E-LEARNING AND MOTIVATION:

A MULTI-FACETED INVESTIGATION OF ELEVEN TO FOURTEEN YEAR OLDS' ATTRACTION TO COMPUTER-BASED LEARNING, AND THEIR MOTIVATIONAL RESPONSES TO THE NOVELTY AND NATURE OF A SELECTION OF SELF-STUDY COMPUTER-BASED LEARNING ACTIVITIES

BY

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ABSTRACT

Are eleven to fourteen year old learners attracted to computers? Can computers motivate them to learn? How do they respond to *new* self-study, computer-based learning activities? Does the *type* of computer-based learning activity affect their motivation?

This study focuses on three important facets of e-learning and motivation – attraction, novelty and activities. The first facet (**attraction**) relates to verifying the existence of, and reasons for, the attraction to computers. Further areas of investigation relate to the effects of this attraction (if it exists) and learners' perceptions of proficiency on motivation. The second facet (**novelty**) relates to learners' perceptions of novelty and responses to different types of novel self-study, computer-based learning activities. **Activities** (the third facet) relates to the motivational effects of different types of self-study, computer-based learning activities.

The study took place in three schools in different geographical areas of the United Kingdom. The participants were eleven to fourteen year olds. The first facet (attraction) was approached using surveys, through online questionnaires and focus group interviews. The second and third facets (novelty and activities) were approached through multiple-case studies, mainly through observations, self-report forms, and focus group interviews.

An important finding is that most learners *are* attracted to computers, but not necessarily motivated to learn with computers. It is argued that today's learners have learning attitudes that are based around fun. Hence, e-learning must accommodate this whilst delivering "serious learning".

The research evidence also show differences in perceived novelty and motivational effects of different types of e-learning activities. In particular, the research evidence suggests that the perception of novelty can be extended by changes or discussions during the interaction with certain activities ("regenerative novelty"). It is argued that knowledge of the novelty and motivational effects should be harnessed to provide engagement with learning.

DIALOGUES, TABLES, FIGURES AND CHARTS

LIST OF DIALOGUES

These hypothetical dialogues have been drawn up as constructs to aid the exploration of the key themes of this thesis. This approach has been used in other theses, such as Read (2009) *and* Ridley (1998).

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ABBREVIATIONS AND ACRONYMS

AdeLE – Adaptive e-Learning with Eye-Tracking

ARCS – Attention, Relevance, Confidence, Satisfaction

Becta – British Educational Communications and Technology Agency (Becta was the government agency leading the national drive to ensure the effective and innovative use of technology throughout learning)

CLT – Cognitive Load Theory

DfES – Department for Education and Skills

EAL – English as an Additional Language

E-learning – Electronic Learning

HCI – Human Computer Interaction

ICT – Information and Communication Technology

ITS – Intelligent Tutoring Systems

IQP – Instructional Quality Profile

JISC – Joint Information Systems Committee

LEPO – Learning Environment, Learning Processes and Learning Outcomes

M-learning – Mobile Learning

MM – Motivational Model

MORE – MOtivational REactive

NCET – National Council for Educational Technology

Ofsted – Office for Standards in Education, Children's Services and Skills

PASW – Predictive Analytics SoftWare

RSS – Really Simple Syndication

SEN – Special Education Needs

SPSS – Statistical Package for the Social Sciences

TAM – Technology Acceptance Model

TEL – Technology Enhanced Learning

TPCK – Technological Pedagogical Content Knowledge

WWW – World Wide Web

ZPD – Zone of Proximal Development

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

1.1.1 THE MOTIVATION TO LEARN

This hypothetical dialogue has been drawn up as a construct to aid the exploration of the theme of this thesis.

Mother: Hello, how was school today?

Ashley: We had a science lesson today, and it was boring.

Mother: What do you mean by boring?

Ashley: It wasn't interesting, and I didn't feel like doing it.

Mother: What do you mean? Science is a very interesting subject.

Ashley: I didn't enjoy the work the teacher asked us to do. He tried to use some silly pictures to make it interesting, but it was still boring!

Mother: But did you get the work done?

Ashley: I only did the work because my teacher said I would fail if I didn't finish it. I'm not so keen on the detentions either!

Mother: Boring or not, you still managed to complete the task. Yes?

Ashley: Yes, but I just don't get schoolwork.

Mother: You seem to be making progress though.

Ashley: A bit. My teacher said we would be using computers for our next lessons, so I'm looking forward to that. I tend to enjoy computer tasks more.

Mother: I think so too. You spend ages on your computer at home.

Dialogue 1: The motivation to learn

Learning is sometimes defined the process of longer-term *acquisition* of new skills, knowledge, behaviours, values, preferences or understanding (Ormrod 2011; Hill 2002; Woolfolk et al. 2008). Another definition, given by Bruner (1977), suggests that learning involves more than just gaining new skills, values or understanding. He describes learning as three processes: the *acquisition* of new information; the *manipulation* of knowledge to fit new tasks; and the *evaluation* of whether the knowledge is adequate to the task. Bruner's (1977) definition suggests that learning can transform an uninformed individual to one who is well-informed (acquisition). Learning can also enable them to apply their knowledge to different situations (manipulation) and assess the impact of the knowledge (evaluation).

If these definitions reflect reality, learning should be considered beneficial. The three processes (acquisition, manipulation and evaluation) could transform a learner's position: from lacking knowledge to gaining knowledge; from having a problem to formulating a solution; and from being uncertain to developing understanding. Some studies, however, have suggested that learning is often considered an unpleasant experience or a bitter medicine that requires "sugar-coating" (see Resnick 2004; Csikszentmihalyi 1990). It seems rather surprising that Ashley (in **dialogue 1**) would describe learning as "boring". When pressed further, learning was described as "uninteresting".

Although this dialogue is fictitious, it reflects a situation that educationalists deal with daily. Teachers are regularly trying to develop a particular type of motivation – the motivation to learn (Woolfolk et al. 2008). Motivation to learn is "the tendency to find academic activities meaningful and worthwhile and to try to benefit from them" (Woolfolk et al. 2008, p. 468). There is the belief that learners who are motivated to learn find academic tasks meaningful and beneficial, regardless of whether or not the tasks are intrinsically interesting (Brophy 2004; Marshall 1987; Burden 2000).

Teachers might resort to a range of strategies, from incorporating "fun" activities to instilling the fear of punishment, in an attempt to achieve or increase learners' motivation to learn. Why is it that, even after learning materials have been carefully prepared, the environment has been made safe for learning, and the teachers have applied knowledge gained from various training sessions, some learners still do not fully engage in certain academic activities? It is as if learners sometimes do not have the will or the driving force to engage in the academic tasks. Hence, a teacher might label a student or a class as "not motivated".

However, McLean (2009) attempts to correct the view that some students are not motivated to learn. He stresses that motivation is not a feature of the learner, but a feature of the *transaction* between the *learner* and the *context*. He draws an analogy between trust and motivation. Like trust, motivation occurs between people rather than within people. According to McLean (2009), there is no such thing as an "unmotivated learner". Whilst they might be unmotivated towards certain academic activities, they could be motivated to wind up the teacher, impress their peers etc. In other words, teachers have to understand that the context (the teacher, subject, peers, and activity) affects students' motivation to learn and ensure that the context is conducive for learning.

Looking at this from another perspective, Rogers (1969) expresses his irritation with the notion that students must be "motivated". He believes that every young person is born with some degree of intrinsic motivation to discover, understand and solve problems. He claims that years in school tend to dampen this intrinsic motivation. Rogers (1969) explains that the problem lies in the fact that other people, not the learners themselves, determine the school curriculum. This restricts learners' freedom to learn what *they* want to learn. Learners sometimes perceive school learning as meaningless to their personal goals and lives. Stressing that school learning does not reflect learners' perception of the real world, Gardner (1995) also points out that many learners cannot provide compelling reasons for attending school. Supporting these views, Papert (1998) argues that school activities are "utterly boring" because the school curriculum deprives learners of personal meaning.

The nature of the school system and the relevance of the school curriculum might have an impact on motivation to learn (see Smith 2010; Rogers 1969; Gardner 1995; Papert 1998). However, teachers do not have full control over what is taught and how it is taught in schools. Teachers are left to figure out tactics to motivate students to make the most of the school curriculum. The challenges that teachers face necessitates deeper understanding of human behaviour and strategies for keeping students motivated to learn. School learning can be beneficial and interesting (Resnick 2004; Csikszentmihalyi 1990). How can we encourage students to engage (and stay engaged) in school learning?

1.1.2 THE FIRST FACET OF THE STUDY: THE ATTRACTION TO COMPUTERS

This hypothetical dialogue has been drawn up as a construct to aid the exploration of a key theme of this thesis.

Ashley: I had a very interesting science lesson today!

Mother: Tell me what happened.

Ashley: We used computers in the lesson and it was very exciting.

Mother: What was it about?

Ashley: There was a wicked animation with bright colours and nice music! And we played a game of spot the difference!

Mother: What did you learn?

Ashley: Something about other planets. There were nice pictures, lovely animations and the sound was good too.

Mother: What are the other planets? What did you learn about them?

Ashley: Some really cool facts.

Mother: What was the title of the lesson?

Ashley: We saw the sun and things moving around. The sound was awesome.

Mother: Do you mean the solar system?

Ashley: Erm… I think so, I can't remember.

Mother: So what tasks did you have to complete?

Ashley: Erm… we were shown some pictures and the program played music if we got it right, which was fun.

Mother: But you don't remember what you learnt?

Ashley: I remember the bright colours, the animation and the music.

Mother: Next lesson, make sure you focus on the work, not just the games and music.

Dialogue 2: The attraction

Amidst the quest for strategies to motivate learners, some researchers have suggested that the use of computer technology as a learning tool can have motivational influences on students (Cox 1997; Means et al. 1997; Pedretti et al. 1998; Becker 2000; Gee 2008). This claim, however, has been fiercely debated (Underwood & Underwood 2001; Wirth & Klieme 2004; Clarke & Feldon 2005; Sutherland et al. 2009). The debates are considered in chapter 2. Whatever our standpoint, motivation is still considered one of the key factors affecting learning (Eccles & Wigfield 1985; Maehr 1984; Csikszentmihalyi & Nakamura 1989; Pintrich et al. 1993). Travers (1977), author of "Essentials of Learning", includes motivation in the list of factors that affect learning (along with information processing, social factors, instruction, prior learning, emotional factors, memory and learning styles).

Why would a learner devote more attention to an academic activity simply because the medium of instruction is a computer? Perhaps this is due to the significant research evidence suggesting that many young people are attracted to computers. This attraction leads to motivation to learn because: computers are seen as useful tools for everyday life (Teo 2006; Pektaş & Erkip 2006; Bovée et al. 2007); young people are confident in the use of computers (Houtz & Gupta 2001; Helsper & Enyon 2010; Gardner et al. 1993); computers are considered easy to use and fun (Carroll et al. 2002); the use of multimedia often helps with gaining learners' attention (Kim et al. 2007); learners might choose computers in response to peer and social pressures (Broady et al. 2010).

Interestingly, there is little denial of some form of attraction to computers. Instead, there is significant debate over whether computers *actually* motivate students to learn. Some have explained that there might be a motivation to choose computers over other forms of learning, but this does not necessarily result in motivation to learn (Clarke & Feldon 2005). Others have explained that there is a motivation towards learning, not necessarily motivation to engage in learning (Krnel & Bajd 2009). Ashley, in **dialogue 2** above, has not necessarily devoted more attention to the computer-based learning activity. Indeed, there was a motivation to use computers, but not necessarily a motivation to devote attention, energy and time to learning from computers.

The suggestion that there is some form of attraction to computers does not seem to have been challenged in significant depth. There is little empirical evidence disputing the existence of some level of attraction to computers. Even the notions of motivation to choose/motivation towards learning are based on the fundamental assumption that the attraction exists. Moreover, reasons provided for the attraction in existing studies (such as Teo 2006; Helsper & Enyon 2010; Kim et al. 2007) start with the premise that learners are attracted to computers.

Every assertion in educational research should be subjected to academic rigour. Rigour is the most important guiding principle of this study. This makes it necessary to verify the claim, on which many assertions are based. The *first* facet to this study pertains to the issue of the *attraction to computers*. This study investigates whether there is indeed an attraction to computers and the reasons for the attraction (if indeed such a phenomenon exists). Moreover, the study investigates the relationship between the attraction to computers and the motivation to learn with computers.

1.1.3 THE SECOND FACET OF THE STUDY: THE MOTIVATIONAL EFFECTS OF NOVELTY

This hypothetical dialogue has been drawn up as a construct to aid the exploration of a key theme of this thesis.

Mother: Another interesting computer lesson today?

Ashley: Today was a bit disappointing.

Mother: What happened? Didn't you use computers today?

Ashley: Yes we did, but it wasn't as exciting as the last lesson.

Mother: Why?

Ashley: This time the games were not as interesting.

Mother: What did your teacher ask you to do?

Ashley: We had to do the same spot-the-difference activity as the last lesson. It's getting boring!

Mother: I thought you enjoyed it the last time.

Ashley: That was last week! Why can't we have a different activity today?

Mother: Maybe your teacher wanted to make sure that you have understood the topic from last week.

Ashley: I do remember a bit more about the solar system from today's lesson.

Mother: So you did learn something today.

Ashley: But there was little fun in it. There is something exciting about doing something new.

Dialogue 3: The novelty

The challenge of motivation to learn does not end in the initial attraction, it extends to the need to keep learners engaged throughout the learning process. The initial attraction to computers might be based on the use of multimedia, games etc, which grab learners' attention (Kim et al. 2007). These features might be appealing and might motivate them towards learning with computers. This poses a problem later on in the learning process when that appeal diminishes: the feature loses its novelty (Keller & Suzuki 2004). The features (the multimedia, games etc) lose their appeal because learners become accustomed to them (Keller & Suzuki 2004). If the features lose their novelty, there is likelihood that learning activities could lose their novelty too. For example, Ashley (in **dialogue 3** above) seems to have lost interest in the spot-the-difference activity.

There is a case for greater understanding of the novelty of e-learning features and activities. Huk et al. (2002) highlights that e-learning research can be flawed, if conclusions are drawn during the initial attraction stages. Such research will not reflect the reality of the entire learning process, especially the time when the novelty has faded away. Greater understanding of how long learners respond to novel activities and features can contribute to research into motivation and e-learning. In practice, insight into novelty can assist with knowing when it is right to vary activities and features to maintain motivation levels.

The *second* facet to this study pertains to the *novelty of activities and features*. This study will investigate the nature of novelty in e-learning (does it end abruptly or does it diminish over time); how long different activities and features remain novel; how learners respond to diminishing novelty; and whether individuals have different motivational responses to novel activities and features.

1.1.4 THE THIRD FACET OF THE STUDY: THE MOTIVATIONAL EFFECTS OF ACTIVITIES

This hypothetical dialogue has been drawn up as a construct to aid the exploration of a key theme of this thesis.

Mother: What did you do today?

Ashley: We had to do a variety of computer activities during the lesson. Some were interesting and some were not.

Mother: What kind of activities were you given?

Ashley: One, we had to listen to a passage and remember it. There was another one where we had to match words and fill in the blanks. There was an interactive quiz. And one where we had to explain natural things such as the weather using our knowledge of science.

Mother: Which ones did you find interesting?

Ashley: I liked the quiz where I could choose my own answers to the questions. I liked to feel in control of the answers.

Mother: So you felt engaged when you could pick answers and interact with the computer?

Ashley: Yes, that was more interesting.

Mother: Which activity did you not like?

Ashley: I did not like the work where I had to listen to the computer reading a long passage to me. That was quite boring.

Mother: Would you prefer activities where you have to do things, rather than just listen?

Ashley: Yes, that would make the lesson better. The reading activity bored me quickly.

Mother: So what did you learn from the quiz?

Ashley: It was fun. There was an annoying but funny noise when you get the answers wrong.

Mother: But do you remember what you learnt?

Ashley: I'm not sure. If I see the quiz questions again, I should be able to click on the correct answers.

Dialogue 4: The activities

The issue of novelty highlights the need to ensure learners remain engaged throughout the e-learning process. The essence of e-learning is not its appeal; the emphasis is supposed to be on its effectiveness for *learning* (Mishra & Koehler 2006; Keller 2006; Hara & Kling 2001). There is the tendency to make e-learning appealing or even entertaining, at the expense of effective learning (see Okan 2003; Keller 2006). The challenge for instructional designers is to produce e-learning systems that deliver learning outcomes effectively, whilst sustaining motivation throughout the learning process (Keller 2006).

In order to deliver effective and motivating learning experiences, instructional designers carefully plan all aspects of the e-learning processes (Smith & Ragan 1999). They consider the key aspects, such as learning objectives, hardware, software, interfaces, learners' needs and cognitive load. The result of these considerations is an e-learning product, which is a reflection of the creativity, thinking processes, experience and goals of the instructional designer (or group of instructional designers) (Clark & Mayer 2008). Learners' *interaction* with the *product* is what makes the *activity* (Joint Information Systems Committee 2004; Beetham 2004; Ravenscroft & Cook 2007).

The implication of this concept, the activity being a mix of the product and the interaction with it, is that each e-learning activity may result in many permutations of learning experiences. Every e-learning product is the result of the instructional designer's creativity, goals and thinking. Thus, e-learning products and the learning experiences they offer are likely to differ considerably, as they will reflect the skills, preferences, and production values of the indivual software designer. Likewise, every learner's interaction is the result of his or her own experience, participation and engagement. The interactions of two learners with the same e-learning product might be different.

The inference that every e-learning activity (the mix of product and interaction) can have many different outcomes has strong implications for research. It will be hugely ambitious to study every possible e-learning product and every possible interaction. This makes the case for the use of classifications. In chapter 4 (section 4.3.2), there are detailed considerations of different classifications of learning activities. This study uses the most comprehensive of these classifications, as specified by Conole (2007a, 2007b). The classifications, which are featured in greater detail in **appendix 8**, are shown in **table 1** below:

Classification	Examples
Assimilative	reading, viewing, listening and writing
Information handling	classifying resources, ordering data and manipulating data
Adaptive	modelling and simulation
Communicative	group-based discussions, debating, presenting and critiquing
Productive	construction of artefacts, writing, drawing, composing and producing
Experiential	investigating, exploring, performing, mimicking and practising

Table 1: Classifications of learning activities (Conole 2007a, 2007b)

The *third* facet to this study relates to the motivational responses to *different types of activities*. It will investigate whether learners exhibit different types or levels of motivation when interacting with different types of e-learning activities. The notion that one activity is "more interesting" or "more motivating" than another, as in the case of Ashley in **dialogue 4** above, is worth exploring. It is also worth investigating the likelihood that some types of activities might increase learners' motivation to learn.

As explained earlier, it is impossible to investigate every e-learning activity. The classifications (in **table 1** above) will be used during this study. The researcher recognises the limitations of using classifications. It is possible that an activity will fit into more than one classification. For example, there is an overlap between the adaptive and experiential activities. It is also possible that an activity will not fit into any classification. Where the possibilities of e-learning activities are huge, the only practical option is to use the classifications as a "best fit" guide.

1.2 GAPS IN RESEARCH, RESEARCH QUESTIONS AND SIGNIFICANCE

1.2.1 GAPS IN RESEARCH AND RESEARCH QUESTIONS

There is significant research suggesting that many young people are generally attracted to, and are proficient in the use of, computers (see, for example, Carroll et al. 2002; Helsper & Enyon 2010; Houtz & Gupta 2001; Teo 2006; Pektaş & Erkip 2006; Bovée et al. 2007). This attraction and the possibilities of multimedia are often associated with motivational influences on learners (Gee 2008; Carroll et al. 2002; Means et al. 1997). Considerable excitement has been generated by the view that young people are attracted to computers (Becta 2003; Means et al. 1997). There is the need to investigate whether this attraction actually exists, why it exists and whether it translates into motivation to learn.

Interestingly, some researchers have pointed out that the novelty of any e-learning feature or activity will fade away over time (Krnel & Bajd 2009; Keller & Suzuki 2004). In fact, certain strategies (e.g. varying activities and adapting instruction to the motivational states of learners) are used to deal with the issue (see, for example, Song & Keller 2001; Paramythis & Loidl-Reisinger 2004; del Soldato & du Boulay 1995). Although these studies have recognised that novelty has some effects on motivation, little analytical attention has been paid to the concept of novelty. This study provides additional insight into novelty by offering an in-depth exploration of learners' perceptions of the novelty of activities as a specific research focus.

From an instructional design perspective, it is worth studying how to generate and sustain motivation to learn in an e-learning environment. Many studies have suggested that motivation can be enhanced by: designing effective interfaces (Lee & Boling 1999; Mayer 2005a; Reeves & Nass 1996); designing effective and efficient e-learning products (Hara & Kling 2001; Keller 2006); paying attention to cognitive load (Paas et al. 2010; Sweller 2005; Chong 2005); and incorporating interactivity (Tang 2005; Stoney & Wild 1998; Thomas 2001).

However, this study differs from other work because it focuses on the motivational effects of different *types of activities*. Although there is a considerable body of research in e-learning and motivation, the possible motivational effects arising from the different types of activities have not been explored at length in existing research. Why do some learners describe an activity as "interesting" and another as "boring"? Why do some learners stay engaged in some e-learning activities and do not respond to certain activities? Questions like these are addressed in this study.

These gaps in research include: the need to verify the attraction to computers; the extent of the relationship between the attraction to computers and motivation to learn with computers; the effects of proficiency in the use of computers and motivation to learn with computers; the novelty effects of different types of activities; and the motivational effects of different types of activities. This study is a thorough investigation of three facets – attraction, novelty and activities. Each facet of the study has several subsidiary questions.

With regard to the **attraction**, this study will answer questions such as:

- Do learners *actually* have an attraction to computers, as is often assumed (for example, Kim et al. 2007; Broady et al. 2010; Prensky 2001a)? What are the reasons for this attraction?

- Does the attraction to computers (if it exists) have any relationship to motivation to learn using computers, as it is sometimes portrayed in media coverage and political rhetoric (for example, Becta 2003; Means et al. 1997)?

- Are there learners who are not attracted to computers? How does this affect their motivation to learn using computers?

- How does proficiency in the use of computers affect the motivation to learn with computers?

With regard to **novelty**, this study will answer questions such as:

- How do learners react when novelty is diminishing or has ended?

- How long does the novelty of different e-learning activities last? What factors influence learners' perception of novelty?

With regard to e-learning **activities**, this study will answer questions such as:

- What are the motivational effects of different types of e-learning activities?

- Which features of e-learning activities affect motivation to learn?

1.2.2 SIGNIFICANCE AND CONTRIBUTION TO KNOWLEDGE

It is a fairly safe claim that education is being transformed from an "ICT-free" past to an "ICT-aware" future (Laurillard 2007, p. 15). Laurillard (2007) is making a point that it is unlikely that ICT will have a reduced role in education over the next decades. It is no surprise that e-learning research has emerged into a coherent discipline in educational research (Mayer 2005b). Motivation is also an area of research with an extensive research base, with many questions still unanswered (Schunk et al. 2010).

The significance of this study comes from its original contribution to a rapidly expanding body of research. Its focus on the three themes (facets), especially novelty and activities, is a deliberate attempt to explore areas of e-learning and motivation research which have not been explored in great depth. By tackling the identified "gaps" in research, this study aims to make a distinct and significant contribution to knowledge. Through this study, there will be greater understanding of attraction, novelty and activities. The findings can be verified by the academic world and can be the basis of further research.

This study goes beyond contributing to the body of academic research into e-learning and motivation: It connects academic research to educational practice. As the study was conducted in real schools, with real students and real e-learning activities, the findings can inform a wide range of educationalists. There are direct implications for instructional designers, teachers, and policy makers. Instructional designers can consider the motivational effects of attraction, novelty and activities during the design and evaluation of e-learning products. Teachers' appreciation of the three themes can assist them with making provisions for their learners to engage in academic learning. Policy makers can also be sympathetic to the motivational needs of learners and the work teachers have on their hands.

Finally, this study will contribute to the researcher's interest in, and understanding of, research. The researcher considers this study to be an entry into the "world of academic research". Hence, this study would form basis of further research and foster reflections on the researcher's teaching practice.

1.3 SCOPE AND CONSTRAINTS

1.3.1 TYPES OF E-LEARNING AND USE OF CLASSIFICATIONS

E-learning can have different meanings (see section 2.3.1 and **appendix 1**). It is important to specify what type of e-learning this study refers to. The researcher has taken the advice of Fraenkel & Wallen (2008) in clarifying important aspects of the study. They suggested a constitutive definition, that is, using a dictionary style approach to explain what is meant. Another suggested approach is to clarify using examples. For clarity, both approaches have been used to define what type of e-learning this study refers to. **Table 2** (below) shows a dictionary style definition of the type of e-learning being investigated and examples of what constitutes e-learning in this study.

Definition	Learning systems that are: • computer-based • designed to deliver academic curriculum content and • are used independent of a facilitator, instructor or teacher
Examples of what constitutes e-learning in this study	• BBC GCSE Bitesize – available at www.bbc.co.uk/schools/gcsebitesize/ • My Maths – available at www.mymaths.co.uk/ • Learning games on www.teach-ict.com
Examples of what **does not** constitute e-learning in this study	• A teacher-led activity using an interactive board • A teacher-led activity, which then leads to learners producing work on a computer • A computer-based quiz or test used solely for the purpose of assessment, where the actual learning activity was not carried on a computer • Reading a textbook on a portable e-book reader (such as kindle)

Table 2: E-learning in this study

This type of e-learning was selected due to their wide availability and the need to keep the research manageable. More importantly, the researcher is keen to provide a contextualised study, based on rigour and in-depth understanding. Choosing a manageable aspect of e-learning should foster rich, well-focussed and in-depth understanding of the area of inquiry, rather than a broad overview which can be taken out of context (see Convery

2009). The researcher has been transparent about the specific type of e-learning under investigation, to ensure that the findings of this study are understood in context.

The researcher also had to use classifications of e-learning activities for aspects of this study. As explained in previous sections, there is a wide range of e-learning activities. The only practical way of identifying the effects of the type of e-learning activity on motivation is to use classifications. It was often difficult to fit certain e-learning activities into one classification. The researcher had to make some "best-fit" judgements about the classifications that the e-learning activities fitted into.

1.3.2 LOCATION AND PARTICIPANTS

This study was conducted in schools located in three regions of the United Kingdom – London, Essex and Nottinghamshire. Between them, the schools have a range of different characteristics (such as Ofsted ratings, type of school and catchment information). The schools were selected from the researcher's own contacts. This improved access and support for the study; it cannot however be considered representative of all the schools in the United Kingdom.

To make the research activity more manageable, there is a focus on 11 to 14 year olds. They would typically be in years 7, 8 and 9 (the first 3 years of secondary school in the United Kingdom). Limiting the research to this age group leads to questions about the specific types and levels of motivation exhibited by the 11 to 14 year olds. There is research evidence suggesting that the type and level of motivation to learn experienced change as children develop. For example, some reports suggest that younger children generally have an intrinsic motivation to learn in earlier years, but this declines roughly between the ages of 8 and 14 (Covington & Müeller 2001; Lepper et al. 2005; Otis et al. 2005; Raffini 1993). Some have explained that this is because they develop the ability to set and strive for long-term extrinsic goals (Battistich et al. 1995; Larson 2000). Another explanation is that their interests shift from mastery goals to performance goals (Lumsden 1999; Ames 1990). Moreover, others have explained that, as they get older, their expectancies of success and the value attached to the school subject matter become interdependent (Jacobs et al. 2002; Wigfield 1994; Eccles et al. 1998).

These reports do not provide any definitive timescale for these motivational developments. It was therefore difficult to determine the motivational condition (expectancies, goals, values etc) of the participants. It was also difficult to determine the extent to which their types and levels of motivation differed from other age groups. It was however more practical to restrict the study to this specific age group – 11 to 14 year olds. Moreover, students in years 7, 8 and 9 were generally more accessible, as they did not have the pressures of examinations and coursework.

1.4 DECLARATION OF THE RESEARCHER'S BACKGROUND AND POSITION

1.4.1 THE (NOT SO) NEUTRAL RESEARCHER

The researcher, his/her values and the research are inextricably locked together (Schratz & Walker 1995). Who sets the research questions? Who decides when, where and how the data will be collected? Who collects the data? Who analyses the data? Who interprets the findings and presents conclusions? The researcher has a great deal of influence on the research processes and outcomes of the research. The assumptions, values, experiences and biases of the researcher constrain the research and threaten its validity (Patton 2002; Fraenkel & Wallen 2008; Lincoln & Guba 1985).

Oliver & Conole (2007) stressed the gravity of the constraint that the researcher introduces when they stated:

> "No work in e-learning is 'neutral'. Any design, claims and practices involve taking a position on what e-learning is, how it should be done, and which aspects of it are important...Rather than attempting to ignore, down-play or 'solve' this situation, as so often happens now, it may be more productive to accept it, to recognise differences (and in some cases, compatibilities) between areas of research and to see whether constructive dialogues between these positions can be established" (Oliver & Conole 2007, p. 220)

I agree with Oliver & Conole's (2007) view that researchers can take positions, before, during or after the research, sometimes subconsciously. I also agree with Carspecken (1996) that my reasons for pursuing this study are intertwined with my own values or experiences. It is risky to ignore or downplay my position and beliefs, at least those that are known to me. I have therefore decided to declare my *known* beliefs, experiences and values. Whilst this does not limit the scholarship of this research, it is hoped that the declaration will elucidate and add a degree of transparency to the factors that could influence the findings.

1.4.2 DECLARATION OF THE RESEARCHER'S BACKGROUND AND POSITION

I spent the first sixteen years of my life in Lagos, Nigeria. Looking back, I believe I was motivated to learn. I had "the tendency to find academic activities meaningful and worthwhile and tried to get the intended learning benefits from them", as defined by Woolfolk et al. (2008) and Brophy (2004). I was happy to engage in most academic tasks, including the subjects or topics I did not find particularly interesting. I was often at the top of the class in my primary and secondary schools. I do not attribute my success in school to motivation to learn alone. In fact, I attribute it more to the culture and ethos in Nigeria at the time. In general, most students wanted to engage in school learning. There was no choice in the matter; education was the single most important thing to young people.

The societal ethos and culture supported school learning. Most parents believed education was important. Some learners had to walk several miles in order to attend the school of their choice. Some learners were so interested in learning that they worked to pay for their books, uniforms etc. Fortunately, my parents could afford to provide the books, fees, uniforms, equipments etc required for schooling. Even this privilege contributed to my motivation to learn. I fully understood the sacrifices my parents had to make and the high expectations attached to them.

My first experience of using computers was at the age of eight. We used computers purely for gaming. Games like space invaders, pacman and digger were my delight. I was attracted to computers and quickly learned how to use them. I associated computers with fun. I used to stay on the computer for hours, often enduring the interruptions of power cuts. The novelty of the games and the features of the computers did not fade away quickly. I enjoyed every moment on the computer. At the time, computers were not used for school learning, although I can imagine that I would have been delighted to engage in e-learning.

When I trained as a teacher in England, I was shocked to see learners disengaged in learning. Amidst all the necessary facilities (books, pens, computers etc), some learners were still not motivated to learn. Due to my background, I could not understand how learners could have all the facilities and still lack the motivation to learn. Whilst learning requires effort and attention, I believe it is actually interesting. This view might be because of my upbringing and the culture in the country I hail from.

I think teachers in the United Kingdom sometimes try to make learning "interesting" by making it easy. I totally disagree with this approach. Why would any learner take pride in engaging in an easy activity? I support the view that the learning situation can be "hard fun" (Papert 1998). Hard fun does not mean it is fun whilst being hard: it means it is fun *because* it is hard (Papert 1998; Papert 1993; Clifford & Friesen 2003; Berry & Wintle 2009).

I get even more frustrated when teachers seem to feel that the shiny equipment (the computer) will somehow motivate learners. Now an experienced teacher with specialism in ICT, I still do not notice any difference in motivation during computer-based lessons. In my experience, the computers, the internet, the ability to control tasks etc tend to distract learners. This is similar to the distractions they encounter in other lessons involving test tubes, calculators, pens, musical instruments etc. I however appreciate that good instructional design can affect motivation to learn.

Whilst I tried to keep an open mind throughout this study and report findings as accurately as possible, I must declare that:

- Due to my upbringing, I am of the opinion that school learning is beneficial and interesting.
- I believe that learning requires effort and attention. It need not be made easier or "sugar-coated" in an attempt to motivate learners.
- Although I have experience of instructional design, I do not have personal experience in using computers to learn curriculum content.

From this point onwards, I will refer to myself in the third person. This approach is taken, not to distant myself from the research, but to project a sense of objectivity, control and authority (Patton 2002).

1.5 THE INTEGRATED APPROACH TO THIS STUDY

Any research perspective is a reflection of the social location, theoretical location and "lens" of the observer (Maxwell 2005, p. 39). The researcher's understanding of motivation is no exception: it is shaped by a review of various theoretical explanations of motivation. Various perspectives and theoretical explanations of motivation will be discussed in chapter 3. The researcher agrees with Ormrod (2011) that no single theory offers complete coverage of motivation. She described the theories as pieces of the motivation "puzzle". Combining the various explanations can provide clearer understanding of the motivation to learn.

Following the review of various theoretical perspectives of motivation, the researcher's understanding is based on an integration of the various explanations. The benefit of this integrated approach is broader understanding of motivation. The integrated understanding owes interpretative debt to the work of various authors, such as Miltiadou & Savenye (2003), Woolfolk et al. (2008), Eccles & Wigfield (2002) and Ormrod (2011). The researcher has simplified various perspectives of motivation into four learner-centred classifications: "*can I* achieve the task?", "*why should I* engage in the task?", "*how do I* accomplish the task?" and "what will *make me* do this task?". These classifications summarise the researcher's understanding of motivation. They are explored in greater detail in chapter 3.

