended Learning in Higher Education, Framework Principles and Guidelines*, San Francisco: Wiley.

Gerlach, J. M. (1994) 'Is this collaboration?', in Bosworth, K., Hamilton, S. eds., *Collaborative learning: Underlying processes and effective techniques* San Francisco, CA: Jossey-Bass, 5-14.

Gibson, I. (2001) 'At the Intersection of Technology and Pedagogy: considering styles of learning and teaching', *Journal for Information Technology for Teacher Education*, 10(1 and 2).

Gijlers, H., Saab, N., Van Joolingen, W., De Jong, T., Van Hout-Wolters, B. (2009) 'Interaction between tool and talk: how instruction and tools support consensus building in collaborative inquiry-learning environments', *Journal of Computer Assisted Learning*, 25, 252–267.

Gillibrand, E., Robinson, P., Brown, R., Osborn, A. (1999). 'Girls' participation in physics in single sex classes in mixed sex schools in relation to confidence and achievement', *International Journal of science education*, 21(4), 349-362.

Ginns, P., Ellis, R. (2007) 'Quality in blended learning: Exploring the relationships between on-line and face-to-face teaching and learning', *Internet and Higher Education*, 10, 53–64.

Gokool-Ramdoos, S. (2005) 'The Online Learning Environment: Creating a space for Mauritian women learners' *The International Review of Research in Open and Distance Learning*, 6(3).

Gold, R. (1958) 'Roles in sociological field observations', *Social Forces*, 36, 217–223.

Goldstein, J., Puntambekar, S. (2004) 'The Brink of Change: Gender in Technology-Rich Collaborative Learning Environments', *Journal of Science Education and Technology*, 13(4).

Goodyear P., Jones C., Asensio M., Hodgson V., Steeples C. (2005) 'Networked learning in higher education: students' expectations and experiences', *Higher Education* 50, 473–508.

Gorand, S., Rees, G., Fevre, R. (1999) 'Two dimensions of time: The changing social context of lifelong learning', *Studies in the Education of Adults*, 31(1), 35–48.

Gorard, S., Selwyn, N., Madden, L. (2003) 'Logged onto learning assessing the impact of technology on participation in life long learning', *International Journal of Lifelong Education*, 22(3), 281-296.

Gorard, S., Selwyn, N. (2005) 'Towards a learning society? The impact of technology on patterns of participation in lifelong learning', *British Journal of Sociology of Education*, 26(1), 71-89.

Gouthro, P. (2005) 'A critical feminist analysis of the homeplace as a learning site: expanding the discourse of lifelong learning to consider adult women learners', *International Journal of Lifelong Education*, 24(1), 5-19.

Green, S., Taber, T. (1980) 'The Effects of Three Social Decision Schemes on Decision Group Process', *Organizational Behavior and Human Performance*, 25(1), 97-106.

Greeno, J., Collins, A., Resnick, L. (1996) 'Cognition and learning' in Berliner, D., Calfee, R. (eds.) *Handbook of educational psychology*, NY: MacMillan, 15–46.

Guba, E., Lincoln, Y. (1994) 'Competing Paradigms in Qualitative Research', in Norman, K., Denzin, Y., Lincoln, S. (eds.), *Handbook of Qualitative Research* Beverly Hills, Ca: Sage Publications 105-117.

Hara, N., Bonk, C., Angeli, C. (2000) 'Content analysis of online discussion in an applied educational psychology course', *Instructional Science*, 28(2), 115–152.

Harrison, R. (1993) 'Disaffection and Access' in Calder, J., (ed.), *Disaffection and Adversity: Overcoming Barriers for Adult Learners*, London: The Falmer Press, 2-19.

Hart, M. (1997) 'Life affirming work, raising children and education', *Convergence* XXX 2(3), 128-135.

Heinssen, R., Glass, C., Knight, L (1987) 'Assessing Computer Anxiety: Development and Validation of the Computer Anxiety Rating Scale', *Computers in Human Behavior* 3(1), 49-59.

Hennessy, S., Deaney, R., Ruthven, K. (2005) 'Emerging teacher strategies for mediating 'Technology-integrated Instructional Conversations': a socio-cultural perspective', *The Curriculum Journal*, 16(3), 265-292.

Hennessy, S., Murphy, P. (1999) 'The Potential for Collaborative Problem Solving in D&T', *International Journal of Technology and Design Education*, 9(1), 1–36.

Henry, J., Stone, R. (1999) 'The Impacts of End-User Gender, Education, Performance and System Use on Computer Self-efficacy and Outcome Expectancy', *Southern Business Review*, 25(1), 10-16.

Hiltz, S. (1995) 'Teaching in a Virtual Classroom', *International Journal of Educational Telecommunications*, 1(2), 185-198.

Hiltz, S., Goldman, R. (2004) *Learning Together Online: Research on Asynchronous Learning Networks*, Mahwah, NJ: Lawrence Erlbaum.

Hiltz, S., Coppola, N., Rotter, N., Turoff, M., Fich, R. (2000) 'Measuring the importance of collaborative learning for the effectiveness of ALN: a multi-measure, multimethod approach', *Journal of Asynchronous Learning Networks*.

Hiltz, S., Wellman, B. (1997) 'Asynchronous learning networks as a virtual classroom', *Communications of the ACM*, 40, 44–49.

Hmelo-Silver, C., Ravit, G., Clark, A. (2007) 'Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark (2006)', *Educational Psychologist* 42 (2): 99–107.

Hoic-Bozic, N., Mornar, V., Boticki, I. (2009) 'A Blended Learning Approach to Course Design and Implementation' *IEEE Transactions on Education* 52(1).

Hui, W., Hu, P., Clark, T., Tam, K., Milton, J. (2008) 'Technology-assisted learning: a longitudinal field study of knowledge category, learning effectiveness and satisfaction in language learning', *Journal of Computer Assisted Learning*, 24(3), 245-259.

Hwang, A., Arbaugh, J. (2009) 'Seeking feedback in blended learning: competitive verses cooperative student attitudes and their links to learning outcome' *Journal of Computer Assisted Learning*, 25, 280-293.

Innocent, N. (2008) 'Where do we go from here?', *Adults Learning*, Nov., 12.

Illeris, K. (2004) 'Towards a contemporary and comprehensive theory of learning', *International Journal of Lifelong Education*, 22(4), 396 - 406

Jackson, S. (2003) 'Lifelong Earning: working class women and lifelong learning', *Gender and Education*, 15(4), 365-376.

Jacobson, M., Spiro, R. (1995) 'Hypertext Learning Environments, Cognitive Flexibility, and the Transfer of Complex Knowledge: An Empirical Investigation', *Journal of Education Computing Research* 12(4), 301-333.

Jay, G., Willis, S. (1992) 'Influence of direct computer experience on older adults' attitude toward computers', *Journal of Gerontology: Psychological Sciences*, 47, 250–257.

Jeong, A., Joung, S. (2007) 'Scaffolding collaborative argumentation in asynchronous discussions with message constraints and message labels', *Computers and Education*, 48(3), 427–445.

Jimenez-Buedo, M., Miller, L. (2010) 'Why a Trade-Off? The Relationship between the External and Internal Validity of Experiments', *International Journal of Qualitative Studies in Education*, 25(69), 301-321.

Johnson, D., Johnson, R., Smith, K. (1991) 'Cooperative Learning: Increasing College Faculty Instructional Productivity', *ASHEERIC Higher Education Report (4), Clearinghouse on Higher Education*, Washington D.C.: The George Washington University.

Johnson, S., Aragon, S., Shaik, N. (2000) 'Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environment', *Journal of Interactive Learning Research*, 11, 29–49.

Johnson-Bailey, J., Cervero, R. (1996) 'An analysis of the educational narratives of Black re-entry women', *Adult Education Quarterly*, 46(3), 142–157.

Joiner, R., Littleton, K., Chou, C., Morahan-Martin, J. (2006) 'Gender and information communication technology', *Journal of Computer Assisted Learning*, 317-319.

Jonassen, D. (1991) 'Objectivism vs. constructivism: Do we need a new philosophical paradigm shift?', *Educational Technology: Research and Development*, 39(3).

Kaartinen, S., Kumpulainen, K. (2002) 'Collaborative inquiry and the construction of explanations in the learning of science', *Learning and Instruction*, 12, 189–213.

Kadiyala, M., Crynes, B. (2000) 'A Review of Literature on Effectiveness of Use of Information Technology in Education', *Journal of Engineering Education*, 177-189.

Kambouri, M., Mellar, H., Logan, K. (2006) 'Adult Learners and ICT: an intervention Study in the UK', Conference Article: First European Conference on Technology Enhanced Learning EC-TEL, 213-226

Kegan, R., Broderick, M., Drago-Severson, E, Helsing, D., Popp, N., Portnow, K. (2001) *Toward a "new pluralism" in the ABE/ESOL classroom: Teaching to multiple "cultures of mind"*, Boston, MA: World Education.

Kemp, W. (2002) 'Persistence of Adult Learners in distance Education', *The American Journal of Distance Education*, 16(2), 65-81.

Kernan, M., Howard, G. (1990) 'Computer Anxiety and Computer Attitudes: An Investigation of Construct and Predictive Validity Issues', *Educational and Psychological Measurement*, 50(3), 681-690.

Khine, M., Lourdusamy, A. (2003) 'Blended learning approach in instructor education: Combining face-to-face instruction, multimedia viewing and online discussion', *British Journal of Educational Technology*, 34(5), 671-675.

King, A. (1997) 'ASK to THINK-TEL WHY: a model of transactive peer tutoring for scaffolding higher level complex learning', *Educational Psychologist* 32(4), 221-235.

Knowles, M. (1990) *The Adult Learner: A Neglected Species*, 4th edn., Houston: Gulf Publishing.

Koedinger, K., Anderson, J., Hadley, W., Mark, M. (1997), 'Intelligent tutoring goes to school in the big city', *International Journal of Artificial Intelligence in Education*, 8(1), 30-43.

Kolb D.A. (1976) *Learning Style Inventory: Technical Manual*, Boston, MA: McBear and Co.

Korupp, S., Szydlik, M. (2005) 'Causes and Trends of the Digital Divide', *European Sociological Review*, 21(4), 409-422.

Kotter, J., Heskett, H. (1992) *Corporate Culture and Performance*, New York: Free Press.

Kreijnsa, K., Kirschner, P., Jochems, W. (2003) 'Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research', *Computers in Human Behavior*, 19(3), 335–353.

Krosnick, J. (1999) 'Survey Research', *Annual Review of Psychology*, 50, 537-567.

Krosnick, J., Alwin, D. (1987) 'An evaluation of cognitive theory of response-order effects in survey measurement', *Public Opinion Quarterly*, 51, 201-219.

Kulik, J., Kulik, C. (1979) 'College Teaching' in Peterson P., Walberg H. (eds.), *Research on Teaching: Concepts, Findings, and Implications*, Berkeley, CA: McCutcheon.

Kumar, A., Kumar, P., Basu, S. (2001) 'Student perceptions of virtual education: an exploratory study', in Mehdi, K. (ed.) *Proceedings of 2001 Information Resources Management Association International Conference*, Toronto, Ontario: Idea Group Publishing, 400–403.

Leach, L., Moon, B. (2000) 'Pedagogy, Information and Communications Technology and Teachers Professional Knowledge', *The Curriculum Journal*, 11(3), 385-404.

Lee, S., Tsai, C. (2011) 'Students' perceptions of collaboration, self-regulated learning, and information seeking in the context of Internet-based learning and traditional learning', *Computers in Human Behavior*, 27 (2011) 905–914.

Lee, S., Tsai C. (2011) 'Students' perceptions of collaboration, self-regulated learning, and information seeking in the context of Internet-based learning and traditional learning', *Computers in Human Behavior*, 27, 905-914.

- Leidner, D., Jarvenpaa, S., (1993) 'The Information Age Confronts Education: Case Studies on Electronic Classrooms', *Information Systems Research* 4(1), 24-54.
- Leidner, D., Jarvenpaa, S. (1995) 'The use of information technology to enhance management school education: A theoretical view', *MIS Quarterly* 19(3), 265–291.
- Leidner, D., Jarvenpaa, S. (1995) 'The Use of Information Technology to Enhance Management School Education: A Theoretical View', *MIS Quarterly* 19(3), 265-291.
- Losh, S.(2004) 'Gender, educational, and occupational digital gaps – 1983–2002', *Social Science Computer Review*, 22, 152–166.
- Lewin, K. (1946) 'Action research and minority problems', *Journal of Social Issues*, 2, 34-46.
- Lincoln, Y., Guba, E. (1985) *Naturalistic Inquiry*. Newbury Park CA: Sage Publications.
- Maki, R., Maki, W., Patterson, M., Whittaker, P. (2000) 'Evaluation of a Web-Based Introductory Psychology Course: I. Learning and Satisfaction in On-Line Versus Lecture Courses', *Behavior Research Methods, Instruments, and Computers* 32(2), 230-39.
- Maor, D. (2000) 'A teacher professional development program on using a constructivist multimedia learning environment', *Learning Environments Research* 2, 307–330.
- Maguire, M., Maguire, S., Felstead, A. (1993) *Factors Influencing Individual Commitment to Lifetime Learning. A Literature Review*, London: Employment Department.
- Martin-Michiellot, S., Mendelsohn, P. (2000) 'Cognitive load while learning with a graphical computer interface', *Journal of Computer Assisted Learning*, 16, 284–293.

- Mayer, R. (2003) 'Elements of a science of e-learning', *Journal of Educational Computing Research*, 29, 297–313.
- Mayer, R. (2004) 'Should There Be a Three-Strikes Rule Against Pure Discovery Learning?', *American Psychologist*, 59(1), 14–19.
- McConatha, D. (2002) 'Aging online: Toward a theory of equality', in Morrell, R. (ed.) *Older adults, health information, and the World Wide Web*, Mahwah, N. J: Lawrence Erlbaum Associates, 22-41.
- McDonald, J. (2008) *Blended Learning and Online Tutoring - Planning Learner Support and Activity Design*, 2nd edn., London: Glower Publishing Limited.
- McDonough, J., McDonough, S. (1997) *Research Methods for English Language Teachers*, London: Arnold.
- McFarlane, S., Beaujot, R., Haddad, T. (2000) 'Time constraints and relative resources as determinants of sexual division of domestic work', *Canadian Journal of Sociology*, 25(1), 61–82.
- McGill, T., Hobbs, V. (2008), 'How students and instructors using a virtual learning environment perceive the fit between technology and task', *Journal of Computer Assisted Learning* 24, 191–202.
- McInnerney, J., Roberts, T. (2004) 'Online Learning: Social Interaction and the Creation of a Sense of Community', *Educational Technology and Society*, 7 (3), 73-81.
- Merriam, S. (2008) 'Adult Learning Theory for the Twenty First Century' *New Directions for Adult and Continuing Education*, 119, 93-98.
- Mertens, D. (2005) *Research and Evaluation in Education and Psychology*, 2nd edn., Sage: London.