Likewise, an integrated approach was taken in the development of a conceptual framework for this study. The review of popular e-learning research models (see chapter 3) shows that a single model does not comprehensively include all aspects of motivational behaviour. Bong's (2006) suggestion of a unified model was considered beneficial to this study. Rather than adopt one model as a conceptual framework for the study, the key concepts of the various models were put together into a "collection of concepts". This is illustrated in **figure 1** (below):

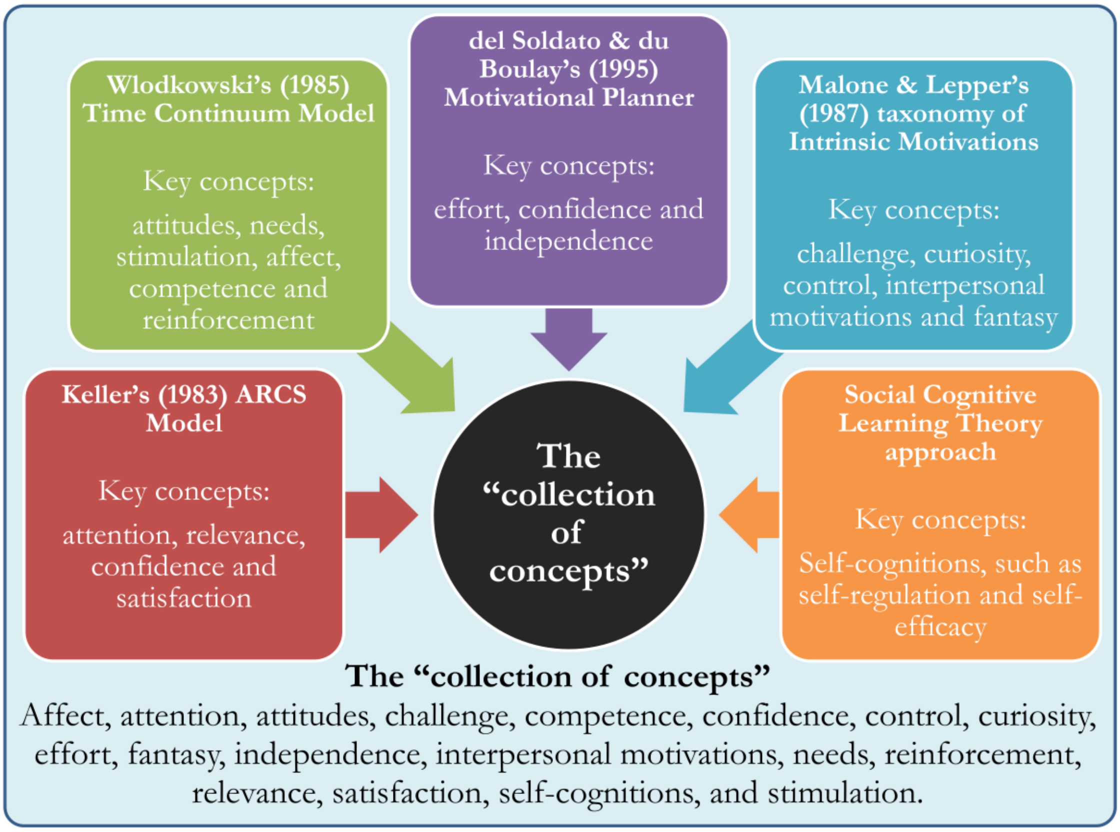


Figure 1: The "collection of concepts" (based on various research models)

The integration of existing models is not a new concept in educational research. For example, Venkatesh et al. (2002) combined two models – a Technology Acceptance Model (TAM) and a Motivational Model (MM) – in their study of user acceptance of technology. According to Venkatesh et al. (2002), the unification of the models extended their understanding of their inquiry. More recently, Phillips et al. (2012, 2010) devised the Learning Environment, Learning Processes and Learning Outcomes (LEPO) framework. They integrated aspects of other conceptual models, such as those conceived by Biggs (1989), Laurillard (2002) and Bain (1999), into the LEPO model in an attempt to focus research attention on all aspects of learning.

In this study, an integrated approach was taken to include the various concepts from each model. There is a great deal of overlap between the models though semantics and degree of detail may change (Bixler 2006). The "collection of concepts" also provided a broad set of ideas from related fields of enquiry and the flexibility to call upon individual ideas. Adopting or developing a single model would limit the results of the study to the concepts used in the model (see Smyth 2006; Miles & Huberman 1994). Since a single theoretical model is unlikely to be comprehensive enough to adequately address all aspects of motivation (Ormrod 2011), the integrated approach was adopted to illuminate several areas of motivation. This broader approach was deemed more valuable than a rigid and narrow framework.

1.6 THE STYLE AND STRUCTURE OF THIS THESIS

1.6.1 THE STYLE OF THE THESIS

This thesis is likely to be of interest to various people in a wide range of roles. Of course, other researchers could be interested in the entire research report. The organisations that gave permission for use of their e-learning materials would also be interested in the findings. Teachers, policy makers and instructional designers are likely to consider and benefit from the research process and findings. To project a sense of authority, control and objectivity, reference to the researcher is made in the third person.

The variety of audiences makes it necessary to adopt an accessible writing style that would benefit all readers. However, the ultimate purpose of the thesis is to advance a point of view to an academic audience through substantial and intellectually rigorous research. Hence, the requirements for the academic award of a doctorate were regarded as the most important factors in the construction of this thesis.

1.6.2 THE STRUCTURE OF THE THESIS

This thesis consists of eight chapters. The present chapter (**chapter 1**) sets the scene and presents a background to the study. It identifies the gaps in research and draws attention to the research aims, questions and significance. It defines the scope and constraints of the study. The chapter also includes declarations of the researcher's background, beliefs and conceptual framework, in order to help readers understand the study's findings.

Chapter 2 is an exploration of relevant debates relating to e-learning and motivation. It starts with the broad concepts of motivation and e-learning then narrows down to one of the areas of interest – attraction. It also includes a critical evaluation of key issues in an emerging area of e-learning, e-learning 2.0.

In **chapter 3**, the key ideas and theories of motivation are presented. The theories relating to motivation and existing research models were evaluated, in order to deepen understanding of e-learning and motivation. This is followed by a review of various research models that have been suggested or used in e-learning research. The research models were evaluated in an attempt to find a suitable conceptual model for this study.

Chapter 4 focuses on instructional design. It starts by exploring the key considerations in instructional design. It then notes the gaps in research, justifying the need for studies relating to the second and third areas of interest – novelty and activities. Following thorough evaluation of existing classifications (types) of activities, a case is made for the use of classifications in this study.

Chapter 5 explains and justifies the methodological approach and decisions taken during the study. The chapter includes full justification of the decision to combine a survey with multiple-case studies; the data collection methods; the data collection instruments; data collection and analysis procedures; ethical considerations; and the steps taken to increase the reliability and validity of this study.

Chapter 6 presents and interprets the findings of the survey, which focuses on the first facet of this study (attraction).

Chapter 7 presents and interprets the findings of the multiple-case studies, which investigate the second and third facets of this study (novelty and activities).

Chapter 8 is discussion of the findings of this study in relation to the research questions and existing research. It also explains the limitations and generalisability of the study. It then concludes the thesis by explaining the implications of the study, offering recommendations and suggesting areas of further research.

CHAPTER 2: E-LEARNING AND MOTIVATION: THE DEBATES

2.1 INTRODUCTION

This chapter is a critique of a wide range of literature relating to motivation and e-learning. It starts with a brief and general exploration of the concept of motivation, providing a synthesis of different perspectives of the phenomenon. It then introduces the idea of motivation to learn. Teachers are keen to encourage learners to develop a particular type of motivation – motivation to learn: this is the willingness to engage in academic learning activities (Wookfolk et al. 2008; Brophy 2004). Many researchers have made the point that motivation to learn helps the learning process (see, for example, Eccles & Wigfield 1985; Maehr 1984; Csikszentmihalyi & Nakamura 1989; Pintrich et al. 1993). Hallam (1996) also stressed the importance of motivation explaining that: "if you lose that [motivation], you lose just about everything".

There are several assertions that e-learning can enhance the "much-desired" motivation to learn. Before examining some of these assertions, this chapter attempts to find a universally acceptable and consistent meaning for the term "e-learning". This is followed by an exploration of relevant debates pertaining to the effects of e-learning on motivation to learn. The promise of e-learning 2.0 (the use of social software for learning) and its possible effects on motivation to learn are also considered.

This chapter goes on to consider the arguments and counter-arguments surrounding the idea that young people are digital natives and adults are digital immigrants (Prensky 2001a, 2001b). Based on this and other arguments, this chapter examines relevant research pertaining to this study's areas of inquiry – attraction. It explores literature which suggest that learners have an attraction to computers and the reasons for this attraction.

2.2 MOTIVATION

2.2.1 MOTIVATION: THE DISAGREEMENTS

> "Despite its intuitive importance, there is much we do not know about motivation. Professionals disagree over what motivation is, what affects motivation, how motivational processes operate, what effects motivation has on learning and performance, and how motivation can be improved" (Schunk et al. 2010, p. 3)

Significant research has gone into understanding the concept of motivation. Early theories of motivation focused on the ideas of *volition* and *will*. Early researchers – Wundt (1874), James (1890) and Ach (1910) – described the will as an individual's desire, want or purpose. They described volition as the act of using this will. According to James (1890), the will is a state of the mind when we desire a particular action and believe that its manifestation is within our power. He then explained that volition is the process of translating intentions into actions.

The early researchers' explanations of this phenomenon (motivation) using the concept of will and volition seems understandable. The explanations, however, raise some important questions. They leave us to wonder how a "will" is formulated. How do individuals formulate their desires, wants or purposes? How do the "wills" get there? Are individuals always conscious of the existence of the "wills"?

Further examination of the concept of will and volition raises further questions about what happens between the occurrence of a will and the action to achieve it (volition). In other words, what happens between having a desire and taking steps to achieve the desire? What determines whether the desire will be converted into action?

Worthy of mention at this stage is the concept of "drive" within Freud's (1966) psychoanalytical theory. He suggested that all actions and behaviours are a result of internal, biological instincts which drive them. He conceived motivation as *psychical energy* (forces within the individual) which is responsible for behaviour. Indeed, the psychoanalytical theory can give some insight into the concept of motivation. For example, a possible explanation for why people exhibit different levels of motivation could be that they have different levels or types of psychical energy within them. If combined with the concepts of will and volition, we can infer that their psychical energy determines the individual's drive to achieve their will.

One major criticism of this assertion is that it is difficult to verify the extent of the psychical energy empirically. Psychical energy is hidden and therefore difficult to measure in a systematic way. It is also not clear how the psychical energy in each individual is formed. More importantly, it is not clear how to generate or enhance psychical energy. Hence, the psychoanalytical theory is quite similar to the concept of will and volition: they provide explanations but do not tell us how to generate motivation.

Other possible explanations of motivation are those suggested by behavioural theories such as Watson (1914), Thorndike (1921), Skinner (1953) and Pavlov (1927). From a behaviourist standpoint, motivation is explainable by observable phenomena. People are motivated by environmental factors (not wills, volitions or drives). They believe that *rewards* and *incentives* can be used to vary the level of motivation exhibited.

A reward is an attractive object or event provided as a consequence of a behaviour. An incentive is an object or event that can be used to encourage a behaviour. Behaviourists believe that the use of rewards and incentives can make people develop the tendencies to act in certain ways. For example, the promise of chocolates (incentive) might encourage a learner to engage in learning. Repeatedly rewarding a learner with chocolates for studying might reinforce the tendency to study. Similarly, consistently withholding the chocolate (incentive) from the learner when behaviour is not desirable could result in a change of behaviour.

Unlike the psychoanalytical theory and the will/volition theories, behaviourist theories offer a way to measure motivation. The quantity and quality of the reward or incentive can be measured. The responses of the individual, indicating the type or level of motivation, can be observed. However, behaviourist theories fail to recognise other factors that may affect how individuals behave. The theories focus on a cause-and-effect approach to behaviour, without considering the complex processes that take place in the human mind. In other words, the observed behaviour does not necessarily give an indication of the beliefs and thoughts that could provoke behaviour. It is difficult to observe or measure these beliefs and thoughts.

The humanistic interpretation of motivation, on the other hand, emphasises personal freedom, choice, self-determination and personal development. Human beings are motivated by factors such as their need for self-actualisation (Maslow 1970); the inborn actualising tendency (Rogers & Freiberg 1994); or the need for self-determination (Reeve et al. 2004; Deci et al. 1991; d'Ailly 2003). The humanistic standpoint therefore is that motivation occurs when we encourage people's inner resources – their sense of competence, self-esteem, autonomy and self-actualisation.

The humanistic interpretation of motivation suggests the behaviourist theories offer incomplete accounts of motivational behaviour. Cognitive theories take this argument against the cause-and-effect approach to motivation further. They claim that mental processes determine human behaviour, not simply by rewards and incentives. Different cognitive theories of motivation stress such processes as goals (Locke & Latham 2002), expectations (Vroom 1964), plans (Miller et al. 1960) and attribution (Weiner 2000). Cognitive theories explain that our mental processes (which manifest themselves as goals, plans, expectations etc) dictate motivation.

The debate about motivation is an ongoing one. Apart from the theories mentioned, there are other theories offering possible explanations. It is impossible to say that a particular theory offers the complete explanation of motivation. It can be argued that all the theories (will/volition, psychoanalytical, behaviourist, humanistic, cognitive and the many other theories) explain aspects of the same phenomenon in different ways. It is no surprise that Schunk et al. (2010) expressed the view that our knowledge of motivation is limited. One thing is clear from the various theories: a wide range of psychologists accept that the phenomenon (motivation) exists.

2.2.2 MOTIVATION TO LEARN

We have established that motivation is a complex and intricate subject encompassing many theories, which reflect different approaches to understanding human thinking and behaviour. Is there a relationship between motivation and learning? Can greater understanding of wills/volition, psychoanalytical, humanistic, behaviourist and cognitive theories of motivation help provide better design for learning?

Sousa (2006, p. 65) expressed the view that "recent research has validated longstanding beliefs that motivation is key to the amount of attention devoted to a learning situation". As early as 1985, Eccles & Wigfield (1985) suggested that motivation affects what learners pay attention to and how effectively they process information. Some studies have indicated that motivation increases initiation of, and persistence in, learning activities, even if learners are occasionally interrupted and frustrated during the learning process (Brophy 1988; Wigfield 1994; Larson 2000). Moreover, there is research suggesting that motivation increases the effort and energy that learners expend in learning activities (Maehr 1984; Csikszentmihalyi & Nakamura 1989; Pintrich et al. 1993).

In fact, some researchers have made clear distinctions between the intrinsic motivation and extrinsic motivation exhibited in a learning situation. Intrinsic motivation comes from the learner – when the learning activity is related to the learner's values, interests, needs and attitudes (Deci & Ryan 1985; Reeve 1996). Whilst it might be possible to generate or nurture intrinsic motivation, there is no guarantee that it can be achieved in every learner at all times. Extrinsic factors, such as money, praise, rewards, punishment, grades etc, can result in motivation (Whitehead 1976). Perhaps the challenge for educationalists is to secure the right balance between intrinsic and extrinsic motivators.

Some researchers have challenged the suggestion that there is a clear dichotomy between intrinsic motivation and extrinsic motivation. One explanation is that our activities fit somewhere between the spectrum of fully self-determined (intrinsic motivation) or fully determined by others (extrinsic motivation) (see Elliott et al. 2000). An alternative explanation, given by Covington & Müeller (2001) and Pintrich & Schunk (1996), is that intrinsic and extrinsic tendencies are two independent possibilities, and at any given time, we can be motivated by some of each.

The key message is that motivation (be it intrinsic, extrinsic, or combination of both) seems to contribute to the attention, energy, time, effort and persistence devoted to learning. Teachers are keen to develop a particular type of motivation – *motivation to learn*. Motivation to learn is "the tendency to find academic activities meaningful and worthwhile and to try to benefit from them" (Woolfolk et al. 2008, p. 468). Motivation to learn involves devoting attention, time energy, persistence etc to academic work, trying to get the most from it, and applying appropriate learning strategies in the process.

Some important principles have emerged from research into motivation to learn. Some of the principles stem from studies that investigated the relationship between learners' motivation and learning outcomes (Vroom 1964; Tollefson 2000, Wigfield & Eccles 2002). Others stem from students' perception of themselves and their capabilities (Bandura 1977; Covington 1992; McClelland 1985). Some principles have their origins in theories of how the learning environment, teaching practices and instructional procedures have supported or conflicted with students' goals and needs (Ford & Nichols 1987, Wentzel 1994; Ford 1992).

An important principle is *motivational belief,* as explained by Stipek (1988). Learners tend to have some self-efficacy beliefs. That is, they hold some opinions about their ability in relation to the specific learning domain. They also hold some outcome expectations (opinions they hold about the success or failure of specific actions). For example, a student might approach a Mathematics question with the view that: "I tend to find algebra difficult (self-efficacy belief) so I am likely to need a lot of help to complete the task (outcome expectation)". These beliefs tend to act as a frame of reference that guide students' thinking, feelings and actions in a learning situation. These motivational beliefs may be favourable (optimistic) or unfavourable (pessimistic). Stipek (1988, 2002) explains that these motivational beliefs form the basis of the level of effort they allocate to an academic task.

Another important principle is the *importance or attainment value* attached to the academic task, as highlighted by Eccles et al. (1998). Learners tend to consider the value of a task using four classifications: importance, interest, utility and cost. They consider the significance of doing well on the task (importance). They also consider the level of enjoyment derived from the task (interest). They form judgements about the extent at which the task helps them to achieve their short or long-term goals (utility). Finally, they consider the cost of doing the task. Learners' assessments of these four categories help them to formulate their response to the academic task.

Further research suggests that students who value the learning activity are less dependent on encouragement, incentives and reward. Whilst rewards and incentives have an important place in motivational theory and research (Hull 1943; Tolman & Honzik 1930; Spence 1960), studies have shown that students are often more committed to an academic task if they believe the objectives are compatible with their own goals (Boekaerts 1998;

Maehr 1984). In fact, much research has shown that offering an extrinsic reward for an activity that the learner already finds interesting can undermine intrinsic motivation (Deci et al. 1999; Lepper & Greene 1978; Lepper & Henderlong 2000). The findings of the studies do not necessarily conclude that rewards should be withheld from students who are intrinsically motivated in the learning activity; they simply highlight that intrinsically motivated learners are less dependent on rewards, incentives, praise etc.

Educationalists are faced with the challenge of arousing and maintaining learners' motivation. They are expected to use appropriate strategies to tackle less helpful attitudes and dispositions, whilst promoting those that are likely to lead to successful learner outcomes. They are also expected to influence learners' perceptions of the importance or attainment values of academic tasks. In addition to the aforementioned, they have to use rewards and incentives effectively to maintain optimum motivation levels. Educationalists have a complex role to play – perfecting the art of sustaining students' motivation to learn.

2.3 E-LEARNING AND MOTIVATION TO LEARN

2.3.1 E-LEARNING: SEVERAL MEANINGS

The broad use of the word "e-learning" seems to complicate the debate. "It seems that everyone from e-learning theorists and practitioners to vendors and learners applies the term e-learning to different methods and products" (Broadbent 2002, p. 10). Andrews & Haythornthwaite (2007) explain this complexity stating:

> "E-learning encompasses any and all forms of communication available to participants, from dedicated course management systems to late-night phone calls and emails in the early hours of the morning, from instructor-prepared lectures to collaborative products generated through discussion boards, blogs and wikis. E-learning is a leaky system; it spreads to take advantage of any and all opportunities for communicating, learning and seeking resources, and like an invasive species, turns up in many places not traditionally associated with formal instruction – the kitchen table, coffee shop, workplace, hotel room on the corner of the bedroom" (Andrews & Haythornthwaite 2007, pp. 18-19)

When researchers refer to e-learning, they could mean very different forms of e-learning. For example, the medium – e.g. television, optical disc, internet, portable media player, intranet, mobile phone, tablet etc – could be very different. The media itself – e.g. text, images, animation, video and audio – could be different. The hardware and software utilised – e.g. mouse, touch-screens, joystick, keyboard, presentation software, computer game etc – could also be different. The mode of learning – e.g. collaborative, self-paced, teacher-led, drill-and-practice etc – could be different.

The multifaceted nature of e-learning is not the only complexity, the continuous change in technology used for learning is another issue. Again, Andrews & Haythornthwaite (2007) emphasise this point stating:

> "E-learning is continuously emergent, emanating from the possibilities of ICT in the hands of administrators, instructors, and learners … The forms and shapes of technology, learning and technology-in-use for learning co-evolve, one pushing, pulling, and modifying the other" (Andrews & Haythornthwaite 2007, p. 19)

If it is difficult to provide a timeless definition of e-learning, can we at least classify it into groups? Broadbent (2002) presented four possible classifications of e-learning – informal, self-paced, leader-led and performance support tools. He described *informal e-learning* as an electronic resource where there is no formal instruction strategy, for example, when a learner accesses a focused online community and finds pertinent information. In a *self-paced e-learning*, there is a formal instruction strategy but learners access the electronic resources at their own pace. Learners decide what they wish to learn, when they wish to learn it and the pace at which they will learn it. His description of *leader-led* e-learning is real (synchronous) or delayed (asynchronous) time system where an instructor, coach or facilitator attempts to scaffold or guide learning. His final classification is the *performance support tool*, which is an electronic material that learners access to gain help in performing a task. An example of a performance support tool could be a wizard embedded in a piece of software to help learners complete a certain task. Broadbent (2002) himself accepts that his classifications are not universally or consistently used. Moreover, he acknowledges that they can sometimes be used interchangeably. There may also be some overlaps, for example, a self-paced, performance support tool.

The Australian Flexible Learning Framework (2007) provides alternative classifications: tier 1, tier 2 and tier 3. This is largely based on the "degree of interactivity" involved between the e-learning system and the learner. *Tier 1 e-learning* is the most basic, and may amount to little more than electronic delivery of content to the learner. Tier 1 could be the use of e-books, online PowerPoint presentations or online manuals. *Tier 2 e-learning* allows the learner to have a degree of interaction with the content being delivered and makes use of a range of media to reinforce learning. It however does not build in interactions between learners, or between learners and their instructor. Examples of this include online quizzes, computer games and simulations. Finally, *tier 3 e-learning* encourages self-directed learning, rich media and engages the learner in a learning community. An example is a virtual classroom, where the students and instructors can interact online.

On closer examination, it is quite easy to see that these classifications have the same issues as Broadbent's (2002) classifications. The issue of interchangeable and inconsistent use of the classifications remain. As technology evolves, researchers' understanding of the term "e-learning" will probably evolve too. The difficulty of finding a universally acceptable definition or classification has some implications for research. When people use technological terminology, what *exactly* do they mean? **Appendix 1** shows some of the terminologies (e.g. ICT and TEL) used in e-learning research and attempts to provide an explanation of the ways in which they are generally used. The main purpose of this section is to point out that there are several meanings to the term "e-learning". Therefore, it is important to probe further into the specifics when considering findings of e-learning-motivation research.

2.3.2 E-LEARNING AND MOTIVATION: THE ASSERTIONS

Some researchers have argued that computers motivate learners to learn. For example, Means et al. (1997) conducted an extensive study of how computers affects learning. Their conclusion was that e-learning "dramatically enhanced students' motivation and self-esteem" (Means et al. 1997, p. 5). They explained that technology increased the amount of time students spent on tasks; their willingness to critically review their work; and their pride in the finished product. They even went on to suggest that learners attribute more importance to computer-based learning. The work of Cox (1997) and Denning (1997), both commissioned by the National Council for Educational Technology (NCET), also indicate that ICT can have positive effects on motivation.

The British Educational Communications and Technology Agency (Becta), a former UK government agency, echoes this assertion in its ICT Research report. The report titled "what the research says about ICT and motivation" concludes that:

> "Research evidence shows that ICT can stimulate, motivate and spark student' appetites for learning and helps to create a culture of success. This can be demonstrated in their increased commitment to the learning task, their enhanced enjoyment, interest and sense of achievement in learning when using ICT, and their enhanced self esteem" (Becta 2003, p. 1)

The conclusions of the research, though interesting, seem to act as prompts for further investigation. What exactly does the Becta report mean by "research evidence"? Where exactly does the "research evidence" come from? Have other views, especially those that are not in agreement with this assertion, been considered? The report claims to be based on "an analysis of available research about the motivational effects of Information and Communication Technology (ICT) on students' commitment to and engagement in learning" (Becta 2003, p. 1).

Hence, it is reasonable to consider the "research evidence" in the "available research" – the basis of the assertion. The report was based on the work of several researchers, such as Cox (1997), Hennessy (2000) and Pedretti et al. (1998). Perhaps the most extensive was the work of Passey et al. (2003). They set out to examine and quantify the impact of ICT on motivation and related issues such as learning outcomes, behaviours, school attendance. They selected a sample of 17 schools which had been identified as using ICT in motivational ways. These schools were representative of school phases and types, geographical locations, socio-economic and ethnic backgrounds of pupils and ICT facilities deployed. The 17 schools were made up of 5 primary, 8 secondary, 2 special schools and 2 Pupil Referral Units.

Passey et al. (2003) also combined qualitative and quantitative data collection methods – interviews involving 121 headteachers, teachers and classroom assistants, 126 pupils, 22 parents, and 24 youth and community workers, healthworkers, careers officers; observation of 33 classes; completion of 1206 pupil questionnaires; and collection of documentary evidence such as pupil attendance, behaviour and attainment records. The data collected during the study suggest that ICT can have a positive effect on students' motivation to learn. In fact, it ended with "emerging messages" – the use of ICT can result in positive motivation for both learners and teachers.

Considering the scale of the research and the range of data gathered, there is a temptation to agree with the "emerging messages". However, the fact that the research was conducted in schools that were deemed exemplars of good ICT practice raises questions about the generalisability of the findings to other contexts. There is a possibility that the context and values in the schools sampled were already inclined towards the view that ICT results in motivation. Replicating the study in other schools might yield different findings. Comparing schools that made motivational use of ICT to those that did not would probably have provided greater understanding of the impact of ICT on motivation to learn. The questions remain: Does the use of ICT always improve learners' motivation to learn? Does it depend on how skilfully it is deployed? Are the positive motivational effects the result of good ICT practices rather than technology? At this stage, it is impossible to say that the motivation to learn is generated by technology per se. It is perhaps due to the *effective use* of technology.

Another interesting argument is based on the view that young people are intrinsically motivated to play computer games. Gee's (2008) argues that educationalists need to learn from the games industry. He stresses that some computer games are long, complex and difficult. He goes on to explain that although young people do not naturally want to do difficult things, they are keen to go through the rigour of these games. He points out that there is something about how games are designed to intrigue and challenge young people. Gee (2008) concludes by saying that computer-based learning can motivate learners, but educationalists need to do what the game makers do – design them (e-learning activities) to enthuse.

Why is it that learners seem to be more interested in computer games than educational tasks on computers, as Gee (2008) suggested? Gaming for pleasure might be motivating; gaming for learning, however, might have different outcomes. Gee (2008) seems to overlook the conflicting views about the benefits of game-based learning. Some literature suggests that game-based learning is motivational (see, for example, Prensky 2002; Oblinger 2004; McFarlane et al. 2002; Garris et al. 2002). Others point out that learners are not necessarily motivated to learn through computer-games, though they might be keen to play games for recreation (see, for example, Wechselberger 2009; Whitton 2007; Papert 1998). Furthermore, Gee's (2008) argument relies heavily on his view of public perception rather than empirical evidence.

More recent research suggesting that e-learning has motivational effects on learning exist. For example, some researchers believe that pedagogical agents can increase learners' motivation (Krämer & Bente 2010; Gulz & Haake 2006; Gulz 2004; Choi & Lee 2005). Pedagogical agents are virtual characters used in digital environments to provide instruction (Veletsianos 2012). Some predict that pedagogical agents will result in even greater motivation in the future, when they will have even more "human-like" features (Krämer & Bente 2010). Another study by Bolliger et al. (2010) indicated that learners experienced greater motivation to learn when using podcasts as the means of communicating and sharing knowledge. These more recent assertions seem to support the claim that e-learning results in motivation.

However, it is not clear how these accounts would accommodate the research of Underwood & Underwood (2001). They provide ample evidence that the mere fact that a learning activity is computer-based doesn't increase the motivation to learn. Their observation of eleven-year-olds working on a drill-and-practice mathematics program showed that the pupils were far from being chastised by the response to an incorrect answer. The pupils were highly delighted to see the computer display seemingly harsh message of "WRONG WRONG WRONG" in bright red letters across the screen. The pupils produced a string of incorrect responses in order to enjoy what appeared a stern reprimand. These pupils failed to see the computer-based exercise as a motivation to learn, they saw it as a motivation to play. Underwood & Underwood (2001) agree that there is an attraction to computers, but question the existence of an attraction to *learning* with computers.

Some survey evidence also suggests that children tend to use computers at home as toys (Wirth & Klieme 2004). Computers seem to offer a wealth of learning opportunities, as well as a wealth of distractions. The findings of Wirth & Klieme (2004) indicate that these distractions reduce the time spent doing learning exercises. This survey raises another important question – are young people interested in computers or the fun associated with computers? What would happen if they had to make a choice between a learning and a play website?

Clark & Feldon (2005) add a further twist to the discourse. They insist there is a need to separate motivation to *choose* from motivation to *learn*. They argue that many of the currently measured motivation variables seem to focus on interest and enjoyment factors that influence access and choice, rather than learning. They explain that computer-based forms of instruction may be chosen over other forms of instruction, based on expected flexibility and ease of learning. Unfortunately, those expectations can reduce their effort towards learning (motivation to learn). Clark & Feldon (2005) believe that e-learning systems should not only generate initial interest in learning, they should increase or maintain students' effort towards learning.

After careful examination of the debate so far, there seems to be some agreement that learners often have an initial attraction to computers. The views of Underwood & Underwood (2001) and Clark & Feldon (2005) reveal one important point – motivation to learn is not generated by simply using a computer. Presenting learners with "any old computer activity" is unlikely to yield motivation (Jaffa 2006; Mayer 2008). As far back as the year 2000, Becker (2000, p. 2) pointed out that "it seems likely, though, that not all computer activities attract the same degree of student interest and effort".

Moreover, there has been a general assumption that *all* learners are proficient in the use of computers. There is significant research evidence pointing to differences in what aspects of technology interests learners, the range of technologies they have access to, and their level of proficiency (Selwyn 2012; Bennett et al. 2008; Kennedy et al. 2008; Bennett & Maton 2010; Facer & Furlong 2001; Kennedy et al. 2010). Grant et al. (2009) also found that there are differences in learners' perception of proficiency and their actual performance on the computer. Hills (2003) highlights the challenges that less proficient learners face by stressing:

> "Engagement and interaction with the machine is an important element of learning. However, this begins to introduce a barrier for some people. For those less proficient at interacting with a computer, engagement is more difficult" (Hills 2003, p. 14)

There are several counter-arguments to this view. Some point out that most young people already inhabit more and more media-rich bedrooms and are therefore already proficient

(Livingstone & Bovill 2005). Others highlight that most young people consider themselves to be expert users of technology (Livingstone & Bober 2005). Moreover, some stress that the level of interest currently generated by non-academic computer-based activities, which also require familiarisation, exceeds what is experienced by the academic ones (Loveless & Ellis 2001; Steinberg 2001; Gee 2008). Whatever our position about the proficiency levels of young people, it is easy to see how learners who have concerns about their proficiency might find it difficult to engage with e-learning.

Convery (2009) neither agrees nor disagrees with researchers' findings on e-learning and motivation. He illustrates how technological rhetoric is created and sustained, and how voices that promote the adoption of technology become privileged and established. Like Reynolds et al. (2003), who described some research findings as "optimistic-rhetoric", he stresses that claims linking technology and increased motivation and engagement appeal to readers' "vision" (i.e. their hopes and wishes). He warns that research into technology and learning sometimes rebutted unwelcome research findings; and exaggerated the voice of technologists and ICT advocates. Such research findings are sometimes published by policy-makers who rely on research based on ICT rhetoric, but low on supporting evidence. Finally, he points out that research reports also exploit presentation through their use of dominant imagery of children actively engaged with technology.

Convery (2009) concludes by suggesting that the way forward is to end the polarisation of researchers into groups of technophiles and technophobes. He believes that research into e-learning must be contextualised and must draw upon a range of evidence. Believing that isolated views and experiences can be used to masquerade hypothesis into evidence-based assertions, he concludes by saying:

> "It is the duty of the researcher to be sceptical, and informed scepticism is the basis for recognising how technology can make a significant contribution to the learning experience … There are many practical methodological steps to be taken in ensuring the quality of educational ICT research, and rejecting seductive but disabling rhetoric is fundamental to ensuring improved research findings are considered in the human context and educational complexity" (Convery 2009, p. 39)

Considering the preceding debate, assertions that the "e" in e-learning automatically results in motivation should be treated with caution. Even buzzwords like "Technology Enhanced

Learning" (TEL) sow the seeds of questionable assertions. It gives the impression the presence of technology improves learning. There may be situations when technology may improve learning, and some situations when it can disrupt learning (Haythornthwaite 2011). These assertions ought to be challenged with some key questions. Firstly, what type of e-learning is under investigation? Secondly, who are the participants of the study? Have the most appropriate instruments being used? Does the research finding fully consider all the evidence in equal weight? Finally, would the same amount of effort and attention be devoted to the activity if it were not in a computer environment?

2.3.3 E-LEARNING 2.0 AND MOTIVATION

The emergence of the term "e-learning 2.0" is likely to intensify the debate. "E-learning 2.0" stems from the emergence of the term "Web 2.0". Web 2.0 is associated with applications on the World Wide Web that facilitate interactive information sharing and collaboration. Placing greater emphasis on social learning and collaboration, E-learning 2.0 relates to the learning aspects of Web 2.0 using social software such as wikis, podcasts, virtual environments, RSS, video sharing, digital repositories, blogs etc. In contrast to traditional e-learning, it does not involve educational materials delivered to learners. Instead, there is a supposition that knowledge is socially constructed. There is already some research evidence suggesting this type of collaborative learning can result in greater understanding (Light 2001; Brown & Adler 2008).

The concept of socially constructing knowledge itself is not new. Social constructivism theories (not to be confused with social constuctionism) have long recognised the importance of social interactions in the acquisition (construction) of skills and knowledge (Bruner 1986; Bandura 1986; Vygotsky 1978). Holmes et al. (2001) have even taken this further by extending the term social constructivism to communal constructivism saying:

> "Learners construct their knowledge through their own learning environment and their interaction with others. The ease with which communities of learners today can communicate and learn from each other stretches socio-constructivism much further. E-learning [2.0] promotes one-to-one, one-to-many and many-to-many interactions, with hugely magnified opportunities for communal support for learning – and, most importantly, for providing a medium to store and make available the knowledge created

> by learners. It is in this specific respect that communal constructivism stretches the socio-constructivism paradigm" (Holmes et al. 2001, p. 3114)

Regardless of the terminology or technology employed, what is most important in this study is the impact of the interactions on students' motivation to learn. Does this type of collaboration motivate students to learn? Crook (2000) argues that collaboration itself is a motivated activity. He provides evidence from developmental psychology showing the importance and attraction of children's engagement in joint interactions. He stresses that the concept of "shared meaning" itself is extremely motivating. Shared meanings refer to the knowledge built up during collaborative activities, the sense of shared histories during the collaboration, and the uniqueness of the shared histories to the group of learners.

Eales et al. (2002) also advocate this by arguing that ownership of the learning problem is a particularly powerful form of motivation. They believe that learners are better motivated when faced with the task of constructing knowledge through interaction with others. They even made a distinction between *authentic motivation* – related to the development of robust, long-term knowledge – and *inauthentic motivation* – focused on assessment and tactics of schooling. They explain that collaboration results in the development of authentic motivation, which in turn result in learning that is more robust and embedded.

This push for motivating learners using the facilities of E-learning 2.0 leaves us to wonder what exactly the role of the teacher is. Should the teacher be a leader, a facilitator or a mere participant in the interactions? Richardson (2010) used the phrase "learners as teachers", explaining that learners are able to construct and develop knowledge. We are left to wonder how the teacher's activities will affect motivation in this environment. Studies so far reveal that too little input from the teacher can have adverse effects on the quality of outcomes and interactions (Jordan 2009; Ertmer et al. 2007; Tolmie & Boyle 2000; Jelfs & Colbourn 2002; Thomas & Carswell 2000). Hence, Kearsley (2000) and Rosenberg (2001) have recommended that teachers should develop competencies that are applicable to online environments.

Juwah (2006) and Roper (2007) have taken this recommendation further. They believe that learners also need to be skilled in "learning how to learn" in this environment. Roper (2007) conducted some studies into successful online learning skills. An interesting aspect of Roper's study is the fact that it is based on students' perceptions. Key suggestions were:

applying knowledge gained to enable retention; making connections with fellow students; making interactions useful to learning; and making the most of time. On motivation, he suggested that each learner must develop a self-motivation plan. He indicated that each learner must find what motivates them (the social interactions, their sense of achievement, incentives etc) and then formulate a personal motivational strategy.

Expecting learners to self-motivate themselves reveals an important point. It shows that we simply cannot assume that learners get more motivated to learn because they are able to form knowledge through a socially, collaborative medium. In fact, we cannot guarantee that the interactions will be purposeful and engaging. Sanger (2010), the co-founder of the popular collaborative resource, Wikipedia, accepts that:

> "There is no reason to think that repurposing social media for education will magically make students more inspired and engaged" (Sanger 2010, p. 18)

From the debates explored, it can be inferred that the level of motivation generated through E-learning 2.0 will depend on a variety of factors: the group dynamics, the role of the teacher, the nature of the learning, the learner, the context, the technology etc. Hence, the use of a collaborative e-learning environment might not necessarily lead to greater motivation to learn.

2.4 DIGITAL NATIVITY AND ATTRACTION TO COMPUTERS

2.4.1 DIGITAL NATIVES AND DIGITAL IMMIGRANTS

So far, the review of the debates into e-learning and motivation have suggested that the computers might have the *potential* to motivate learners. However, it seems the use of computers does not automatically result in motivation to learn. Other authors suggest that learners' themselves are familiar with computers and attracted to them (Tapscott 2008; Livingstone & Bovill 2005; Tapscott 1998; Prensky 2001a). Prensky (2001a) highlights this familiarity and attraction to computers by separating them from adults. He points out that:

> "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach. Today's students have not just changed incrementally from those of the past, nor simply changed their slang, clothes, body adornments, or styles, as has happened between generations previously … They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age … Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives" (Prensky 2001a, p. 1)

Prensky (2001a) believes that today's learners are "native speakers" of the digital language of computers, video games and the internet. He asserts that their exposure to technology has reorganised their thinking patterns (Prensky 2001b). He explained that most learners have spent more time playing video games and watching TV than reading. Livingstone & Bovill (2005) also draw attention to the fact that young people inhabit media-rich bedrooms. Another writer explained that digital technologies are part of young people's lives that they take it for granted (Fee 2009). An interesting concept is that this generation learned to use a mouse about the same time it learned to use a spoon (Papert 1999). More recently, Crook (2012) explained that many young people are very familiar with many Web 2.0 services (though there are some tensions with their use for education).

Prensky (2001a) even went on to separate the young people from the adults, using the terms "*digital natives"* and "*digital immigrants"*. Our young people who have been born into the digital age are the natives, whilst those who were not born into this age, but have adopted many or most of the new technology are the immigrants. The natives are fluent in the use of technology, whilst the immigrants learn to adapt to their newfound environment, whilst retaining an "accent".

It is easy to understand that Prensky (2001a) is trying to make a distinction between two types of people. The system of classification (age) itself is debatable. Is he really suggesting that every learner all over the world falls into one of these classifications, and to the same degree? The issue is not the distinction itself or which age group fall into the categories. The issue is: what effect does this have on motivation and learning? Prensky (2001a) asserts that there is a difference in *thinking patterns*. He lists some characteristics of the digital native – short attention span, interest in the future content (rather than legacy), faster and random access (rather than step by step). He even goes on to explain that there is a possible physiological difference between the brains of natives and immigrants (Prensky 2001b).

In effect, Prensky (2001a, 2001b) believes that there is a native/immigrant divide, meaning that learners feel as if e-learning instruction is from indecipherable and thick-accented foreigners. Oblinger & Oblinger (2005) signify their agreement with this concept. They clarified that one generation's technology is taken for granted by the next; for young people, it is simply the way things are done. Dede (2005) argued that some learning styles are emerging because of the advances in technology. Does this mean we have to ignore or adapt existing learning and motivation theories and strategies, as we are dealing with a new breed of learners with different thinking patterns? How will educationalists and instructional designers adapt e-learning materials, considering they are not natives themselves?

Before educationalists suddenly make a dash towards developing new motivational strategies and theories, it is worth noting that there are significant counter-arguments against the native/immigrant concept. The notion that young people are, by nature, "digital natives" has been challenged. Some research evidence suggests that young people are not completely comfortable with ICTs, as they are sometimes unable to evaluate and avoid online risks (Livingstone & Helsper 2007; Buckingham et al. 2005; Livingstone 2008; Cheong 2008).

Perhaps that is precisely what Prensky (2001a, 2001b) was pointing out: young people are different. Whilst the older generation concern themselves with judgements about risks, these young people perhaps have a different mindset. It is possible that their way of thinking makes them more inclined to completely ignore the risks or accept them as normal life experiences. Young people perhaps think the benefits of technology (which has now become a way of life) far outweigh the risks. Contrary to what we believe, they might actually be the ones that are comfortable with ICT (including managing the risks involved).

This view, though interesting, assumes that *all* young people are "wired" to be comfortable with technology and the risks. We know from the work of Facer & Furlong (2001) that there are some inequalities in terms of access, tolerability and skills towards technology. Bennett et al. (2008) also highlighted that there is research evidence showing disparity in the population of young people, rather than similarities. Helsper (2008) also warned about the risk of classifying all learners as a group of experts explaining it can lead to overconfidence in young people's skills. Through a national survey, Helsper & Eynon (2010) supported other researchers, such as Bennett et al. (2008) and Kennedy et al. (2008), who have explained that there are differences between the preferences and skills of cohorts of young people.

Helsper & Eynon (2010) also challenged the validity of the concept of natives/immigrants itself. Introducing a new dimension to the argument, they provide ample evidence that the digital divide is not based purely on generation. They considered Presky's (2001a) description of digital natives. Through a nationally representative survey, they revealed that there are other variables to predicting if someone is "digitally native".

Helsper & Enyon's (2010) own research shows that younger age groups (14-17 and 18-24) interacted more with ICT and internet. They tended to multi-task more and more and used the internet as their first port of call for the widest range of activities. This survey, pointing out that young people are more conversant with technology, somewhat supports Prensky's view (2001a, 2001b). However, their research suggests that the breadth of use seemed to be more indicative of digital nativity. Other factors such as gender, education and experience are also contributing factors. Perhaps most interestingly, they expressed the view that adults can become natives, by acquiring skills and experience in interacting with ICT (i.e. increasing their breadth of use).

The thought that the gap between natives and immigrants can be closed must be good news for instructional designers, teachers, parents and other adults. The introduction of these new variables (breadth of use, gender, education and experience) makes distinguishing between digital natives and immigrants a pointless exercise. For example, how can we consider a young person with limited breadth of use a digital native? Rather than "nativity" being based on age, the level of confidence or competence with technology would be a more beneficial measure.

2.4.2 ATTRACTION

The assertion that learners are "wired" differently has perhaps led to the assumption that at least some learners are attracted to computer technology. The use of terms like, digital natives, screenagers, Millenials, Net Generation, internet generation, and tech-whizz, give the impression that there is a natural pull towards computer technology. Of course, there are some disagreements about whether students are actually *motivated to learn with computers* (for example, see Sutherland et al. 2009; Means et al. 1997; Wirth & Klieme 2004; Clarke & Feldon 2005).

The issue of motivation to learn with computers is some way down the road. There are some preceding questions. Are learners actually attracted to computers? If they are, what are the reasons for this attraction? How does the attraction to computers compare with "traditional" settings? Finally, how can educationalists take advantage of this attraction? We need to understand the value that learners attach to computer technology. Only then, can we start to explore their motivation to learn with computers.

Perhaps the answer lies in the research evidence suggesting that young people consider computers as *necessary for everyday life* (Teo 2006; Pektaş & Erkip 2006; Bovée et al. 2007). Firstly, the perception that computers are necessary tools suggests that they find it relevant to their needs and goals. This suggests that there is more than an attraction; computers seem to influence their lifestyle. Computers have become part of their daily lives. It further suggests that they are familiar with computers.

This is perhaps related to the reported levels of *confidence* with computers. Some researchers have reported that young people have a positive view of their capabilities (Houtz & Gupta 2001; Helsper & Enyon 2010; Gardner et al. 1993). The feeling that they will be able to cope with computer activities probably makes it attractive to them. Some have warned that this perception of confidence might not be indicative of their true level of ability (Helsper 2008; Helsper & Enyon 2010). Nevertheless, we can understand how a perception of confidence can be sufficient for at least an initial attraction.

Where does this confidence come from? What exactly are they confident about? All the discussion about their status as digital natives indicates that their *experience* is a contributory factor. Could it be a *perceived ease of use*, the feeling that their naturally "get on" with computers? Is it possible that they perceive computers as *fun* tools? Carroll et al. (2002) reported that some learners described certain technologies (mobile phones, SMS and chat) as "our stuff". In effect, they were suggesting that these technologies represented their domain, an area that they belong, are competent in, and enjoy.

According to Broady et al. (2010), *peer and social pressures* can also have an effect on their attitude towards computers. It is conceivable that young people might find computers attractive simply because "that's the sort of thing that young people like us are into". It is possible that young people have built a culture where they are attracted to computers because they are "in vogue". The issue of peer and social pressure is worth considering during research. It might be useful to separate those that are actually attracted to computers from those that are influenced by peers. This seems problematic in practice. Firstly, some learners might not be conscious of the presence or extent of peer influence. There is also the possibility that some are now attracted to computers though social pressures might have initiated the attraction.

It is difficult to find research denying young people's attraction to computers. Suggesting that they do not adopt all types of technologies, Carroll et al. (2002, p. 1780) explained that "young people tend to experiment with and evaluate a technology if it is convenient, affordable, supports their actual rather than hypothetical activities or satisfies a need for style or fashion". The suggestion that they are willing to experiment supports the notion that there is some level of attraction. They are not likely to experiment with something they fully believe is uninteresting. The fact that there is very little research disputing the attraction to computers is quite surprising. There is the need for research that verifies this claim. Further research into why this attraction exists (if it does exist) and how educationalists can take advantage of it will also be beneficial.

2.5 CHAPTER SUMMARY

Motivation has been at the centre of a great deal of debate. The motivation to learn, whilst being highly sought-after, remains a complicated concept. It can be argued that the importance of motivation has led to various disagreements about how to motivate learners. On a positive note, motivation can be seen as so important that researchers are offering explanations from several perspectives. The result is a rich research base with explanations for a phenomenon that would otherwise have remained a mystery.

The emergence of computers for educating young people has also added to the debate. It is hard to find research evidence denying young people's attraction to computers. This attraction is sometimes believed to result in motivation to learn with them. This belief has been fiercely debated. This debate is probably due to the different facets to e-learning. Sometimes, findings from one facet are taken out of the context and are generalised. There also appears to be a divide between technophobe and technophile researchers (Convery 2009). This affects the outcomes of studies, as the research can be skewed to reflect the researchers' position rather than being determined by objective and rigorous enquiry.

The evidence so far suggests that, in general, young people have some level of familiarity or proficiency in the use of computers. There are also some reasons to believe that there might be an attraction to computers, but this is not necessarily the motivation to learn with computers. Some researchers have described this as motivation to choose (Clark & Feldon 2005) and motivation towards learning (Krnel & Bajd 2009). This attraction to computers, especially the reasons for the attraction, is an area that requires further examination. It would also be useful to know whether this attraction (if it exists) translated into motivation to learn. Furthermore, it is not clear whether there are learners who are not proficient or attracted to computers. What are the implications of lack of proficiency on their motivation to learn when using e-learning systems?

CHAPTER 3: E-LEARNING AND MOTIVATION: PERSPECTIVES AND RESEARCH MODELS

3.1 INTRODUCTION

This chapter brings together several theories of motivation and presents them from "the e-learners' perspectives". The theoretical explanations have been taken from a wide range of theories, such as behaviourist, cognitive and goal theories of motivation. To reflect what learners consider during the learning activity and for simplicity, the explanations have been simplified into four main areas – "can I?", "why should I?", "how do I?" and "make me!". These four areas, which are based on a review of existing literature in motivation theories, show the researcher's conceptual understanding of motivation.

This chapter also includes an evaluation of the most popular research models. These models have acted as conceptual frameworks for some studies in e-learning and motivation. The models also provide some strategies (sometimes referred to as tactics) which can be used to motivate learners. The strengths and weaknesses of the research models were evaluated in the hope for a suitable conceptual framework for this study.

3.2 MOTIVATION FROM E-LEARNERS' PERSPECTIVES

3.2.1 FROM THE LEARNERS' POINTS OF VIEW

This study would be incomplete without an exploration of learners' perspectives and reasons for motivation. Some researchers, such as Mayer (2005a) and McFarlane (2001) have already recommended a learner-centred approach. Referring to multimedia learning environments, Mayer (2005a) eloquently makes the case when he explained that:

> "Learner-centred approaches begin with an understanding of how the human mind works and ask, 'How can we adapt multimedia to enhance learning?' The focus is on using multimedia technology as an aid to human cognition … The premise underlying the learner-centred approach is that multimedia designs that are consistent with the way the human mind works are more effective in fostering learning than those that are not" (Mayer 2005a, p. 9)

Like Mayer (2005a), Mayes & de Freitas (2007) also argue that design decisions should be based on clear theoretical principles. Rather than considering motivation from solely an instructional design perspective, placing more emphasis on theoretical principles of learner motivation might result in e-learning systems that are more effective. This leads to two questions: What are the reasons for the presence, increase and decrease in motivation to learn? How do these affect learning in an e-learning environment?

Miltiadou & Savenye (2003, p. 82) illustrate the magnitude of the issue of motivation by explaining that: "questions about why learners engage in, pursue, and accomplish certain goals or tasks, or why they avoid others, have been the subject of scholarly inquiry since the writing of 5th century BC Greek philosophers such as Plato and Aristotle". Whilst there is truth in this statement, some relevant theories explaining learners' motivation have proven useful. Some researchers have explained that there are no specific e-learning theories per se, only slight modifications of existing theories (Holmes & Gardner 2006; Mayes & de Freitas 2007).

The rest of this section considers some of the theoretical explanations of motivation from the learners' perspective. It is based on theoretical explanations of learners' behaviour when engaged with e-learning instruction (or indeed any other form of instruction). The intention is to bring together and present the researcher's understanding of motivation to learn. Some of the explanations relate to humanistic, behaviourist, cognitive, socio-cognitive and trait theories of motivation. For simplicity and accessibility, they have been classified under four categories relating to: "*can I* achieve the task?", "*why should I* engage in the task?", "*how do I* accomplish the task?" and "what will *make me* do this task?".

3.2.2 CAN I?

Some theories suggest that students' motivation to learn is influenced by their perception of their ability to complete the task. Learners ask themselves questions like: "can I complete this task?"; "what are my chances of success?"; "what factors affect my chances of success?"; "am I in control of the factors?"; and "what was the reason for my past success or failure?" Their perceptions are explained by theories relating to self-efficacy (see Bandura 1986) and attributions – the three dimensions of locus of control, stability and controllability (see Weiner 1984, 1986, 2004, 2005).

Self-efficacy refers to the learner's confidence in their ability to control their thoughts, feelings and actions (Bandura 1986; Bandura 1997). It is believed that learners' perceptions of self-efficacy influence their emotions (Bandura et al. 1977; Stumpf et al. 1987); the amount of effort and perseverance on the task (Brown & Inouye 1978); their choices of behaviour (Betz & Hackett 1981); and their actual performance (Schunk 1981; Locke et al. 1984). Research has shown that learners with high self-efficacy were more likely to attempt different strategies or develop new ones when faced with difficulty, rather than give up (Bandura 1993). The work of Schunk (1991) also suggests that learners with high self-efficacy increased effort and persistence when faced with difficulty, when others might quit or avoid the task.

How do learners develop their perception of self-efficacy? Why do some learners have higher levels of self-efficacy than others? Some researchers believe that learners make cognitive appraisal of certain factors before making a judgement of their efficacy. For example, Schunk (1989b) suggested that the factors affecting learners' perceptions were: their perceived ability; the difficulty of the task; the amount of effort expended; the amount of external assistance received; the number and patterns of success and failures; their perceived similarities to models; and the persuader's credibility. Bandura (1986) also listed the factors as: actual experiences; vicarious experiences; verbal persuasion; and physiological indexes.

Another important factor is learners' *locus of control*. Rotter (1966) describes it as the belief about the extent to which behaviour influences success or failure. Learners' judgement about their likelihood of success in a task can be perceived to be the result of their own abilities or effort (internal locus of control). They could also believe that external factors such as difficulty, luck and other people's actions influence their success or failure (external locus of control). Locus of control is regarded as an important factor affecting achievement and performance (Pintrich & Schunk 1996; Zimmerman & Bandura 1994; Pajares & Miller 1994). In particular, the importance of internal locus of control has been emphasised in research. Some studies have shown that, irrespective of intelligence levels, learners with high internal locus of control often performed better (Shell et al. 1995; Schunk 1991).

Another dimension of attributions is *stability*. Learners make a judgement about whether the cause of success or failure is fixed (stable) or variable (unstable) over time and across situations. For example, a learner might believe that they will continue to excel in an academic task because of their ability. This is because they expect their ability to remain stable over a long term. In general, learners do not expect the same outcomes for unstable causes (Moreno 2010b). For example, they do not expect to be lucky every time, because luck is considered unstable.

Learners also have beliefs about the *controllability* of the cause of success or failure. They make judgement about how much control they have over the cause of success or failure (Miltiadou & Savenye 2003). Some causes are considered controllable. For example, a learner might believe that committing more effort to a task will result in success. In this case, the amount of effort committed is a controllable cause. They might however believe that the difficulty of the task in not controllable. Learners are more likely to show anxiety, reduced persistence and avoid tasks if they perceive the cause to be uncontrollable (Moreno 2010b).

Ormrod (2011) makes it clear that attributions are an excellent example of knowledge construction in action: Learners constantly combine existing knowledge and beliefs with new events, forming newer explanations and beliefs. As the newly formulated knowledge and beliefs are self-constructed, they might not reflect the reality of the situation. For example, failure might be attributed to unclear instructions, when the cause was their own lack of effort. Some studies even suggest that learners tend to attribute their success to internal causes (e.g. hard work and ability) and their failures to external causes (e.g. other people and luck) (Rhodewalt & Vohs 2005; Whitley & Frieze 1985; Marsh 1990).

3.2.3 WHY SHOULD I?

Other theories have tried to explain motivation from learners' perspective by linking them to the reasons for engaging in a particular learning activity. It is believed that learners consider the extent to which the learning activity relates to their goals, interests and levels of curiosity. They ask themselves questions like: "will I enjoy this task"; "what is the value of the task"; "how does this relate to my own goals?"; "will I get any recognition for my effort?"; and "how will my performance measure up to my peers'?". These questions are explained by theories relating to intrinsic tendencies (see Deci & Ryan 1985) and goal attributions – especially the two dimensions of mastery and performance goals (see Ames 1992; Ford 1992; Ford & Nichols 1987; Covington & Müeller 2001).

Intrinsic motivation stems from factors within the learner and inherent within the learning task. As opposed to *extrinsic motivation* (which comes from external factors, such as grades, money etc), learners actually want to engage with the learning activity. They might perceive the learning activity as pleasurable, relating to their interest, values and desire. They tend to have a natural tendency to set themselves challenges and persist in the learning situation (Deci & Ryan 1985). Some researchers have even suggested that such learners can get to a state where they are completely focused on the learning activity that they ignore other tasks and lose track of time – the phenomenon called *flow* (Csikszentmihalyi 1990; Csikszentmihalyi & Nakamura 1989; Csikszentmihalyi 1996; Csikszentmihalyi et al. 2005).

It is not just intrinsic tendencies that motivate learners. Learners can also be directed by their particular goals. Learners sometimes exhibit a desire to acquire additional knowledge or master a skill, in spite of difficulties and mistakes made. This desire is often called *mastery goals* (Ames & Archer 1988), learning goals (Covington 2000), task involvement (Nicholls et al. 1985), task-goal (Anderman & Midgley 1997) or task incentive (Maehr & Braskamp 1996). Regardless of the variations in designation, there is a general agreement among the authors that the mastery goals affect the amount of value attached to, persistence in, and effort expended in task relating to that goal.

Some learners are not necessarily motivated by the mastery goals. They do not necessarily focus on gaining a good understanding of the topic, they focus on making a good impression (such as the respect of their peers) or achieving a certain end result (such as grades). This type of goal is known as *performance goal* (Dweck & Leggett 1988), outcome/achievement goals (Brophy 2005), ego-goals (Nicholls 1989), self-enhancing goals

(Skaalvik 1997) or ego incentive (Maehr & Braskamp 1986). The desire to achieve these performance goals tend to motivate learners to commit time, attention and effort to tasks. As opposed to possessing a mastery goal, performance goals tend to limit learners' attentions to the superficial aspects of the tasks. They tend to devote enough attention to enable them to achieve the positive impression or end result. Hence, they often fail to retain what they have learnt (Pintrich & Garcia 1991; Greene & Miller 1996).

There are other interesting classifications of goals. In reflection of their need for *relatedness*, especially in a collaborative learning environment, students might show signs of *social goals*, such as gaining peer approval (Wentzel et al. 2007; Dowson & McInerney 2001; Ford & Smith 2007; Hicks 1997; Ford 1996). Learners can also develop *career goals*, which might influence their motivation to engage in learning tasks (Lapan et al. 2003). Interestingly, learners can have *performance-avoidance goals* – the desire to avoid receiving unfavourable feedback or appearing inadequate (Elliot & Thrash 2001). They might even have a *work-avoidance goal*, using strategies like complaints, off-task behaviour etc, in an attempt to minimise their effort in the learning task (Jagacinski et al. 2008; Coddington & Guthrie 2008; Dowson & McInerney 2001).

Learners can have numerous goals at any point in time (Hidi & Harackiewicz 2000; Covington & Müeller 2001; Meece & Holt 1993). They use a range of strategies (e.g. combining, prioritising, modifying or abandoning) to deal with the goals (Urdan & Maehr 1995; Dodge et al. 1989; Covington 2000). Students will often be more successful if all their goals point to the same direction (Ford 1992; Wentzel 1999). When the goals do not align with each other, they might abandon one goal to satisfy another (for example, avoiding work in order to maintain friendships) (Phelan et al. 1994; McCaslin & Good 1996; Ogbu 2008; Brown 1993). It is also possible for them to combine goals, for example, forming social groups (social goal) in order to practice new skills (mastery goal). There is also a possibility that schools' push towards "achieving target grades" will persuade learners to swap their mastery goals for performance goals.

3.2.4 HOW DO I?

In addition to finding a reason for engagement, learners consider *how* they will approach the learning task. They adopt strategies for engaging in learning tasks and maintaining their levels of motivation. These strategies can be overt (apparent activities, like note taking, repeating words etc.) or covert (mental activities, like identifying important information, checking understanding and recall) (Kardash & Amlund 1991). They consider issues like: "how do I retain the information"; "how do I control the learning situation"; "how do I manage my time?"; "how do I make use of feedback?"; and "how do I manage my own effort towards success?".

When considering motivation and overt/covert learning strategies, researchers tend to refer to the term *self-regulation*. Self-regulation is the learner's ability to understand and control their learning (Winne 1995; Zimmerman 1994; Schunk & Zimmerman 1994). Self-regulation can be beneficial to motivation and learning. Zimmerman (1994) believes it enables learners to control emotional difficulties; select and use appropriate cognitive strategies for knowledge construction and retention; and plan and monitor their progress in relation to their goals. Learners' ability to develop appropriate strategies and control their learning (self-regulation) increases the likelihood of persistence when facing difficulties (Schunk & Zimmerman 1994).

Self-regulation involves learners' use of *cognitive and metacognitive strategies* (Pintrich & De Groot 1990). Payne (1992) describes cognitive strategies as the behaviours and thoughts in which learners are engaged in during learning. According to Flavell (1976, 1987), metacognition is the learners' knowledge about their own cognitive processes. In other words, cognition refers to "learners' thinking processes" and metacognition refers to learners' knowledge of how effective learning is most likely to take place.

Cognitive and metacognitive strategies include: self questioning/explanation (stopping to question and re-explaining what they have learnt); comprehension monitoring (periodically checking understanding and recall); identifying important information (making judgement about critical pieces of information); critical thinking (application of prior knowledge, problem solving, decision making and evaluations); elaboration (summarising, paraphrasing and finding own examples and problems) and cognitive awareness (planning, regulating and monitoring thinking) (Pintrich et al. 1991; Talbot 1997; Reynolds & Shirey 1988; Dunlosky et al. 2002; deLeeuw & Chi 2003).

In order to self-regulate, learners also use *resource management strategies* (Pintrich & De Groot 1990). These strategies include: time management (planning, tracking and monitoring progress over time); help seeking (seeking to clarify knowledge); peer learning (communicating with peers to clarify or discover new knowledge); environment planning (choosing an appropriate environment for learning, away from distractions or nearer to useful materials); and effort management (choosing to manage attention and effort and persisting through challenging tasks).

Motivation to learn affects the cognitive processes and strategies learners employ (Eccles & Wigfield 1985). A change in cognitive and metacognitive strategies could possibly affect motivation to learn over time. For example, a learner's motivation can be affected by the development of comprehension monitoring and help seeking strategies. Their level of confidence might improve if they realise that the strategies are effective.

3.2.5 MAKE ME!

Self-efficacy and attribution beliefs are important factors in motivation to learn. Intrinsic tendencies and goals are also important. Skills and strategies in self-regulation also have their place. In some cases, however, it might be necessary to introduce reinforcements (e.g. rewards, feedback, praise etc) to motivate learners to engage in learning. Some learners perform learning tasks that are not related to their interest and goals, initially at least, in order to obtain the reinforcement (Ormrod 2011; Moreno 2010b). The use of reinforcements is largely based on behaviourist perspective – the belief that it is possible to condition learners to behave in a certain way by using certain stimuli (a desirable item, praise, punishment etc).

In some cases, learners are motivated by both intrinsic and extrinsic factors (Covington & Müeller 2001; Lepper et al. 2005). For example, it is possible for a learner to be interested in knowing more about the human anatomy (intrinsic), desire to be a doctor (for both intrinsic and extrinsic reasons) and be keen to get good grades and a place in university (extrinsic goal). Intrinsic motivation is believed to be more desirable, as students with only extrinsic motivation are more likely to process information superficially (Larson 2000; Gottfried et al. 2001; Schiefele 1991). However, extrinsic motivation may be the only thing that will get some learners to attempt learning (Ormrod 2011).

3.2.6 MOTIVATION OF ELEVEN TO FOURTEEN YEAR OLDS

The previous sections provide broad summaries of motivation from learners' points of view. It is more beneficial to identify the peculiar motivational behaviours that apply to the specific age group involved in this study – eleven to fourteen year olds. Many authors have described this age group as a critical stage in human development, a transition from childhood to maturity (Coleman 1980; Bee 1998). This age group is peculiar because learners go through many physical, social and intellectual changes (Bee 1998; Bee & Mitchell 1984; Berk 2010).

A visible sign is perhaps the physical changes of puberty, as the early adolescent experiences a growth spurt. Not only are there obvious physical changes, other less obvious changes occur. For example, changes in the brain make them more likely to seek and enjoy novel experiences (Berk 2010). In addition, there appears to be changes in their relationships with their peers, parents and other adults (Bee & Boyd 2004; Bee & Mitchell 1984; Coleman 1980). Furthermore, the transition moves them from concrete reasoning to formal operations, which could lead to changes in self-concept, increase in moral reasoning, and identity formation (Bee 1998).

Moving on to their motivation, they start to seek independence at this age. Bee (1998) points out that this new push for independence inevitably leads to more confrontations with parents over limits. Coleman (1980, p. 2) further explains that the young adolescent starts to believe that freedom and independence are their "legitimate right". They begin to question old values, roles and ideas of identity (Bee & Mitchell 1984). The learners perhaps ask the questions: why should I? They wonder whether they really need to engage in particular learning activities. They wonder whether certain learning activities have any relevance to their goals (which perhaps change frequently at this stage).

Another important aspect of motivation is the drop in self-esteem at the early stages of adolescence. As highlighted by Bee (1998) the young adolescent has to cope with a whole new set of demands and skills – new social skills, the need to formulate an adult identity, more complex tasks in school. These excessive demands seem to result in a drop in self-esteem, particularly in females, at the beginning of young adolescence (Bee 1998; Bee & Boyd 2004). During this stage, they are likely to question their ability to succeed in learning tasks (can I?).

Many theorists have highlighted that, at this age, learners develop different cognitive capabilities (Case 1998; Kuhn & Franklin 2006; Luna et al. 2004; Berk 2010). They tend to be more selective in what they pay attention to; increase in knowledge; develop strategies for acquiring and storing information they believe to be relevant; and develop thinking speed and processing capacity. These cognitive changes, however, tend to result in irrational decision-making, idealism and self-consciousness (Berk 2010).

It is easy to see how the combination of selective attention and the development of cognitive strategies can lead to irrational decision-making and idealism. Self-consciousness, however, is better explained by the concept of egocentrism (see Elkind 1967; Elkind & Bowen 1979). They seem to have *imaginary audiences*, believing others are focused on their thoughts and behaviour. They also tend to have a *personal fable*, the belief that they are unique and special. These cognitive distortions tend to lead to particular behaviours. For example, their perception of their peers' view about them could affect the extent of their motivation towards a learning activity (imaginary audience). They could also take risks, believing that they are unique and will have different experiences from others (personal fable).

Hence, the target age group for this study is peculiar in many ways. Firstly, they are at the beginning stages of the transition from childhood to maturity. Secondly, it is clear that they experience certain changes, which can affect their motivational behaviour. It is also worth noting that each individual's development is likely to be different from others'.

3.2.7 WHAT ROLE DO THESE THEORIES PLAY?

These theories provide explanations of motivation from learners' perspectives. The key message is that no single theory offers the complete understanding of motivation. Instead, they offer pieces of the motivation "puzzle", enabling understanding of motivation (Ormrod 2011). It is worth noting that the theories are interrelated to each other. For example, some researchers have indicated that mastery goals are related to self-regulation and self-efficacy (Ames & Archer 1988; Nolen 1988; Meece et al. 1988; Schunk 1995; Urdan et al. 1997). Some have also suggested that self-efficacy beliefs can influence learners' use of cognitive and metacognitive strategies (Pintrich & De Groot 1990; Garcia 1995).