- Martens, R., Gulikersw, J., Bastiaens, T. (2004) 'The impact of intrinsic motivation on e-learning in authentic computer tasks', *Journal of Computer Assisted Learning*, 20, 368-376.
- Maxwell, J. (1992) 'Understanding and validity in qualitative research', *Harvard Educational Review*, 62(3), 279-300.
- Mezirow, J. (1991) *Transformative Dimensions of Adult Learning*, San Francisco: Jossey-Bass.
- Middlecamp, C. (1999) 'What Is Feminist Pedagogy? Useful Ideas for Teaching Chemistry', *Journal of Chemical Education*, 76(4).
- Miles, M., Huberman, A. (1994) *Qualitative Data Analysis: An Expanded Sourcebook*, (Second edition), London: Sage Publications.
- Milheim, M., Martin B. (1991) 'Theoretical bases for the use of learner control: three different perspectives', *Journal of Computer-Based Instruction*, 18, 99–105.
- Miltiadou, M., Yu, C., (2000) 'Validation of the online technologies self-efficacy scale (OTSSES)', *Proceedings of SITE 2000, Society for Information Technology and Teacher Education International Conference*, San Diego, CA: ERIC 445672
- Moore, M.G. (2002) 'Preface' in Moore, M., Anderson, W. (eds.) '*Handbook of Distance Education*', Mahwah, N.J.: Lawrence Erlbaum Associates, ix–xii.
- Morrell, R., Mayhorn, C., Bennett, J. (2000) 'A survey of World Wide Web use in middle-aged and older adults', *Human Factors*, 42, 175–182.
- Mugny, G., Doise, W. (1978) 'Socio-cognitive conflict and structure of individual and collective performances', *European Journal of Social Psychology*, 8, 181–192.
- Muirhead, R. (2007) 'E-learning, is this teaching at students or teaching with students?', *Nursing Forum*, 42(4), 178-184.

- Mulhall, A., (2003) 'Methodological Issues in Nursing Research. In the field: notes on observation in qualitative research', *Journal of Advanced Nursing*, 41(3), 306–313.
- Mulnar, A., (1997) 'A brief history', *Computers in Education* 27(3).
- Mumford, E. (2001) 'Advice for an action researcher' *Information Technology and People*, 14(1), 12-27.
- Neo, M. (2003) 'Developing a collaborative learning environment using a web-based design', *Journal of Computer Assisted Learning*, 19, 462–473.
- Nisbet, J., Watt, J. (1984) 'Case study' in Bell, J., Bush, T., Fox, A., Goodey, J., Goulding, S. eds., *Conducting Small-Scale Investigations in Educational Management*. London: Harper & Row, 79-92.
- Nunan, D. (1992). *Research Methods in Language Learning*. Cambridge: Cambridge University Press.
- Neuhauser, C. (2002) 'Learning style and effectiveness of online and face-to-face instruction', *American Journal of Distance Education*, 16, 99–113.
- Neumann, E., Finaly-Neumann, E. (1989) 'Predicting juniors' and seniors' persistence and attrition: a quality of learning experience approach', *Journal of Experimental Education*, 57, 129–140.
- Neumann, J., Hirschhorn, L. (1999), 'The challenge of integrating psychodynamic and organizational theory', *Human Relations*, 52(6), 683-94.
- Ng'ambi, D., Johnston, K. (2006) 'An ICT –mediated Constructivist Approach for increasing academic support and teaching critical thinking skills', *Educational Technology and Society*, 9(3), 244-253.

Niemiec, R., Walberg, H. (1987) 'Comparative Effects of Computer Assisted Instruction: A Synthesis of Reviews,' *Journal of Educational Computing Research*, 3(1), 19-37.

Nilsen, H., Puroo, S. (2005) 'Balancing Objectivist and Constructivist Pedagogies for Teaching Emerging Technologies: Evidence from a Scandinavian Case Study 2005' *Journal of Information Systems Education*, 16(3).

Norman, D.A., Spohrer, J.C. (1996) 'Learner-centered education', *Communications of the ACM* 39, 2-4.

Odogwo, H., Nyala, J. (2010) 'Female Students' Competence in the use of ICT and their Future Career', *European Journal of Scientific Research*, 43(4), 554-562.

Ogletree, S., Williams, S., (1990) 'Sex and Sex-typing Effects on Computer Attitudes and Aptitude', *Sex Roles*, 23(11) 703-712.

Opie, C. (2004) *Doing Educational Research*, London: Sage.

Otte, G. (2007) 'New questions for online learning, and new answers: the case of the CUNY Online Baccalaureate', *On the Horizon* 15(3), 169-176.

Parente, D., Duck, J., Zhao, X., Fizel, J. (2007) 'Collaboration: Leading and Learning by Example', *MERLOT Journal of Online Learning and Teaching*, 3(2).

Park, S. (1994) 'Research, Teaching and Service: Why shouldn't women's work count?', *The Journal of Higher Education*, 67(1), 46-84.

Piccoli, G., Ahmad, R., Ives, B. (2001) 'Web-based virtual learning environments: a research framework and preliminary assessment of effectiveness in basic IT skills training', *MIS Quarterly* 25, 401-426.

Pretzlik, U. (1994) 'Observational methods and strategies', *Nurse Researcher* 2(2), 13-21.

Puntambekar, S., Luckin, R. (2003) 'Documenting Collaborative Learning: what should be measured and how?', *Computers and Education*, 41(2003), 309-311.

Qvortrup, L. (2006) *Knowledge, Education and Learning - E-learning in the knowledge Society*, Copenhagen: Samfundslitteratur Press

Rainer, R., Laosethakul, K., Astone, M. (2003) 'Are gender perceptions of computing changing over time?', *Journal of Computer Information Systems*, Summer, 108-114.

Rapoport, R., (1970) 'Three dilemmas of action research', *Human Relations*, 23, 499-513.

Reeves, T. (1993) 'Pseudoscience in Computer Based Instruction: The Case of Learner Control Research', *Journal of Computer-Based Instruction* 20(2), 39-46.

Reigeluth, C. (1991) 'Reflections on the implications of constructivism for educational technology', *Educational technology*, 34-37.

Remenyi, D., Onofrei, G., English, J. (2009) '*An Introduction to Statistics using Microsoft Excel*', Reading UK: Academic Publishing Limited.

Reynolds, D., Treharne, D., Tripp, H. (2003) 'ICT- the hopes and the reality', *British Journal of Educational Technology*, 34(2), 151-167.

Richardson, J., Swan, K. (2003) 'An examination of social presence in online learning: Students' perceived learning and satisfaction', *Journal of Asynchronous Learning Networks*, 7(1), 68-88.

Ricks F., (2002) '*The paradox: Research as practice and practice as research*', Paper presented at the 2nd National Research Symposium on the Voluntary Sector Coalition of National Voluntary Organizations, Toronto.

Roca, J., Chiub C., Martíneza F. (2006) 'Understanding e-learning continuance intention: an extension of the technology acceptance model', *International Journal of Human-Computer Studies*, 64, 683–696.

Robertson, J., Grant, M., Jackson, L. (2005) 'Is online instruction perceived as effective as campus instruction by graduate students in education?' *Internet and Higher Education*, 8, 73–86.

Rockhill, K. (1982) 'Researching participation in adult education: the potential of the qualitative perspective', *Adult Education* 33(1), 3-19.

Rogers, W., Meyer, B., Walker, N., Fisk, A. (1998) 'Functional limitations to daily living tasks in the aged: A focus group analysis', *Human Factors*, 40, 111–125.

Rosenberg, J., Yates, P. (2007) 'Schematic representation of case study research designs', *Journal of Advanced Nursing*, 60(4), 447–452.

Rovai, A., Luckin, R. (2003) 'Sense of community in a higher education television-based distance education program', *Educational Technology, Research and Development*, 51, 5–16.

Rovai, A., Ponton, M., Derrick, M., Davis, J. (2006) 'Student evaluation of teaching in the virtual and traditional classrooms: A comparative analysis', *Internet and Higher Education*, 9, 23–35.

Russell, T. (1999) *The No Significance Difference Phenomenon*, Raleigh, NC: North Carolina State University Press.

Saab, N., Van Joolingen, W., Van Hout-Wolters, B. (2007) 'Supporting communication in a collaborative discovery learning environment: the effect of instruction', *Instructional Science*, 35, 73–98.

Savicevic, D. (2008) 'Convergence or divergence of ideas on andragogy in different countries', *International Journal of Lifelong Education*, 27(4), 361-378.

Scanlon, L. (2008) 'Adults' motives for returning to study: the role of self-authoring', *Studies in Continuing Education*, 30(1) 17-32.

Schön, D. (1987) *Educating the reflective practitioner: toward a new design for teaching and learning in the professions*, San Francisco: Jossey-Bass.

Schuller, T., Brassett-Grundy, A., Green, A., Hammond, C., Preston, J. (2002) '*Learning, Continuity and Change in Adult Life: wider benefits of learning*', Research Report No. 3 London Institute of Education.

Schunk, D. (2005) 'Self-regulated learning: the educational legacy of Paul R. Pintrich', *Educational Psychologist* 40, 85–94.

Slater, N. (2008) 'Large-scale Open Source eLearning Systems at the Open University', *Educause Centre for Applied Research, Research Bulletin*, 2008(12).

Selwyn, N., Gorard, S. (2003) '*Reality bytes: examining the rhetoric of widening educational participation via ICT*', *British Journal of Educational Technology*, 34(2), 169-181.

Selwyn, N., Gorard S., Furlong, J. (2005) 'Whose Internet is it Anyway? : Exploring Adults' (Non) Use of the Internet in Everyday Life', *European Journal of Communication*, 20(5).

Shen, J., Hiltz, S., Bieber, M. (2008) 'Learning Strategies in Online Collaborative Examinations' *IEEE Transactions on Professional Communications* 51(1).

Shen, Q. (2009) 'Case Study in Contemporary Educational Research: Conceptualization and Critique Cross-cultural Communication' *Canadian Academy of Oriental and Occidental Culture*, 5(4).

Sheridan, J. (2007) 'Lifelong Learning in a Postmodern Age: Looking Back to the Future through the Lens of Adult Education'.

- Silverman, D. (1987) *Communication and Medical Practice*, London: Sage.
- Slavin, R., (1980), 'Cooperative Learning in Teams: State of the Art', *Educational Psychologist*, 15(2), 93-111.
- Slavin, R. (1995) '*Cooperative Learning: Theory, Research and Practice*', Needham Heights, Mass.: Allyn and Bacon.
- Slavin, R. (1996) 'Research on Cooperative Learning and Achievement: What We Know, What We Need to Know', *Contemporary Educational Psychology*, 21(1), 43-69.
- Sluijsmans, D., Martens, R. (2004) 'Performance assessment in integrated e-learning', in Jochems, W., Van Merriënboer, J., Koper, R. eds., *Integrated E-learning: Implications for Pedagogy, Technology and Organization*, London: Routledge Falmer, 39–51.
- Smith, G., Heindel, A., Torres-Ayala, A. (2008), 'E-learning commodity or community: Disciplinary differences between online courses', *Internet and Higher Education*, 11, 152–159.
- Snowman, J., Beihler, R. (2000) '*Psychology Applied to Teaching*', Boston USA: Houghton Mifflin Company.
- Stalker, J. (2001) 'Misogyny, women, and obstacles to tertiary education: a vile situation', *Adult Education Quarterly*, 51(4), 288–305.
- Stenhouse, L. (1988) 'Case Study Methods' in Keeves (ed.) *Educational Research Methodology and Measurement: an International Handbook*, Oxford: Pergamon.
- Strijbos, J. (2010) 'Assessment of Computer-Supported Collaborative Learning' *IEEE Transactions on Learning Technologies*, 37.

Suitor, J., Mecom, D., Feld, I. (2001) 'Gender, household labour, and scholarly productivity among university professors', *Gender Issues*, 19(19), 50–67.

Summers, J., Beretvas, S., Svinicki, M., Gorin, J. (2005) 'Evaluating Collaborative Learning and Community', *The Journal of Experimental Education*, 73(3), 165-188.

Sun, P., Tsai, R., Finger, G., Chen, Y., Yeh, D. (2008) 'What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction', *Computers and Education*, 50(4), 1183-1202.

Susman, G., Evered, R. (1978) 'An assessment of the scientific merits of action research', *Administrative Sciences Quarterly*, 23, 582–603.

Tanner, H., Jones, S. (1994) 'Using Peer and Self-assessment to Develop Modelling Skills with Students Aged 11 to 16: A Socio-constructive View' *Educational Studies in Mathematics*, 27(4), 413-431.

Tian, Y. (1996) 'Divorce, gender role and higher education expansion', *Higher Education*, 32, 1–22.

Tripp, D. (1985) 'Case Study Generalisation: An Agenda for Action', *British Educational Research Journal*, 11(1), 33-43

Tutty, J., Klein, J. (2008) 'Computer-mediated instruction: A comparison of online and face-to-face collaboration', *Educational Technology Research and Development*, 56, 101–124.

UNESCO (1997) *Declaration of the Fifth Conference on Adult Education*, Paris: UNESCO.

Vandenbroeck, M., Verschelden G., Boonaert, T. (2008) 'E-learning in a low-status female profession: the role of motivation, anxiety and social support in the learning divide', *Journal of Computer Assisted Learning*, 24, 181–190

Volman, M., Eck, E. (2001) 'Gender equality and information technology in education: The second decade', *Review of Educational Research*, 71(4), 613-634.

Volman, M., Eck, E., Heemskerk, I., Kuiper, E. (2005) 'New technologies, new differences: Gender and ethnic differences in pupils use of ICT in primary and secondary education', *Computers and Education*, 45, 35-55.

Vygotsky, L. (1978) '*Mind in Society: The Development of Higher Psychological Processes*', Cambridge, MA: Harvard University Press.

Wallace, M. (1998). *Action Research for Language Teachers*. Cambridge: Cambridge University Press.

Wang, Y. (2003) 'Assessment of learner satisfaction with asynchronous electronic learning systems', *Information and Management*, 41, 75-86.

Warring, M. (1999) 'Counting for nothing: what men value and what women are worth', 2nd edn., Toronto: University of Toronto Press.

Warrington, M., Younger, M. (2001) 'Single-sex classes and equal opportunities for girls and boys: perspectives through time from a mixed comprehensive school in England', *Oxford Review of Education*, 27 (3), 339-356.

Webster, J., Hackley, P. (1997) 'Teaching Effectiveness in Technology-Mediated Distance Learning', *Academy of Management Review* 40(6), 1282-1309.

Weinberger, A., Fischer, F. (2006) 'A framework to analyze argumentative knowledge construction in computer supported collaborative learning', *Computers and Education* 46, 71-95.

Weiner, B. (1979) 'A theory of motivation for some classroom experience', *Journal of Educational Psychology*, 71, 3-25.

Wetzel, C., Radtke, P., Stern, H. (1994) *Instructional Effectiveness of Video Media*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Willis, J. (2007) *Foundations in Qualitative Research: Interpretive and Critical Approaches*, California: Sage.

Wilson, N., McLean, S. (1994) *Questionnaire Design: A Practical Introduction*. Newtown Abbey, Co. Antrim: University of Ulster Press.

Williams M. (1996) 'Learner-control and instructional technologies' in Jonassen, D. ed., *Handbook of Research for Educational Communications and Technology*, New York: Simon and Schuster Macmillan.

Yin, R. (1984) *Case Study Research*. Beverly Hills, CA: Sage Publications.

Yin, R. (1994) *Case Study Research, Design and Methods*, 2nd ed., London: Sage Publications.

Yin, R. (1999) 'Enhancing the Quality of Case Studies in Health Services Research', *Health Services Research*, 34(5), Pt 2, 1209-1224.

Yin R. (2003) *Case Study Research: Design and Methods*, 3rd edn., London: Sage Publications.

Zhang, D., Zhao, J., Zhou, L., Nunamaker, J. (2004) 'Can e-learning replace online learning?', *Communications of the ACM*, 47(5), 75-79.

URLs

Allen, I., Seaman, J. (2006), 'Making the Grade: Online Education in the United States', Sloan-C., Needham, MA, [available online]

www.sloan-c.org/publications/survey/pdf/making_the_grade.pdf

[accessed 9/10/2010]

Austin, A. and Baldwin, R. (1992) 'Faculty collaboration: Enhancing the quality of scholarship and teaching', [available online]

<http://eric.ed.gov.proxy.lib.ul.ie/PDFS/ED347958.pdf> [accessed 10/9/2011]

Dearing Report (1997) *Higher Education and the Dearing Report* [available online]

<http://www.lifelonglearning.co.uk/greenpaper/ch4005.htm> [accessed 14/2/2011]

Department for Education and Employment (1996) 1997–1999 Single Programming Document, London, HMSO [available online]

<http://www.lifelonglearning.co.uk/greenpaper/> [accessed 6/2/2011]

Department for Education and Employment (1998) *The Learning Age: a renaissance for a new Britain*, London: HMSO, [available online]

<http://www.lifelonglearning.co.uk/greenpaper/> [accessed 6/2/2011]

Dillman, D., Smyth, J., Christian, L., Stern, M. (2003) 'Multiple answer questions in self-administered surveys: the use of check-all-that-apply and forced-choice question formats', Paper presented at the American Statistical Association, San Francisco, CA. [available online]

<http://survey.sesrc.wsu.edu/dillman/papers/2002/multipleanswerquestions.pdf>

[accessed 10/2/2011]

European Commission (2000) 'A Memorandum on Lifelong Learning'

[available online] <http://www.bologna-berlin2003.de/pdf/MemorandumEng.pdf>

[accessed 28/12/2010]

European Commission (2001) '*Making a European Area of Lifelong Learning a Reality*', COM (2001) 678. [available online]

<http://www.bologna-berlin2003.de/pdf/MitteilungEng.pdf> [accessed 10/2/2011]

Kelley, L., Ringstaff, C. (2002) 'The Learning Return on Our Educational Technology Investment' [available online]

<http://www2.schooltube.com/Files/Tabs/Educators/learningreturn.pdf>

[accessed 20/9/2011]

Leney, T., May, T., Hayward, G., Wilde, S. (2007) 'International Comparisons in Further Education', Qualifications and Curriculum Authority [available online],

<http://www.europarchive.org.tna/20070305111521/dcsf.gov.uk/research/data/uploads/RR832.pdf>

[accessed 21/9/2011]

OECD (1996) 'Lifelong Learning, Policy Brief' [available online]

<http://www.oecd.org/dataoecd/17/11/29478789.pdf> [accessed 28/12/2010]

Schutte, J. (1997) 'Virtual Teaching in Higher Education: The New Intellectual Superhighway or Just Another Traffic Jam?', California State University, Northridge, CA, [available online]

<http://www.csun.edu/sociology/virexp.htm> [accessed 10/2/2011]

Sharp, R., Benfield, G., Roberts, G., Francis, R. (2006) 'The undergraduate experience of e-Learning: A Review Of UK literature and practice' The Higher Education Academy, [available online]

http://business.heacademy.ac.uk/assets/documents/research/literature_reviews/blended_elearning_full_review.pdf [accessed 4/4/2011]

Sticht, T. (2004) 'Re: Evidence-based adult education and literacy system. AAACE-NLA', [available online]

<http://lists.literacytent.org/pipermail/aaace-nla/2004/000719.html>

[accessed 4/11/2010]

Wenglinsky, H. (1998), 'Does it compute? The relationship between educational technology and student achievement in mathematics', Educational Testing Service Policy Information Report, [available online]

http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/17/11/aa.pdf [accessed 20/1/2009]

World Health Organisation (2002) 'Active Ageing – A Policy Framework', WHO, Geneva, [available online]

http://whqlibdoc.who.int/hq/2002/WHO_NMH_NPH_02.8.pdf [accessed 19/8/2011]

APPENDIX A

TESTS

1. Pre-test ICT Only Learning Questionnaire on knowledge of the cell at the start of the course

- Q1. Did you ever study the cell before?
- Q2. What level did you study the cell to?
- Q3. Could you name any parts of the cell?
- Q4. Can you describe any functions of the parts of the cell?
- Q5. Do you know what meiosis is?
- Q6. What is meiosis?
- Q7. Do you know what mitosis is?
- Q8. What is mitosis?
- Q9. What is a tumour?
- Q10. Do you know any differences between benign and malignant tumours?
- Q11. Can you list some of the differences between benign and malignant tumours?

1. Post-test ICT Only Learning The Cell

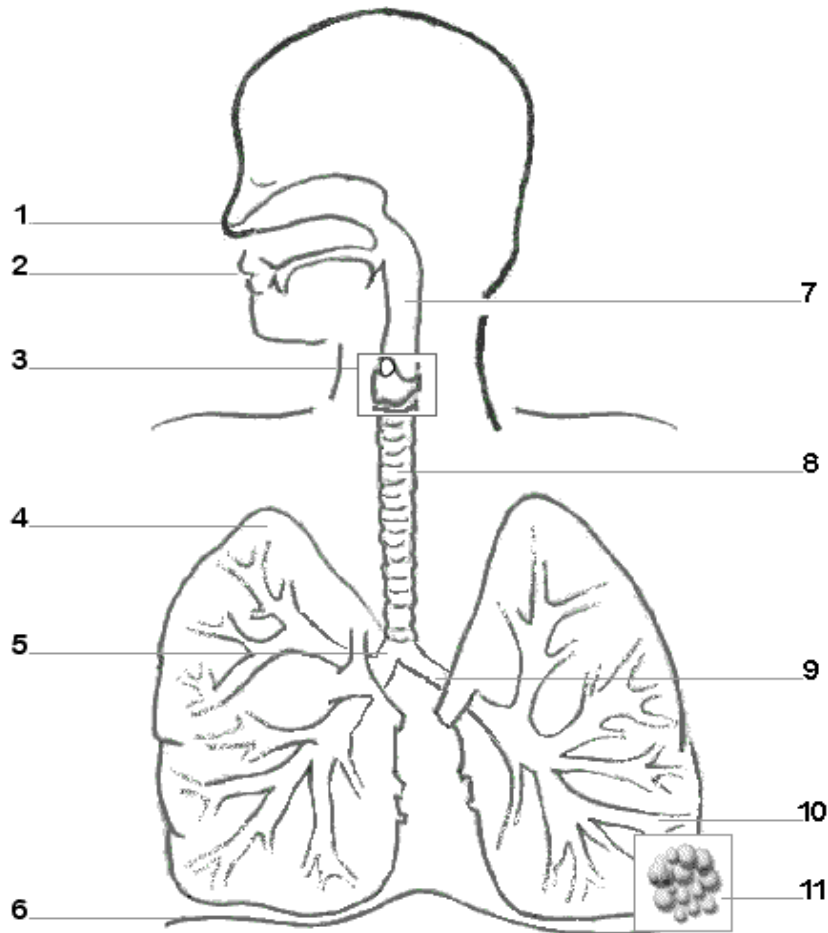
- a. Differentiate between mitosis and meiosis.
- b. Explain the differences between benign and malignant tumours.
- c. Draw and label a typical animal cell explaining the functions of its parts.

2. Pre-test Blended Learning Questionnaire on knowledge of the respiratory system at the start of the course

- Q1. Did you ever study the respiratory system before this course?
- Q2. What level did you study the respiratory system to?
- Q3. Could you please fill in any parts of the respiratory system and their functions.
- Q4. Could you name the gases that are exchanged in the lungs?
- Q5. Could you explain the exchange of gases in the lungs?
- Q6. What gas controls breathing?
- Q7. Can you describe the mechanism of breathing?

2. Post-test Blended Learning The Respiratory System

- a Label the parts of the respiratory system 4, 6, 9, 10 and 11. (2 Marks)



- b Explain the process of the exchange of gases in the alveoli. You may draw a diagram to help your explanation. (3 Marks)
- c What gas controls the breathing rate in humans?
Describe the mechanism of breathing. (5 Marks)

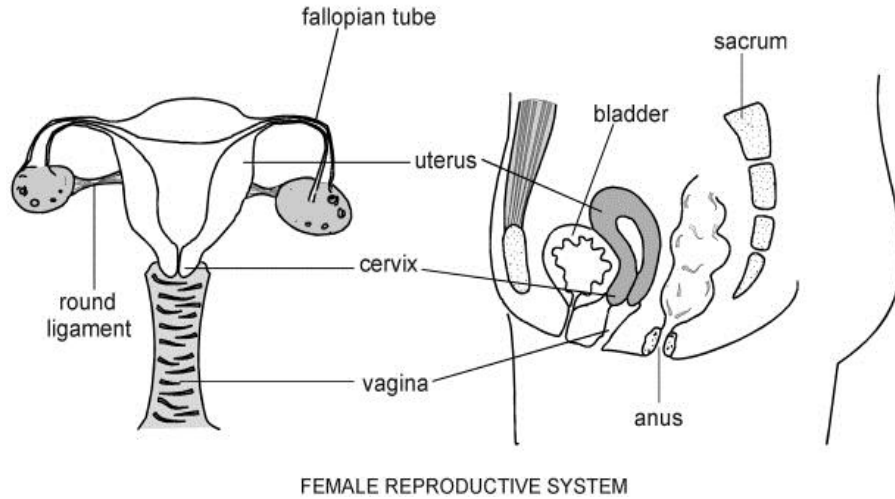
3. Pre-test Traditional Learning Only Questionnaire on knowledge of the reproductive system at the start of the course

- Q1. Did you ever study the reproductive system before this course?
- Q2. What level did you study the reproductive system to?
- Q3. How long ago did you study the reproductive system?
- Q4. Name any parts of the female reproductive system and their functions.
- Q5. Name any parts of the male reproductive system and their functions.
- Q6. How many chromosomes does a human have?
- Q7. How many chromosomes are there in a human egg?
- Q8. How many chromosomes are there in human sperm?
- Q9. What is the endometrium?
- Q10. Can you name the main hormones involved in the development of the endometrium?

3. Post-test Traditional Learning Only

The Reproductive system

(a) Where in the female reproductive system does the following occur:



Implantation _____

Fertilisation _____

Ovulation _____

Insemination _____ (2 Marks)

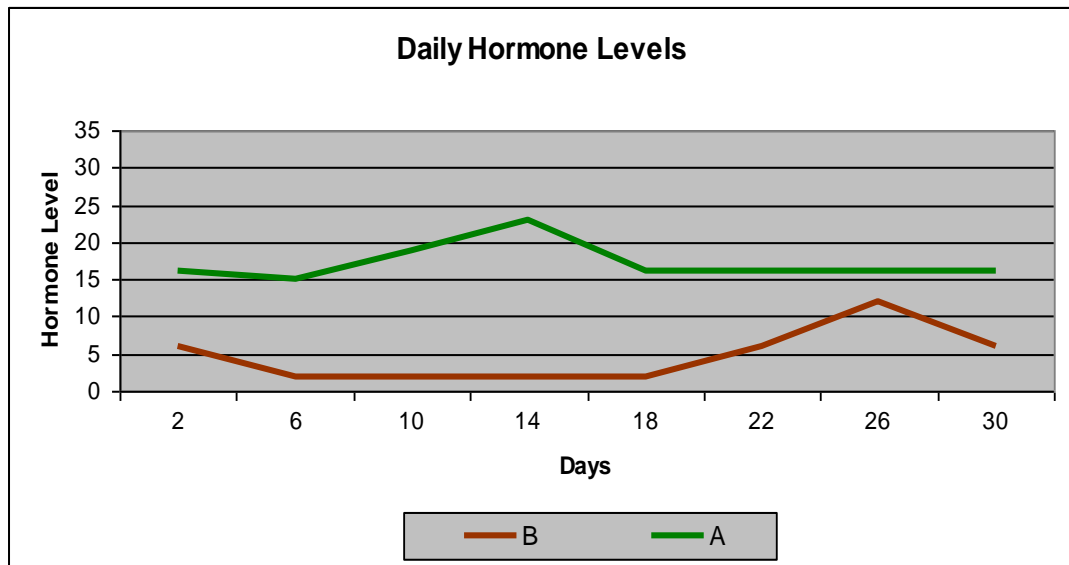
(b) Answer the following questions with regard to the male reproductive system.