These theories assist with understanding learners' reasons, beliefs and strategies when engaging with e-learning systems. There is a case for the amalgamation of the various ideas from the theories. Combining the ideas from the various theories can provide fuller understanding of motivation from the learners' perspectives. Taking a learner-centred approach during instructional design, using ideas from various motivation theories, could translate into engagement in e-learning (Mayer 2005a).

We could continue making optimistic assertions, or even use interesting alliterations like this:

> "As a learning psychologist, I believe it is important to open our minds to a broader definition and understanding of the "e" in e-learning. To many, the "e" means electronic, but I assert that the "e" means more than electronic when applied to e-learning. It actually means "exciting, empirical, empathetic, extra, emerging, energetic, exceptional, early, eloquent, everywhere, ephemeral, extended, effortless, epic, evangelistic, eclectic, engaging, extended" learning – and more" (Luskin 2010, p. 1)

The alternative is to combine ideas from various motivation theories, which are grounded in evidence, to inform instructional design.

3.3 INSTRUCTIONAL DESIGN: RESEARCH MODELS

3.3.1 KELLER'S ARCS MODEL

A popular model used in e-learning-motivation research is the *ARCS model* – "a model for analysing learner motivation and designing motivational tactics that are keyed to specific areas of a motivational problem and integrated with teaching and learning strategies" (Keller & Suzuki 2004, p. 230). The model was "derived from a comprehensive review and synthesis of motivational literatures" (Keller & Suzuki 2004, p. 230). The result of this "comprehensive review and synthesis" was four classifications – attention, relevance, confidence and satisfaction.

The first classification is related to gaining and sustaining the learners' *attention*. This involves the use of a variety of interesting animations, graphics or the use of incongruity or conflict. Other factors that can relate to gaining and sustaining attention are the introduction of mystery (to stimulate a sense of inquiry) and variability (as users adapt and lose interest over time). There is research evidence to support the importance of gaining and sustaining attention of learners (Berlyne 1965; Kopp 1982).

The second classification is related to the need to build *relevance*. Learners must perceive that the instructional requirement is consistent with their past experiences, learning styles and goals. Concepts that explain relevance are "authenticity" of the task (Duffy et al. 1993), competence (White 1959), motives (McClelland 1984), self-determination (Deci & Ryan 1985) and flow (Csikszentmihalyi 1990). This category seems to have some association with goal theory, which assumes that establishing proximal (short term) and distal (longer term) goals and students' ability to measure their progress can be motivating (Hodges 2004).

Confidence relates to enabling students to establish positive expectancies for success. Attributing success to their ability and effort rather than luck, helping learners set realistic goals and organising materials in order of difficulties all assist with boosting learners' confidence. This category has links to self-efficacy theory, relating to learners' beliefs about their capabilities to attain certain goals (Bandura 1977; Bandura 1997). There are also links to attribution theory, relating to how a learner attributes causes to events and behaviour (Weiner 1974).

The final category in the ARCS model is *satisfaction*, related to the idea that learners must gain positive feelings about their learning experience. Rewards, praise, feedback and recognition all help to increase their positive feelings. Skinner (1968) documents the value of using positive reinforcements. The deliberate avoidance of negative influences (such as threats, overt surveillance) can also influence motivation. Another aspect of satisfaction is the learner's perception of fairness and appropriateness of the amount of work required.

It is worth mentioning that, in recent work, Keller expanded the ARCS model to include *volition*, titling it the ARCS-V model (Keller 2010; Keller 2011). He revisits the historical considerations of motivation from the perspectives of will and volition (James 1890). He explained that volition is the process of putting one's will into action (Keller 2010a; Keller et al. 2005; Keller 2010b). He noted that much of motivation research focuses on goals and expectancy, not volition. Hence, he expanded the model to include volitional strategies, for example, providing study tips (see Keller et al. 2005; Kim & Keller 2010; Astleitner & Lintner 2004; Kim & Keller 2008).

In order to build in ARCS into an instructional system, Keller (1987a) presented a systematic instructional design process for developing motivational strategies (tactics). There are four steps – define, design, develop, and evaluate. The steps involve analysing the motivational problem (define); brainstorming and selecting strategies to be used (design); implementing the strategies (develop); and assessing the impact on motivation and learning outcomes (evaluate).

Keller's model provided a systematic design process and suggestions of motivational strategies relevant to ARCS (Keller 1983, Keller 1987b; Keller 1987c). The ARCS model has been considered effective in some research, such as Astleitner & Lintner (2004), Bohlin et al. (1993) and Klien & Freitag (1992). The model, however, does not offer any guidance on how to determine which motivational strategies will be most effective in particular contexts.

3.3.2 WLODKOWSKI'S TIME CONTINUUM MODEL

The ARCS model offers a systematic approach to instructional design. Wlodkowski (1985) however, offers an alternative model. Wlodkowski's Time Continuum Model of Motivation focuses on planning for the different *periods of the learning process* – the beginning of the learning process; during the learning process; and the end of the learning process. Each period has two distinct factors associated with it, resulting in six key questions to aid motivational planning.

At the *beginning phase*, Wlodkowski (1985) believes the focus should be on *attitudes* and *needs*. The instructional designer should fully consider the learner's needs and how to meet them. The designer also needs to consider how to develop a positive learner attitude. A needs assessment should be performed before the instruction is designed. Some of the strategies suggested include the use of icebreaker activities, stating clear objectives, stating success criteria and allowing for choice and self-direction (Wlodkowski 1985).

During the *learning* phase, *stimulation* and *affect* need to be in focus. During this phase, it is important to maintain the learner's participation. Suggested motivational strategies include varying of presentation style, making the content relevant to the learner, use of humour and personalising the content (Wlodkowski 1985).

At the *end* of the learning process, the factors are *competence* and *reinforcement*. Suggested motivational strategies at this phase include frequent feedback, communicating learner's progress, demonstrating how the learner is responsible for progress, relating the learning to the learner's goals and providing rewards (Wlodkowski 1985).

Evidence of how this model will offer any added value to the ARCS model is not clear. They are very similar: they recommend similar strategies and were created using knowledge in related fields (Hodges 2004). Dividing motivational strategies into the phases (before, during and after) can sometimes be problematic. It almost suggests that some motivational strategies belong to a particular phase. For example, developing a learner's attitude should be an ongoing process, not limited to the beginning phase. Nonetheless, the use of time is relevant to this study because of the possible link to motivation during the initial attraction and the time when activities are considered novel.

3.3.3 DEL SOLDATO & DU BOULAY'S MOTIVATIONAL PLANNER

Focusing on Intelligent Tutoring Systems (ITS), where the system's ability to adapt to learners' needs is paramount, del Soldato & du Boulay (1995) establish a relationship between *domain-based* and *motivational-based* planning. Domain-based planning refers to the detection of the learner's *knowledge or skill* and reacting to increase the knowledge. The same concept can be applied to motivation, where the learner's *motivational state* is detected and the system reacts appropriately to increase motivation (motivational planning).

Citing Keller (1983) and Malone & Lepper (1987), they point out that issues like confidence, curiosity, challenge and control influence the learning process. Recognising the importance of motivation, they argued for the insertion of a *motivational state modeller* and a *motivational planner* into ITS. In other words, they encouraged the diagnosis of motivation states (motivational state modeller) and introduction of appropriate strategies (motivational planner). Their model focused on three aspects – effort (persistence in tasks), confidence (learner's belief of their self-efficacy) and independence (perceived feeling of not needing help to accomplish tasks). They supported this with a range of strategies (tactics) to increase effort, confidence and independence. They devised a system that produces a

MOtivational REactive plan (MORE) by detecting learners' motivational states and reacting appropriately to sustain their motivation.

Other than its focus on detecting and adapting to learner states, this model does not offer any additional benefit to the other models. In fact, the three aspects it proposes (effort, confidence and independence) appear to be limited in scope. For example, important factors, like relevance and attention, are not explicitly covered in this model. Relevance is considered an important aspect of motivation (Brophy 1983; Simons et al. 2004; Hannifin et al. 1999; Jonassen 1999). Other elements like attention and needs could have broadened the scope of this model.

3.3.4 MALONE & LEPPER'S TAXONOMY OF INTRINSIC MOTIVATIONS

Of particular interest is the taxonomy of Intrinsic Motivations for Learning, developed by Malone & Lepper (1987). The taxonomy includes the usual factors – *challenge* (goals, uncertain outcomes, performance feedback and self esteem), *curiosity* (sensory and cognitive), *control* (contingency, choice and power) and *interpersonal motivations* (cooperation, competition and recognition). The unique factor in this taxonomy is the concept of *fantasy*. Fantasy involves mental understandings of settings and situations that do not exist. For example, the fantasy context of hangman could be applied to a spelling activity. Fantasy is often associated with educational gaming environments.

It is believed that motivation could occur if a learner identifies with settings, characters and situations in the fantasy (Bixler 2006). She suggests that fantasies may also assist with relating past experiences with new concepts. Moreover, she indicates that where there is a natural relationship between the fantasy and the skills to be learnt, we could have the desirable state of flow (see Csikszentmihalyi 1990). This view is supported by empirical evidence demonstrating that materials embedded in a fantasy context can enhance learning and motivation (Cordova 1993; Garris et al. 2002).

Malone & Lepper (1987) even made the distinction between *intrinsic fantasy* and *extrinsic fantasy*. They explained that, in intrinsic motivation, there is an integral and continuing relationship between the fantasy context and the instructional content. They declared that endogenous (intrinsic) fantasies are both more interesting and more educational than exogenous (extrinsic) fantasies (Malone & Lepper 1987).

Malone & Lepper's (1987) work has not gone without scrutiny. Habgood et al. (2005a) question the empirical basis of their work, criticising the concept of endogenous (intrinsic) fantasy. They also provided their own empirical evidence downplaying the role of "integral and continuing relationship", with reference to the idea of endogenous (intrinsic) fantasy (Habgood et al. 2005b). In spite of the disagreements, Habgood et al. (2005a, 2005b) neither dispute the usefulness of this taxonomy, nor the importance of fantasy in motivation. Their research just did not show any need for the terms intrinsic and extrinsic fantasies. They ended their study by saying:

> "Continuing to use the term intrinsic fantasy in this context would therefore only stand in the way of gaining a deeper understanding of how to successfully harness the possible affect of computer games [and possibly other fantasy-related environments] for educational use" (Habgood et al. 2005b, p. 8)

Whilst there might be arguments about intrinsic and extrinsic fantasy, the evidence seen suggests that fantasy does have its place in research relating to e-learning and motivation. Malone & Lepper's taxonomy of Intrinsic Motivations for Learning seems to be the only model with fantasy as part of the mix.

3.3.5 SOCIAL COGNITIVE LEARNING THEORY APPROACH

Cocea & Welbelzhal (2006) believe that there is a missing element in e-learning research. They highlight that research into e-learning seems to focus on instructional design. Cocea & Welbelzhal (2006) advocate the inclusion of self-cognitions (self-regulation, self-efficacy etc) in the models and approaches. They stress that assessing learners' motivational states through their interaction with the system is insufficient. They suggest a learner-based approach, where the learner's cognitive and affective states play a part in motivational enhancements.

They referred to the work of Lim (2001) indicating that self–efficacy is a good predictor of learner satisfaction. They also referred to the work of Wang & Newlin (2002), where self-efficacy was linked with performance. Arguing that social cognitive learning theories offer a well-established framework for learning, they stress that the learner's view (self-belief) should be incorporated into the design of e-learning systems.

The idea of integrating a learner-based approach to learning seems useful. It adds a different dimension to the instructional design approach to e-learning motivation. **Appendix 2** shows details of the differences and possible benefits that can arise if the social cognitive learning theory approach is taken during instructional design. Using the learner as a source of information for detecting motivational states, rather than focusing just on the instructional design, might lead to better personalisation of learning.

Cocea & Welbelzhal's (2006) own admission confirms the difficulty of this approach. They explained that there is difficulty in assessing learners' state without asking them. They accept that asking learners can be intrusive and disruptive to the learning process (although self-reflection is thought to be beneficial to learning). From Cocea & Welbelzhal's (2006) arguments, we can see the benefits of self-cognitions and obtaining information about motivational states from learners. There are however problems with incorporating these into instructional design.

3.4 CHAPTER SUMMARY

The very nature of motivation is so complex that several theories exist. It would therefore be risky to base understandings of motivation on one perspective. For example, simply relying on behaviourist or goal perspectives is unlikely to give a complete picture of motivation. What is more important is that the knowledge of human behaviours gained from these theories should be applied to instructional design.

All the research models offer useful ideas for gaining learners' attention and sustaining motivation. The key ideas from these models point to the importance of understanding learners' needs; making instruction relevant to learners; boosting learners' confidence; varying activities and presentation; using feedback and other reinforcements; encouraging learner control or independence; incorporating curiosity; engaging learners using fantasy; and encouraging self-efficacy and self-regulation.

An integrated approach, combining concepts from various motivational theories and models, has been taken for this study. Rather than adopting one of the theoretical perspectives or e-learning research models, the researcher believes that combining key ideas would provide broader and more complete understanding of motivation and e-learning. A composite analytical framework would also provide the flexibility to select ideas and concepts that apply to the particular context of this study.

CHAPTER 4: E-LEARNING AND MOTIVATION: INSTRUCTIONAL DESIGN

4.1 INTRODUCTION

This chapter moves on from motivation theories and research models, and focuses on key considerations in instructional design. It starts by explaining the difficulties associated with detecting and measuring motivation. It goes on to challenge the need for the term "motivational design". Recognising the importance of *learning* in instructional design, the concepts of efficiency and effectiveness are explored.

Other instructional design considerations that are believed to affect motivation to learn (such as cognitive load, interfaces, learner control and interactivity) are discussed, with the major arguments and counter-arguments explored. There is also an evaluation of the potential benefits and issues associated with adaptive and personalised e-learning.

Finally, this chapter establishes the importance of investigations into *novelty* and *activities* (the second and third facets of this study). This study is based on classifications (types) of activities, due to the vast quantity and range of e-learning activities. Hence, the case for using classifications and a review of existing classifications are reported.

4.2 INSTRUCTIONAL DESIGN: KEY CONSIDERATIONS

4.2.1 DETECTING AND MEASURING MOTIVATION

What exactly do researchers mean when they say "learners showed an *increase/decrease* in motivation"? This immediately suggests that there are *indicators* of motivation. This could perhaps be the learner's willingness to engage with the instruction or the desire to achieve a goal. The statement also suggests that there is a *measure* of motivation. This measure will make it possible to compare motivational levels experienced at different points in time and different learning environments. Finally, the *method* used to detect and measure motivation is something of interest.

In e-learning research, there are already some indicators of motivation. For example, researchers have used the effort, persistence, confidence, achievement, choice of tasks and independence exhibited during learning as indicators of motivation (Keller 1983; Schunk 1989a; Weiner 1992; Shuell 1992; Schunk et al. 2010). de Vicente & Pain (2002) provided more comprehensive classifications and definitions of motivational indicators. They listed indicators relating to the *learner's state*: confidence, sensory interest, cognitive interest, effort and satisfaction. They also listed indicators relating to the *learner's trait*: control, challenge, independence and fantasy.

Indeed, these indicators might provide clues about learners' motivation. The question is: how do we detect and measure them? If we are to develop a strategy for increasing students' motivation to learn in an e-learning environment, we ought to be able to assess and compare motivational levels over time and under different conditions. There lies the problem. Whilst the manifestation of the indicators can be observed, obtained from the learner or electronically detected (from physiological states), they are difficult to quantify. Moreover, it is difficult to tell if the "observed motivation" is not "observed pretence". In fact, asking users about their motivation levels may not be open to conscious appraisal (Atkinson 1964). Assessing physiological states like respiration and heart rate is also very intrusive.

There is obviously some complexity in the detection and measurement of motivation (Whitehead 1976; Smith 2008; de Vicente & Pain 1998). Brynner & Whitehead (1972) made two suggestions about how the problem of measuring motivation can be tackled. They believe that we can attempt to assess the strength of particular motives (e.g. motive to achieve). We can also attempt to measure the attractiveness of a particular outcome of achievement (e.g. praise and targets). The fact that Brynner & Whitehead (1972) described the suggestions as "attempts" hints that there is some difficulty involved with having a measure for motivation. Although the suggestions point us towards what we can measure, they do not provide any objective measure of motivation, something that can be used effectively for comparisons and evaluations. Pintrich & De Groot's (1990) suggestion –

measuring the value, the expectancy and the affective components – does not provide an objective measure either.

As motivation is effectively an emotional response, it is difficult to detect and measure objectively (de Vicente & Pain 1998). For now, there seems to be no complete answer to Picard's (1995, p. 3) questions: "How do we observe emotional expressions and states? Is it via some metaphysical sixth sense with which we discern un-vocalised feelings of others?" In spite of this complexity, researchers have persisted in their attempt to detect and measure motivation using a range of data collection methods.

A popular approach to collecting data about learners' motivational states is the use of questionnaires. These are often used at the start or at the end of the interaction. For example, Arshad (1990) used questionnaires to model the level of confidence at the start of the interaction. Whitelock & Scanlon (1996) used questionnaires at the end of the interaction to assess a range of motivational factors. The use of questionnaires solely for pre-interaction or post-interaction is criticised as being static, as it does not reflect the idea that motivation changes during the interaction (del Soldato 1994). Nonetheless, questionnaires have been used in some studies to detect motivational characteristics over time (the more enduring characteristics of the learner). For example, Gardner's (1985) work suggests that series of questionnaires can be useful for working out learner motivational characteristics.

Researchers have also used self-report measures to detect and measure learners' perception of motivation. Learners can periodically or spontaneously update their perceived level of motivation (providing an update on factors such as interest, boredom, difficulty and confidence). They can report their motivational states through features of the interface like sliders and icons. de Vicente & Pain (1999) expressed the view that people are willing to express their motivational states and that the reports seem to be valid. The belief that self-reports are valid does not agree with Atkinson's (1964) view that people are not conscious of their true levels of motivation. Apart from the issues of accuracy, self-reports raise more questions. For example, how does the need to self-report affect the learning process? Stopping to report can interrupt the learning process. How does the timing of the self-report affect the results? Learners' perception of motivation might be different when certain events occur during the interaction.

Yet, some researchers believe it is possible to infer motivational states by observing non-verbal clues like facial expressions, intonation and body language (Lepper et al. 1993). The accuracy of this method is quite questionable. Take facial expression, for example, how can a researcher decide whether a "straight face" signifies concentration, boredom, confusion or something else? To add to this subjectivity, Goleman (1995) suggests that people who are more open to their own emotions are more skilful in their ability to read others'. If this assertion is correct, it means that researchers who are not "self-aware" will have great difficulty with this approach.

A more promising approach is the possibility of inferring motivational states through learners' interactions with the system. de Vicente & Pain (2002) believe that it is feasible to diagnose motivation through learners' interactions. Behaviour clues such as mouse movements, hesitation, time spent on tasks, speed and quality of performance can give an indication of motivation (see Hershkovitz & Nachmias 2011; Beck 2004; de Vicente & Pain 2002; Cocea & Weibelzahl 2007; Zhang et al. 2003; Qu & Johnson 2005). Beck (2004) also believes that learners' response times to tasks in relation to actual performance can be used to model disengagement.

In 2002, de Vicente & Pain (2002) asked 10 participants to watch recordings of learners' interaction with a tutoring system. The participants did not have access to the learners' gestures, facial expressions etc. Although the participants initially thought it would be virtually impossible to infer the learners' motivational states, they were able to infer 85 "motivational diagnosis inference rules". These are rules that could be used to diagnose motivational states of learners through observation of interactions. They concluded their study, in 2002, by explaining that the validity of the rules was yet to be proven.

A year later, de Vicente & Pain (2003) attempted to "validate" the rules. They set out to filter out the rules that were not widely accepted by the participants. They ended up with a set of 41 rules that could be used to diagnose motivational states of learners. The fact that we now have a smaller set of diagnosis rules does not necessarily mean we have a *validated* set of rules. We have a filtered list, a shortlist, or a preferred list, but not necessarily a validated list. More evidence is needed to prove that the accepted rules are actually the most effective rules. They admitted that they could not explain why some of the rules were not commonly accepted. Clearly, this method (though promising) still requires further development before it can be considered a convincing and reliable method.

Neither the observation of non-verbal clues nor the observation of interactions gives researchers the opportunity to communicate with the learner. Verbal communication (e.g. interviews) with the learner before, during, or after the interaction offers unique benefits. The researcher has the opportunity to clarify the meanings of nonverbal expressions and interactions. Patton (1990) makes it clear that relying on observation or self-report techniques is not sufficient for gathering data about feelings. Communicating with the learners can also provide useful information about their motivation states. For example, multiple requests for hints indicate a low level of confidence. However, the issues of disruption to the learning process and reliability of learners' expression of their motivational states remain.

Unlike self-reports, observations and communication, eye tracking provides a less disruptive and objective source of data. "Eye tracking is a technique whereby an individual's eye movements are measured so that the researcher knows both where a person is looking at any given time and the sequence in which their eyes are shifting from one location to another" (Poole & Ball 2005, p. 211). Eye tracking technology has been used in some projects, for example, the AdeLE (Adaptive e-Learning with Eye-Tracking) by Gütl et al. (2004). Eye tracking can provide information about where the learner's attention is. However, it does not explicitly explain the cognitive or affective states of the learner. Moreover, Al-Khalifa & George (2010) wrote about the limitations of the technology itself. They explained that the data captured can be inaccurate because of the constant movements of the eyes. They also explained that it is difficult to recognise the exact position of focus when the subject is gazing.

Picard (1997) reports about how motivational states can be detected and measured through physiological states. Sensors that measure skin response, respiration, heart rates etc can be used to detect learners' motivational states. Whilst this method might be able to detect and measure certain aspects of motivational states objectively, they are likely to generate negative reactions. Learners (or their parents) are likely to perceive this method as intrusive.

Researchers use a range of methods in their attempts to detect and measure the motivational states of learners during e-learning. Some of the issues associated with the methods are the accuracy of students' motivational states, the reliability of the methods and the level of intrusion. The strengths and weaknesses of each method point to the importance of combining the methods. Combining two or more methods can compensate for the weaknesses of each method. It can also increase accuracy of the assessment (Weibelzahl & Kelly 2005). Even with combined methods, an objective measure of motivational indicators seems to be a distant goal.

4.2.2 MOTIVATIONAL DESIGN: RETHINKING THE TERMINOLOGY

Motivational design is "the process of arranging resources and procedures to bring about changes in motivation" (Keller 2006, p. 3). In effect, motivational design involves active consideration of factors affecting interest and engagement of learners during instructional design. Keller & Suzuki (2004) acknowledged that instruction (teacher or machine-based) affects learner motivation, either positively or negatively. They explained that motivational design is about influencing learner motivation, not controlling it.

The abundance of research evidence makes it difficult to argue against the relationship between motivation and learning (for example, Dewey 1938; Malone 1981; Brophy 1988; Wigfield 1994; Pintrich et al. 1993). In fact, "many instructors consider the motivation levels of learners the most important factor in successful instruction" (Dick & Carey 1996, p. 92). Most views of learning and instruction point to the importance of learner motivational factors, such as positive outcome expectations, self-efficacy, effort and perceived value of learning (Stipek 1996).

Whilst we might not be prepared to argue about the relationship between motivation and learning, we should still question why motivation should be singled out. Motivation to learn is one of the many factors affecting learning. Other factors (such as hunger) can affect learning (Read & Felson 1976). Does that warrant a hunger-based design? Why should motivation be given more weight than the other factors that affect learning? In fact, it can be argued that instructional designers already consider motivation. Who designs e-learning systems with the desire to bore and annoy learners?

Gagné's (1970) work, titled "the events of instruction", used to be an important reference point for instructional design (Astleitner 2000; Smith & Ragan 2000). His nine "events of instructions" provided useful guidelines for instructional designers. The events are: gaining attention; informing students of objectives; stimulating recall of prerequisites; presenting new content; providing learning guidance; eliciting performance; providing feedback; assessing performance; and enhancing retention and transfer.

Although motivation is not explicitly mentioned, the guidelines clearly show some recognition of the importance of motivation. For example, gaining attention and providing feedback have been associated with various motivational strategies. Gagné's events of instruction covers learning as a whole, with an appropriate level of weight given to motivation. It appears that "motivational design" simply refers to a concept that is already integrated into the process of instructional design.

How does motivational design differ from the normal practice of instructional designers? Firstly, motivational design suggests that there should be greater focus on motivation than the various other factors that affect learning. Motivation, the focus of motivational design, is very complex. For example, Keller (2006) recognises the unstable nature of motivation. Learners' motivation can change considerably over a short period of time. Keller (2006) also acknowledges that it is difficult to measure the influences and changes in motivation. Giving extra attention to motivational design seems to complicate the instructional design process.

Notwithstanding, the fact that motivation is difficult to assess does not warrant its exclusion from instructional design or research. Further research into the factors that influence changes in motivation and how to accurately measure the variances would be of benefit to educationalists. This will be useful because "instructional materials with the factor of motivation considered can help learners better enjoy the knowledge acquisition process and benefit most from learning" (Cheng & Yeh 2009, p. 603). We can understand the need for motivation in instructional design (where the instructional design process includes consideration of how to motivate learners). The use of the terminology, motivational design, however, seems to place excessive emphasis on motivation at the expense of other factors that affect learning.

4.2.3 EFFICIENCY AND EFFECTIVENESS

Keller (2006), who supports the use of the term, "motivational design", makes an interesting distinction between *efficiency* and *effectiveness* in instructional design. *Efficiency* refers to the economy in the use of materials, instructional time and other resources. *Effectiveness* refers to how well people can learn from the system. He points out that efficiency is generally not viewed as relating to motivation to learn. This is because an efficient system does not necessarily add to learners' intrinsic interest. The exception to this rule is that an inefficient system can be considered boring and irritating because it makes poor use of time and resources. Effectiveness, however, is more closely related to motivation. An effective system appeals to the learner simply because it has more impact in helping the learner to achieve the learning outcomes.

How exactly does it relate to instructional design and motivation to learn? The answer lies in the effect that inefficient and/or ineffective e-learning systems can have on learner motivation. An inefficient system is likely to frustrate the learner, leading to a diminished level of motivation (see, for example, Hara & Kling 2001). Hence, an inefficient system is not likely to deliver the learning benefits that are desired.

Keller (2006) warns that e-learning systems can be appealing, without being effective. It is possible for a learner to show signs of enjoyment in the use of an e-learning system, without *actually learning* from it. He also explains the possibility that a system can be effective, without it being enjoyable. Other extrinsic factors separate from the instruction itself (such as grades, certificates etc) can motivate a learner to use a system to learn. Such a system would be considered effective (as it delivers the learning outcomes), even though it is not the main source of learners' motivation.

Motivation is important in e-learning: the system's ability to effectively deliver the learner's goals and instructional outcomes is also important. It is important that instructional designers monitor the quality of learning, rather than get carried away with the motivational aspects of e-learning. Keller (2006) explained that:

> "To be effective, motivational tactics have to support instructional goals. Sometimes the motivational features can be fun or even entertaining, but unless they engage the learner in the instructional purpose and content, they will not promote learning … Thus, motivational design [the practice of incorporating motivation into instructional design to deliver effective learning, not the terminology] is concerned with how to make instructions appealing without becoming purely entertaining" (Keller 2006, p. 4)

The concepts of effectiveness and efficiency can be useful ways of evaluating and classifying e-learning systems. An interesting area of research will be the development of a model that will measure or rate the efficiency and effectiveness of e-learning systems. There is already a model, known as Instructional Quality Profile (IQP), designed to analyse the quality of instruction with respect to instructional objectives (Merrill et al. 1979; Schunk 2004). The Instructional Quality Profile analyses the instructional quality – "the degree to which instruction is effective, efficient and appealing" (Merrill et al. 1979, p. 165). This could perhaps be adapted to the e-learning situation, with suitable additions, removals or amendments.

4.2.4 COGNITIVE LOAD THEORY AND INSTRUCTIONAL DESIGN

There has been "increased interest and focus on the efficiency and effectiveness of various instructional design strategies" (Chong 2005, p. 1). If we are to build motivational strategies into e-learning, whilst ensuring effectiveness and efficiency, we need to gain deeper understanding of human cognition (Mayer 2005a). Cognitive science is the study of the mind, attention, mental processes of learning, problem solving and perception. The scope of cognitive science is vast indeed, consisting of several research disciplines including artificial intelligence, psychology, philosophy, learning sciences and sociology. Cognitive science however offers some interesting concepts for educationalists and instructional designers.

Debates about the role of motivation in instructional design are being influenced by concepts from the Cognitive Load Theory (CLT). Cognitive Load Theory is concerned with the constraints on the human working memory and the types of instructions that can be used to deliver learning effectively (Sweller 1994). Two main memory systems – *working memory* and *long-term memory* – are said to complement each other during learning (Clark 2005). Cognitive Load Theory assumes that a learner only has limited mental processing capacity. Hence, for learning to be effective, mental resources need to be allocated appropriately.

The working memory, which Miller (1956) described as short-term memory, is believed to be very limited in capacity (Miller 1956; Cowan 2001) and duration (Peterson & Peterson 1959; Dosher 2003). Working memory is believed to be *active*, and responsible for learning novel content. Unfortunately, working memory is limited in how much information it can hold at any point in time, and how long it can hold it for.

On the other hand, long-term memory is a "relatively *passive* repository of all knowledge and skills stored in structures called *schemas*" (Clark 2005, p. 595). The limitations associated with working memory (capacity and duration) do not arise when dealing with knowledge from long-term memory already stored in schemas (van Merriënboer & Ayres 2005).

The general idea of CLT is that the limited capacity of working memory means that learning tasks that require a lot of processing in the working memory can result in cognitive overload, which adversely affects learning (de Jong 2010; Lohr & Gall 2008). According to Paas et al. (2004), cognitive underloads (where there are low processing demands) are also not desirable because they may not generate interest. They believe that excessively high load (overload) or excessively low load (underload) may result in the learner ceasing to learn.

For reference, there are three terms used to describe the types of working memory load – *intrinsic, extraneous* and *germane*. Intrinsic cognitive load is related to the complexity of the learning task. Extraneous load relates to the design or presentation of the instructional materials. Germane load refers to the demands placed on working memory through the mental processes that allow the learning to occur (van Merriënboer & Ayres 2005; Chong 2005; Boileau 2005).

Before discussing the relevance of CLT to motivation and instructional design, it is worth investigating the constructs of the theory itself. Indeed, Ozcinar (2009) found that "Cognitive Load Theory" was second only to "instructional design" in the keywords used to search documents relating to instructional design. Nevertheless, the popularity of CLT should not exempt it from the usual academic scrutiny. A theory can be most-searched, regardless of its scientific rigour, for various reasons (such as controversy surrounding it and the profiles of its advocates). Paas et al. (2010) also asserted that 4 of the top 20 most productive researchers, listed in the work of Jones et al. (2010), use Cognitive Load Theory as a central theory in their work. The response to counter this argument is that the contexts of their research need to be examined in closer detail before any definite conclusion can be reached.

Paas et al. (2010) attest the validity of the CLT as a theory by explaining that: it has survived and has been influential; has evolved over the years; has been responsive to other fields; and has generated effective instructional designs and procedures. In spite of these, CLT has been dismissed as having limitations in conceptual, methodological and practical terms (Schnotz & Kürschner 2007; Moreno 2006; Gerjets et al. 2009; Brünken et al. 2009; de Jong 2010).

For example, de Jong (2010) provided a wide range of compelling arguments questioning the fundamental basis of the theory. He used examples to demonstrate that the different types of cognitive load cannot be distinguished clearly. Whilst this argument is not enough to discredit the theory, further evidence draws attention to the lack of a reliable and valid measure of cognitive load (Brünken et al. 2009; Stull & Mayer 2007; de Jong 2010; Moreno 2010a). de Jong (2010) further questions the reliability of the methods and approaches used to estimate cognitive load (e.g. self-reporting, questionnaire and physiological measures) arguing that so far the use of the methods have yielded results that are inconsistent, sometimes did not measure all the components of cognitive load, and do not actually assist with identifying the critical level of overload.

With the basis of the CLT in question, an important question is, "does this highly influential theory offer any useful ideas for designing e-learning systems to motivate learners?" Moreno (2010a, p. 137) believes that CLT has been "remarkably silent about the relationship between load, affect and motivation". She points out that CLT does not include key elements such as self-beliefs, self-efficacy, perceived value and perceived cost of the task. Some of these elements are explained in other influential theories of motivation, such as expectancy, attribution, self-efficacy and goal theories.

In spite of these opposing arguments, CLT does have some implications for motivation and instructional designers. There is the need to maximise the focus of instructional activities (germane load), avoid unnecessary and confusing instruction (extraneous load), whilst being mindful of the mental effort required in working through the activities (intrinsic load). A number of useful guidelines for instructional design (see, for example, Sweller 2005; Chong 2005), have been developed as a consequence of CLT. From the arguments above, we can infer that cognitive load does have some implications for instructional design. However, it should just be considered one of the many factors that can affect motivation during e-learning.

4.2.5 INTERFACES AND INTERACTIVITY

In the last section, it was argued that Cognitive Load Theory has some implications for instructional design. This view is supported by Stoney & Wild (1998) who indicate that the four elements of instructional design for effective learning are *learner control, interactivity, cognitive load* and *functionality*. They believe that cognitive load and the other three elements must be considered if we are to provide user interfaces and activities that motivate learners. They also stress the importance of interfaces by saying:

> "The interface in multimedia is more than a means of providing access to the use of the product – the interface is the product: it defines the experience of the product and limits its use. A major task facing all designers in instructional multimedia is that of maximising this experience for the learner; that is, of describing and creating an interface that is intrinsically motivating, interactive, intuitive and correspondingly imposes a minimum cognitive load on the user" (Stoney & Wild 1998, p. 40)

Some researchers have suggested that user interfaces can illuminate learning through increased attention, information processing, memory, motivation and concept development (Dix et al. 1998; Dix et al. 2006; Le Doux 1998; Schank & Cleary 1995; McNeil 2009; Yeomans & Arnold 2006; Kelly 2003). Other research conducted by Reeves & Nass (1996), and supported by Dix et al. (1998), stress that system usability affects motivation, as well as individual-related variables (such as cognitive styles, prior experience, and task knowledge). Indeed, we can understand the importance of user interfaces to motivation to learn. How can we expect learners to effectively engage in e-learning if the system's interface does not provide opportunities for learning?