(i) Where is sperm produced? (1 Mark)

(ii) Why is it an advantage for the testes to be situated outside the main body cavity? (1 Mark)

(iii) Why is it important that the sperm and the egg have only 23 chromosomes? (1 Mark)

- (c) The graphs illustrate changes in the levels of two hormones, A and B, which are involved in the development of the endometrium, during the female menstrual cycle.



- (i) Name one of these two hormones. (1 Mark)
- (ii) What happens in the ovary around day 14 of the cycle? (1 Mark)
- (iii) Apart from the two hormones illustrated, another hormone called FSH has a role in the cycle.

Where is FSH produced?

Give one function of FSH? (1 Mark)

- (iv) Which graph, A or B, represents the hormone secreted by the *corpus luteum* (yellow body)? (1 Mark)
- (v) Draw a line graph in the space above A and B to illustrate the changes that take place in the thickness of the endometrium over the course of the cycle. (1 Mark)

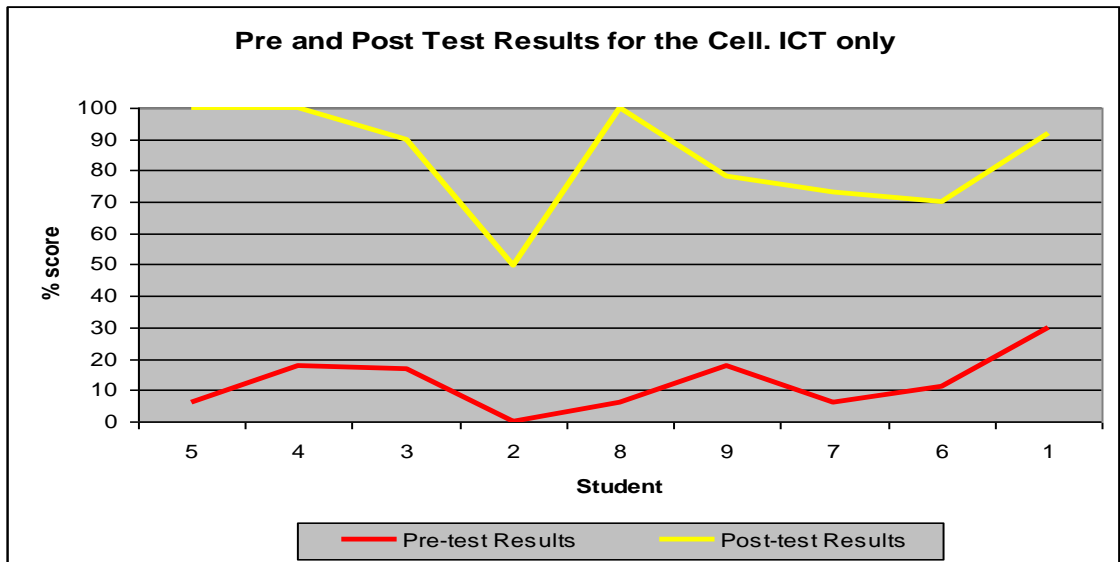


Fig. 4.2 Pre and post test results for the cell: ICT only

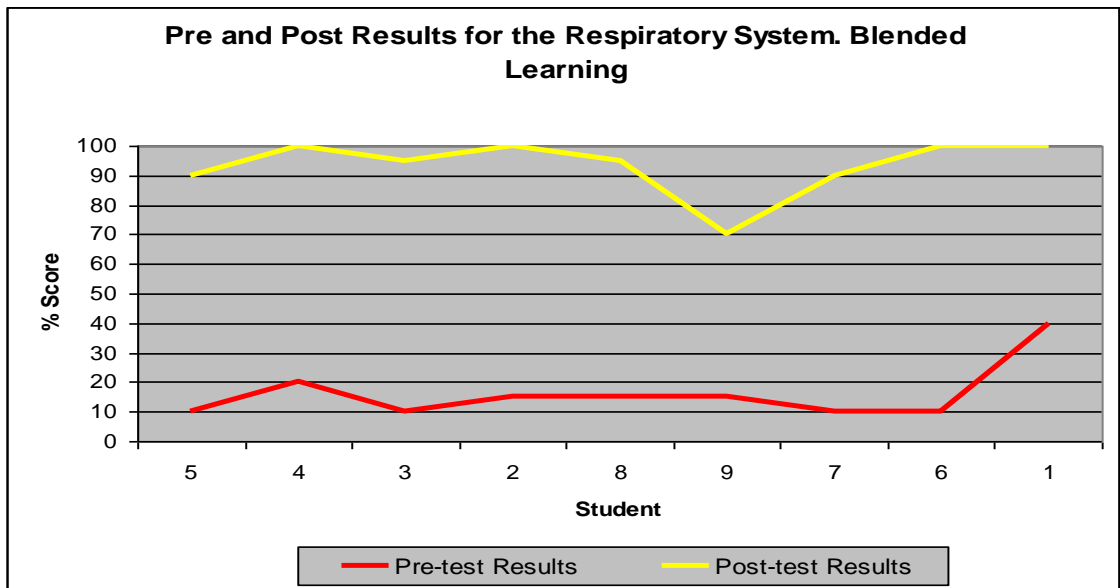


Fig. 4.3 Pre and poet test results for the respiratory system: blended learning

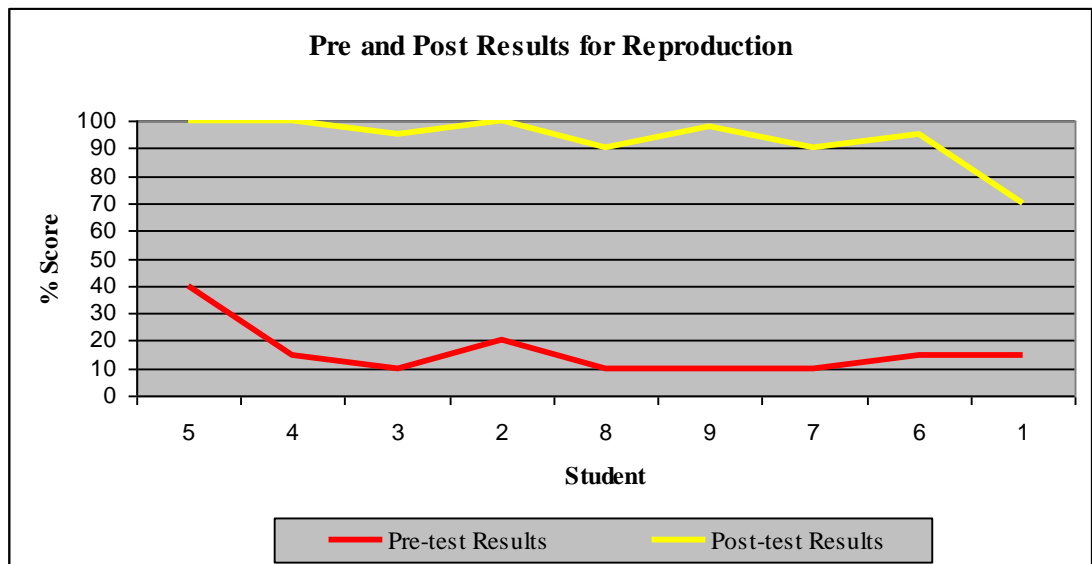


Fig. 4.4 Pre and post test results for the reproductive system: traditional learning

	ICT ONLY			BLENDED			TRADITIONAL		
	The Cell and Cancer			Respiratory System			Reproductive System		
	Pre test	Post test	Post minus Pre	Pre test	Post test	Post minus Pre	Pre test	Post test	Post minus Pre
Student 1	30	92	62	40	100	60	70	90	20
Student 2	0	50	50	15	100	85	0	50	50
Student 3	17	90	73	10	95	85	60	85	25
Student 4	18	100	82	20	100	80	25	90	65
Student 5	6	100	94	10	90	80	30	100	70
Student 6	11	70	59	10	100	90	10	100	90
Student 7	6	73	67	10	90	80	15	50	35
Student 8	6	100	94	15	95	80	20	70	50
Student 9	18	78	60	15	70	55	30	85	55
Average	12.4	83.7	71.2	16.1	93.3	77.2	29	80	51.1

Table 4.3 Pre-test and pos-test results

It is the increase between pre-tests and post-tests, not the highest marks that indicates learning has occurred. Blended learning has the highest average increase in marks of 77.2% followed by ICT only learning with an average increase in marks of 71.2%. The average increase in marks with traditional learning is much lower at 51.1%. Consider the average difference in marks between blended learning and traditional learning, $77.2\% - 51.1\% = 26.1\%$, this average difference in marks does not yield a clear value of the improvement in learning between these learning methods. The pre-test mark for traditional learning was the highest, at 28.9%, which means that traditional learning could only achieve a maximum improvement of $100 - 28.9 = 71.1\%$.

Average Percentage Improvement

Average Percentage Improvement	$= (\text{increase in mark} / \text{maximum possible increase}) * 100\%$
--------------------------------	--

E.g. Average increase in mark 71.2%
 Pre-test mark 12.4%
 Maximum possible increase in mark $100\% - 12.4\% = 87.6\%$

Average Percentage Improvement	$= 71.2\% / 87.6\% * 100\% = \mathbf{81.3\%}$
--------------------------------	---

Individual Percentage Improvement

Individual Percentage Improvement	$= (\text{individual increase in mark} / \text{maximum possible increase}) * 100\%$
-----------------------------------	---

Hypothesis Test for learning through ICT only

Hypothesis testing using one-tailed t-tests

Null Hypothesis H_0 : $\mu_0 = 82.083$
Learning through ICT only does not improve achievement relative to blended learning or traditional learning.

Alternative Hypothesis H_1 $\mu_1 > 82.083$
Learning through ICT does improve achievement relative to blended learning or traditional learning.

Mean, \bar{X}	81.9167
Standard Deviation, s	17.7285
Sample Size, n	9
Degrees of Freedom	8
Level of Significance, α	0.05

t-calculated	0.0281
t-critical	1.8595

Accept H_0 as the absolute value of t-calculated is not greater than t-critical.

Learning through ICT only does not improve achievement compared to blended learning and traditional learning.

Hypothesis Test for learning through Blended Learning

Null Hypothesis H_0 : $\mu_0 = 82.083$

Learning through ICT only does not improve achievement relative to blended learning or traditional learning.

Alternative Hypothesis H_1 $\mu_1 > 82.083$

Learning through ICT does improve achievement relative to blended learning or traditional learning.

Mean, \bar{X} 93.3333

Standard Deviation, s 11.2361

Sample Size, n 9

Degrees of Freedom 8

Level of Significance, α 0.05

t-calculated 2.7368

t-critical 1.8595

Reject H_0 as the absolute value of t-calculated is greater than t-critical.

Blended learning improves achievement compared to learning through ICT only or traditional learning.

Hypothesis Test for Traditional Learning

Null Hypothesis H_0 : $\mu_0 = 82.083$
Learning through ICT only does not improve achievement relative to blended learning or traditional learning.

Alternative Hypothesis H_1 $\mu_1 > 82.083$
Learning through ICT does improve achievement relative to blended learning or traditional learning.

Mean, X	72
Standard Deviation, s	20.8604
Sample Size, n	9
Degrees of Freedom	8
Level of Significance, α	0.05

t-calculated	1.4501
t-critical	1.8595

Accept H_0 as the absolute value of t-calculated is not greater than t-critical.

Traditional learning does not improve achievement relative to blended learning and learning through ICT.

APPENDIX B
QUESTIONNAIRE

The Impact of Information and Computer Technology on Adult Learning

Dear Learner,

As part of my Masters in Digital Media Development for Education I am researching the impact of computers on adult learning. I would be grateful if you would take part in this research by answering the questionnaire.

You are under no obligation to fill in this questionnaire. Any information will be treated in confidence. You will not be identified within my final thesis.

Many thanks for your cooperation,

Lucia Ramsey

Questionnaire

(Ordinal scores in blue are included)

Section A. Please tick (✓) the appropriate box.

		YES	NO
1	Have you studied computers (ICT) before?	1	0
2	If 'YES' what was the name of the course?	1	0
3	Do you have a computer at home?	1	0
4	Do you have internet access at home?	1	0
5	Did you expect to use ICT on this course?	1	0
6	Did you feel apprehensive about using ICT on this course?	0	1
7	Do you think students should have access to ICT in school?	1	0
8	Do you think having ICT skills will benefit you?	1	0
9	Do you think your teacher should use more ICT equipment?	1	0

Table 4.1 Student profile: first nine questions

Section B. Please tick (✓) the appropriate box.

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
10	I enjoy working with computers in class	5	4	3	2	1
11	I prefer NOT to use computers in class	1	2	3	4	5
12	Using Computers in class improves my learning	5	4	3	2	1
13	I prefer to work at my own pace	5	4	3	2	1
14	I prefer it when the teacher controls the pace of learning on individual tasks	1	2	3	4	5
15	The harder I work the better my results will be.	5	4	3	2	1
16	I feel apprehensive about using computers	1	2	3	4	5
17	Using computers in class makes learning more interesting	5	4	3	2	1
18	I find using computers frustrating	1	2	3	4	5
19	I would like to learn more ICT skills	5	4	3	2	1
20	I enjoy using ICT to learn other subjects	5	4	3	2	1
21	I learn ICT better when collaborating with my class mates	5	4	3	2	1
22	I would improve my ICT skills if given the opportunity	5	4	3	2	1
23	I think computers are easy to learn	5	4	3	2	1
24	I learn ICT better when working alone	1	2	3	4	5
25	I am more willing to put in the effort if I believe I can succeed at the task	5	4	3	2	1

Please tick (✓) the appropriate box.

I would feel confident using ICT:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
26	If I could get help if I got stuck.	5	4	3	2	1
27	If someone helped me get started.	5	4	3	2	1
28	If I did similar tasks before	5	4	3	2	1
29	I would not feel confident learning new computer skills	1	2	3	4	5

Please tick (✓) the appropriate box.

		All the time	Very Often	Often	Some times	Almost Never	Never
30	I ask my classmates to help me when I get stuck while using the computer	5	4	3	2	1	0
31	I help my classmates on the computer when they ask	5	4	3	2	1	0
32	I don't like to ask my classmates for help on the computer	0	1	2	3	4	5
33	My teacher shows me how to do things on the computer	5	4	3	2	1	0
34	I don't ask my teacher for help on the computer	0	1	2	3	4	5
35	I prefer using ICT on my own	0	1	2	3	4	5
36	I prefer using ICT in a team	5	4	3	2	1	0
37	My classmates help me learn ICT	5	4	3	2	1	0
38	My classmates encourage me to learn ICT	5	4	3	2	1	0

39. How often do you use computers:

every day 5

a few times a week 4

once a week 3

occasionally 2

never 1

Other, please specify _____

40. What do you use computers for (tick as many boxes as needed)

Booking things e.g. flights, shows accommodation

Buying and selling e.g. ebay, Amazon

Social sites e.g. Facebook, Bebo

Research for your course

Sending and receiving emails

Surfing the net

Type up course assignments

Other, please specify

0, no ticks,

1, one tick

2, three ticks

3, four ticks

4, five ticks

5, six ticks or more

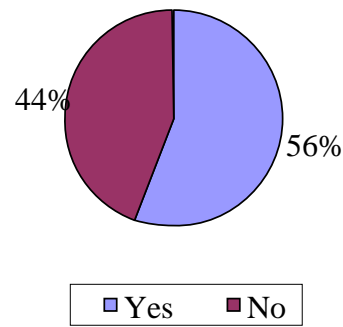
‘Other’ occurred in one response qualifying the respondent for a score of 5

If there are any other comments you wish to add please feel free to do so

Results

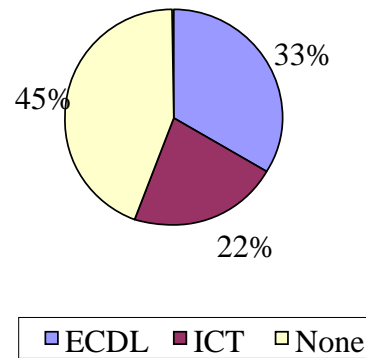
1. Have you studied computers (ICT) before?

Previous ICT Course



2. If 'YES' what was the name of the course?

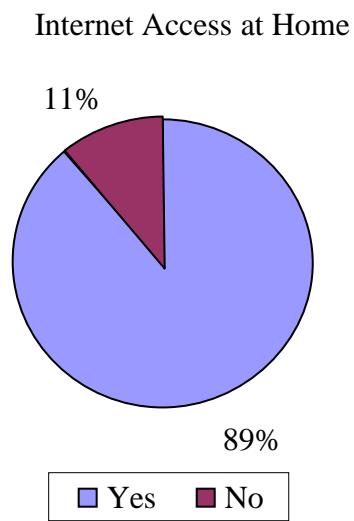
Name of Previous ICT Course



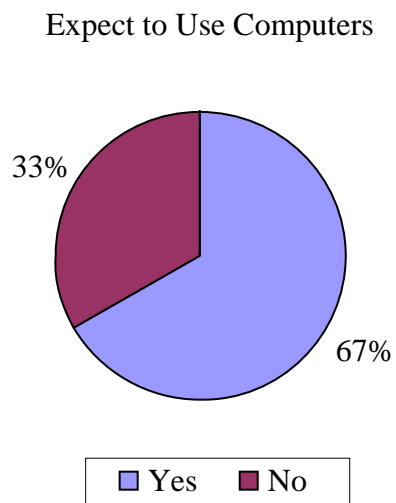
3. Do you have a computer at home?

100% of respondents have a computer at home.

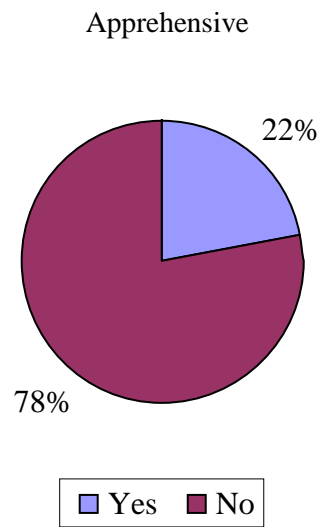
4. Do you have Internet access at home?



5. Did you expect to use computers on this course?



6. Did you feel apprehensive when you realised that you would be using computers on this course?



7. Do you think students should have access to computers in school?

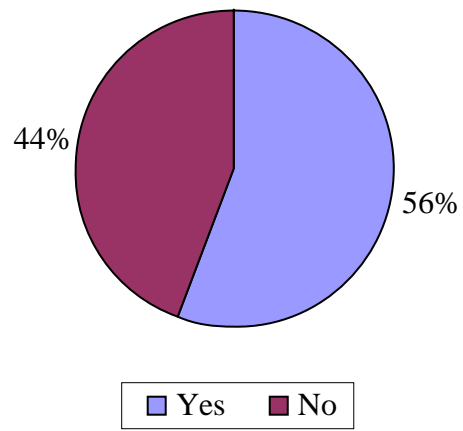
100% of students think students should have access to computers at school.

8. Do you think having ICT skills will benefit you?

100% of students think that having ICT skills will be of benefit to them.

9. Do you think your teacher should use more ICT equipment?

The Teacher should use more ICT



Summary of Results for Questions 1 to 9

Question	Q 1	Q 02	Q 03	Q 04	Q 05	Q 06	Q 07	Q 08	Q 09	Total
Student 1	1	1	1	1	1	1	1	1	1	9
Student 2	0	0	1	1	1	1	1	1	0	6
Student 3	0	0	1	1	1	1	1	1	0	6
Student 4	0	0	1	1	0	0	1	1	0	4
Student 5	0	0	1	0	0	0	1	1	0	3
Student 6	1	1	1	1	1	1	1	1	1	9
Student 7	1	1	1	1	1	1	1	1	1	9
Student 8	1	1	1	1	1	1	1	1	1	9
Student 9	1	1	1	1	0	1	1	1	1	8
Average	0.56	0.56	1.00	0.89	0.67	0.78	1.00	1.00	0.56	

Table 4.2 Summary of Results for Questions 1 to 9

Satisfaction

Construct 1

Fig. 4.7 shows that there is marked linear correlation between questions 10, 12, 17 and 20.

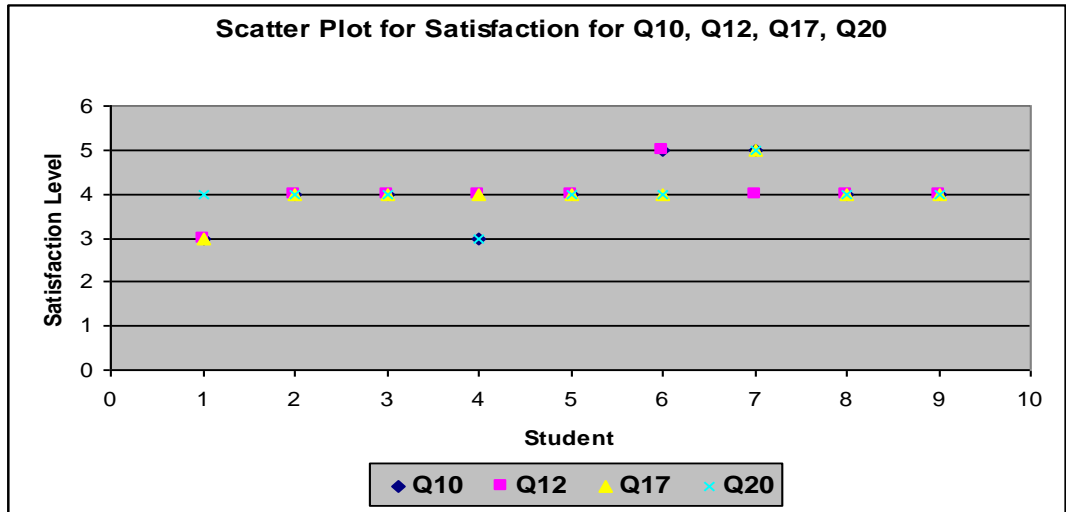


Fig. 4.7 Scatter plot for satisfaction Q10, Q12, Q17, Q20

There is marked linear correlation between questions 11, 16, 18, and 19.

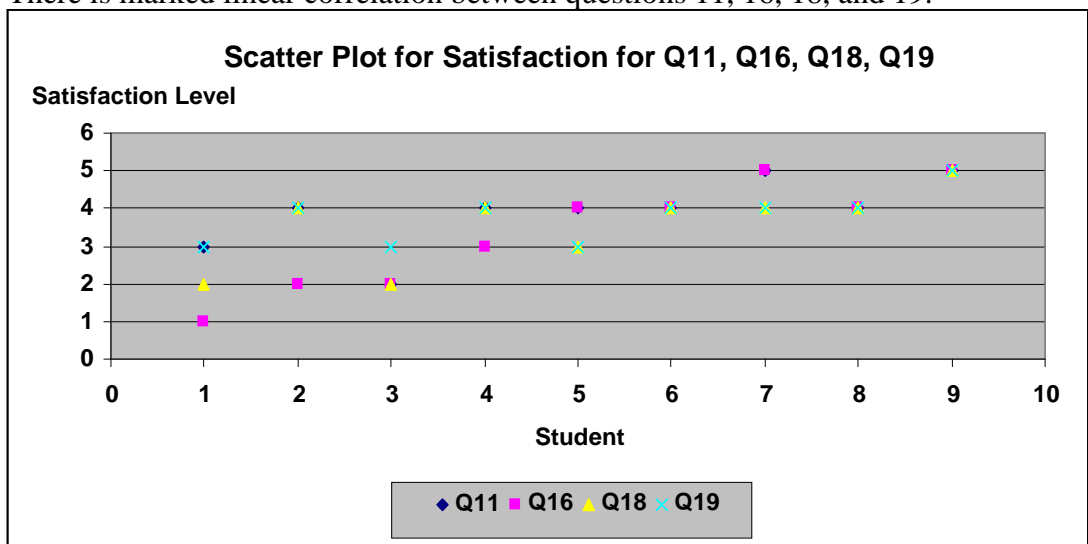


Fig. 4.8 Scatter plot for satisfaction Q11, Q16, Q18, Q19

Fig. 4.9 depicts a high degree of linear correlation between questions 39 and 40.

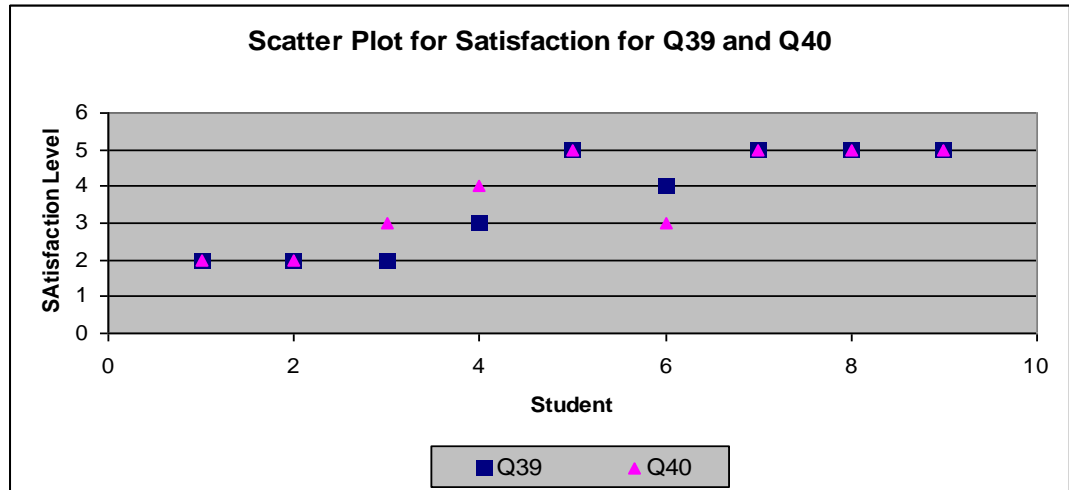


Fig. 4.9 Scatter plot for satisfaction for Q39 and Q40

It is evident from the scatter plots that there is a marked linear correlation between the grouped questions in this construct, satisfaction. Curvilinear correlation was also investigated using scatter plots but linear correlation provided the best fit.

Pearson's Linear Correlation Coefficient for Satisfaction

Question	Q10	Q11	Q12	Q16	Q17	Q18	Q19	Q20	Q23	Q39	Q40
Q10	~	0.38	0.71	0.63	0.71	0.35	0.27	0.71	0.55	0.50	0.27
Q11	0.38	~	0.27	0.79	0.54	0.87	0.76	0.27	0.17	0.73	0.60
Q12	0.71	0.27	~	0.53	0.50	0.49	0.38	0.00	0.51	0.36	0.19
Q16	0.63	0.79	0.53	~	0.71	0.73	0.62	0.35	0.68	0.94	0.86
Q17	0.71	0.54	0.50	0.71	~	0.49	0.38	0.50	0.51	0.53	0.58
Q18	0.35	0.87	0.49	0.73	0.49	~	0.95	0.00	0.37	0.58	0.48
Q19	0.27	0.76	0.38	0.62	0.38	0.95	~	0.00	0.47	0.44	0.39
Q20	0.71	0.27	0.00	0.35	0.50	0.00	0.00	~	0.26	0.35	0.19
Q23	0.55	0.17	0.51	0.58	0.51	0.37	0.47	0.26	~	0.42	0.44
Q39	0.50	0.73	0.35	0.94	0.53	0.58	0.44	0.35	0.42	~	0.91
Q40	0.27	0.60	0.19	0.86	0.58	0.48	0.37	0.19	0.44	0.91	~

Table 4.7 Pearson's Linear Correlation Coefficient for Construct 1: Satisfaction

Cronbach's alpha coefficient test for internal consistency was used to test for reliability of the data collection instrument

Average of all inter-item correlations $r = 0.4916$,

Number of items $n = 11$

$$\alpha = nr / \{1 + (n-1)r\}$$

Cronbach's Alpha coefficient for satisfaction = 0.9141

This indicates that this construct is a very highly reliable instrument of data collection.

Ordinal scores for each question in Construct 1: Satisfaction

	Question	Frequency of Scores				
		1	2	3	4	5
Q10	I enjoy working with computers in class.	0	0	2	5	2
Q11	I prefer not to use computers in class.	0	1	1	5	2
Q12	Using Computers in class improves my learning.	0	0	1	7	1
Q16	I feel apprehensive about using computers	1	2	1	3	2
Q17	Using computers in class makes learning more interesting.	0	0	1	7	1
Q18	I find using computers frustrating.	0	2	1	5	1
Q19	I would like to learn more ICT skills.	0	0	3	5	1
Q20	I enjoy using ICT to learn other subjects.	0	0	1	7	1
Q23	I think computers are easy to learn	0	3	1	5	0
Q39	How often do you use computers?	0	3	1	1	4
Q40	What do you use computers for?	0	2	2	1	4

Table 4.9 Scores for each question in the construct for satisfaction

From **Table 4.9** it can be seen that scores 4 and 5 are most prevalent indicating high levels of satisfaction. Q39 and Q40 have a different distribution of scores as the questions are based on time spent using ICT and the different ways ICT is used both predictors of satisfaction. Q16, Q18 and Q23 have lower levels of satisfaction.