It is worth noting that some of the four elements (learner control, interactivity, cognitive load and functionality) suggested by Stoney & Wild (1998) are intensely debated. Take learner control, for example, there is a belief that giving learners control over the e-learning system, contents, pathways or process can increase intrinsic motivation to learn (Becker & Dwyer 1994; Schwier 1995). To counter this belief, Reeves (1993) found that not all students are intrinsically motivated by high levels of control. Moreover, some studies have shown that students given learner control do not always make the right choices (Carrier 1984; Clark & Mayer 2008). Even when provided with control, it could have little or no effect on their *perception* of control (Lepper & Chabay 1985; Kehoe 1979).

In fact, providing high levels of control is in direct contradiction to the concept of cognitive load reduction, which suggests that the number of options should be reduced in order to reduce cognitive load (Oren 1990). Whilst some researchers have shown the benefits of learner control (Ertelt et al. 2005; Mayer & Chandler 2001; Mayer et al. 2003), others have found some limitations (Moreno & Valdez 2005; Tabbers et al. 2004). In any case, attempting to "increase motivation" through learner control may not result in increased learning, it could just increase the time spent learning (Schwier 1995). Considering the issue of adaptive e-learning which is trending nowadays (Bian & Xie 2010; Ahmad et al. 2004; Köck & Paramythis 2010), the dilemma is: should we adapt to the motivational state of the learner (thereby reduce or remove learner control and choice) or should we increase learner control (and hope that learners make the most of their time and e-learning content)?

Another element mentioned by Stoney & Wild (1998) is interactivity. Stoney & Wild (1998) themselves expressed the view that interactivity involves a variety of media (multimedia) in which the user actively participates. Thomas (2001) also explained that interactivity relates to when learners are not simply passive recipients of information, they engage with material that responds to their action. Tang (2005) took this further by identifying four types of interactivity: *control* (where learners determine content, pace and depth); *response* (where the computer responds to learners' answers and actions); *manipulate* (when learners can explore and arrive at a rule or principle); and *co-construct* (where learners work together with a computer to achieve a goal).

The possibility of using multimedia to deliver active participation and engagement of learners seems exciting. In reality, e-learning's promise of active participation and engagement seems more challenging. Haydn (2003a) pointed out that, in some cases, learners' interactions tend to be fairly low-level, of little learning value and can sometimes be used to avoid challenge and difficulty. The fact that they get a response when they press or click on various objects does not necessarily focus their attention on learning. The use of multimedia itself does not seem to motivate learners either. Haydn (2003a) points out that multimedia should be used to provide access to resources that would otherwise be inaccessible, instead of "sugar-coating" learning.

Can we guarantee that incorporating multimedia into e-learning will get students motivated to learn? No, *real* interactivity should go beyond multimedia and response to learners' activities. It is about learners' *engagement* with the e-learning activities. Referring to the work of Schick (1995, 2000a, 2000b), Haydn (2003a) stressed that the "bells and whistles" of multimedia have taken the attention off the more important facets of interactivity. Haydn (2003a) and Schick (1995, 2000a, 2000b) agree that the learning activity must involve cognitive engagement. The quote below illustrates this view:

> "Does the activity force the learner to think, rather than simply remember, does it put the seeds of a new idea in learners' minds? Does it make them think about 'connections' (either temporal or geo-political) that had not occurred to them before – including links to present day problems and dilemmas? Does the question posed intrigue the learner in a way that encourages them to read in more depth, and persevere in a difficult enquiry? Does it disturb their preconceptions?" (Haydn 2003a, p. 196)

The question is: how can we design interfaces that effectively motivate learners, whilst delivering learning outcomes? To answer this question, de Lera & Mor (2007) explained that we need to refocus on Human Computer Interaction (HCI), especially the *human aspects,* even more so than effectiveness and efficiency which are often measured. They argue that it is not even sufficient to deliver efficient and effective e-learning environment; the environments need to empower students to learn.

The question is not what needs to be done, but *how*. It is the desire of teachers, instructional designers, policy makers, parents and the students themselves to have an environment where learners are empowered to learn. How do we create interfaces that include the "human aspects" and "empower learners to learn"? A number of guidelines for designing motivational interfaces and interactions have been proposed. Lee & Boling (1999) put them into two categories: *expansive*, those aimed at enhancing motivation, and *restrictive*, those aimed at preventing loss of motivation.

They started by explaining the importance of proper organisation of material. They identified research which showed that organisation of content was important for motivation (both expansive and restrictive). Well-organised materials assist learners with developing and sustaining interest in content; promote their engagement with the content; improve reading and comprehension; and assist with processing of important material (Hannafin & Hooper 1989; Galitz 1989; Cook & Kazlauskas 1993; Faiola & DeBloois

1988). They believe that these well-organised systems enable learners to achieve their learning goals without fatigue and confusion.

Appendix 3 shows a brief summary of Lee & Boling's (1999) guidelines on the elements that make up an e-learning environment, such as typography, images and audio. Although the guidelines do not cover all elements of e-learning systems (such as video) and all the possibilities of e-learning (such as speech recognition), this is clearly an attempt to offer definite advice to instructional designers. Mayer (2005a) presents more up-to-date guidelines that are based on relevant research. They were referred to as the basic and advanced principles of how to design multimedia learning environments and are summarised in **appendix 4** and **appendix 5**.

Does this mean that an e-learning system that meets the guidelines will motivate learners? Kinzie (1990) believes that the *learners* themselves need to be prepared for the e-learning instructional experience. Kinzie (1990) believes that guidelines for interactions with e-learning systems only contribute to effective designs. This is only beneficial if learners make *effective use* of the system. The synergy between effective design and effective use is what yields learning benefits.

It is quite clear that instruction should be designed well, in order to provide learners with the best opportunities for learning. Learners also have to make effective use of the materials. Discussing the need for synergy between effective design and effective use is meaningless. It appears to be simply clever language without any information about how to actualise this synergy. However, Kinzie's (1990) core message to educationalists is that *learners themselves must be trained to respond effectively to e-learning systems (which have to be well-designed).* He further explained that learners need three components to effectively interact and engage with e-learning: *learner control, self-regulation* and *continuing motivation*.

Kinzie (1990) explains that *learner control* offers motivational benefits and valuable learner experience – learners make learning decisions, they experience the results of those decisions and they discover strategies to deal with different situations. Whilst this might be something to aim for, the challenges surrounding providing learner control (which have been discussed earlier) need to be considered. He explains that *self-regulation* is a high level of cognitive engagement, which includes organising the approach towards learning; active selection and processing of information; making links with prior understandings; and self-checking and tracking learning progress. *Continuing motivation* refers to the intrinsic motivation in the learning activity, which is driven by perception of relevance, stimulation of curiosity and self-efficacy. Students experiencing continuing motivation do not need external pressure to return to the activity; the activity itself is the reward.

Kinzie (1990) makes it clear that:

> "To be truly effective, many educators suggest going a step further, by training students in the use of global learning strategies for a variety of instructional situations. This recommendation is based on the belief that learners who command the greatest range and depth of learning skills will be the best equipped to handle learner control and other forms of instructional self-management" (Kinzie 1990, p. 6)

Although there are no practical suggestions about how to develop the prescribed qualities in learners, Kinzie's (1990) view does offer a different outlook: instead of designing interactions to motivate learners, we should spend more time developing learners' motivational strategies which will enable them to actively engage with the materials over a sustained period. Whilst this can be of benefit in the long-term, educationalists have to engage learners who have not developed those skills *now*. In the meantime, instructional designers must rely on principles that assist with incorporating real interactivity and motivation, such as those suggested by Stoney & Wild (1998), Lee & Boling (1999) and Mayer (2005a).

4.2.6 ADAPTIVE AND PERSONALISED E-LEARNING

For a long time, motivation has been seen in e-learning as a "matter of design" (Smith 2008, p. 2). It was assumed that "proper instructional design and provision of suitable activities would engage all learners" (Cocea & Weibelzahl 2006, p. 1). Research activity now trends towards adaptive e-learning systems – ones that adapt to the need and characteristics of the individual learner (Bian & Xie 2010; Ahmad et al. 2004; Köck & Paramythis 2010). The benefit of this is that content can be personalised to the needs of the learner during instruction. Adapting to learners' needs, though desirable, may reduce their desire to take responsibility for their own learning process (Beetham 2007).

Adaptive e-learning tends to take four forms – adaptive *interaction*, adaptive *course delivery*; adaptive *content discovery and assembly*, and adaptive *collaboration support* (see Paramythis & Loidl-Reisinger 2004). Technology makes it possible to modify the graphical interfaces (e.g. colours schemes, font sizes) to accommodate user preferences, requirements or abilities; reorganise interaction tasks; or adopt alternative interaction styles (adaptive interaction). It is also possible to optimise the "fit" between the course and the learner's characteristics (adaptive course delivery). Apart from the course, the content of the course can be personalised to each learner's characteristics (content discovery and assembly). Finally, adaptive techniques can be used in a collaborative environment to ensure a good match between collaborators (collaboration support).

Some research have suggested that adapting and personalising learning activities can have an effect on learners' motivation to learn. For example, Song & Keller (2001) believe that motivationally adaptive feedback has a positive effect on learners' attention. Moshinskie (2001) also expressed the opinion that varied presentation formats have positive effects on learners' motivation. Bonk (2002) and Reeves (2001) found that materials relevant to a learners' work or personal interests were successful motivators for learning.

The promises of adaptive e-learning do not just lie in the ability to adapt to learners' preferences. What is more important is the possibility to respond to the *changes* in the learners' motivation. Of particular interest is the work of Song & Keller (2001) and their use of motivational tactics (strategies that influence motivational behaviour). They developed an approach that judged learners' motivational states and adjusted the amount and type of motivational tactics accordingly. They had three groups: a *motivationally minimised* group, who had well-designed but motivationally unenhanced version of a program on genetics; a *motivationally saturated* group, who received all the 24 tactics that were available in a tactic folder; and a *motivationally adaptive* group. In order to measure motivational levels, they embedded three motivational diagnostic surveys of self-reported levels of attention (curiosity), relevance and confidence. For verification, they followed the survey with a check quiz. Their comparison of the three groups revealed interesting (though predictable) results – the motivationally adaptive group showed higher effectiveness, motivation and attention.

There are other studies into adaptive motivation (del Soldato & du Boulay 1995; Astleitner & Keller 1995; Rezabek 1994). Song and Keller's (2001) study is particularly interesting.

They made regular judgements of the learners' motivational states and introduced motivational strategies (tactics) automatically. Their study suggests that adaptive learning can improve learners' motivation.

As explained earlier, research in e-learning needs to be thoroughly and critically examined. The first thing to consider is Song & Keller's (2001) claim that "one of the challenges in responding to changes was knowing when to delete motivational strategies and when to add them" (Song & Keller 2001, p. 6). This study therefore makes us question two key aspects – the ability of the adaptive system to make accurate judgements of motivational states and the consequences associated with making inaccurate judgement of motivational states.

Even Song & Keller (2001, p.6) recognised that "if learners are already motivated, they may find it de-motivating to be exposed to unnecessary motivational tactics". This might help explain why there was clear evidence of enhancement of attention in the motivationally enhanced group, but no difference in other components studied (relevance and confidence). It is possible that learners exposed to just the content, without the distraction of motivational strategies, recognised the relevance as they learnt about the content with minimal distraction. It has been noted that strategies aimed at achieving motivation sometimes do entertain learners, but do not maximise information processing or learning (Shute & Towle 2003; Moreno & Mayer 2000).

After closer examination of the research methods used in Song & Keller's (2001) study, it is possible that alternative conclusions could be reached if a different approach was taken. For example, learners used self-report methods to indicate their level of motivation. Measuring learners' level of effort towards the task might have provided different, and possibly more accurate, sets of results. In addition, their use of embedded motivational analysis might have been too distracting, requiring a hiatus or interruption to students' learning process. The use of real-time eye tracking technologies, as used in the work of Merton & Conati (2006) and Al-Khalifa & George (2010), can provide a more natural data gathering tool in future research. Notwithstanding, the study provides fairly credible evidence that adaptive e-learning can enhance motivation to learn.

There are clear benefits in the possibility of adapting e-learning materials to the needs of the individual learner. If we could set a *user model* (also known as profile) that matches the needs and characteristics of the learner, we might enhance their motivation to learn. Is it possible to *accurately* determine a user model for each learner? Some researchers have made some attempt to suggest what should be used to determine the user model. For example, Vasilyeva et al. (2007) suggested a range of parameters that are important for adaptation of e-learning systems. Some of these are personal data, cognitive abilities, user's attention, memory, cognitive and learning styles, and personal decision abilities. The number of parameters in the list shows that personalisation and adaptation in e-learning is an area where much research effort is needed.

4.3 NOVELTY AND ACTIVITIES

4.3.1 NOVELTY AND ACTIVITIES: THE MOTIVATIONAL EFFECTS

In the last section, various instructional design considerations were evaluated. This was done to explore the key ideas of instructional design. Whilst there are many views and debates in these areas of instructional design, an important aspect of e-learning seems to receive little attention: the e-learning activities. It seems surprising that there is little research on the possible motivational effects arising from the *nature* of the various e-learning activities.

Some studies have focussed on game-based learning as an area (for example, Papastergiou 2009; Huang 2010; Garris et al. 2002). Others have focussed on collaborative learning (for example, Sanna & Hanna 2011; Roberts 2004; Chen & Jang 2010; Sanna et al. 2010). These, however do not reflect the variety of e-learning activities available. More importantly, it does not help instructional designers to compare the possible motivational effects that could arise from the different types of e-learning activities.

Another area of e-learning research that is often mentioned but not studied is the concept of novelty. Many assert that the new features of technology result in initial attraction which fades away after a while (for example, Clark 2001; Baylor et al. 2004; Yan 2004; Keller & Suzuki 2004; Fry & Love 2008). Keller & Suzuki (2004) recognised this when they explained that:

> "Technology offers many innovative features that can be used to make instruction more appealing to learners. However, many of these features are interesting only because they are novel and may lose their appeal as learners become accustomed to them" (Keller & Suzuki 2004, p. 229).

Huk et al. (2002) have warned about the implication of novelty on e-learning research. They explained that when there are new features and activities learners are likely to show an initial interest. This interest diminishes after a period. Hence, there is a high possibility that researchers will arrive at false conclusions if they attempt to measure motivation during the initial phase. This leads to questions about whether it is possible to gauge the periods for novelty of different features and activities. Does the novelty end abruptly or does it diminish over time? Do certain activities have tendencies to remain novel for longer periods?

There seems to be little research on the motivational and novelty effects of different types of activities. Is there a relationship between the activity and the type and levels of motivation experienced? Is there a relationship between the activity and the types and duration of learners' perceptions of novelty? These are some of the questions that will be investigated in this study. Answers to these and other questions will inform the practice of instructional designers and educators because they will be able to vary activities to sustain learner motivation. They will be able to combine existing knowledge of instructional design principles with the new ideas emerging from this study – the motivational and novelty effects of different types of e-learning activities.

4.3.2 LEARNING ACTIVITY: THE MUCH-NEEDED CLASSIFICATIONS

The Joint Information Systems Committee, JISC, (2004) describe a learning activity as an *interaction*. Based on the work of Beetham (2004), they explained that the learning activity is the learners' *interaction* with the learning *environment*, which leads to planned learning *outcomes*. Beetham (2007) later added another variable (*other people*), perhaps in response to the rise in collaboration in e-learning. Beetham (2007, p. 28) suggests that interaction is the key factor when she defined a learning activity as "a specific interaction of learner(s) with other(s) using specific tools and resources, orientated towards specific outcomes".

This definition of a learning activity suggests that the learning environment (hardware, multimedia etc) is not as important as the interaction. Ravenscroft & Cook (2007, p. 212) support this view by putting it quite simply: "learning is interaction". The quality of the interaction is what increases or decreases the likelihood of achieving the desired learning outcomes. As Haydn (2003a) indicated, learners sometimes engage in low-level interactions that do not result in the desired learning outcomes. The challenge of instructional design is to make the learner an active participant engaged in the learning activity (interaction).

Every learning activity is different, so there is a case for the use of classifications. There ought to be a way of grouping similar learning activities. The Australian Flexible Learning Framework (2008) suggested two broad groups – *"recall and comprehension"* (those that build knowledge); and *"apply and collaborate"* (those that build skills and performance for competence). **Appendix 6** shows the groups and examples of activities that fit into the groups. The major drawback of this classification is that they are too broad. They identified nine different types of activities that can be considered "recall and comprehension" activities. For the "apply and collaborate" activities, they identified twenty different types of activities.

Jonassen (2000) suggested an alternative to this classification – *rule-based*, *incident-based* and *strategy-based* activities. *Rule-based activities* require learners to apply standard rules, guidelines and procedures. *Incident-based activities* require learners to reflect or make decisions whilst engaged in authentic events or incidents. *Strategy-based activities* require strategic planning, expert judgement and troubleshooting. After an analysis of Jonassen's (2000) work, Oliver et al. (2007) suggested an addition to the classification – *role-based activity*. They described *role-based activities* as those requiring learners to assume roles within a real-life setting. **Appendix 7** has more information about these classifications and the types of learning tasks and resources used in typical environments.

Whilst these classifications are useful, another classification, based on the work of Conole & Fill (2005) and Conole (2007a, 2007b) is more comprehensive. They explained in their taxonomy that learning activities have three components – *the context*, *the pedagogy* and *the task*. A comprehensive overview of this *taxonomy of learning activities* is in **Appendix 8**. The context refers to the intended learning outcomes, aims, difficulty levels, subject environment, time, environment etc. The pedagogy is the learning or teaching approach adopted. They referred to pedagogical perspectives suggested by Mayes & de Freitas

(2007): associationist (gradual building of patterns of associations), cognitive (based on attention, perceptions, thinking and reasoning) and situative (based on social and cultural settings).

From a learner motivation perspective, the most important aspect is probably the learning task (which will be considered "activity" during this study). Even Conole (2007a) described the task as the most useful aspect of the taxonomy. Inspired by Laurillard's (1993, 2002) work on educational media types, Conole (2007a, 2007b) suggested six groups. The groups are:

- assimilative (e.g. reading, listening and writing)
- information handling (e.g. classifying resources and manipulating data)
- adaptive (e.g. modelling and simulation)
- communicative (e.g. group-based discussions)
- productive (e.g. construction of artefacts)
- experiential (e.g. undertaking an investigation)

From a motivation perspective, it will be useful to know whether learners show signs of different types or levels of motivation when tackling different learning activities. As indicated earlier, there is limited research in this specific area.

Using classifications as the basis of research can be complicated. There is a possibility that certain learning activities will fit into more than one category. For example, an e-learning software that is a simulation of an office environment will probably fit into both the adaptive and communicative categories. One possible solution will be to attempt to judge to which category the activity more closely belongs. The vast quantity and range of e-learning activities, which arguably are the result of the creativity and experience of the designers, increase the likelihood that some activities will not fit into any classification. Despite these issues, the wide variety of e-learning activities makes classifications the practical option for this research. They can provide a useful starting point for studying learners' motivational levels when engaging with different learning activities.

4.4 CHAPTER SUMMARY

The research evidence indicates that a wide range of factors affect motivation to learn in an e-learning environment. Cognitive load, user interfaces, interactivity and pedagogy appear to have some effect on learners' motivation. However, the use of the term "motivational design", though presented by a key author in the field of motivation and instructional design, seems unnecessary. Considerations for motivation have always been, and should continue to be, integral to the instructional design process.

Although there are several debates and ideas on instructional design, the motivational and novelty effects of various e-learning activities have not been extensively and systematically explored. Most relevant to this research, but inseparable from the other factors, is whether different e-learning activities offer different levels or types of motivation. Other areas of interest are the perceived duration of novelty and the novelty effects of the different e-learning activities. The vast quantity and range of e-learning activities makes it necessary to rely on categories, like those suggested by Conole (2007a, 2007b). The use of categories is practical, but does have its limitations.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 INTRODUCTION

There is considerable degree of controversy surrounding methodological approaches to research: qualitative vs. quantitative (Bogdan & Biklen 2007); descriptive, associational and intervention studies (Fraenkel & Wallen 2008); positivism vs. interpretivism (Crotty 1998); objective vs. subjective (Burrell & Morgan 1979); taking an outsider perspective vs. the insider perspective (Morey & Luthans 1984); and nomothetic (group-centred and generalised) vs. idiographic (individual-centred and context-based) (Luthans & Davis 1982).

These controversies highlight the wide range of approaches to research today and the differences in researchers' beliefs of how studies should be conducted. It is therefore important that researchers explain and justify the ways in which inquiries are conducted. Following on from previous chapters, where the research problem was introduced and existing literature were evaluated, this chapter reports on the methodological approach used to investigate the three aspects of this study – attraction, novelty and activities.

Following careful consideration of the strengths and weaknesses of various approaches, as well as the multi-faceted nature of the study, the researcher decided to combine survey and multiple-case study approaches. In this chapter, the researcher justifies the reasons for combining methodological approaches. The researcher also justifies the choice of location, the selection of participants, the procedures for collecting and analysing data and the ethical considerations.

Most importantly, this chapter explains the steps that were taken to improve the validity and reliability of this study. This doctorate is an entry qualification into the "world of educational research". The researcher is therefore keen to conduct a thorough research that has academic credibility and rigour. The researcher's desire to establish credibility and academic rigour meant that considerations of the validity and reliability of the study took place throughout the research process.

5.2 METHODOLOGICAL APPROACHES

5.2.1 THE NATURE OF THIS STUDY

Research into e-learning and motivation can be complex. As highlighted in chapter 2 (section 2.3.1), the multifaceted nature of e-learning (Andrews & Haythornthwaite 2007; Broadbent 2002), the wide variety of e-learning contexts (Convery 2009), the divides between researchers (Reynolds et al. 2003; Convery 2009) and the continuous changes in technology (Andrews & Haythornthwaite 2007) makes e-learning a complicated area of enquiry.

Motivation is also a complex subject, with very diverse views on what it is, and how it affects the learning process (Schunk et al. 2010). Although some people might know when they see or experience it, the researcher believes motivation remains a mysterious aspect of human behaviour. Is it a personality style? Could it be a brain impulse? Can one develop motivation as a habit? Is it a decision, made consciously or in the subconscious? Some explanations can be found in chapters 2 and 3 of this thesis, where different perspectives and theories relating to motivation are explored. These perspectives and theories associate words such as desire, will, interest, effort, enthusiasm, determination, drive, persistence and attention with motivation, highlighting the many convolutions associated with the phenomenon.

These complexities highlight the importance of clarity in the definition of the context of this study. This study focuses on *motivation to learn* exhibited by *11 to 14 year olds,* when using in *computer-based learning* systems that are designed to *deliver academic curriculum content,* in the *absence of a facilitator/instructor/teacher*. More information about this area of focus, the rationale for choice and explanation of the context can be found in chapter 1. There are three facets to this study – the attraction to computers, the novelty of e-learning activities/features and the motivational effects of different types of e-learning activities. The context and the three facets of this study must be the basis of the selection of the most appropriate methodological approach. The selected approach must provide opportunities for the three facets to be explored effectively.

5.2.2 POSSIBLE APPROACHES TO THIS STUDY

With full understanding of the nature of the study and the areas of inquiry, the researcher proceeded to identify the most appropriate methodological approach. A wide range of possible approaches, such as experimental research, action research, evaluation, case studies, phenomenology, content analysis, grounded theory and ethnography and surveys was considered. Although no one approach is inherently superior to the other, each has its distinctive strengths and weaknesses (Singleton & Straits 2005; Fraenkel & Wallen 2008). These strengths and weaknesses were evaluated in order to find the most appropriate approach. Moreover, evaluating these methodological approaches enabled the researcher to recognise the weaknesses in the chosen approaches and take steps to limit the effects of the weaknesses.

One of the approaches considered was *experimental research* – "the process of manipulating one or more factors (variables) that may influence participants' behaviour" (McMillan 2008, p. 11). Experimental research is sometimes associated with quantitative studies, which aim to identify quantifiable data. Experimental research is particularly good at testing cause-and-effect relationships. As discussed in chapter 2 (section 2.2.1), cause-and-effect relationships, which are often associated with the behaviourist perspective of motivation, do not lead to the complete understanding of motivation. Moreover, the researcher does not have knowledge of, or control over, all the variables that can affect the motivation levels of the participants. Hence, designing experiments to investigate the three facets of this study would be difficult.

Rather than seeking to investigate cause-and-effect relationships (as in experimental studies) the researcher considered the suitability of *phenomenology* for this study. Phenomenology involves investigating and describing the reaction to, or perception of, an area of inquiry (phenomenon) from the perspective of those who experience it (Titchen & Hobson 2005; Bogdan & Biklen 2007; Fraenkel & Wallen 2008). Phenomenology provides a unique opportunity for this study since it focuses on participants' interpretation. Paying close attention to the perspectives of learners during this study can provide the insight into the level of motivation experienced and the reasons for it. They are the ones who experience the motivation; they are the ones who can interpret their experience. Although the subjectivity associated with learners' own interpretation of their motivation could be considered a weakness, there are strengths in seeing motivation from the learners' perspective (see Robson 2002).

The researcher also considered *evaluation research* – the careful examination of a programme, problem or intervention strategy, requiring the definition of some criteria and using them to assess the situation (Gay et al. 2009; Norris 1993; Walberg & Haertel 1990; Keeves 1988; Popham 1988). The approach would be more suited to research such as the appropriateness of the e-learning provision. This study concerns itself with explaining the factors that could influence motivation to learn in an e-learning environment. Whilst the concept of defining criteria and judging against criteria could simplify the research process, this approach is unlikely to provide the desired outcomes.

Perhaps related to evaluation research is *action research* (see Cousins & Earl 1995; Fetterman 1996). Narrowing the gap between research and practice, action research involves taking a cyclical approach to constructing knowledge and developing practice (Mills 2010; Whyte 1991; Elliott 1991; Noffke & Somekh 2005). Instead of it being research on a topic, it is research *from within* that setting carried out by the participants or researchers working in collaboration with them (Noffke & Somekh 2005). This study neither aims to solve a problem, nor foster reflective practice leading to change or innovation. Hence, this approach is not likely to be appropriate to the study.

Some consideration was given to *ethnography* as a methodological approach for this study. Ethnography is an "in-depth study of the culture of a particular group of people, where the ethnographer seeks to describe the culture and convey the patterns of life, beliefs and ideologies as well as formal and informal relationships" (Drew et al. 2008, p. 350). Whilst it can provide detailed insight into the context, it lends itself more to describing culture. This research seeks to investigate the relationship between e-learning and motivation, making ethnography unsuitable for this study.

Though sometimes considered a form of, or related to ethnography (see, for example, LeCompte & Schensul 2010; Orum et al. 1991), *case studies* were considered. Case studies require the researcher to identify a "case", which some researchers have described as an object of study (Stake 1995), or a procedure of inquiry (Merriam 1998). A "case" could be an individual, a group of people, a school, a programme, a process, a group of people, an event or even any combination of these (Creswell 2005; Fraenkel & Wallen 2008; Robson 2002; Stark & Torrance 2005). During case studies, the aim is to conduct in-depth exploration of that particular case.

The ability to select a particular case offers great flexibility. The focus on a small and manageable case also provides an opportunity to gain in-depth understanding of the case. This level of flexibility and the ability to gain deep understanding of the case is very useful for this. Case studies however raise some concerns about whether (and the extent to which) the findings can be generalised beyond the realms of the case, or indeed within the case itself (see Robinson & Norris 2001; Maxwell 1992; Maxwell 2005). Another issue could be how to determine the boundary of the study – knowing what to include or exclude from the case (Stark & Torrance 2005).

The researcher also considered generating a theory that relates to the area of inquiry. *Grounded theory* seeks to develop theory from the data obtained during the study (Bryant & Charmaz 2007; Corbin & Holt 2005; Strauss & Corbin 1998; Glaser & Strauss 1967). This can be useful as the theories that are "grounded" in the data during the study are likely to fit the specific situation closely. There are already many relevant theories in e-learning and motivation (see chapter 3). This study seeks to gain an understanding of the research area and offer explanations, not develop theories necessarily.

Survey research is another approach that was considered. Surveys are often used to describe aspects of behaviours, characteristics, beliefs, attitudes and opinions of a population (Creswell 2005; Fraenkel & Wallen 2008). Though sometimes associated with quantitative research, it is possible to obtain qualitative data (Gay et al. 2009; Creswell 2005). It is possible to obtain answers to standardised questions, whilst allowing open-ended responses. This approach seems to be suitable for this study. The possibility for use in a descriptive study, such as this, and its popularity made it a feasible approach.

The purpose of this section is to briefly describe the considerations before the methodological approach was chosen. A wide variety of approaches was evaluated to give the researcher an opportunity to consider the strengths and weaknesses of the different approaches and their suitability for this study. The researcher agrees with Smith (1991), that the purpose of the research is key: this should guide the choice of methodological approach. Rather than select an approach based on familiarity, ideology, own preference or other people's expectations, the researcher sought to select an approach that would be most suitable to this study.

5.2.3 CHOSEN APPROACH: MIXING THEM UP

After full consideration of the research aims and the strength and weaknesses of various methodological approaches, the researcher decided to combine different approaches. Various reasons have been advanced for combined approaches – triangulation by using one approach to strengthen claims to reliability, the desire for more complete and fuller understanding, and compensating for the weaknesses of one approach through the strengths of another (Creswell & Plano Clark 2011; Perlesz & Lindsay 2003). Some theorists have also proposed that researchers should be pragmatic in their choice of research approach (Johnson & Onwuegbuzie 2004; Greene 2005; Johnson et al. 2007; Teddlie & Tashakkori 2003). In this case, the multifaceted nature of this study made it necessary to consider more than one approach.

The **first facet** of this study is an investigation into the **attraction** to computers. The research questions can be found in chapter 1 (section 1.2.1). The researcher decided to use a **survey** to tackle this area of inquiry. Surveys are useful for collecting information in order to describe the beliefs, attitudes and opinions of a population (Fraenkel & Wallen 2008). This is precisely what the first facet is about – the need to describe the beliefs, attitudes and opinions of young people about their attraction to computer-based learning. Survey research seems to match the demands of the research questions relating to "attraction": to confirm whether there is an attraction to computers; investigate the reasons for the attraction; and examine whether/when/why this attraction translates to motivation to learn.

Apart from the likelihood to provide answers to the research questions, other strengths made it more appropriate to this research. For example, the popularity of surveys contributed to the choice. The target population (11 to 14 year olds) understand it, since they have probably been involved in some form of survey. It is also possible to use online systems to collect information, making it possible to collect data from more than one setting at very little cost.

However, the researcher is aware of the weaknesses of this approach. Firstly, they are difficult to alter once the pilot phase of the study has begun. They are also limited to reports on attitudes and beliefs, rather than actual observations. Thirdly, they can be susceptible to reactivity, leading to measurement errors like lack of truthfulness and instability of opinions (Singleton & Straits 2005). In order to mitigate the effects of these weaknesses, the researcher used a pilot study to improve the design of the research. Moreover, two data collection methods (online questionnaire and focus group interviews) were used for triangulation purposes. The researcher also conducted a panel study, where the survey was repeated on the same population at another time. The purpose of this was to uncover changes in responses and to explore reasons for the changes.

The **second facet** of this study is an investigation into **novelty** of e-learning activities or features. The research questions (see section 1.2.1) seek to provide understanding of novelty – how long it lasts; how learners respond to it; and learners' perception of how long the activities remain novel. The **third facet** of this study explores the motivational effect of different types of e-learning **activities**. This facet seeks to investigate the level and type of motivation learners experience when engaged in different types of e-learning activities. The researcher decided to tackle the **second and third facets (novelty and activities) jointly** using **case studies**.

Case studies provide the opportunity to conduct an in-depth and intensive examination of a setting. The nature of this study, as explained in previous sections, necessitates the use of a contextualised and focussed approach. Case studies were chosen over other approaches because they provide the opportunity for a manageable, yet in-depth investigation of motivation with regard to novelty and activities. Considering the time and resource constraints associated with this self-funded doctorate programme, the case studies offered opportunities for a focussed, in-depth study.

Although case studies provide opportunities for in-depth examinations, there are concerns about how well the results can be generalised. Case studies tend to offer depth, rather than coverage. Can the findings be useful in situations other than the cases being studied? The findings of this study provide opportunities for "naturalistic generalisations", where readers can identify aspects of the case that are applicable and comparable to their own contexts (Melrose 2010; Stake 1995; Stake 1994). To address the doubts of the generalisability of the case studies, a further action has been taken. The researcher decided to conduct multiple-case studies (same studies in three different schools) in order to strengthen the study (Stake 1994; Robinson & Norris 2001). The definition of the cases, the data collection methods and the processes are discussed in later sections.

This section provides an explanation of the chosen approaches. A combination of approaches – survey and case studies were deemed appropriate to this study. This decision was based on how closely the approaches match the areas of inquiry, as well as practicality. Steps have been taken to reduce the impact of the weaknesses of the survey and case study approaches. The diagram below (**figure 2**) shows the three facets and the selected approaches, illustrating that the second and third facets (novelty and activities) are tackled jointly.