The high satisfaction level is most prevalent, occurring in 48.1% of responses, followed by very high satisfaction level which occurred in 24.5% of responses, followed by moderate satisfaction in 14.2% of responses, low satisfaction occurred in 10.4% of responses and very low satisfaction occurred in 2.8% of responses.

High satisfaction and very high satisfaction constitute 72.6% of responses.

Hypothesis Test for Construct 1: Satisfaction

Hypothesis testing using one-tailed t-tests

Based on median = 3

Null Hypothesis H_0 $\mu_0 = 3.3$ ICT has no impact on learner satisfaction

Alternative Hypothesis H_1 $\mu_1 > 3.3$ ICT improves learner satisfaction

Mean X	3.74747	
Standard Deviation s	0.696475	(average per person)
Sample Size n	9	
Degrees of Freedom	8	
Level of Significance α	5%	

t-calculated	1.927454
t-critical value	1.859548

Reject the Null Hypothesis as t-calculated is greater than t-critical value

Accept the Alternative Hypothesis: the use of ICT improves learner satisfaction

This result is very close, splitting the sample into those students who previously attended an ICT course and those who have not reveals that ICT does not improve satisfaction for students who have no previous ICT courses whereas ICT does improve satisfaction for those students who have previously attended an ICT course.

Hypothesis Test for Construct 1: Satisfaction

For students who have not previously attended an ICT course.

Based on median = 3

Null Hypothesis H_0 $\mu_0 = 3.3$ ICT has no impact on learner satisfaction

Alternative Hypothesis H_1 $\mu_1 > 3.3$ ICT improves learner satisfaction

Mean X 3.1136
Standard Deviation s 0.42234 (average per person)
Sample Size n 9

Degrees of Freedom 8

Level of Significance α 5%

t-calculated **1.3241**

t-critical value **1.859548**

Do NOT reject the Null Hypothesis as t-calculated is not greater than t-critical value

ICT does not improve learner satisfaction for students who have not previously attended an ICT course.

Hypothesis Test for Construct 1: Satisfaction

For students who have previously attended an ICT course.

Based on median = 3

Null Hypothesis H_0 **$\mu_0 = 3.3$** ICT has no impact on learner satisfaction

Alternative Hypothesis H_1 **$\mu_1 > 3.3$** ICT improves learner satisfaction

Mean X 4.2545

Standard Deviation s 0.33649 (average per person)

Sample Size n 9

Degrees of Freedom 8

Level of Significance α 5%

t-calculated **8.50991**

t-critical value **1.859548**

Reject the Null Hypothesis as t-calculated greater than t-critical value

ICT improves learner satisfaction for students who have previously attended an ICT course.

Self-efficacy

Construct 2

Pearson's Linear Correlation Coefficient for Self-efficacy

Question	Q13	Q14	Q15	Q22	Q25	Q26	Q27	Q28	Q29
Q13	~	0.76	0.34	0.35	0.27	-0.35	0.53	0.68	0.63
Q14	0.76	~	0.4	0.36	0.36	0.54	0.85	0.67	0.52
Q15	0.34	0.4	~	0.63	0.4	0.47	0.32	0.17	-0.1
Q22	0.35	0.36	0.63	~	0.25	0.5	0.5	0.11	0
Q25	0.27	0.36	0.4	0.25	~	-0.4	0.13	-0.3	0.11
Q26	-0.35	0.54	0.47	0.5	-0.4	~	0.75	0.64	0.22
Q27	0.53	0.85	0.32	0.5	0.13	0.75	~	0.53	0.56
Q28	0.68	0.67	0.17	0.11	-0.3	0.64	0.53	~	0.48
Q29	0.63	0.52	-0.1	0	0.11	0.22	0.56	0.48	~

Table 4.14 Pearson's Linear Correlation Coefficient Table for Construct 2: Self-efficacy

Cronbach's Alpha coefficient

To test for reliability of the data collection instrument Cronbach's alpha coefficient test for internal consistency was used.

Average of inter-item correlations $r = 0.66$

Number of items $n = 9$

$$\alpha = nr / \{1 + (n-1)r\}$$

Cronbach's Alpha coefficient = 0.94586 This indicates that this construct is a very highly reliable instrument of data collection.

Some of the questions in this construct do not need to correlate for example question 13 based on attribution theory and question 26 based on Bandura's theory that self-efficacy improves with encouragement from peers, do not correlate because an aspect

of question 13 is to work alone whereas an aspect of question 26 is to get help. Similarly question 25 is negatively correlated with question 26; a positive correlation is not expected between question 25 and question 26 as question 25 considers individual effort whereas question 26 is based on getting help from others.

Score	Q13	Q14	Q15	Q22	Q25	Q26	Q27	Q28	Q29	%
5	1	0	4	0	3	1	0	2	0	13.6
4	6	4	5	6	5	7	8	5	6	64.2
3	2	4	0	3	1	1	1	2	1	18.5
2	0	0	0	0	0	0	0	0	2	2.5
1	0	1	0	0	0	0	0	0	0	1.2

4.13a Frequency of scores for construct 2: Self-efficacy

5 = Very high self-efficacy 4 = High self-efficacy 3 = Moderate self-efficacy
 2 = Low self-efficacy 1 = Very low self-efficacy

High self-efficacy had the highest occurrence at 64.2%, it occurred in every question.

Collaborative Learning
Construct 3
Pearson's Linear Correlation Coefficient for
Collaborative Learning

	Q21	Q24	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38
Q21	~	0.58	0.58	0.79	0.79	0.5	0.78	0.47	0.34	0.7	0.55
Q24	0.58	~	0.00	0.39	0.39	0.29	0.59	0.64	0.10	0.64	0.37
Q30	0.58	0.00	~	0.54	0.39	0.58	0.59	0.27	0.40	0.46	0.37
Q31	0.55	0.54	0.54	~	0.40	0.44	0.82	0.80	0.33	0.88	0.59
Q32	0.79	0.39	0.39	-0.3	~	0.12	0.80	0.31	0.49	0.46	0.42
Q33	0.50	0.29	0.58	0.0	0.12	~	0.30	0.00	-0.34	0.50	0.63
Q34	0.78	0.59	0.59	-0.2	0.80	0.30	~	0.70	0.51	0.81	0.61
Q35	0.47	0.64	0.27	0.0	0.31	0.00	0.70	~	0.60	0.7	0.25
Q36	0.34	0.10	0.40	0.1	0.49	-0.34	0.51	0.60	~	0.09	-0.22
Q37	0.70	0.64	0.46	0.29	0.46	0.50	0.81	0.70	0.09	~	0.74
Q38	0.55	0.37	0.37	-0.3	0.42	0.63	0.61	0.25	-0.22	0.74	~

Table 4.18 Pearson's Linear Correlation Coefficients for Construct 3: Collaboration

Using Cronbach's alpha test for internal consistency as a calculation of reliability

Average of all inter-item correlations is 0.3831

Number of items, 11

Cronbach's Alpha coefficient = 0.8722992

This indicates that this construct is a highly reliable instrument of data collection.

Pearson's Linear Correlation Coefficient Table for Construct 3: Collaborative learning while learning ICT

	Q21	Q24	Q33	Q34	Q37	Q38
Q21	~	0.58	0.5	0.78	0.7	0.55
Q24	0.58	~	0.29	0.59	0.64	0.37
Q33	0.50	0.29	~	0.30	0.50	0.63
Q34	0.78	0.59	0.30	~	0.81	0.61
Q37	0.70	0.64	0.50	0.81	~	0.74
Q38	0.55	0.37	0.63	0.61	0.74	~

Pearson's Linear Correlation Coefficient Table for Construct 3: Collaborative learning while using ICT to learn other topics

	Q30	Q31	Q32	Q35	Q36
Q30	~	0.54	0.39	0.27	0.40
Q31	0.54	~	0.40	0.80	0.33
Q32	0.39	-0.3	~	0.31	0.49
Q35	0.27	0.0	0.31	~	0.60
Q36	0.40	0.1	0.49	0.60	~

Frequency of Ordinal Values for Collaborative Learning

Collaboration Level	Question											%
	21	24	30	31	32	33	34	35	36	37	38	
Never	0	0	0	0	2	0	1	1	0	1	1	6%
Almost never	0	0	1	0	0	0	0	1	0	1	1	4%
Sometimes	0	2	5	3	3	6	2	2	4	6	3	36%
Often	3	2	2	2	3	3	4	2	4	1	4	30%
Very Often	6	5	1	2	1	0	1	2	0	0	0	18%
Always	0	0	0	2	0	0	1	1	1	0	0	5%

Table 4.16a Frequency of scores for construct 3: Collaboration

Summary of Questionnaire Data on Collaboration

Responses to questions 21 and 24 indicate that students believe that they often learn ICT when collaborating. Questions 30, 31 and 32 reveal that students are more inclined to give help than to ask for help. Responses to question 33 indicate that students sometimes or often experience support from the teacher while using ICT. Responses to question 34 indicate that students with no ICT experience ask the teacher for help more often. Responses to questions 35 and 36 indicate that apart from students 1 and 7 all students believe that using ICT often improves collaboration. Responses to question 37 indicate that apart from students 1 and 7 all students believe that they sometimes receive support from their peers to learn ICT. The other students were not competent enough to help students 1 and 7. Responses to question 38 indicate that apart from students 1 and 9 all students believe they sometimes or often receive peer encouragement to learn ICT. It is noticeable that ‘very often’ and ‘all the time’ rarely occur.

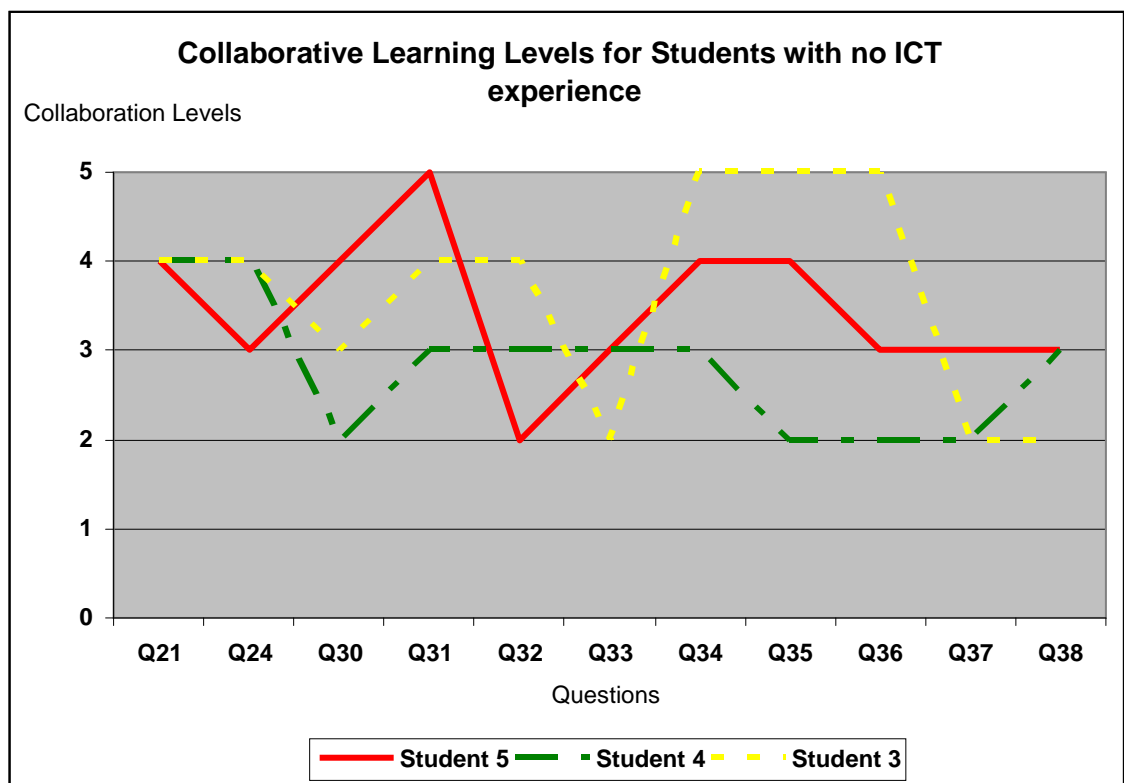


Fig. 4.18 Collaborative learning levels for students with no ICT experience

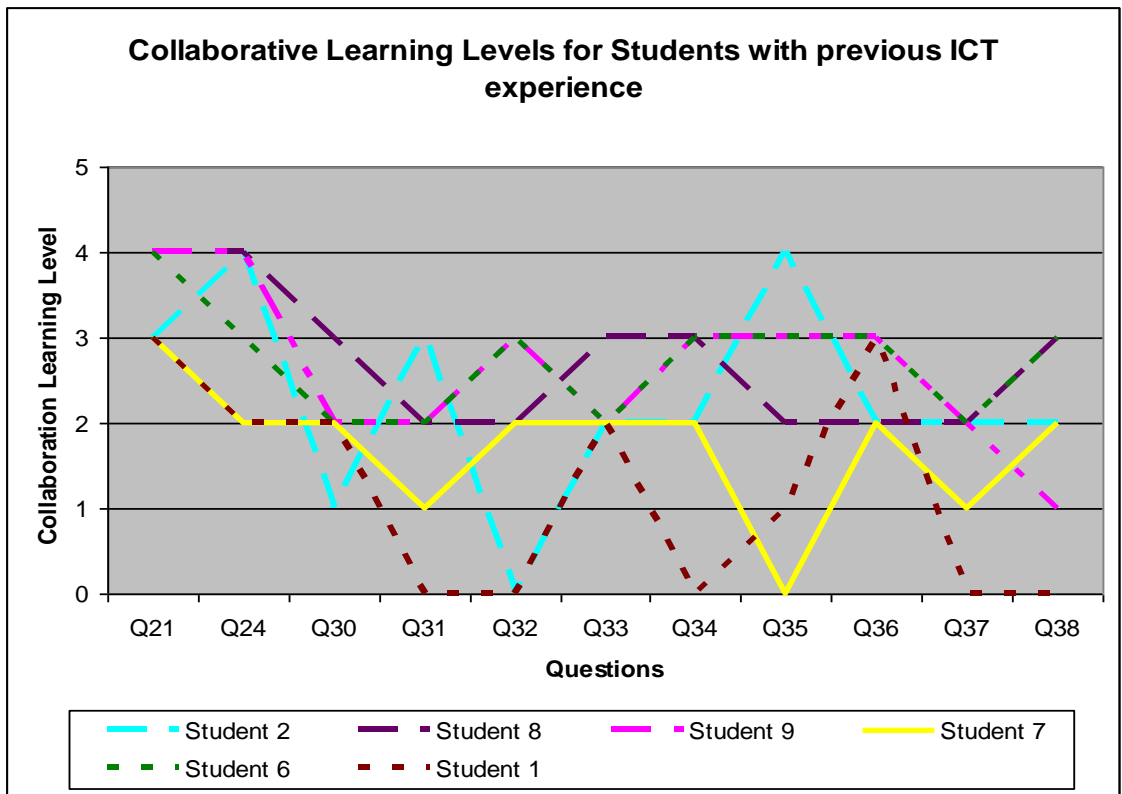


Fig. 4.19 Collaborative learning levels for students with previous ICT experience

APPENDIX C
GROUP INTERVIEW

Group Interview

Student 5 was absent.

Although all students have access to computers students 3, 4 and 5 have not used computers at all, other family members use the computers. Student 5 acquired a computer during this course.

1. When doing the report for communications, do you think that using ICT for typing up the questionnaire and for research improved your report?

- Student 4: Yes, definitely, I felt more confident giving out the questionnaire as it was typed, more likely to be taken seriously.
- Student 2: The report looked better, neater.
- Student 3: Yes, definitely using the computer for research was quicker, more detailed, internet for politics, newspapers...
- Student 9: Yes, especially for research.
- Student 3: Saves expense of buying newspapers, saves time, money.
- Student 2: More sources, more access, more potential.
- Student 1: Yes, but I didn't type up my report, it was good for the questionnaire, they need to be typed, and for research, research from the internet.
- Student 8: I didn't do the report because I did Communications last year, but the typed questionnaires look more professional.
- Student 7: People don't take hand written questionnaires seriously; using the internet for research saves time.
- Student 6: Yes, you need to use ICT for these things now.

2. Do you think that using ICT helped with learning the cell and respiratory system and other parts of the anatomy and physiology course?

- Student 2: It did, able to do research, look at pictures, moving images.
- Student 3: It made the cell more interesting.
- Student 4: I liked the moving images and the colour especially the cell dividing.

- Student 9: I liked doing the cell, the respiratory system was complicated and it helped with that.
- Student 1: Yes, it made the class more interesting, I liked the animations and the quizzes.
- Student 8: Definitely, the animations made things clearer.
- Student 7: Yes definitely.
- Student 6: Yes, with the Internet you hardly need books.

3. Do you feel that you learnt more by using ICT than not using ICT?

- Student 3: I learnt about computers, using the internet and getting information for research.
- Student 4: I never used a computer before, I've learnt a lot of ICT.
- Student 2: Using computers helped me learn about the body.
- Student 9: It's good for getting information for assignments but there is just too much information.
- Student 8: As you know I was absent a lot and worked from home, I got a lot of information from the Internet.
- Student 7: Yes I learn more by using ICT.
- Student 1: Yes, I learnt a lot by researching for my assignments on the Internet.
- Student 6: Yes, there is a lot of information on the internet but I think I learnt as much on Nursing and we didn't use ICT for that.
- Student 7: I suppose it depends on the module.

4. Which do you think is the best way to learn

- (i) by using ICT only as you learnt the cell**
- (ii) by not using ICT at all as you learnt the reproductive system**
- (iii) by using some ICT like the lungs (blended learning)?**

- Student 4: Yes, using some ICT but not just ICT only, the lungs was the best.
- Student 2: It is important to use ICT, the lungs.

- Student 3: I suppose it's better to use both the books and ICT seeing how much information you can get from the internet for school work.
- Student 9: Yes, I preferred the cell, I am OK with computers, just could not get the mechanism of breathing.
- Student 8: I really enjoyed doing the cell and I think that was the best way to learn.
- Student 7: I liked the cell as well but I think I learnt more with the lungs.
- Student 6: I never did the lungs before and I think I learnt more for the lungs.
- Student 1: I like using ICT, and I liked the cell, but it is good to have the books as a back up.

5. In your opinion is it better to learn on your own or with a team. Are there any other suggestions?

- Student 3: A team can be motivating, you can ask for help.
- Student 4: It's nice to do normal class work in a team, you can do more in class, you can ask questions, check others' point of view.
- Student 2: It is better to learn in a team but when you know what you are going to do it is better on your own.
- Student 9: For ideas, fun, a team is better, there's less stress. Team work is good to get started but then I like to do it on my own, my problem is stopping. Sometimes there is just too much information and I can't stop.
- Student 3: Yes, you go overboard then I get worried that I am not doing enough.
- Student 8: A team is more fun, more ideas,
- Student 7: Yes, but sometimes I need to work on my own.
- Student 1: I prefer to learn on my own. You should have the choice to learn in a team or to do it yourself.
- Student 6: Yes. It depends on what we have to work on, in a team at the beginning is OK but then I prefer to work on my own.

6. Do you think that working with computers encourages students to work alone or in groups?

- Student 4: It encourages students to work with a group – especially the quizzes and surfing the net but not sure about doing the report.
- Student 2: Somebody who is computer literate would want to work alone. If you didn't have a clue Google can help.
- Student 3: Less computer literate people would want to work in a group whereas a student with computer skills would prefer to work alone.
- Student 9: I think it is easier to work on your own on a computer if you know what you are doing; quizzes are better fun in a team.
- Student 1: I prefer to work on my own and it's easier to work on your own using computers.
- Student 7: Working on my own on the computer is faster than working in a team but I like working in a team sometimes.
- Student 8: I am better working on my own on the computer and working from home too, but a team for quizzes and research, it's more fun.
- Student 6: It's easier to work on your own on a computer.

7. If you had the time would you consider doing a course in ICT?

- Student 3: Definitely, feel it's a must, I may not look forward to it, no great love, don't like looking at it for more than half an hour.
- Student 4: It has to be done.
- Student 2: Yes. I use ICT a lot and would do a course, computers are important in today's world.
- Student 9: I have the ECDL but it is important to learn new skills on an on going basis.
- Student 8: Well I am too old to do any more courses but I have already done the ECDL and other ICT courses and they were worth it.
- Student 7: I have the ECDL and if I needed to do another computer course I would do it.

- Student 6: I like using computers and I want to do more ICT courses.
- Student 1: I have the ECDL too, I would like to do web design. Every adult should be computer literate to help them ease up their huge daily activities.
- Student 8: I use SAGE for work all the time and could not do with out it.

8. Does using ICT make learning more satisfying?

- Student 3: No because I don't like ICT, unless I had to. It improved the presentation for the report.
- Student 4: More interesting, yes, but for handing up assignments handwriting is just as good. I wouldn't be able to think about the content if I had to type and I wouldn't have the time.
- Student 2: Some things you can only get with ICT.
- Student 9: Yes, you can get more information for assignments but I wouldn't type up my assignments. I enjoyed what we did on the computers but wouldn't have the time to word process everything, I don't see the point wasting valuable time word processing when there's so much to learn.
- Student 8: Yes because you can get so much more information from the internet and you don't have to waste time searching for books. And assignments, I wouldn't hand write an assignment now.
- Student 7: Yes.
- Student 6: Yes, I type up my assignments too, I think it's easier and looks better.
- Student 1: Yes, definitely, I enjoyed doing the anatomy on the computer, I was glad we were using computers; the course was more up to date.

9. How confident are you with ICT, on a scale of 1-10?

- Student 3: 3
- Student 4: 3

Student 2: 5. I am always on the computer, keeping in touch, can get my size when shopping online.

Student 9: 6.

Student 4: With the right tutor and the right course I could be a 5.

Student 1: 8

Student 6: 8

Student 7: 7

Student 8: 7

10. a. Are men better at using ICT than women?

b. Are younger people better at using ICT?

c. Are boys better at ICT than girls?

Student 3: Younger are better. Are men better than women? It depends on what career they are in.

Student 2: Men are more likely to play games and get addicted.

Student 4: So are boys. Girls like to chat, facebook, communication and shopping.

Student 9: Younger people don't fear them as much as they have grown up with them.

Student 2: Secretarial courses for girls.

Student 3: A lot is personal interest.

Student 8: Younger people use ICT all the time, they learn from each other. Older people need to do a course, ICT doesn't come naturally.

I don't think men are better at using ICT than women, my boss leaves all the computer work to me.

Student 1: Yes. Older people use ICT because they need to for work or to keep in touch with family. Younger people use it for every thing. There's more difference between older and younger then between men and women.

Student 7: Yes, it's more to do with work and age than anything else.

Student 6: Yes, but carers don't use ICT much. My husband uses ICT for business all the time.

	Self-assessed Confidence rating in interview Q9 Scale 1 to 10	Confidence level in questionnaire from question 29 Scale 1 to 5	Position in class from questionnaire	Position in class from interview
Student 1	8	5	1 st	1 st or 2 nd
Student 2	5	4	2 nd to 6 th	6 th
Student 3	3	3	7 th	7 th or 8 th
Student 4	3	2	8 th	7 th or 8 th
Student 6	8	4	2 nd to 6 th	1 st or 2 nd
Student 7	7	4	2 nd to 6 th	3 rd or 4 th
Student 8	7	4	2 nd to 6 th	3 rd or 4 th
Student 9	6	4	2 nd to 6 th	5 th

Table 4.15 Self-assessed confidence compared to questionnaire

The results from the questionnaire correspond to the results from the group interview.

APPENDIX D
GROUP DISCUSSION

Group Discussion

You are nearly finished the course at this point, how do you feel about the course?

Student 4: I had no idea that there was going to be so much work in this course.

Student 3: Me neither.

Student 9: We were told at the interview that it was tough going but I didn't realise it would be so tough.

Do you have any advice for the next group of students?

Student 4: You need to have everything else in your life sorted out or you will not be able to keep up with the work load.

Student 3: But what if you don't have the rest of your life sorted out, this – this could be something you need to get.

Student 7: You can't wait until everything is OK before you get an education. You may never get a chance to get round to it.

Student 1: You need to organise your life to get time to do homework.

Student 4: All I am saying is that I couldn't have stuck at it if I didn't have a happy family life and the time to do homework.

Student 8: You are lucky, you are very organised. I am organised too but I have other priorities. The problem is having to work and study and I can't afford to give up my work.

Student 9: Well if I was doing this again, in fact if I get onto this course in ----- I will be giving up the work. ----- (husband) won't be too pleased. I'll work every second week-end and no more.

Student 2: It was a lot harder than I expected, I thought it would be a nice morning class, something social to get me out while the children were at school and back into work.

Student 6: It was hard work and a tough year but I'm glad I did it and I finished it.

The other students looked knowingly and sympathetically at student 6 nodding their agreement.

- Student 4: I nearly dropped out at the beginning. I didn't know how to switch on a computer or what an assignment was. I feel I have achieved a lot.
- Student 3: Me too.
- Student 9: Well, we'll have a full level 5 in one year and the other group in ----- are taking two years to do it, I don't think I could do two years.
- Student 1: I'm glad to get it done in one year.
- Student 3: I'd rather have a lot of work over a short time than spread it out over two years. But then what about ----- it may have suited her over two years?
- Student 4: She didn't drop out because of the work load you know....

Thanks. We'll finish the discussion here.

There were family and work issues that arose with the students through out the year that caused absenteeism and had priority over their course work. Eight of the nine students finished the course, this high completion rate was mainly attributed to with the students supporting each other.

APPENDIX E
OBSERVATIONS ON AN ANATOMY CLASS

Observation of Class on the Anatomy of the Cell

The teacher is the observer therefore interactions with the teacher, or the teacher scaffolding discussions is not included. The observation is of student-student interaction only. The class was designed to allow for spontaneous collaboration but could proceed smoothly had no collaboration taken place.

Process

Two sets of observations were carried out during a two hour class on 22nd September. The first set of observations commenced ten minutes from the beginning of the class. The second set of observations commenced forty five minutes into the class. Each set of observations consisted of three observations at two minute intervals for a duration of ninety seconds each. During the ninety second observation each student was observed for a ten second interval. There were nine students. The observations were tabulated, notes were also taken.

The first set of three observations took place ten minutes from the start of the class at two minute intervals on the 10th, 12th and 14th minute.

The second set of three observations took place forty five minutes from the start of the class at two minute intervals on the 45th, 47th and 49th minute.

The computers were arranged around the walls of the room, the observer could see all the computer screens. There is no set seating arrangement, students choose their own seats.

The observer scanned the students in a clockwise direction starting with the leftmost student, student 2, and followed the seating arrangement to the rightmost student, student 9.

Background

Students 3, 4 and 5 have no previous experience on computers. Students 1, 6, 7, 8 and 9 have attended ICT courses. Student 2 is self taught.

Students settled into the classroom, switched on their computers and logged on. Students 5, 3 and 4 were shown how to move the mouse, click on the mouse to choose an icon or to type. The teacher gave the class their instructions.

Exercise 1

Students were instructed to

- (1) click on the 'Internet Explorer' icon,
- (2) type 'diagram of an animal cell' into the Google text box
- (3) click on the second site down: 'Cell models: interactive animation'
- (4) click on 'animal cell' to bring up a diagram of an animal cell
- (5) roll their mouse over the diagram of the cell which would reveal the labels for each part
- (6) find the ten parts that were previously written on the board and draw the cell with its ten parts.

Observation: 90 seconds, 10 seconds scan on each student.

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√		√	√	√	√	√	√
Off Task			√						
Challenge level	1	3	0	0	3	0	3	0	1
Effort level	1	2	0	0.5	3	0.5	3	0.5	1
Attitude	▲	*	0	▲	■	▲	■	▲	▲
Working alone	√		√			√			
Getting Help		√ 2			√ 8				
Giving Help				√ 3					
Looking at another's screen		√ 2			√ 8		√ 7		√ 7
Logged on	√	√		√	√	√	√	√	√
Start Menu	√	√		√	√	√	√	√	√
Google	√			√		√	√	√	√
Sites Page				√		√		√	√
On Site						√			

Observation 1A

Challenge Level Key:

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

Notes on Observation 1

Student 2 helped student 5. Student 8 helped student 3. Students 4 and 9 were checking their progress against student 7.