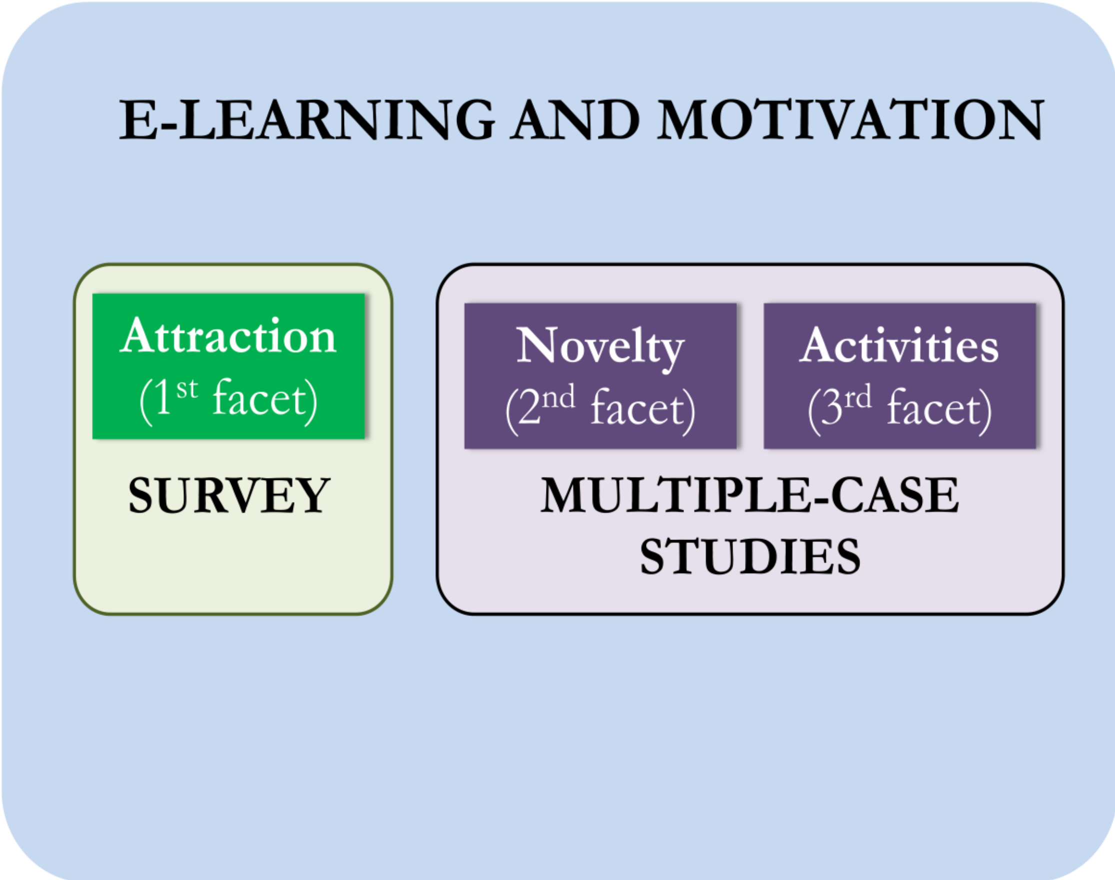


Figure 2: The approaches to the three facets of this study

5.2.4 THE PLACE OF RESEARCH MODELS

In chapter 3, various models used in e-learning research were evaluated. The researcher considered how useful each model would be as conceptual framework for this study. For example, the ARCS model (Keller 1983) offers a structured approach to designing instruction whilst offering a range of motivational strategies (tactics). Wlodkowski's Time Continuum Model (Wlodkowski 1985) focuses on the phases involved in the learning process (the beginning, during and the end). del Soldato & du Boulay's Motivational Planner, though more closely related to Intelligent Tutoring Systems (ITS), offers some pointers on detecting and adapting to learners' motivational states (del Soldato & du Boulay 1995). Malone & Lepper's taxonomy of Intrinsic Motivations introduces the concept of fantasy, something that is missing from other models (Malone & Lepper 1987). Some have also argued for the inclusion of self-cognitions (self-regulation, self-efficacy etc) in e-learning research models (Cocea & Welbelzhal 2006).

After a full review of the various models pertaining to motivation in e-learning, the researcher's view aligns with that of Bong (2006) who believes that:

> "The field [of motivation research] suffers from a lack of comprehensive models that are capable of capturing the full dynamics underlying observed behaviours. Different theoretical orientations among researchers often result in a rather arbitrary inclusion or exclusion of variables which leads to the misspecification of models" (Bong 2006, p. 149)

Bong (2006) highlights that various models in motivation research tend to emphasise particular aspects of motivation over others. This tends to lead to different conclusions depending on their conceptual orientations. Bong (2006) echoes the suggestions of various researchers (Meece et al. 1990; Schunk 1990), calling for an "integrated approach", where various constructs are unified into one comprehensive model. After intensive investigation, the researcher is yet to find a comprehensive model that is exhaustive in its specifications.

Bong's (2006) concept of an "integrated approach" has, nevertheless, influenced the role of the e-learning research models in this study. Rather than adopting one model as a conceptual framework for this study, the researcher decided to place the key concepts of the research models in a "collection". This provided the opportunity for a broad overview of the concepts, but also the flexibility to call upon individual concepts. The research models had a place in this study – not as one rigid and limited model, but a "collection of concepts" that guided the study. **Figure 1** (in section 1.5) shows the key concepts, based on the research models evaluated, titled the "collection of concepts".

5.3 LOCATION AND TARGET POPULATION

5.3.1 LOCATION

The research was conducted in three schools located in three regions of the United Kingdom – London, Essex and Nottinghamshire. The schools were selected from the researcher's own contacts. This selection raises some immediate concerns about how representative the selected schools and their learners are of the wider population of 11 to 14 year olds. However, it was found that selecting schools from the researcher's own contacts provided better access and the possibility of greater participant support for the study.

Nonetheless, the researcher acknowledges that selecting three schools from contacts is unlikely to reflect the different characteristics of the wider population. For example, the selected school do not reflect a geographical spread. Furthermore, they do not reflect the different types of schools (e.g. independent, faith school, grammar etc). Whilst this selection is still not representative, the limited time and resources available for this research project, conducted by one researcher, makes this the only practical option.

Between them, however, the schools have a range of different characteristics. For example, the schools cover the Ofsted ratings of outstanding, good and satisfactory. Other common indicators, such as ethnicity, Special Education Needs, English as an Addition Language, Free School Meals, are featured in different degrees in the schools.

Table 3 (below) shows further details of the selected schools:

School	Description and characteristics
A (London)	School A is a large, 11-18, comprehensive school within the Greater London area. A significant number of students are from areas of deprivation. The number of students identified as having special education needs (SEN) is above the national average. The number of students who speak English as an additional language is above the national average. The school was deemed "satisfactory" by Ofsted.
B (Essex)	School B is a very large, 11-18, comprehensive school in Essex. The catchment is socio-economically diverse. The number of students identified as having special education needs (SEN) is above the national average. The number of students who speak English as an additional language is well below the national average. The school was deemed "good" by Ofsted.
C (Nottinghamshire)	School C is a relatively small, 11-18, voluntary-aided faith school in Nottinghamshire. The catchment is socio-economically diverse. The number of students identified as having special education needs (SEN) is well below the national average. The number of students who speak English as an additional language is also well below the national average. The school was deemed "outstanding" by Ofsted.

Table 3: Descriptions of schools involved in this study

It is worth noting that many of the research activities could take place in other settings – e.g. in homes, in youth centres etc. The location of the study can have an effect on participants' responses (see Fraenkel & Wallen 2008). The school setting was chosen for two reasons. Firstly, this research focuses on students' learning of academic curriculum content. The school environment helped maintain that focus. Many students generally associate school with academic curriculum work, which might not necessarily be the case in a youth centre or home. Secondly, the school represented a safe and familiar environment, where participants and their parents would feel more comfortable with the research.

5.3.2 TARGET POPULATION

The main target audience for this study was 11 to 14 year olds in the selected schools. The target audience are generally in years 7, 8 or 9 (the first three years of secondary school in the United Kingdom). **Table 4** (below) shows further details of the target population in the selected schools:

School	The target population (year 7, 8 and 9 pupils)
A (London)	**Year 7 students** Number of students: 72 boys and 78 girls Number of students in the year group identified as having SEN: 39 **Year 8 students** Number of students: 78 boys and 91 girls Number of students in the year group identified as having SEN: 37 **Year 9 students** Number of students: 132 boys and 132 girls Number of students in the year group identified as having SEN: 109 *This information was correct as at 28th March 2011.*
B (Essex)	**Year 7 students** Number of students: 160 boys and 160 girls Number of students in the year group identified as having SEN: 87 **Year 8 students** Number of students: 146 boys and 167 girls Number of students in the year group identified as having SEN: 91 **Year 9 students** Number of students: 169 boys and 143 boys Number of students in the year group identified as having SEN: 85 *This information was correct as at 28th March 2011.*
C (Nottinghamshire)	**Year 7 students** Number of students: 78 boys and 88 girls Number of students in the year group identified as having SEN: 47 **Year 8 students** Number of students: 78 boys and 83 girls Number of students in the year group identified as having SEN: 28 **Year 9 students** Number of students: 91 boys and 76 girls Number of students in the year group identified as having SEN: 35 *This information was correct as at 29th March 2011.*

Table 4: Details of the target population

5.4 DATA COLLECTION METHODS AND CONSIDERATIONS

5.4.1 SURVEY: DATA COLLECTION METHODS

The decision to investigate the first facet (attraction) through surveys was mainly due to the familiarity of the target population with this approach. The researcher knows from experience in schools that students are often asked to take part in surveys for various purposes. Surveys were also selected because of their suitability for collecting the relevant data for this study. The next stage was to identify the most appropriate data collection method. Several methods (such as observations, data from secondary sources, questionnaires, interviews etc) were considered. The key considerations were: their likelihood to provide answers to the research questions; their likelihood to help collect valid and reliable data; and the suitability of the method for 11 to 14 year olds.

The researcher's desire to collect data that represented the views of the entire target population in the selected schools made *online questionnaires* an obvious choice of method. Cost, anonymity, familiarity of many respondents; objectivity and standardised data collection; and the potential to reach a large number of participants/respondents are some of the advantages of using questionnaires (Chadwick et al. 1984; Leman 2010a; Bryman 2008, Gall et al. 2007).

In this context, the choice was based on the desire to capture the views of the entire cohorts of 11 to 14 year olds; a census survey (see Leman 2010a; Simon & Burstein 1985). Moreover, the target population are quite familiar with questionnaires, with many years of experience in completing feedback sheets, evaluations and other questionnaires. Finally, the objectivity and readiness for statistical analysis associated with using online questionnaires for data collection made it attractive.

An online questionnaire was chosen over other types of questionnaires, such as printed or telephone questionnaires, for a number of reasons. A major reason for using online questionnaires was the low cost. It was free to produce. It was free to distribute (the schools were simply provided with web addresses). Another reason was that the data were returned in an electronic format, ready for statistical analysis.

However, there are shortcomings in using online questionnaires to gather the views of young people about the first facet of this study (attraction). Firstly, the researcher role is diminished because he/she has no contact with the respondents (Verma & Mallick 1999). Moreover, there is neither a way to change the survey once it has began, nor a way to probe or follow up on interesting leads (Singleton & Straits 2005; Chadwick et al. 1984; Bryman 2008). The response rate is typically low or even inaccurate; the lack of face-to-face interaction sometimes means that people do not take them seriously (Singleton & Straits 2005; Leman 2010b).

The researcher took some steps to deal with these shortcomings. To deal with issues relating to low response rates, the researcher requested that the online questionnaires were completed in the first ten minutes of the students' ICT lessons under teacher supervision. Moreover, an "introduction screen" clearly stated the purpose of the questionnaire and the estimated time for completion.

Perhaps the strongest concerns were the possibility of receiving untruthful data and the limitation arising from relying solely on the rather brief data collected through the online questionnaires. To minimise the effect of these concerns, open-ended questions were built into the questionnaires, encouraging participants to explain the reasons for their choice. To further ensure there are in-depth explanations, the online questionnaires were complemented by *focus group interviews* with some pupils from each school. More information about the strategy used to select participants for the focus group interviews is provided in later sections. The focus group interviews not only served as a way to increase the researcher's involvement, they also served as a way to gather in-depth, qualitative data to triangulate the quantitative data from the online questionnaires (see Drew et al. 2008).

Focus group interviews can be particularly useful for gaining initial understandings of an issue (Gibbs 1997; Fowler 1995; Krueger & Casey 2000; Wellington 2000) or to explore/ generate hypothesis (Powell & Single 1996). As there are already some research and claims about attraction to computers (see section 2.4.2), there was no need to use the focus group to gain initial understanding or generate hypotheses. In this study, the focus group interviews were used to complement the online questionnaires (see Gibbs 1997). Understanding learners' attraction to computers and learning with computers seemed to require a research method that would allow the researcher to explore issues in greater depth and reveal areas that the researcher had not considered (see Smith & Bowers-Brown 2010).

The strength of the focus group interviews lies in the wealth of data that can be generated when the group participants stimulate each other to articulate their views, revise their views or even have a debate about their multiple perspectives (Cohen et al. 2007; Wellington 2000; Bryman 2008; Kitzinger 1995; Bogdan & Biklen 2007). During focus group interviews, participants are encouraged to discuss and engage with each other, rather than just with the researcher (Smith & Bowers-Brown 2010). Learners are generally used to classroom discussions and interactions in schools. This familiarity made focus group interviews a worthy method for this study.

Another reason for choosing focus group interviews was that it made it possible for respondents to make comments in their own words. Where there are difficulties with reading and writing, focus group interviews still make collecting meaningful data possible. This would otherwise be difficult if relying solely on the online questionnaire. Furthermore, it is possible to record non-verbal clues (e.g. body language and facial expressions) which would otherwise be impossible when using questionnaires alone (Smith & Bowers-Brown 2010).

One interesting concept, as highlighted by Bryman (2008), is the fact that focus group interviews foster the relinquishing of some control to participants. This means that participants can discuss issues that the researcher had not considered or covered in the online questionnaire. This "relinquished control" offers a balance between empowering participants (for the sake of richer data and new ideas) and ensuring the researcher is involved in the data collection process. Henn et al. (2006) also highlight the benefits of sharing control with participants and creating opportunities for them to construct their account of the subject matter.

Although the "relinquished/shared control" idea seems promising, there are some difficulties. The researcher has to manage and facilitate the group discussions. Many researchers have warned that some participants might feel uncomfortable with discussing certain issues or experiences in the presence of their peers (Bogdan & Biklen 2007; Smith & Bowers-Brown 2010; Robinson 1999). There could also be power struggles, conflicts within the group (Robson 2002; Robinson 1999). In some cases, there could be difficulties in keeping the discussion on topic (Bogdan & Biklen 2007).

More importantly, there are concerns about factors that threaten the validity of data gathered from focus group interviews. One or two people can dominate the discussion, leading to distorted or unrepresentative outcomes (Fontana & Frey 2005; Flick 2009; Robinson 1999). It is difficult to generalise the findings due to the small number of participants (Gibbs 1997; Robson 2002; Robinson 1999). The researcher often introduces some response effects (see, for example, Davies 2010; Singleton & Straits 2005; Sudman & Bradburn 1974). There is also the tendency to place greater faith on the findings due to the live and immediate nature of the discussions (Robinson 1999; Robson 2002).

The researcher recognised the difficulties as well as threats to the validity of the study. Hence, certain steps were taken to minimise the effects. Although the study does not involve any sensitive topics, the researcher still emphasised to the group that their ideas will be valued and will remain confidential. Moreover, the respondents were encouraged to respect the opinions of others. To deal with the bias that could arise from group dynamics, the researcher involved all members in the focus groups without interfering with the flow of the discussions. Finally, the findings of the focus group interviews were not considered immediately. Audio recordings (of discussions) and written notes were considered alongside the online questionnaire data.

This section explains the rationale for choosing a combination of online questionnaires and focus group interviews as the data collection methods for the survey. Whilst it is believed that this combination is suitable for tackling the research questions, the researcher recognises that:

> "No method can deliver ultimate truth...One might argue that some methods are more suited than others for conducting research on human construction of social realities, no one would argue that a single method – or a collection of methods – is the royal road to ultimate knowledge" (Guba & Lincoln 2005, p. 205)

It is true that all data collection methods have their strengths and weaknesses, which ultimately affect the quality and accuracy of the data being gathered. It is also true that other methods can result in alternative findings. The researcher appreciates that the choice/administration of the data collection methods can affect the findings and trustworthiness of the study. Hence, the measures highlighted in this section were taken to address the issues.

5.4.2 MULTIPLE-CASE STUDIES: SELECTING THE ACTIVITIES

The second and third facets of this study (novelty and activities) were investigated through in-depth case studies in the three different schools. The case studies focussed on the effect of novelty and the type of activity on motivation to learn. There was a focus on computer-based learning systems that are designed to deliver academic curriculum content and are used independent of a facilitator, instructor or teacher. Selecting activities for this study was not without its challenges.

The first challenge related to the *use of classifications* as the basis of this study. The wide variety of computer-based learning activities necessitated the use of classifications. After a full review of a wide range of classifications (see section 4.3.2), Conole's (2007a, 2007b) classifications were found to be most comprehensive.

The classifications are:

- Assimilative (e.g. reading, viewing, listening and writing)
- Information handling (e.g. classifying resources and manipulating data)
- Adaptive (e.g. modelling and simulation)
- Communicative (e.g. group-based discussions, presenting and critiquing)
- Productive (e.g. construction of artefacts, drawing, composing and producing)
- Experiential (e.g. undertaking an investigation)

It is often difficult to fit certain e-learning activities into one classification. Some activities had elements of two or more classifications. The researcher made some "best-fit" judgements about the classifications that the e-learning activities fitted into. The researcher recognises that the use of classifications for e-learning activities threatens the validity of the study. The inevitable errors arising from fitting the e-learning activities into a limited number of possible groupings could result in inaccurate conclusions being drawn. However, the "best-fit" approach seemed to be the only practical approach.

Apart from the issues associated with the use of classifications, the *subject matter* delivered through the e-learning system posed a threat to the validity of this study. It is known from the work of Brophy (2004), Green et al. (2007) and Smith et al. (2005) that learners can exhibit different types and levels of motivation when learning certain topics or subjects over others. Many factors influence learners' motivation and decision to learn particular topics and subjects (Smith et al. 2005). The danger is that inaccurate conclusions can be drawn from participants' interaction with the e-learning activities, with little or no consideration for how their motivation levels could have been influenced by their interest (or lack of interest) in the subject matter.

Furthermore, the effect of *participants' prior knowledge* of the subject matter was considered. There is a debate about whether prior knowledge of the subject matter influences motivation to learn more. Some studies have suggested that prior knowledge of a topic has positive influences on learner motivation (see, for example, Schiefele 1992; Garner & Gillingham 1991; Alexander et al. 1995; Alexander et al. 1994). The conclusions of the other studies have been contradictory (see, for example, Baldwin et al. 1985). Some have identified errors in the approaches taken during the studies, hinting that there were inaccuracies in the conclusions (see, for example, Ng & Bahr 2000; Tobias 1994; Krapp 1999). The uncertainty and debate over the effect of prior knowledge on motivation influenced the researcher's decision to ask participants to engage in topics that they were not likely to have any prior knowledge.

After full consideration of the possible threats (use of classifications, subject matter and prior knowledge) and the areas of enquiry (novelty and activity), the following guidelines were used to select the activities:

- **Two e-learning activities from each classification** were selected for use during this study. By selecting two activities, it was possible to compare participants' experiences of the two activities belonging to the same classification. This was likely to be more reliable than selecting only one activity from each classification. Time constraints made it impossible to select more than two activities from each classification.

- The topics delivered through the selected activities were **neither too technical nor non-technical.** It was difficult to predict the subjects or topics that would influence individual participants' motivation. It was also cumbersome to rely on participants' appraisal of their preferences. To reduce the effect of individual preferences in certain topics/subjects on motivation, the selected activities bordered on the boundary between technical and non-technical topics. Some studies have suggested that this approach allows easier generalisations across a range of subjects or topics (see, for example, Cocea 2007).

- The aim was to select activities that were **moderately challenging**. It was important to provide opportunities for participants to demonstrate their motivation to learn through sustained effort, concentration and persistence (see Brophy 2004; Brophy 1988; Wigfield 1994; Larson 2000; Maehr 1984; Csikszentmihalyi & Nakamura 1989; Pintrich et al. 1993).

- The participants were required to learn topics which they were **unlikely to have any prior knowledge of**. The effect of prior knowledge on motivation was unclear and outside the scope of this study, so it was necessary to standardise the conditions by removing this variable altogether. This approach has been suggested as one of the techniques for controlling and minimising threats to internal validity (Fraenkel & Wallen 2008). It was of course difficult to ensure that none of the participants had any prior knowledge of the topics.

Based on these guidelines, the researcher selected the twelve activities in table 5 (below) for this study. The researcher obtained permission from the owners (where appropriate) for use in this study. **Appendix 12** is an acknowledgement of the sources of the e-learning activities, including details of when permission for use was obtained.

Classification	Name and brief description of the activity	Topic(s) covered
Assimilative (e.g. reading, viewing, listening and writing)	Tour of Parliament – a learning activity based on a tour of the Houses of Parliament, where learners click on areas of interest and view information and pictures about it.	Citizenship History Politics
	Culture Zone – a learning activity that uses multimedia to present a timeline of the history of Britain, with a focus on the impact of other nationals on the British culture.	History Culture Citizenship
Information handling (e.g. classifying resources, ordering data and manipulating data)	Looking at Mutual Funds – a learning activity where learners gain an understanding of mutual funds vocabulary, calculate average return on investments and use charts to analyse past fund performance.	Investments Mathematics Personal Finance
	Words with Multiple Meanings – a learning activity where learners consider the context of various sentences, recognise the multiple meanings of words and select the appropriate words for the context.	English Vocabulary
Adaptive (e.g. modelling and simulation)	MP for a Week – a simulation activity that allows learners to step into the shoes of an MP, meet constituents and other ministers, deal with the media, plan and make speeches etc.	Politics Citizenship
	Energyville ™ – a simulation activity that places the learner in charge of an average industrialised city, requiring them to make decisions and create safe energy sources in the present to create a sustainable future.	Economics Environment
Communicative (e.g. group-based discussions, debating, presenting and critiquing)	Climate Wiki – an online wiki created for the collaborative production of an article/document about climate change.	Environment Science Citizenship
	Heated Debate – an online chat room created for an online debate about the pros and cons of animal testing.	Citizenship Science (Biology) Science (Chemistry)
Productive (e.g. construction of artefacts, writing, drawing, composing and producing)	FWG Bridge – an activity focussing on Physics and Finance, where learners are required to construct a solid bridge to an allocated budget.	Science (Physics) Finance
	Sketch2 – a learning activity where learners produce sketches and paintings of pictures which disappear shortly afterwards.	Art
Experiential (e.g. investigating, exploring, performing, mimicking and practising)	Coffee Shop – a learning activity that teaches business principles by allowing learners to explore and investigate the effects of product pricing, profits, sales, inventory, business reputation, demand and supply on the stability of businesses.	Business Studies Economics
	Starting Out – a learning activity that focuses on personal finance, where learners explore and predict what life could be like when they finish school.	Personal Finance

Table 5: E-learning activities that were selected for the multiple-case studies

The strict guidelines highlighted above were used to select the twelve activities. The above e-learning activities were shown to a group of sixteen learners in the target population in School A (as part of a pilot study) to verify that the activities were moderately challenging and covered unfamiliar topics. The researcher's supervisor was consulted for feedback on how well the activities fitted into the categories and their suitability for this study. After gaining their approval, the researcher sought to explicitly define the multiple cases for this study. The multiple-cases are defined in the next section.

5.4.3 MULTIPLE-CASE STUDIES: DEFINING THE MULTIPLE CASES

The researcher adopted the multiple-case studies approach for investigating the second and third facets of this study (novelty and activities) because of its strength in providing in-depth, contextualised understanding of an issue as complex as motivation. Yin (2009) explained that case studies are the preferred strategy for finding answers to "how" or "why" questions to a contemporary phenomenon in a real-life context, where there is little control over the events. The researcher had very little control over the vast amount of e-learning systems available. It was therefore necessary to conduct in-depth, focussed and manageable case studies, hence the selection of the twelve activities.

There are however many criticisms of case studies, including those relating to: the possibility of bias in the case selection; informal or undisciplined research designs; subjectivity in the conclusions drawn; its suitability only for initial data collection and generation of hypothesis; difficulties in replications; and questions about generalisability (Gerring 2007; Tellis 1997a, 1997b; Stark & Torrance 2005).

Flyvbjerg (2004) also argued that the criticisms are the result of many misunderstandings about case study research. Like many other researchers (for example, Melrose 2010; Stake 1995; Stake 1994; Orum et al. 1991), he argued that the context-dependent knowledge generated through case studies sufficiently holds up when compared to other approaches. Flyvbjerg (2004) even went on to identify sceptics of case studies research who have changed their views over time as they investigated the approach (for example, Campbell & Stanley 1966; Campbell 1975; Eysenck 1976; Ragin & Becker 1962).

The researcher is of the opinion that the issues raised by the critics should not be ignored. The researcher believes that academic rigour can only be achieved if those criticisms are addressed. Instead of brushing aside the criticisms, some important questions need to be asked. What will be done to remove bias in the selection of the case? What will be done to improve the generalisability and credibility of the study? What steps will be taken to reduce the subjectivity of the conclusions of the study? Some of these concerns are addressed through the approach taken in this study. In an attempt to improve the credibility of this study, the case studies were conducted in three different schools in different geographical locations. The results from the schools could then be compared. Moreover, multiple methods of data collection were used to gain fuller understanding and for triangulation purposes.

Although steps have been taken to increase the credibility of this study, the researcher believes that clarity and transparency about the specific cases under investigation is most important. Only then, can the conclusions of this in-depth study be fully understood in context. Below is a definition of the cases under investigation:

The purpose of the case studies was to explain the effects of novelty and the types of e-learning activities on students' motivation to learn. The research questions are in chapter 1 (section 1.2.1). The case studies took place in three different schools, making it possible to compare the findings. The schools are significantly different in terms of location, catchment data and standards ratings.

Six learners from the target population (11 to 14 year olds) in each school were selected using a purposive sampling strategy. The sample included both genders, varying academic, ICT proficiency and motivation levels, representing the typical characteristics of the population.

Twelve e-learning activities that broadly fit the six classifications of activities (tasks) suggested by Conole (2007a, 2007b) were selected, two per classification. The classifications are: assimilative (e.g. reading, listening and writing); information handling (e.g. classifying resources and manipulating data); adaptive (e.g. modelling and simulation); communicative (e.g. group-based discussions); productive (e.g. construction of artefacts); and experiential (e.g. undertaking an investigation).

As learners could be motivated by individual preferences, subject matter and prior knowledge, the e-learning activities covered topics that were moderately challenging, unfamiliar and neither too technical nor non-technical.

The case studies examined the interaction of the selected 11 to 14 year olds in the three schools with the selected e-learning activities. The effect of novelty and the type of e-learning activity on motivation was examined, using a combination of observations, computer recordings of interactions, self-reports and focus group interviews.

5.4.4 MULTIPLE-CASE STUDIES: DATA COLLECTION METHODS

The rationale for selecting the e-learning activities has been explained in previous sections. The definition of the multiple-cases studies for investigating the second and third facet of this study (novelty and activities) have also been discussed in previous sections. This section explains the next step – the selection of appropriate data collection methods that would provide answers to the research questions was the next step. Case studies tend to involve the use of a range of data collection techniques for collecting rich, in-depth data (Robson 2002; Creswell 2005; Fraenkel & Wallen 2008).

The researcher recognised the benefits of using a range of data collection methods. However, the use of a range of data collection methods was based on their suitability for this study. The main considerations were the appropriateness for the research questions and their suitability for use with the participants. An obvious data collection method for this study was *observation*. The researcher observed participants as they interacted with the e-learning activities. The researcher made notes of key behaviours that suggested increase or decrease in motivation.

Non-verbal clues observed during interaction can be useful for inferring motivation states (Lepper et al 1993). In this case, observations during interactions were chosen for two reasons. Firstly, observations provided the researcher with the opportunity to record events as they occurred. It was important to watch learners and record events as the participants engaged with the e-learning activities, rather than delay the data collection process. Apart from the timing of the data collection, observations made it possible for verbal and non-verbal clues to be collected.

The participants engaged with the e-learning activities in groups, in order to comply with child protection guidelines and because one-to-one observations could be intimidating. As the researcher was working alone, it was impossible to fully observe all participants in the groups simultaneously. Hence, *recordings of participants' interactions* provided some compensation for this constraint. The recording of the participants' interaction provided access to behaviour clues such as speed, hesitation, navigation, response times and quality of performance. Some useful data about motivation can be collected from recording of interaction with the e-learning activities (see, for example, de Vicente & Pain 2002; Qu & Johnson 2005; Hershkovitz & Nachmias 2011; Beck 2004; Cocea & Weibelzahl 2007).

Whilst observations and recordings of participants' interactions can provide useful data, they both have limitations. These limitations posed a threat to the validity of this study. The participants knew they were being observed; they also knew their interactions with the e-learning activities were being recorded. What effect did the presence of the researcher have on the participants' actions? Did knowledge of the recordings affect their actions? The participants also knew that the focus of the study is the motivation to learn. What effect does the awareness of the purpose of the study have on their activities? Although the participants were used to being observed during ICT and other lessons, there are some differences between the environment of this study and a typical ICT classroom. This observer effect could give a distorted impression of the behaviours they exhibit and the nature of their interaction with the e-learning activities (see, for example, Newby 2010, Jones & Somekh 2005; Robson 2002; Fraenkel & Wallen 2008).

The awareness of the observer's presence and the purpose of the study is not the only threat. The researcher's characteristics, ideas and expectations also introduce some bias into what is seen during the interaction and in the recordings. Total objectivity cannot be achieved, as our understanding of what we observe is to some degree influenced by our own experiences (Fraenkel & Wallen 2008). Robson (2002) simplifies this by explaining that the researcher can be selective in what they pay attention to, how they interpret what is seen, and what they remember. It is difficult to measure the observer bias; researchers may not be aware of their bias.

The researcher believed that adequate attention ought to be given to these threats to the validity of this study. Some researchers have made suggestions for tackling the observer effect and observer bias that can occur during the observation of and analysis of recordings of interactions (see, for example, Robson 2002; Fraenkel & Wallen 2008; Jones & Somekh 2005). One suggestion that was useful during this study was the importance of building positive relationships with participants. The way their interactions would be analysed and reported was explained clearly, with a particular reference to anonymity and confidentiality. Throughout the process, the researcher also thoroughly reflected on own preconceptions and possible observer effects.

Clearly, these efforts only minimise the impacts of observer effect and bias. They do not eliminate them. Relying on data from the observation and recording of interaction was therefore not sufficient for this study, in which academic rigour is paramount. Moreover, observation and recording of interaction were only useful for reporting motivational behaviours, but not for explaining the reasons for the motivational behaviours. This weakness of observation and recording interactions made *focus group interviews* an additional data collection method for this study.

The researcher agrees with Patton's (1990) view that:

> "We interview people to find out from them those things we cannot directly observe. The issue is not whether observation data is more desirable, valid or meaningful than self-report data. The fact of the matter is that we cannot observe everything…We cannot observe feelings, thoughts and intentions. We have to ask people questions about those things" (Patton 1990, p. 86)

Apart from their use for collecting information about participants' feelings, thoughts and intentions, the focus group interviews were useful for verifying or refuting the findings during the observation and recording of the interactions. The strengths of focus group interviews for this study, such as the possibility of gathering rich, qualitative data through group interactions and the participant's ability to link it to normal classroom discussions, have been discussed in previous sections (see the data collection methods for the survey in section 5.4.1). The weaknesses of focus group interviews, such as the researcher's influence on responses and the effects of the dynamics of the group on the discussions, have also been discussed. Rather than simply acknowledge the weaknesses of focus group interviews, appropriate steps were taken to minimise the effects of the weaknesses. This was similar to the steps taken for the focus group interviews for the survey.

The reasons for choosing to combine observation, recording of interaction and a series of focus group interviews as data collection methods for the multiple-case studies have been discussed in this section. This selection of methods was due to the desire to gather rich, varied and relevant data and for triangulation purposes, by compensating for the weaknesses of each method. Finding answers to the second and third facets of this study required seeing them in action and understanding their feelings. Using a combination of observation, recording of interaction and focus group interviews provided the opportunity to collect the relevant data.

5.5 DATA COLLECTION INSTRUMENTS

5.5.1 SURVEY: DATA COLLECTION INSTRUMENTS

The decision to use online questionnaires and focus group interviews as data collection methods for the survey was based on: consideration of the research questions; the strengths and weaknesses of the methods; and their practicality. It was also important to devise appropriate instruments that can collect, measure and record data effectively. The survey required the use of appropriate attitudinal measures that would provide answers to the first facet of this study (attraction).

The researcher attempted to locate existing instruments that could be used for, or adapted to fit, this study (see Creswell 2005; Fraenkel & Wallen 2008). It was difficult to locate existing instruments that would effectively address the requirements of this study. The researcher therefore decided to develop instruments specifically for this study. Steps were taken to ensure the validity and reliability of the instruments. In particular, the work of Benson & Clark (1982) provided a useful framework for developing and validating the instruments. They suggested four phases – planning, construction, qualitative evaluation, validation. Whilst following these steps in the framework does not guarantee the validity and reliability of the instruments, use of the framework provided a systematic approach to developing the instruments.