Student 1 was off task, the teacher knew that this student was very competent with ICT and would quickly catch up. Students 3 and 4 were energised and rising to this new challenge. Student 3 was seated beside student 8 who is competent with ICT. Student 4 was seated beside student 7 who is competent with ICT. Student 5 was very unsure of herself and was seated in between students 2, a self-taught student, and student 1 who is competent. Student 9 was not very confident and checked her progress with student 7 who she was sitting beside.

At minute 12 all students were on the Internet site.

Observation: 90 seconds, 10 seconds scan on each student

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√	√	√	√	√	√	√	√
Off Task									
Challenge level	1	3	1	1	3	2	3	2	2
Effort Level	1	3	1	1	3	2	3	2	2
Attitude	▲	*	▲	▲	■	▲	■	▲	■
Working alone	√	√	√			√			√
Getting Help							√ 7		
Giving Help								√ 4	
Looking at other's screen			√ 8	√	√		√	√	
Working together				√ 8 3	√ 3 8				
Working on Site	√	√		√	√	√	√	√	√

Observation 1B

Key as 1A

Challenge Level Key:

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

Observation: 90 seconds, 10 seconds scan on each student

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√	√	√	√	√	√	√	√
Off Task									
Challenge Level	3	2	2	2	3	2	3	2	3
Effort Level	3	2	2	2	3	2	3	2	3
Attitude	▲	■	▲	▲ ■	■	▲	▲	▲	▲
Working alone	√	√	√			√			
Getting Help									
Giving Help									
Looking at other's screen		√ 1					√ 7		
Working together				√ 3 8	√ 3 8				
On Site	√	√	√	√	√	√	√	√	√
Writing and Drawing				√	√	√	√	√	√

Observation 1C

Challenge Level Key:

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

Students were drawing a diagram of the cell with its parts. After the observation the teacher led a discussion on the functions of the parts of the cell. Students checked the internet page for the functions, students 1, 7 and 8 went into other sites and got other

definitions for the functions. The students exchanges definitions and compared work. The class summarised the functions and annotated their diagram with the functions. There was a high degree of spontaneous collaboration.

Exercise Two Anatomy Quiz

Students were instructed to

- (1) go to Google home page and type 'Quizzes for kids on the animal cell',
- (2) click on the second site down: 'Biology4kids.com: cell structure'
- (3) scroll down the page until they see 'take quiz on cell' and click on this
- (4) play the quiz by clicking on the correct answer.

If students were finished early they could try the list of other sites written on the blackboard.

The teacher ensured all students were on the quiz site and had started the quiz before commencing a series of three observations at two minute intervals. This series of observations began at forty five minutes into class on the 45th, 47th and 49th minutes.

Observation: 90 seconds, 10 seconds scan on each student

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√	√	√	√	√	√	√	√
Off Task									
Challenge Level	3	3	2	2	3	2	3	2	2
Effort Level	3	3	2	2	3	2	3	2	2
Attitude	■	■	▲	■▲	▲	■	▲	■	■
Working alone	√	√	√	√	√	√			
Collaborating							√479	√279	√479
Looking at others screen		√2					√7		√7
Asking questions / answers from					√84				

Observation 2A

Challenge Level Key:

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

√ 8 4 Student 3 asks a question of the class which is answered by students 8 and 4

√ 2 Student 5 is looking at student 2's screen

During the 30-40 second interval student 2 asked a question of the class which was answered by student 1. This does not show on the table because student 8 was being observed at this point.

Observation

90 seconds, 10 seconds scan on each student.

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√	√	√	√	√	√	√	√
Off Task									
Challenge Level	3	2	2	2	2	2	3	2	2
Effort Level	3	2	2	2	2	2	3	2	2
Attitude	■	■	▲	▲	▲	▲	■	▲	▲
Working alone			√			√			
Getting Help									
Giving Help									
Looking at other's screen				√ 3			√ 7		√ 7
Working together	√ 2 5	√ 2 5		√ 3 8	√ 3 8		√ 4 7 9	√ 4 7 9	√ 4 7 9
Progressed to second quiz									√

Observation 2B**Challenge Level Key:**

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

Observation: 90 seconds, 10 seconds scan on each student

Time seconds	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Student	2	5	1	8	3	6	4	7	9
On Task	√	√	√	√	√	√	√	√	√
Off Task									
Challenge Level	3	2	2	2	2	2	3	2	2
Effort Level	3	2	2	2	2	2	3	2	2
Attitude	▲	▲	▲	■	■	▲	■	▲	■
Working alone			√			√			
Collaborating on quiz questions	√ 2 5	√ 2 5		√ 3 8	√ 3 8		√ 4 7 9	√ 4 7 9	√ 4 7 9
Collaborating on ICT									
Progressed to another quiz			√			√	√	√	√
Asked about other quizzes / answered			√ 9						

Observation 2C

Challenge Level Key:

0	no challenge, just physical effort required
1	minimal challenge
2	challenging enough
3	extremely challenging

Effort Level should match the Challenge Level for progress to occur.

Attitude Key:

*	anxious
0	neutral
▲	positive, confident
■	positive, animated

By the end of the observation all students had progressed on to a second quiz.
A high degree of collaboration was observed among students and passing of information about the cell not only within cliques but between cliques.
The observer considered this a highly collaborative situation.

APPENDIX F
OBSERVATION OF REPORT PROJECT

Observation of students using ICT to work on their Report

An unstructured observation was carried out on Wednesday 8th December to investigate the impact of ICT on collaborative learning. The class duration was one hour and thirty minutes.

The students were instructed to carry out an investigation on a topic of their choice and write up a report on their findings. Students used Microsoft Office Word to write up a questionnaire for a survey and the Internet for further research.

Student 8 was exempt from this exercise due to credits carried over from a previous course.

Observation 1

Time 0 to 9 minutes:

Students arranged themselves into teams, decided on a topic and hand wrote the possible questions:

Students 4 and 9 were sitting beside each other, they were joined by student 7 who moved across the room to sit with students 4 and 9.

Student 1 declared that she wanted to do her project alone and student 2 who was sitting beside student 1 moved seat and joined students 4, 9 and 7.

Team A

Students 4, 9, 7 and 2 began discussing what topic they would investigate. Student 9 pushed for unemployment as a topic, other students agreed to the topic and a consensus was reached. Students began to contribute sample questions and alter and improve on the questions. All students contributed questions which were discussed, altered or ratified. They nominated student 4 to write out questions.

Student 1 decided on cross-border shopping as her topic and also started writing up questions.

Team B

Students 3, 5 and 6 were sitting beside each other and decided to form a team. They discussed topics and eventually decided on the recession. All students contributed questions, student 3 was nominated to write up the questions.

Minute 9 to minute 10: All students on task

Observation 2

Time 20 to 25 minutes:

This is a continuation of the students designing their questionnaire.

Team A: Students 4, 9, 7 and 2

Student 2 stated that unemployment was too personal a topic for a questionnaire. She explained that she would not want to answer these questions and would not like to ask another person to answer them. Student 4 wholeheartedly agreed, student 2 agreed, student 9 conceded that they should look at other topics. Discussions ensued. All students were involved. They agreed on smoking as the new topic and discussed issues relevant to smoking.

Student 1:

Student 1 worked alone writing up questions. Student 1 was almost finished her questions.

Team B: Students 3, 5 and 6

Student 3 took the lead. Student 6 asked for clarity on the topic and all three students began to redefine the topic to politics in Ireland. All students contributed and discussed sample questions.

Collaboration between teams:

Students 4 and 9 in Team A gave sample questions on politics to Team B, student 3 wrote the questions down. Students 3 and 6 gave sample questions on smoking to Team B, student 4 wrote them down.

Minute 25 to minute 26: All students on task

Observation 3

Minute 40 to minute 45:

Students moved into the adjoining computer room to type the questionnaire each team nominated one person to type up the questionnaire. There were enough computers for each student. Student 1 went to the computer room and was already typing up her questions by the time the Team A and Team B filtered into the computer room.

Student 1:

Student 1 worked alone typing up questionnaire. This student was competent with the computer.

Team 4, 9, 7 and 2:

Student 7 typed up the questionnaire, Student 4 helped by reading out the questions and checked for mistakes in numbering and grammar. Students 9 and 2 talked off task. Student 9 offered to take a turn typing if student 7 got tired. (Student 4 had very limited experience word processing).

Team 3, 5 and 6:

Student 6 typed up the questionnaire while student 3 checked questions and grammar. Student 5 looked on. (Students 3 and 5 had very limited experience word processing).

Minute 45 to minute 46: Students 1, 7, 4, 6 and 3 are on task. Students 9, 7 and 5 are off task.

Results of Observations

Observations 1 and 2 revealed a high degree of collaboration between students who chose to work in teams, there was a high degree of engagement. Observation 3, set in the computer room revealed a drop in the amount of collaboration, less engagement and more students off task.

APPENDIX G
OBSERVATION MESSAGE CONVEYING

Observation of students executing a new task using ICT

A new task for all students

While some students had ICT experience they were unfamiliar with the ICT equipment deployed in this exercise.

The students had to record a voice message onto the computer. The students wore headphones with a microphone. The teacher set up Audacity and the students had to click on 'record' using the mouse. They then spoke into the microphone, when they finished they clicked on stop. To hear their message the students clicked on play. If satisfied with the outcome the student could finish, otherwise they could repeat the process until they were satisfied with their work. They could do as many recordings as necessary until they were satisfied with their final recording. The teacher worked on a one-to-one basis with each student.

The teacher showed each student individually how to work with the equipment.

Student 7 followed instructions after one demonstration. She was very willing and completed the task on her first attempt.

Students 8, 6 and 1 watched a demonstration by the teacher, they attempted the task, and with some help finished the recording. On their second attempt they completed the task independently. Student 1 was very giddy about hearing her own voice.

Student 2 was not comfortable with the task, she is Ghanaian and not confident with English. She watched the teacher demonstrate how to use the equipment. She started but stopped the recording before completing the task. She did not like speaking into the microphone. The teacher replayed the message for student 2 to listen to. The teacher was very encouraging as were the rest of the class. The teacher decided to let the other students leave early to enable student 2 do the task privately. The teacher demonstrated the use of the equipment again. The student started, she got flustered

saying the message, the teacher stopped the recording and student 2 listened to the message. Student 2 made two more attempts at the task. By her third attempt the student could work correctly and independently with the equipment but she found the message difficult to say.

Student 9 watched the teacher demonstrate the task, she let the teacher start, stop and replay the recording while she spoke into the microphone and listened. On her second attempt the student started the recording but got flustered and let the recording run on a little before she stopped it. On replaying the message she decided that she was satisfied with the message but made one more attempt to use the equipment properly.

Students 3 and 4: teacher demonstrated to each individually and then started them off and they continued and finished off themselves. Both students were confident about what they had to say but were not confident about working with the equipment. Both students listened to their work and were happy with it. They made one more attempt each and correctly used the equipment.

Student 5: this student was very hesitant about doing the task. The teacher demonstrated and started her off, student 5 continued and finished herself, the teacher replayed the message. The student was not satisfied with the result, she had made mistakes in her message because she was nervous. The student stayed on after other students left to do the recording privately. The teacher was very encouraging and patient. The student made another attempt, this time she started the recording herself, but panicked when she tried to stop the recording. On her third attempt the student used the equipment correctly, she made another attempt to improve the message and then was happy to finish.

Student 7 was the most competent using the equipment followed by students 8, 6 and 1, followed by students 3 and 4, then student 9, student 2 and finally student 5.

Table 4.10 is a summary of the results. The maximum satisfaction rate is 5 and the satisfaction rating decreases as the number of attempts required for the student to be satisfied increases. The anxiety rating was an observation on how well the student approached and coped with the task. Anxiety was rated on a scale of 1 to 5.

Competency was based on the number of attempts to succeed with the equipment, as the number of attempts increased the competency rating dropped. Competency was rated from 1 to 5. The calculation of average confidence was based on the assumption that confidence is directly related to competence at doing a task, satisfaction on completion of the task and inversely related to anxiety. Average confidence was rated from 1 to 5. On this occasion the empirical data for confidence matched the observations.

Summary of the message giving exercise

	Number of attempts to succeed with equipment N	Number of attempts to be satisfied with message M	Anxiety level, P on a scale of 1 to 5	Mark out of 5 marks	Satisfaction $5-(M-1)$	Average Confidence, $\frac{5-(N-1)}{3} + \frac{5-(M-1)}{3} + \frac{5-P}{3}$	Average confidence matches observation
Student 1	2	2	1	4	4	4	√
Student 2	3	4	3	4	2	2.33	√
Student 3	2	2	2	4	4	3.67	√
Student 4	2	2	2	4	4	3.67	√
Student 5	3	4	4	4	2	2	√
Student 6	2	2	2	4	4	3.67	√
Student 7	1	1	1	4	5	4.67	√
Student 8	2	2	1	4	4	4	√
Student 9	3	2	2	4	4	3.33	√

Table 4.10 Summary of the message giving exercise

APPENDIX H

VIGNETTES

Vignettes

- Student 4: Initially I was afraid to leave a site in case I could not get to it again. Working on the computer, looking at internet sites, was so much easier than I expected.
- Student 2: I am good with computers. I like computers
- Student 1: I am good with computers. I have ECDL
- Student 4: I have never used a computer before, my husband has one at home.
- Student 5: I have never used a computer before and I just got one but it is not connected to the internet yet a friend is coming to connect it today.

The teacher informed students 4 and 9 that on other community care courses the students had to Word-process all their assignments.

Student 4 responded that she would have dropped out of the course a long time ago if she had to type her assignments. That she would not be able to think about the content if she had to type and she would not have the time.

Student 9 said she enjoyed what we had done on the computers but would not have the time to word process everything and she did not see the point wasting valuable time word processing when there was so much to learn.

Student 8: (55-60 age group, with ICT qualifications)

‘To a lot of adults using a computer is a daunting task. A lot of adults are unfamiliar with the interactions of computer technology and exploring the Internet. Learning as part of a team with the guidance of the teacher motivates students to explore and learn. To be able to partake in the community, working and social environment, more encouragement is needed to encourage our mature population.’

APPENDIX I PREDICTORS

Fig.1. The following charts depict the predictors of satisfaction, self-efficacy and learning climate that were tested using observation, questionnaires and interview.