The *online questionnaires* included a combination of fixed-response questions (where respondents can only select from a number of fixed options) and open questions (where respondents can enter text to clarify their choices or provide more information). The researcher paid care and attention to ensure that the questions in the questionnaire provided answers to the research questions. The researcher also ensured that the appropriate scales of measurement were used. Not only was it important to ask appropriate questions, it was important that the options provided accurately captured the views of the respondents.

The questions and the options were developed in consultation with the researcher's supervisor, who was very generous with his time to critique and provide feedback on the questionnaire. The approach to testing and improving the questionnaire was an iterative one, where the process continued until there was a sense of confidence that the questionnaire was fit for its purpose. In addition to the thorough "test-improve-retest" process, the views of sixteen members of the target population in one of the schools were used during a pilot study to refine the questionnaire. These efforts ensured that reasonable steps were taken to:

- Motivate respondents to complete the questionnaire – by using an introduction to persuade respondents to proceed and by placing fact-based questions before opinion-based questions;
- Eliminate questions that led the respondents towards a certain answer;
- Ensuring the simplicity, clarity and appropriateness of the questions and options, through the elimination of complex, burdensome or ambiguous questions;
- Avoid the use of emotive language, which could influence the respondents' response;
- Eliminate questions where the researcher had made false or inaccurate assumptions about respondents' knowledge or understanding;
- Avoid double-barrelled items, where two questions or options are presented as one;
- Increase the likelihood that questions and options would have the same meaning to all respondents.

This process facilitated the development of a viable online questionnaire suitable for collecting relevant data. The refined online questionnaire can be found in **appendix 9**. The online questionnaire had an introduction page and five other pages. The introduction page explained the purpose of the online questionnaire and persuaded respondents to proceed. Page 1 contained questions seeking to collect general information about the respondent – age and gender. Page 2 included questions about their use of computers and their perceived levels of proficiency with computers. Page 3 probed further into their use of computers for learning. Page 4 sought to compare computer-based learning to other forms of learning. Page 5 thanked them for completing the questionnaire.

The same process was used to develop an effective set of questions (and possible prompts) for the *interview schedule* used for the focus group interviews. Although the questions in the online questionnaire allowed respondents to enter comments, the interviews were an opportunity to collect more detailed data. The questions in the focus group interview schedule were designed to collect complementary qualitative data whilst providing the opportunity to clarify obscure questions, and prompt respondents to expand on particularly important or revealing responses (see Creswell 2005). Taking the advice of Burgess (1984) and Arthur & Nazroo (2006), the focus group interview schedule was used, not as an exact precision of coverage, but as an aide-mémoire or mechanism for steering the discussions.

The oral, face-to-face nature of the focus group interviews made it necessary to establish a good rapport with the respondents whilst facilitating a good rapport between the respondents (Davies 2010; Cohen et al. 2007). Hence, the focus group interview schedule included the use of an icebreaker activity to allow participants to interact with each other. The researcher and participants were asked to share three pieces of information about themselves. This activity also made it possible for the researcher to identify some of the characteristics of the participants early on in the process.

Like the questions in the questionnaire, the input from the researcher's supervisor and the sixteen members of the target population ensured that the focus group interview schedule was fit for purpose. The result of the test is a refined focus group interview schedule that was likely to collect data about the attraction to computers. The focus group interview schedule can be found in **appendix 10**. The prompts were particularly useful during moments of silence and for probing further into the views of participants.

There was the need to keep full and accurate records of what was discussed during the focus group interviews. Relying on memory and field notes alone can lead to partial recall and errors due to the incomplete account of the discussions (Denscombe 2007; Fraenkel & Wallen 2008; Davies 2010). The researcher considered the appropriateness and the possible effect of video or audio recording. Firstly, the researcher considered the possibility that participants might be less willing to fully take part (or be truthful) in the discussions if video or audio recording were used (see Harper 2005). The researcher also considered the ethical and child protection issues associated with gathering videos or audio evidence of minors, as pointed out by Gold (1989).

Audio recordings were selected as they presented a balance between getting the complete record of the discussions, whilst addressing some of the ethical, child protection and reluctance issues. As Patton (2002) pointed out, audio recordings do not eliminate the need for taking field notes. The researcher also took field notes which provided a means of recording non-verbal communication, the atmosphere and other contextual factors.

This section details the steps taken to develop and fine-tune the research instruments – the questionnaire and the interview schedule. The focus of the process was the appropriateness of the instrument for collecting data relevant to the research questions. All the questions in the online questionnaire and focus group interview schedule have been designed to collect information relevant to the research questions. **Appendix 11** shows the questionnaire and focus group interview questions mapped with the research questions. The inclusion of comment boxes (in the online questionnaires) and the flexibility (in the use of the focus group interview schedule) made it possible to collect qualitative data to complement the quantitative data.

5.5.2 MULTIPLE-CASE STUDIES: DATA COLLECTION INSTRUMENTS

The data collection methods used for the multiple-case studies (observation, recording of interaction and focus group interviews) were selected because of the desire to not only see the motivational effects of e-learning, but to also understand feelings, thoughts and ideas of the target population. The data collection methods were selected because of their combined suitability for answering the research questions relating to novelty and activities (the second and third facets of this study), through the gathering of rich, qualitative and contextualised data.

The uniqueness of the multiple-case studies meant that there was difficulty in finding existing instruments that could be used. It was therefore necessary to devise instruments for the multiple-case studies, ensuring that they were valid and reliable. The qualitative nature of the multiple-case studies meant that objective measurement instruments did not seem to be appropriate. The multiple-case studies required some level of flexibility during data collection, to ensure that all the relevant data were collected. Objective instruments were therefore not suitable.

More importantly, the qualitative nature of the study made the researcher an instrument, bringing a particular dimension into the inquiry (Patton 2002). In fact, the researcher believed that the primary and most significant instrument is the person who controls the data collection process, the analysis and the reporting of findings – the researcher. Hence, the researcher's self-awareness and reflexivity were the most important considerations of this study (see MacBeth 2001; Patton 2002; Schwandt 2001). Throughout this study, the researcher engaged in an ongoing examination of their own perspective in relation to the participants' and those receiving the findings of the study (see Patton 2002).

One of the instruments used for the multiple-case studies was the *activity log*. It was used to record the participants' reactions and activities during their interaction with the e-learning activities. It was also used to record the motivational clues that were detected during the playback of the recorded interactions. The activity log included the facility to make descriptive notes, but also reflective notes (as suggested by Creswell 2005 and Fraenkel & Wallen 2008). The activity log also included the "collection of concepts", which was designed to integrate several conceptual models for this study instead of a single conceptual model. This allowed the researcher to identify and record elements of the "collection of concepts" that were observed. The activity log is in **appendix 13**.

An *interview schedule* was devised to act as aide-mémoire for the focus group interviews. The goal was to gather and record relevant data that would provide answers to the research questions. To ensure that the interview schedule was suitable for this study, a thorough "test-improve-retest" approach was adopted. Drawing on the experience of the researcher's supervisor and the sixteen members of the target audience in one of the schools (during a pilot study), suitable questions and possible probes were developed. **Appendix 14** shows the refined focus group interview schedule.

The researcher also devised a *self-report form*, which participants used to record their initial thoughts immediately after their interaction with each e-learning activity. The self-report form had two benefits. It made it possible for participants to record their immediate thoughts and feelings after their interactions. The researcher believed it would be more accurate to capture their thoughts and feelings shortly after the interaction with each e-learning activity.

The self-report form also served as a reminder of the participants' experiences during the focus group interviews. Bernard (2000) stressed the importance of this approach by describing it as "cued recall", where participants are asked to consult records to remind them of past events. As people's memories sometimes fail them, using the self-report form can increase the accuracy of their self-reported behaviours (Bernard 2000). Like all the other instruments in this study, this self-report form went through a rigorous process of testing to ensure it was suitable for this study. **Appendix 15** shows the refined self-report form.

This section explains the process of selecting and fine-tuning the research instruments – activity log, interview schedule and self-report form. **Appendix 16** shows the self-report and focus group interview questions mapped with the research questions. Throughout the process, the key consideration was their suitability to collect reliable and valid data. The iterative approach to testing and refining the instruments led to significant improvements to the instruments. The role of the researcher as an instrument was also discussed, with the researcher taking deliberate steps to be self-aware throughout the research process. Most importantly, this section explains how the data collection instruments were combined and used to collect rich qualitative data for the multiple-case studies.

5.6 SAMPLING

5.6.1 SAMPLING STRATEGY

The inquiry into the first facet (attraction) was approached through a survey, with online questionnaire and focus group interviews as the data collection methods. The second and third facets (novelty and activities) were approached through multiple-case studies, with observations, recordings of interactions and focus group interviews as the data collection methods. The target population is large and has a range of characteristics. The researcher had access to some of the characteristics of the population (such as total numbers of each gender), but many other characteristics (such as learning styles, personality, prior attainment and social backgrounds) were unknown. A major issue was how to select a suitable sample that was representative of the population. This issue is not unique to this study, as Becker (1998) expressed:

> "Sampling is a major problem for any kind of research. We can't study every case of whatever we're interested in, nor should we want to. We need the sample to persuade people that we know something about the whole class" (Becker 1998, p. 67)

Becker (1998) was referring to the need to select a sample that was representative of the population. Generalising from an unrepresentative sample is likely to raise questions about the validity of the study (Creswell 2005; Maruyama & Deno 1992). The researcher recognised the importance of a representative sample, but had to deal with several constraints. Firstly, child protection and data protection legislations meant there was restricted access to the full list of the target population. Secondly, the characteristics of the target population were mostly unknown. This ruled out probability sampling techniques, such as random, stratified and systematic sampling.

In fact, some refer to the probability sampling techniques as "representative sampling", suggesting that they are a robust method of providing representative samples, which ultimately increase the external validity of research (Bernard 2000; Robson 2002, Leman 2010a, Fraenkel & Wallen 2008). However, it is also fair to say that probability sampling techniques do not guarantee representativeness because of the randomness associated with them (Gobo 2004; Lewin 2005; Fraenkel & Wallen 2008).

In this study, the researcher sought to strike a balance between selecting a suitable sample and dealing with the practicality of conducting the research in schools. This study combined *census* (involving the entire target population) and carefully selected *purposive samples* (where teachers' knowledge and access to data about the population were used in the selection of participants). The entire cohort in the three schools were invited to complete the online questionnaire. This meant that the entire population were included in this aspect of the study. In other cases, the teachers were asked to select participants based on the guidelines below:

- The participants from each year group should have *equal numbers of males and females;*
- The participants from each year group should have *varying academic abilities (based on teachers' perceptions and attainment data);*
- The participants from each year group should have *varying levels of proficiency in the use of computers (based on teachers' perceptions);*
- The participants from each year group should have *varying levels of motivation to learn (based on teachers' perceptions).*

In most cases, purposive sampling involves using personal judgement to select participants that would be appropriate for the study (Davin & Sutton 2004; Robson 2002; Fraenkel & Wallen 2008; Leman 2010a). The researcher believed that samples that included both genders, varying academic, proficiency and motivation levels, would represent the typical characteristics of the population. Purposive sampling ensured that the samples included the typical characteristics of the population, meeting the needs of this study whilst using the expert knowledge of the teachers.

Although the researcher did not have access to information about the population, the teachers did (but were unable to disclose such information). Moreover, the teachers had regular contact with the target population, so they had first-hand knowledge of their students. It made sense to use the teachers' knowledge of their students to select the sample. The guidelines ensured that the selected sample in each school met the requirements set by the researcher. The accuracy of teachers' judgement of their students might be questioned. Whilst this might be worth considering, their inside information meant that their judgement was likely to be far better than the researcher's lack of information. **Table 6** (below) shows an overview of the sampling strategy used in this study:

Inquiry	Approach and data collection methods	Sampling techniques
First facet (attraction)	Survey, through: • Online questionnaires • Focus group interviews	Combination of: • Census of whole cohort was used for the online questionnaire • Purposive sampling was used for the focus group interviews
Second facet (novelty) Third facet (activities)	Multiple-case studies, through: • Observations • Recordings of interactions • Focus group interviews	Purposive sampling

Table 6: Overview of the sampling strategy used in this study

5.6.2 SAMPLE SIZE

Apart from the census surveys using the rather cheap online questionnaires, it was impossible to collect the views of the entire population. Apart from the constraints of limited knowledge of characteristics of the population, there were financial and time constraints. This made it necessary to work with a purposive sample of the population, which took advantage of the teachers' professional judgement and access to student information. Like Lewin (2005), Galfo (1983) explained how time and funding limitations could force researchers to work with a sample, stating:

> "Because of the limitation of time and funding, perfect induction or complete enumeration of the total population being studied is not always possible. The investigator must work with only a sample of the population" (Galfo 1983, p. 66)

Apart from the need to select a sample, the limitations of time and funding affected the size of the samples selected for this study. The researcher needed to select a manageable amount of participants for the focus group interviews and the case studies. It was decided that the samples should be made up of six students – a boy and a girl, per year group.

Between them, the sample included both genders, varying academic, ICT proficiency and motivation levels.

Although some researchers, such as Fowler (1988), Lipsey (1990) and Cohen (1977), have put forward some formulas for calculating suitable sample sizes, the unknown variation in the characteristics of the population meant mathematical calculation of a suitable sample size was problematic and impractical. Nevertheless, six participants per school could be considered rather a small sample.

The researcher believed that representativeness is not a simple case of "the larger the better" (David & Sutton 2004; Leman 2010a). The guidelines set for selection helped in the selection of participants who had some of the typical characteristics of the population. It was more important to select small, but carefully chosen samples that reflect the typical characteristics of the population (see Oppenheim 2005). The selected samples made the research activities manageable, considering the time and financial constraints. Furthermore, the smaller sample size enabled the researcher to conduct in-depth analysis, which has credibility, rather than a broad and superficial overview with limited insight.

5.7 DATA COLLECTION PROCEDURES

5.7.1 PILOT STUDY

Many researchers have written about the importance of conducting a pilot study. Gay et al. (2009) described pilot studies as "dress rehearsals" that allow researchers to identify unanticipated problems and issues in the data collection procedures. Robson (2002) and Bell (2005) added that piloting provides an opportunity to revise the design to ensure that meaningful data can be collected during the live study. He explained that piloting was particularly important for fixed research designs. To emphasise its importance, piloting has been described as "an integral part of any research" (Youngman 1994, p. 180).

In this study, piloting was used to refine the research instruments and fine-tune the research procedures before the live study started. It also gave first-hand experience of the complexities the researcher would encounter during the live study. A convenience sample (see Cohen et al. 2007) of sixteen participants from the target population was selected. The participants of the pilot study were from School A. Though chosen out of convenience, they reflected the characteristics required for the live study – both genders, varying ages, levels of proficiency, academic ability and perceived motivation to learn. It must be pointed out that the sixteen participants were included in the census survey, but not the other research activities. In addition to the pilot study, detailed feedback from the researcher's supervisor was used to improve the instruments and procedures.

In February and March 2011, the draft online questionnaires were shown to the participants for feedback. They provided useful feedback. For example, they pointed out that asking whether people were "attracted" to computers could be misleading or even inappropriate. They also recommended that magazines should be removed from the list of possible alternatives to computer-based learning. They pointed out that magazines could distort the responses because magazines are associated with fun and were rarely used for academic learning. An iterative approach was taken to testing and refining the online questionnaire. The result was an online questionnaire that the researcher hoped would be valid and reliable for this study. The questionnaires took between six and twelve minutes to complete during the pilot, which seemed to be an acceptable timeframe for the target population.

In March 2011, the quality of the interview schedule for the survey was evaluated. Six of the sixteen participants of the pilot study were interviewed. This was a particularly useful experience. They gave first-hand experience of how the interview questions might be received and interpreted during the live study. Through the pilot interviews, the researcher was able to practice, review and hone interviewing skills, as mentioned by Fielding & Thomas (2001). Finally, the pilot interviews made it possible to refine questions and develop more probes that stimulate discussions (see Barbour & Schostak 2005). The result of the pilot interviews was a slightly confident and "aware" researcher, equipped with a refined interview schedule, ready for the live interviews.

In April 2011, the e-learning activities for the multiple-case studies were shown to the sixteen participants of the pilot study. They confirmed that the activities were moderately challenging and covered unfamiliar topics. This confirmation was crucial because it was important that the activities tested participants' motivation to engage in and persist in the e-learning activities. The researcher also got the opportunity to practise and understand the challenges of observing participants while they interacted with the e-learning activities, something that Robson (2002) described as "learning on the job".

The research instruments for the multiple case studies – the activity log, the self-report form, and the interview schedule – were also put to the test. Initially, the researcher intended to use the activity log to observe more than one participant at the same time. The pilot study revealed that this approach was not practical, as it was difficult to accurately record all events at the same time. This was the reason for use of recordings of interactions to compensate for this issue. The researcher also recognised the benefit of the self-report form when they served as good reminders during the pilot interviews. Finally, the interview questions and probes were refined to ensure that meaningful data were collected.

5.7.2 LIVE STUDY

Following the pilot study, where the researcher gained first-hand experience of the research environment and the research instruments were thoroughly refined, the researcher proceeded to the live study. The first activity was the administration of the online questionnaires. In April 2011, all years 7, 8 and 9 students in the three selected schools were asked to complete the online questionnaires. This took place at the start of their ICT lessons, with the teachers supervising their activities. The students had the option to opt out of the online questionnaires. Parents could also complete an opt-out form to indicate that they did not want their children to complete the online questionnaires.

Between June and July 2011, the same online questionnaires were administered again. This approach is often referred to as a panel study (Singleton & Straits 2005; Bernard 2000; Fraenkel & Wallen 2008). In this study, it was used to verify the findings from the first set of online questionnaires. As online questionnaires were very cheap to administer and analyse, the researcher decided to use the second set of questionnaires as a way of checking the data collected through the first set of online questionnaire. The results can then be compared, thus improving the credibility of this study.

Between June and July 2011, the researcher also conducted the focus group interviews in the three schools. These focus group interviews focussed on the first facet (the attraction). The interview schedule can be found in **appendix 10**. There were six selected participants from each selected school. The researcher did not see the need to break the groups into subgroups, as six was found to be a manageable number of participants. The six participants also included all the characteristics that were required. Audio recordings of the focus group interviews were used to capture the full discussion. Field notes were also used to record additional data, such as facial expressions and body language.

The next research activity was the interaction with the twelve e-learning activities. This took place in June and July 2011. The six selected participants from the selected schools were invited to use the e-learning activities. The participants were allowed up to 40 minutes on each activity. They were given the freedom to stop interacting with (or return to) the e-learning activities for whatever reason and at any point. They were also asked to complete the self-report form (see **appendix 15**) immediately after interaction with each activity. A digital clock was provided to help them estimate how long they spent on each activity and how long it remained novel to them.

The researcher used the activity log (see **appendix 13**) to record the behaviours experienced during their interaction with the e-learning activities. Their interactions with the e-learning activities were also recorded using screen-recording software (Matchware ScreenCorder 5). At a later time, but within two days, the activity log was used to record the motivational clues that were detected during the playback of the recordings. Unfortunately, the recordings of interactions of participants in Schools B and C could not be retrieved because the screen-recording software crashed. It was not possible to re-record the activities because the crashes occurred at the end of all the interactions and the recording had been lost. Records of the researcher's observation were however available for analysis.

Following the interactions with each type of e-learning activity, focus group interviews were conducted. The goal was to discuss the experiences of the participants during the interaction with the e-learning activities, answering questions relating to the second facet (the novelty of the activities and the features) and the third facet (the motivational effects of the activities). The participants used the self-report forms, which they had completed during the interactions, to remind themselves and the rest of the group about their experiences. The focus group interviews were recorded using a digital audio recorder in order to fully capture the discussion. The researcher also used field notes to gather additional data.

At this point, the researcher had gathered a wide range of rich quantitative and qualitative data. The census survey ensured that the views of most of the 11 to 14 year olds were captured, providing data relevant to the first facet (attraction). The six participants from each school also provided the opportunity to gather in-depth qualitative data to complement the data from the online questionnaire. The data collection procedures, with the aid of the six participants from each school, also provided rich, in-depth qualitative data needed for explaining the research questions relating to the second and third facets (novelty and activities).

5.8 DATA ANALYSIS AND STORAGE PROCEDURES

5.8.1 SURVEY: DATA ANALYSIS PROCEDURES

The online questionnaires were used to gather quantitative data. The benefit of using online questionnaires was that the data were already collated and was available in an electronic format. The data were downloaded into Microsoft Excel 2007 and PASW Statistics 18 (SPSS). Although the data were already organised into pivot tables, it needed to be analysed and interpreted. The researcher used simple descriptive analysis – in particular, frequency tables, percentages and charts – to describe the views of the learners. Cross-tabulations were also used to highlight differences in responses from one school (or other variables) in relation to others. Following the advice of Haughton & Stevens (2010), the researcher decided to focus on the research questions first, before expanding into wider areas that seemed interesting.

The online questionnaires also provided useful qualitative data as they allowed participants to add open comments. This qualitative data were analysed along with the data from the focus group interviews. A few days after each focus group interview, the researcher made verbatim transcripts of the audio recording, in order to capture the full discussion. However, the researcher was aware that transcripts are always partial and selective (Rapley 2007). As spoken material is converted to text, the context, language and feel of the discussions are lost (Arksey & Knight 1999). To address this issue, the field notes taken during the focus group interviews were used in conjunction with the transcripts.

The researcher started the analysis by reading all the transcripts, field notes and the open comments from the questionnaires. This improved familiarisation with the data and the key concepts emerging from it. The researcher then proceeded to coding the data. The researcher was mindful that qualitative data, compared to quantitative data, are typically spread out, imprecise and context-based. It was therefore necessary to scrutinise the data and exercise care in the interpretation of the data (see Bogdan & Biklen 2007).

The researcher decided to use a combination of deductive and inductive approaches to coding. Smith & Davies (2010) explained that the deductive approach is concept-driven, based on a review of literature. In contrast, the inductive approach is data driven, emerging from the data. The "collection of concepts", based on key concepts from several e-learning research models, had been devised for this study. The researcher however believed that this should be combined with any other themes that emerged from the data. The "collection of concepts" acted as a starting point for coding the data, with the emerging coding categories ensuring that the study was not limited to just the concepts in the collection.

The researcher then went through the open comments from the questionnaires, the transcripts and the field notes, marking each unit of data (paragraphs, phrases, words, sentences) pertaining to the coding categories. In some cases, units of data fitted into more than one coding category. Hence, many units of data had more than one marking next to them. The researcher proceeded to interpret the coded data, asking difficult (but necessary) questions about: the dominant themes; the relationships between the themes; the relationship between the themes and existing literature; and new meanings that could be proposed (see Bryman 2008; Sandelowski 1998; Smith & Davies 2010).

5.8.2 MULTIPLE-CASE STUDIES: DATA ANALYSIS PROCEDURES

For the multiple-case studies, the researcher had a wide range of qualitative data to analyse. This included the activity logs completed during the sessions whilst the participants interacted with the e-learning activities. The activity logs were also used to record motivational clues that were inferred during the playback of the recordings of the interactions with the e-learning activities. In fact, some analysis occurred during the observation and completion of the activity logs. This is because the "collection of concepts" was incorporated into the activity log and were used to record occurrences of events that related to the elements in the "collection of concepts".

The activity logs were considered with other qualitative data – verbatim transcripts of the audio recording from the focus group interviews, the field notes taken during the focus group interviews, and self-report forms completed by the participants. Before coding the data, the researcher read through all the material in order to have a grasp of the key content and context (see Smith & Davies 2010). The "collection of concepts" were used for coding whilst additional coding categories were generated from the data, combining deductive and inductive approaches to coding (see David & Sutton 2004; Smith & Davies 2010). Additional coding categories were generated by marking units of data (words, phrases, patterns of behaviour, events, and participants' ways of thinking) that stood out (see Bogdan & Biklen 2007).

The researcher agrees with Corbin & Holt (2005) that concepts and themes do not wave red flags denoting their importance. Events, behaviours and views that are significant to the research questions could go unnoticed or could be considered less important. The researcher therefore took steps to interact with the data, by asking questions and making comparisons between the units of data and comparing the data to existing literature (see Creswell 2009; Corbin & Holt 2005; Strauss & Corbin 1998; Bryman 2008; Sandelowski 1998; Smith & Davies 2010).

The researcher's interpretations were sent to the participants (member checks) in an attempt to increase the trustworthiness of the study (see Gay et al. 2009; Guba 1981). The member checks served as a way of checking the accuracy of the researcher's findings and interpretations (Creswell 2005). It was also done in compliance with the ethical principles adopted for this research, where mutual respect between the researcher and participants is taken seriously (the ethical principles are discussed in later sections).

As the participants might want to please the researcher or might not understand the research findings, the researcher asked someone else to check the data gathered and research process against the interpretations (external audit). The external auditor, though known to the researcher, helped the researcher to get an outsider's view of whether the findings are grounded in the data; the degree of researcher bias; the accuracy of the inferences; and the suitability of methodological decisions (see Schwandt & Halpern 1988; Creswell 2005).

5.8.3 STORAGE PROCEDURES

In a few cases, personal data about the participants were gathered. The participants were generally between the ages of 11 and 14. Hence, the participants, their parents and teachers, would naturally expect some assurance that the data would be handled with sensitivity and stored in a secure place. The researcher ensured that all the data collected were not disclosed to any other party.

The online questionnaire data were stored on the servers of a survey company. They assured customers about their security arrangements stating that their "linux servers are ultimately secure and it is impossible for anyone external to gain access to the data". They also indicated that their "survey data and responses are backed up daily".

The Microsoft Excel spreadsheets, the PASW (SPSS) files, the interview transcripts and the recordings of the interactions were all stored on a password-protected computer. The files were also password-protected where possible. The non-electronic materials, such as activity logs and field notes, were also secured in a locked cabinet. These became a form of case record, which can be used to verify the researcher's interpretations (see Stenhouse 1978, Walker 2002).

5.9 TIME SCHEDULE

The Gantt chart below, figure 3, shows the research activities and when they were carried out. In the interest of transparency, the researcher wishes to point out that the activities and the timings in this schedule are very different from the predictions in the research proposal. This is because the researcher's understanding of social research has significantly improved since the time of the proposal. Hence, it has been necessary to modify the proposed approach to the study. Greater understanding of the areas of inquiry, owing to extensive and ongoing review of literature, has also contributed to the changes in activities and timings.

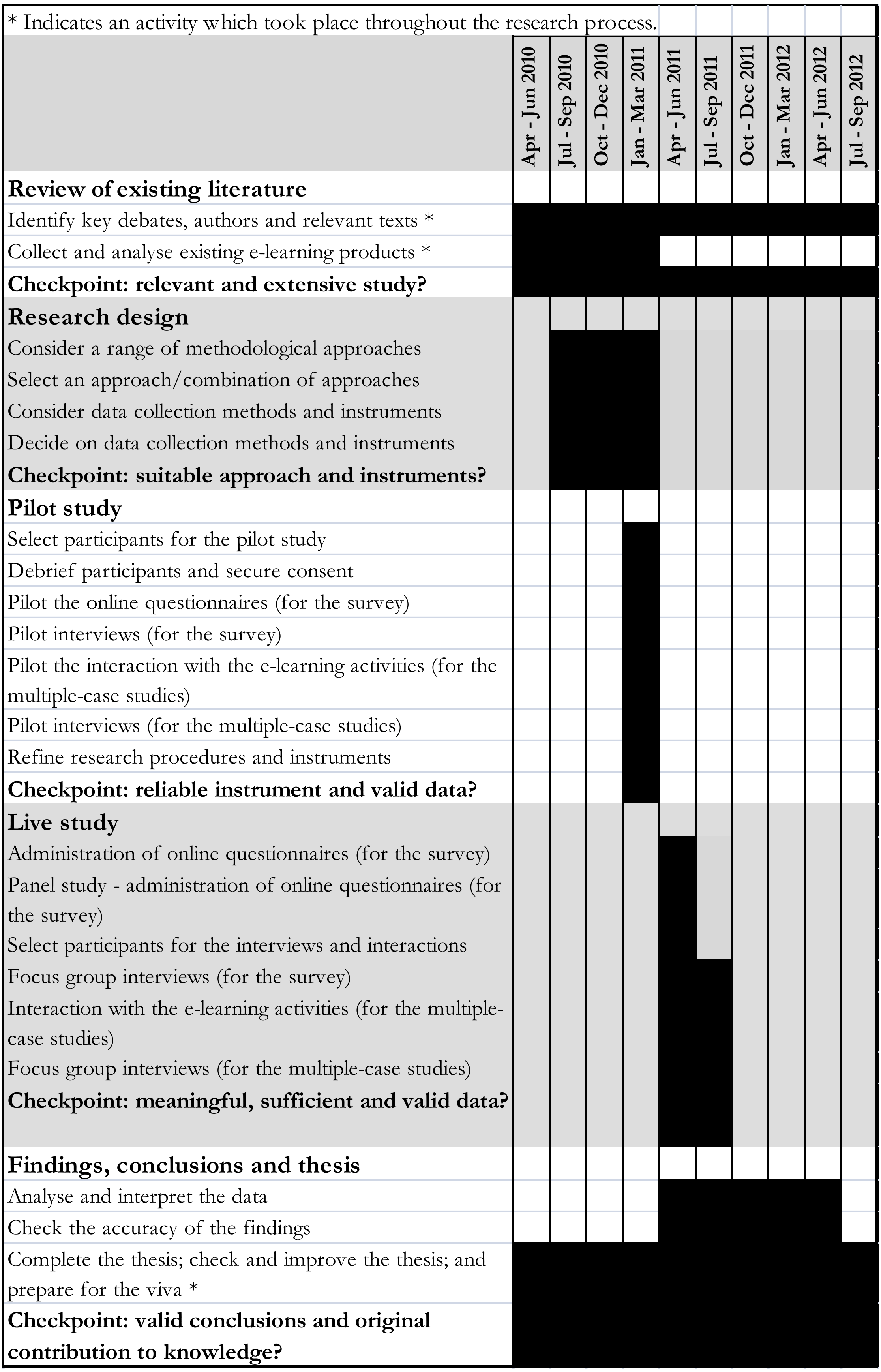


Figure 3: Gantt chart showing the research activities and timings

5.10 ETHICAL CONSIDERATIONS

5.10.1 THE ETHICAL PRINCIPLES THAT GUIDED THIS RESEARCH

Gathering data about motivation to learn is an intrusion into the daily routine of learners and their teachers. This level of intrusion ought to be matched with the appropriate level of respect and trust. The researcher was keen to create a win-win relationship – whereby participants are pleased to take part, valid data are collected and constructive conclusions are obtained. The researcher recognised that it is their duty to identify and address possible ethical issues (see Deetz 1985).

Many researchers have tried to list the ethical issues associated with social research in general. For example, Miles & Huberman (1994) produced a broad list of typical ethical issues. Moreover, Fetterman (2009) described several ethical issues using life cycle terms like inception, birth, adolescence and retirement. The list provided by Renzetti & Lee (1993) bears a great deal of resemblance to the issues that are associated with this study. They stated that:

> "The ethical issues include privacy and confidentiality, safety of individuals, validity of the research, respectful communication including consent and debriefing, avoidance of deception, equitable treatment of all the parties involved, responsible stewardship of the data and of the knowledge that is gained, and responsible relationships with participants" (Renzetti & Lee 1993, p. 19).

Following the identification of possible ethical issues, the researcher set some principles that would be adhered to throughout the study. In order to protect the researcher, the research work and the participants, the following principles, as suggested by Miller & Brewer (2003), were adopted:

- Informed consent – Throughout the study, clear and straightforward information about the aims of the research, the approximate timings of the activities, and how the data will be used were communicated to participants.

- Voluntary consent – Participants were always reminded that taking part in the research is voluntary and that their desire to pull out at any time would be honoured and respected.

- Confidentiality – Participants were informed that their identities would be protected but their personal views and actions could be revealed during or at the end of the research. These personal views and actions would be recorded and reported in a way that protects the identities of the participant. Participants were also informed of the importance of keeping the identities and views of the other participants confidential.

- The academic community – The participants were reminded throughout the study that the researcher has a professional duty to report findings without any falsification. The findings would however be presented to them for checking.

5.10.2 PERMISSIONS, INFORMATION, OPT-OUT AND CONSENT

The principles identified in the last section guided this research. Before proceeding to the fieldwork, the researcher made an application to the Ethics Committee of the School of Education and Lifelong Learning at the University of East Anglia. This application was to secure approval to conduct fieldwork, declare possible ethical issues, and demonstrate how these issues would be addressed. Supporting documents, such as permission letters, consent forms, participant information sheets and research procedures were submitted along with the application. This application was approved in April 2011.

The researcher sent letters to the headteachers of the selected schools. The letter provided information about the purpose of the research, the research activities, and the timings of the activities. The headteachers were asked to confirm whether the research could take place in the schools. All three headteachers gave permission for the study to take place in the schools. Likewise, letters were sent to the individual teachers involved in the study with similar information as the headteachers. They also confirmed their support for the study. The letter sent to the headteachers can be found in **appendix 17** and the letter sent to the teachers can be found in **appendix 18**.

Although the entire cohort of years 7, 8 and 9 were invited to complete the online questionnaire, they were allowed to opt out. Their parents were also provided with information sheets and tear-off opt-out forms (see **appendix 19**). There was a deliberate attempt to make the information sheets and opt-out forms easy to understand.

Each selected participant for the interviews and the interactions with the e-learning activities was provided with an information sheet and tear-off consent form (see **appendix 20**). The simplicity of language and use of cartoon-style images was a deliberate attempt to make them accessible and secure the trust of participants. They were not allowed to take part in the study until the consent forms were returned, signed by parents or guardians. Throughout the study, the participants were informed that their personal information would not be disclosed to anyone else. During data collection, personal data were recorded in such a way that they could not be linked to the individuals. They were however informed that their views and actions could be presented at a professional meeting or published. The fact that other participants could know their views was stressed.

Ethical considerations were taken into account throughout the research process. The ethical principles, which were explained in the previous section, guided the study. It was hoped that they would make it possible for the research to be conducted in a cooperative environment, where mutual respect and truthfulness are established.

5.11 VALIDITY AND RELIABILITY

5.11.1 THE IMPORTANCE OF VALIDITY AND RELIABILITY

Just as it is the duty of the researcher to ensure that ethics are considered throughout the study, the researcher believes that there is also a duty to try to optimise validity and reliability. Validity refers to "the appropriateness, correctness, meaningfulness and usefulness of the specific inferences researchers make based on the data they collect" (Fraenkel & Wallen 2008, p. 148). In other words, validity relates to whether the inferences correspond to the research questions and whether they offer the "truth" of the situation.

Muijs (2011) makes the point that ensuring validity in educational research is not as simple or obvious as it seems. He explains that the concepts measured in educational studies often cannot be measured directly. For example, it is difficult to measure attitudes and feelings because we cannot plug directly into learners' heads. He described these concepts as *latent variables*. Hence, researchers have to develop instruments (such as questionnaires) that measure these concepts indirectly. These instruments, which he described as *manifest variables*, are designed to measure the latent variables. He stresses that it is difficult to know whether the manifest variables are in fact measuring what they are purporting to measure.

Other authors (for example, McMillan 2008; Cohen et al. 2011; Miller et al. 2012) have highlighted that validity goes beyond the measure, what Muijs (2011) described as the manifest variable. They argue that validity relates to the *inferences* that are generated from the measure, not the measure per se. Whilst the measure may be valid, there is still the likelihood that the inferences generated from the results would be invalid. According to McMillan (2008), the validity of the inference is determined by an overall evaluative judgement, based on the evidence gathered and the nature of the interpretation. Hence, validity is not to be considered an absolute value, but a matter of extent (Cohen et al. 2011; Gronlund 1981; McMillan 2008).

Considering validity as an overall evaluative judgement of the extent to which the inferences are appropriate and meaningful, it is no surprise that many authors have put forward different kinds of validity. For example, Maxwell (1992) suggests descriptive validity (the factual accuracy of the report); interpretative validity (the researcher's ability to identify and interpret meanings); theoretical (the theoretical explanations); generalisability (the suitability for other contexts); and evaluative validity (the taking of an evaluative position). In fact, Cohen et al. (2011) lists twenty kinds of validity. Most notable are internal validity (the extent to which the explanations are based on the data); external validity (the extent to which the explanations can be generalised to other contexts); and content validity (the extent to which the instruments measure the items they are meant to measure).

More importantly, the researcher understands that, if appropriate and meaningful inferences are to be made from the study, there needs to be a deliberate attempt to guard against invalidity throughout the research process. Cohen et al. (2011, p. 198) explained that invalidity can be "both insidious and pernicious as it can enter at every stage of a piece of research". During the research process (from the design, to data collection, to analysis and to the dissemination of findings), threats can be introduced to the validity of studies. Whilst there is no foolproof way of guaranteeing validity (Robson 2002), certain steps could be taken (and have been taken) to increase it. These are reported in the next section.

Highly connected to validity is reliability, the "stability and consistency with which we measure something" (Robson 2002, p. 101). Reliability is concerned with the precision of the measure – the likelihood that we will arrive at similar results if the research is carried out in a similar context. An unreliable measure is a serious problem for research because the results would be untrustworthy (Muijs 2011).

Hence, researchers take steps to estimate and improve reliability. McMillan (2008) provides five estimates of reliability. One estimate of reliability is *stability* (administering the same measure later). Another estimate is *equivalence* (administering two forms of the same measure). It is also possible to combine *equivalence and stability* (administering one form of the measure and then another form later). Another estimate, *internal consistency*, involves finding the relationship between items measuring the same trait. Finally, another estimate, *agreement*, involves the use of two or more raters to measure the same phenomenon independently to see if they agree).

The researcher agrees with David & Sutton (2004, p. 171) that "it is not possible to totally eliminate errors". Considering the research instruments, for example, would the respondents give the same answers if asked at a different time? Considering the participants, would their responses be the same at different times, in different locations and under different conditions? Considering the researcher as an instrument, for example, would the inference be the same if someone else gathered and interpreted the data? Nevertheless, like validity, the researcher has a duty to strive to improve reliability. The steps taken in this study have been detailed in previous sections, but are summarised in the next section.

Much has been written about the relationship between reliability and validity (see, for example, Cohen et al. 2011; Fraenkel & Wallen 2008). Kirk & Miller (1986) provided a broad explanation of this relationship stating:

> "Loose speaking 'reliability' is the extent to which a measurement procedure yields the same answer however and whenever it is carried out; 'validity' is the extent to which it gives the correct answer" (Kirk & Miller 1986, p. 19)

An unreliable measure cannot be valid, but a reliable measure may still be invalid (Lewin 2005; Robson 2002; Gay et al. 2009; Singleton & Straits 2005; Fraenkel & Wallen 2008; David & Sutton 2004). It would be impossible to formulate valid conclusions, if the data collected fluctuate wildly. However, reliability in measurement, though important, is not sufficient for validity as it is possible to consistently and accurately measure the wrong thing. The implication of this relationship means that researchers should work towards both high reliability and high validity (Dahlberg & McCaig 2010; Fraenkel & Wallen 2008).

Validity and reliability were considered throughout the research process. The researcher believes that establishing validity and reliability is not only about adherence to rules and procedures: it is about loyalty to the spirit of research (see Sandelowski 1993). The steps taken to address the threats to validity and reliability were not simply to fulfil certain criteria, but to ensure that the findings of this study are credible and hold up to academic rigour. These steps have been explained in previous sections of this chapter. The next section brings them all together, by summarising them.

5.11.2 CONSIDERATIONS AND STEPS TAKEN DURING THIS STUDY

One major threat to the validity of the study is that of its external validity, the extent to which the research can be generalised to the wider population and applied to different settings. The choice of schools, the limited set of e-learning activities and the use of classifications of activities threaten the external validity of this study. The researcher acknowledges this threat, but stresses that generalisability was not the goal of this study. Instead, the researcher aimed for credibility and rigour. This was the reason for conducting the same studies in three different schools. It is hoped that the credibility and rigour will then allow readers to understand this study in its context and apply it to their own contexts (see Melrose 2010; Yin 2009; Stake 1995; Stake 1994).

Another threat is the representativeness of the sample. Although a census survey was conducted, the interviews and multiple-case studies only involved six participants per school. This sample size is low and the use of purposive sampling strategy is questionable. Moreover, the use of teacher judgement in the selection of participants was also an area of potential error. The access, time and financial constraints meant the researcher had to rely on teacher judgments in the selection of a rather small but manageable sample. The use of purposive sampling allowed the researcher to specify the characteristics that are likely to be beneficial to the study, something that is not guaranteed by many probability sampling techniques (Gobo 2004; Lewin 2005; Fraenkel & Wallen 2008).

Furthermore, the methodological approach and choice of data collection methods could introduce some threats to the validity of methods. Whilst it can be argued that questionnaires, observations, computer recordings and focus group interviews are suitable data collection methods, other methods can result in alternative explanations (Guba & Lincoln 2005). The decision to combine surveys and multiple-case studies was due to their suitability for the research questions, not preference or familiarity (see Smith 1991; Perlesz & Lindsay 2003). Likewise, the data collection methods were chosen for their suitability. The combination of data collection methods was a deliberate triangulation strategy to increase validity through the generation of a fuller picture and verification of findings (see Dahlberg & McCaig 2010; Read & Marsh 2002; Guba 1981; Gay et al. 2009).

The reliability of the research instruments and data collection procedures is also a real threat. What is the guarantee that the questions and options in the questionnaires would be understood in the same way? What effects did the presence and personality of the researcher have on participants during the interaction and interviews (observer effects, observer bias and interviewer effects)? What effect did the focus groups or the audio recording of the interviews have on participants? In an attempt to address these threats, a thorough pilot study was conducted. During the pilot study, the instruments (especially the questionnaire) were fine-tuned using an iterative approach with reliability and validity in mind (see Robson 2002; Gay et al. 2009). The pilot study was also a useful practice, as the researcher's interviewing and observation skills were honed (see Fielding & Thomas 2001; Barbour & Schostak 2005).

The researcher's own prejudices, bias, assumptions and expectations posed as a threat throughout the research process. It is risky to assume that the researcher is completely objective, accurate and unbiased (Patton 2002; Gibbs 2007). Gibbs (2007, p. 91) points out that reflexivity is a fundamental issue that needs addressing, describing it as "the recognition that the product of research inevitably reflects some of the background, milieu, and predilections of the researcher". The researcher's background and position has already been declared in chapter 1 (section 1.4.2), demonstrating some level of self-awareness. The researcher also engaged in the process of ongoing examination of his views in relation to the participants and those receiving the findings (see Patton 2002; Schwandt 2001; MacBeth 2001).

It is true that total reliability and validity cannot be guaranteed in any research (Robson 2002; David & Sutton 2004). Nevertheless, the researcher's commitment to the credibility and academic rigour has influenced the entire research process. Some of the strategies proposed by Gay et al. (2009), based on the work of Guba (1981), have been adopted. These include: the revelation of underlying assumptions or bias; triangulation using multiple methods and sources; detailed description of the contexts; practising reflexivity; and member checks.

5.12 CHAPTER SUMMARY

The researcher's decisions in terms of methodological approach, data collection methods, data collection instruments and research procedures have been discussed in this chapter. The researcher recognises that another researcher could have taken an alternative approach to this research. Would similar conclusions be drawn if an alternative approach was taken? It is the uncertainty of the answer to this question that necessitates clear justification of the methodological decisions made during this study.

That is precisely what this chapter aimed to do. The chapter started by explaining the nature of this research, the possible methodological approach to tackling the study and the reasons for choosing a combined approach – survey and multiple-case studies. The case was made for the use of a "collection of concepts", integrating the key concepts of several research models. Rather than applying a single, rigid and limited conceptual framework to this study, the "collection of concepts" was adopted for breadth and flexibility. The choice of data collection methods, the instruments and the sampling strategies used during this study were also justified.

The pilot study, extensive reading, and the feedback and advice of highly experienced researchers contributed to the refinement of the research instruments (including the researcher's ability as an instrument). This research process, and the ethical guidelines adopted to establish a positive relationship between the researcher and the participants, contributed to the reliability and validity of this study. With the satisfaction that reasonable steps have been taken to increase reliability and validity, the results and findings are presented and discussed in the next three chapters.

CHAPTER 6: FINDINGS OF THE SURVEYS (ATTRACTION)

6.1 INTRODUCTION

This chapter reports on the results of the surveys investigating the attraction to computers, which forms the first facet of this study. Online questionnaires and focus group interviews were used to gather relevant data. The online questionnaires were made available to all the 11 to 14 year olds (learners in years 7, 8 and 9) in the three schools during April 2011. A panel study was conducted in June/July 2011 to verify the findings, where the questionnaires were administered again. **Appendix 22** shows a summary of the responses during the original and panel studies. The findings of the panel study were broadly consistent with the original study. Hence, they are reported once in this chapter. The findings of the focus group interviews carried out in the three schools are also reported in this chapter.

These efforts were intended to find answers to the research questions relating to the **attraction** to computers, which are:

- Do learners *actually* have an attraction to computers, as is often assumed (for example, Kim et al. 2007; Broady et al. 2010; Prensky 2001a)? What are the reasons for this attraction?

- Does the attraction to computers (if it exists) have any relationship to motivation to learn using computers, as it is sometimes portrayed in media coverage and political rhetoric (for example, Becta 2003; Means et al. 1997)?

- Are there learners who are not attracted to computers? How does this affect their motivation to learn using computers?

- How does proficiency in the use of computers affect the motivation to learn with computers?

The chapter starts with the details of responses to the online questionnaires and the profiles of learners who took part in the focus group interviews. This is followed by the results from the questionnaires and focus group interviews, organised in the order of the research questions. Where responses across the three schools are similar, they are reported together.

6.2 QUESTIONNAIRE RESPONSES AND INTERVIEW PARTICIPANTS

6.2.1 RESPONSES TO THE ONLINE QUESTIONNAIRES

The intention was to gather data from the entire cohorts of 11 to 14 year olds in the three schools. In addition to full coverage of opinions and ideas, it was expected that the census surveys would increase confidence in the generalisability of the study (see Parker 2011). In practice, it was impossible to get responses from all the 11 to 14 year olds in the three schools. This was due to student absences, alternative educational arrangements and changes in the number of students on the schools' rolls, which were out of the researcher's control.

Table 7 shows the number of responses to the online questionnaires in each school. About 97.4% of the target population within School A completed the questionnaires. The percentage of responses from Schools B and C were considerably less; 89.2% and 87% respectively. These percentages are based on the number of students on the schools' rolls around the end of March 2011.

School A		
Age	**Number of responses**	**Percentage of the cohort**
11	92	15.8%
12	156	26.8%
13	160	27.4%
14	160	27.4%
Total number of responses	568	97.4%
Responses that could not be collected	15	2.6%
Number of students in cohort (as at 28/03/2011)	583	100%
School B		
Age	**Number of responses**	**Percentage of the cohort**
11	240	25.4%
12	369	39.0%
13	93	9.8%
14	141	14.9%
Total number of responses	843	89.2%
Responses that could not be collected	102	10.8%
Number of students in cohort (as at 28/03/2011)	945	100%
School C		
Age	**Number of responses**	**Percentage of the cohort**
11	28	5.7%
12	72	14.6%
13	192	38.9%
14	138	27.9%
Total number of responses	430	87.0%
Responses that could not be collected	64	13.0%
Number of students in cohort (as at 29/03/2011)	**494**	**100%**

Table 7: Responses to the online questionnaires (grouped by age)

Although the response rates were high, it must be pointed out that the characteristics of the students who could not complete the online questionnaires are unclear. However, the number of responses was still high enough for meaningful analysis to take place.

It was also important that the views of both genders were sufficiently represented. **Table 8** shows the number of responses from each gender in relation to the total number of students. The percentages of responses from each gender ranged from 85% to 99.3%. The implications of the differences in the percentages (e.g. the characteristics of the students who could not complete the online questionnaires) are unclear. Furthermore, the impact of having a higher percentage of responses from males than females in two of the schools is unclear. Overall, the high number of responses, however, points to a reasonable level of confidence in terms of the representativeness of the views of the students across the schools.

School A			
Gender	**Number of responses**	**Number of students in the cohort (as at 28/03/2011)**	**Percentage of responses**
Male	269	282	95.4%
Female	299	301	99.3%
School B			
Gender	**Number of responses**	**Number of students in the cohort (as at 28/03/2011)**	**Percentage of responses**
Male	438	475	92.2%
Female	405	470	86.2%
School C			
Gender	**Number of responses**	**Number of students in the cohort (as at 29/03/2011)**	**Percentage of responses**
Male	220	247	89.1%
Female	210	247	85.0%

Table 8: Responses to the online questionnaires (grouped by gender)

6.2.2 THE PARTICIPANTS OF THE FOCUS GROUP INTERVIEWS

The focus group interviews involved six students from each school. The teachers selected the students, using the specified selection guidelines (see section 5.6.1). In general, the students had some of the typical characteristics of the population, though the researcher acknowledges the limitations due to the size of the sample. The same students took part in the multiple-case studies, the findings of which are presented in chapter 7.

Table 9 shows brief profiles of the selected participants. More detailed information can be found in **appendix 21**, which shows the participants' academic abilities, levels of proficiency in the use of computers, levels of motivation to learn, and other educational needs. It must be pointed out that the profiles are based on teachers' perceptions, judgements and knowledge of their prior attainments.

School A			
Student	**Age**	**Gender**	**Level of motivation to learn (based on teachers' perceptions)**
A1	12	Female	Average
A2	12	Male	Average
A3	13	Female	Above average
A4	13	Male	Average
A5	14	Female	Above average
A6	14	Male	Below average
School B			
Student	**Age**	**Gender**	**Level of motivation to learn (based on teachers' perceptions)**
B1	11	Female	Average
B2	12	Male	Below average
B3	12	Female	Below average
B4	13	Male	Above average
B5	13	Male	Average
B6	13	Female	Above average
School C			
Student	**Age**	**Gender**	**Level of motivation to learn (based on teachers' perceptions)**
C1	12	Male	Average
C2	12	Female	Below average
C3	13	Male	Above average
C4	13	Female	Average
C5	14	Male	Above average
C6	14	Female	Above average

Table 9: Participants in the focus group interviews and multiple-case studies

6.3 THE ATTRACTION TO COMPUTERS AND THE REASONS FOR THE ATTRACTION

6.3.1 QUESTIONNAIRE FINDINGS

Based on students' feedback during the pilot study, it was decided that the use of the phrase "attracted to computers" would not be appropriate for the target population (11 to 14 year olds). Hence, it was replaced with "like using computers". Respondents were asked whether they like using computers. The options were: yes, no and sometimes. The responses to this question are shown in **table 10**.

	School A Frequency and percentage	School B Frequency and percentage	School C Frequency and percentage
Yes	474 (83.5%)	693 (82.2%)	312 (72.6%)
No	2 (0.4%)	3 (0.4%)	6 (1.4%)
Sometimes	92 (16.2%)	147 (17.4%)	112 (26.0%)

Table 10: Do you like using computers?

In all three schools, the majority of students (over 72%) indicated that they liked using computers. Very few students in the three schools indicated that that they did not like using computers. From the review of relevant literature (see chapter 2), this outcome was expected. Existing research evidence already suggests that many learners might accept that there is an attraction to computers (Bovée et al. 2007; Teo 2006; Helsper & Enyon 2010; Prensky 2001a; Pektaş & Erkip 2006). Hence, the data provide an up-to-date confirmation of this claim. The reasons given for this attraction to computers are provided in later sections, where the open-ended responses and focus group interview findings are reported.

An alternative response could have been obtained if the question was framed in another way. For example, the question could have used a rating scale where respondents rate how much they like using computers. The rating scale was not used because it was felt that the attraction to computers might not have a definite answer, but could depend on one or more factors. Hence, the third option (sometimes) was included to provide opportunities for these factors to be explored.

As shown in **table 10**, the percentage of students who indicated that they sometimes like using computers ranged between 16.2% and 26% of the total number of responses across the three schools. This suggests that this group of learners are not automatically attracted to computers. Their attraction to computers is likely to be influenced by other factors, such as the digital content, the technology and their preferences.

To investigate their attraction to computers further, the respondents were asked to provide rough estimates of how long they spend on computers daily. Their responses are shown in **table 11**.

	School A Frequency and percentage	School B Frequency and percentage	School C Frequency and percentage
I do not use computers	8 (1.4%)	3 (0.4%)	0 (0.0%)
Less than 1 hour a day	56 (9.9%)	144 (17.1%)	94 (21.9%)
About 1 hour a day	150 (26.4%)	216 (25.6%)	100 (23.3%)
About 2 hours a day	110 (19.4%)	213 (25.3%)	128 (29.8%)
About 3 hours a day	102 (18.0%)	126 (14.9%)	60 (14.0%)
Over 3 hours a day	142 (25.0%)	141 (16.7%)	48 (11.2%)

Table 11: How long (roughly) do you spend a day on computers?

Across the three schools, more than 54% indicated that they use computers for two or more hours a day. Although the data indicate that the majority (over 54%) of learners spend two or more hours on computers daily, it does not give an indication of how much of this time is spent on school computers or influenced by teachers (e.g. online homework). It is worth pointing out that Eynon (2010) found that most young people (78% of 12 year olds and 84% of 14 year olds) are expected to use technology for homework. Hence, the responses to this question do not provide clear evidence of the existence of an intrinsic attraction to computers. They however suggest that there is some willingness or ability to use computers.

It was interesting to find that most learners who took part in these surveys use computers. The number of respondents who indicated that they do not use computers was very low (only 1.4% in School A, 0.4% in School B and 0% in School C). This is broadly consistent with the surveys carried out by Eynon (2010) and Galloway (2008). They reported that

95% of young people use computers. Whilst teachers might influence their computer use, these findings give an indication of the frequency and extent of computer use among young people.

The ability or willingness to use computers does not necessarily indicate an attraction to computers. It is perhaps more beneficial to know what they use computers for. Hence, the respondents were asked to provide details of their computer use. Their responses are shown in **table 12**.

	School A Frequency and percentage of total number of responses	School B Frequency and percentage of total number of responses	School C Frequency and percentage of total number of responses
Learning (including educational games)	286 (50.4%)*	360 (42.7%)*	208 (48.4%)*
Games (not including educational games)	330 (58.1%)*	540 (64.1%)*	266 (61.9%)
Social networking	424 (74.6%)*	651 (77.2%)*	346 (80.5%)*
Communicating with friends/family	330 (58.1%)*	555 (65.8%)*	282 (65.6%)
Downloading/viewing media	336 (59.2%)	576 (68.3%)	296 (68.8%)
Internet surfing/research	60 (10.6%)*	69 (8.2%)*	346 (80.5%)*
Other	60 (10.6%)	15 (1.8%)	30 (7.0%)
I do not use computers	10 (1.8%)	15 (1.8%)	0 (0.0%)
The asterisk (*) has been used to highlight key data referred to in the text			

Table 12: What do you use computers for?

Table 12 shows that many learners use computers for social networking (74.6%, 77.2% and 80.5% in Schools A, B and C respectively). The average percentage of respondents who indicated that they use computers for social networking across the three schools was 77.4%, signalling an attraction to the use of computers for social networking. Furthermore, in all the three schools, there were more responses to the use of computers for social networking than any other activity.

There were also high numbers of responses for the use of computers for gaming, communicating with friends/family and downloading/viewing media, ranging from 58.1% to 68.8%. The average across the schools for the use of computers for games was 61.3%. At about the same level as games, the average for communicating with friends or family was 63.2%. An average of 65.4% across the three schools indicated that they use computers for downloading or viewing media.

In all the three schools, the number of responses indicating use of computers for learning is less that all the other activities discussed so far. The percentages of responses to the use of computers for learning were 50.4%, 42.7% and 48.4% in Schools A, B and C respectively. The average percentage of responses to the use of computers for learning across the three schools was 47.1%.

Although the percentages of responses in the three schools for use of computers for learning was not particularly low, they suggest that the respondents have preferences for the other activities. The frequency of use of the computers for learning is less than social networking, non-educational games and downloading/viewing of media. A simplistic interpretation of this finding is that learners are more attracted to social networking, gaming and downloading/viewing media than learning. It is however more complicated since learners' use of computers for learning might be influenced by teachers' expectations and the school curriculum (see Eynon 2010). This means the gap between the attraction to computer-based learning compared to other activities (such as social networking) might be wider than indicated in their responses. The data gathered also do not take into account the possibilities of learning through social networking and the downloading/viewing of media.

Another interesting finding is that there was a higher frequency of responses for internet surfing/research in School C compared to the other schools. Whilst the responses to the use of computers for internet surfing/research in the other schools were only 10.6% and 8.2%, there was an overwhelming response of 80.5% from School C. In fact, the total number of responses was the same as social networking, the activity that seemed to be most dominant across all the three schools.

This suggests the possibility of a "school effect" (see Morgan 2001; Sparkes 1999; Dupriez & Dumay 2006; Raudenbush & Willms 1995). A possible explanation is that, in School C, teachers have made a conscious attempt to educate learners in the use of the internet for research. Another possible explanation, though less likely, is that the students in the other schools did not fully understand the term “internet surfing/research”. This perhaps highlights the significance of the role of teachers in influencing learners’ use of computers and their understanding of key terms.

It must be pointed out that there is a minor issue regarding the accuracy of the data gathered in Schools A and B. In response to the question “how long do you spend on computers?”, 8 and 3 learners in Schools A and B respectively indicated that that they do not use computers (see **table 11**). This was different to the responses to the question “what do you use computers for?”, where 10 and 15 learners in Schools A and B respectively indicated that they do not use computers (see **table 12**). Although the discrepancies in the data are minor when compared to the overall number of responses, it is important to be transparent about the data gathered.

6.3.2 QUESTIONNAIRE FINDINGS (OPEN-ENDED RESPONSES)

The data from the last section shows that the majority of respondents (83.5%, 82.2% and 72.6% in Schools A, B and C respectively) indicated that they like using computers. However, a considerable number of respondents (16.2%, 17.4% and 26% in Schools A, B and C respectively) indicated that they *sometimes* like using computers. Moreover, more than half of the respondents in each school indicated that they spend more than two hours on computers daily. Their responses also indicate that the respondents use computers for social networking than any other activity. This section reports on the open-ended responses to the questions “what do you use computers for?” and “do you like using computers?”. The open-ended responses to each question across the three schools were very similar, so they are reported together.

THOSE WHO ANSWERED “OTHER” TO THE QUESTION “WHAT DO YOU USE COMPUTERS FOR?”

In response to the question “what do you use computers for?”, some respondents selected “other” to indicate that they use computers for activities other than the ones specified in the questionnaire (see **table 12** or **appendix 9**). They were allowed to provide open-ended descriptions of the other activities they use computers for. About thirty respondents across the three schools explained that they use computers for various *creative activities*. These included creating drawings/animations, authoring websites, writing scripts for shows, making music beats and uploading videos to the internet. About twenty respondents across the three schools indicated that they use computers for *online reservations or shopping*. Some respondents provided general statements like "nearly everything" and "I use the computer for a lot of things".

THOSE WHO ANSWERED "YES" TO THE QUESTION "DO YOU LIKE USING COMPUTERS?"

As shown in **table 10**, a large number of respondents (over 72% across all schools) indicated that they are attracted to computers (like using computers). Their responses were supported by brief comments about their attraction to computers. The comments are consistent with some of the reasons for the attraction to computers, which were discussed in chapter 2 (section 2.4.2).

As expected, many respondents considered computers to be fun and entertaining to use. This *perception or expectation of fun and entertainment* appears to draw them to computers.

For example, one respondent stated:

> *"I like using computers because they [are] fun"*

Others explained:

> *"Because computers are entertaining and it is better than being bored"*

> *"I chose yes, because it helps me enjoy myself a lot more"*

> *"Because when i'm [I'm] bored it passes time"*

> *"I just find using the computer fun"*

In addition to the perception/expectation of fun and entertainment, many respondents indicated that they find computers *easy to use*. They also explained that computers sometimes have features that provide *help*. Some of their comments illustrate this point:

"[I like using the computer] because its [it is] easy to use"

"[I like using the computer] because I find it easy to control"

"[I chose] yes because it is easier and more helpful than parents with homework"

"[I like computers] because the computer is like a dictionaire [dictionary] that helps you or entertains you sometimes"

These quotes illustrate that some of the learners perceive computers to be easy to use. This could perhaps be an indication of their proficiency in the use of computers. It could also be an indication of the simplicity of the applications and features of computers that they have access to. It is unclear what hardware or software the respondents had in mind when they made these comments. Hence, it is impossible to clarify whether all types of hardware and software are considered easy and helpful.

Closely related to the perception of ease of use and helpfulness, the data suggest that learners have an *appreciation of the benefits* of computers. This appreciation of the benefits seems to attract them to computers. Many respondents supported their responses with comments indicating that they recognised the benefits of computers. For example, some commented about how the computer can assist with poor handwriting and literacy explaining:

"Because ithelp u [it helps you] with spellings"

"Because my hand writing [handwriting] is not neat ... it is easier ot [to] type"

"Because it is really cool when you use the keyboards instead of just plain old writing"

The appreciation of the communication and networking benefits is expressed in these comments:

"I like using computers because I like to keep in contact with my friends and family via social networking sites such as facebook, msn and skype..."

"The social networking sites helps [help] me connect with my friends more"

"Because you [I] can communicate with friends and family for free if you [I] don't see them everyday..."

"You can chat to friends with out [without] letters"

Recognising the benefits of having access to information and resources, the following comments were made by some respondents:

"It is a good learning tool"

"Computers show alot [a lot] of information which you did not know about"

"Because it is a quick and easy way to look things up..."

"I like using them because I like to discover what's out there through the internet"

"Because using computers has a wide range of possibilities from online flash games to learning worksheets to entertaining videos"

In appreciation of the opportunities for creativity and design, one respondent commented:

"Because I enjoy using computers to create/design things..."

The most popular benefit stated in the responses related to communication and networking. This was followed by those relating to access to information and resources. Crook's (2012) study suggests that young people are active users of web-based communication and networking tools. He also suggests that many young people make active and frequent use of the internet to investigate their topics that are relevant to their personal interests. Their comments, however, seem to go beyond access. They pointed to the speed of access to information/friends, variety of available information/resources and friends, and little or no cost associated with these benefits.

Some learners indicated that they like using computers because they saw it as *necessary for their current or future existence*. It seems their current levels of reliance on computers (and anticipated levels of reliance in the future) make computers attractive to them. Illustrations of this reason are in the comments below:

"Because my life would have no possible meaning at all without my computers..."

"It is revoltion [revolution] in the 21st century"

"Because, computers are the future, and it is best to learn from them...when you get a job they will want to know if you can use a computer"

"Because they are [computers are] good for the future"

These responses suggest that the learners have subconsciously considered the reasons for using computers ("why should I"). Their responses suggest that they believe that computers are relevant to their present or future needs, goals and aspirations. Relevance, one of the concepts of Keller's (1983) ARCS model (see section 3.3.1), is featured in some of their comments. For example, the respondent who indicated that their life would be meaningless without computers is making the point that the present worth or relevance of computers is so strong that they now rely on them. Likewise, other respondents explained that computers are relevant to their future career, social or work goals.

Some of the respondents indicated that they are attracted to computers because they believe they are *proficient* in their use. For example, some commented that:

"[I selected yes because] I think I im [I am] good with computers"

"[I selected yes] because I am good at it [using computers]"

Self-efficacy (Bandura 1986), competence (Wlodkowski 1995; Keller 1983) and confidence (del Soldato & du Boulay 1995) are key conceptual explanations of this reason. There seems to be a connection between their perceptions of competency in the use of computers and their confidence and desire to use computers.

The reasons respondents gave for their attraction to computers concur with other studies (see section 2.4.2). A list of reasons, however, was deemed insufficient. Instead of a list, an evaluation of the prominence of these reasons was considered more beneficial. It is more likely to advance the understanding of the attraction to computers because it would give an indication of the importance of each reason. **Table 13** shows the frequency of themes relating to each reason given for the attraction. It is important to note that some of the open-ended responses included more than one reason, therefore one response sometimes increased the frequencies of two or more reasons.

	School A Frequency of comments relating to this reason	School B Frequency of comments relating to this reason	School C Frequency of comments relating to this reason
Perception/expectation of fun and entertainment	286	280	229
Appreciation of the benefits	273	241	186
Perception of ease of use/availability of features that provide help	105	84	108
Perception of own proficiency	64	69	92
Perception that they are necessary for their current/future existence	42	74	101
No comment was made	55	54	8
The comment made was unclear	12	6	11

Table 13: Frequencies of the reasons for the attraction to computers

The frequency analysis across the three schools indicates that most respondents expect or believe that computers are fun and entertaining. This suggests that fun and entertainment is important to learners and is one of the main reasons for their attraction to computers. This was closely followed by an appreciation of the benefits of computers, particularly for social networking and other types of communications.

THOSE WHO ANSWERED “NO” TO THE QUESTION “DO YOU LIKE USING COMPUTERS?”

As shown in **table 10**, very few respondents indicated that they do not like using computers; two (0.4%), three (0.4%) and six (1.4%) in Schools A, B and C respectively.

The two respondents in School A did not provide any open-ended comments to clarify their response. Only one of the three respondents in School B provided an open-ended comment. They expressed their concerns about their proficiency in the use of computers:

"[I selected 'no'] because i [I] am not good at useing [using] the computer"

Three of the six respondents in School C gave open-ended responses. One of their comments was unclear. The other two commented that:

"They're boring and complicated"

"They are very slow"

The comments do not provide any specific information about what exactly the learners find boring or complicated. They do not give an indication of what exactly they mean by "slow". It however suggests that proficiency, usability and the performance of the computers can affect learners' judgement of the attraction to computers.

THOSE WHO ANSWERED "SOMETIMES" TO THE QUESTION "DO YOU LIKE USING COMPUTERS?"

Some respondents made brief comments to clarify why they selected "sometimes" when asked the question "do you like using computers?". The vast majority of responses revealed that *performance issues* associated with using computers influenced their response. It appears that they have some expectations of the performance of computers. In particular, they seem to be quite intolerant of slow computers. Some of their comments include:

"Sometimes they can be quite frustrating if they go slow or freeze etc"

"My computer has some down falls [downsides]...it won't load quickly enough, i [I] sometimes have no internet access"

"Computers can sometimes make the simplest things long when they are slow"

"...sometimes they freeze or get virus [a virus] or just shut down and brake [break]"

"Sometimes they frezze [freeze] and it takes a long time to get whatever you were doing back"

"Because all my past computers have blown up"

"Because its [computers are] good but they [it] can be slow which is very enoying [annoying]"

Although the meaning of "slow" is not very clear from their comments, it can be interpreted as intolerance of computers with low specifications or poor performance. An alternative explanation is the possibility of a mismatch between the learners' cognitive or motor agilities and that of the computer. They then experience frustration or boredom because they believe the computer is unable to "keep up" with them.

Others expressed their frustration when they believe they are *not proficient* in the use of certain aspects of the computers. For example, some commented that:

"Because I find it difficult to use certain programmes [programs]"

"Because sometimes I can use them and sometimes I can't"

"I chosen [chose] sometimes because some stuff [aspects of the computer] a [are] confusing"

"Because most of the time i konw [know] what I am doing and sometime,s [sometimes] I don't know what I am doing"

Although these views do not indicate which aspects of computers are considered difficult, they suggest that learners are not proficient in all aspects of computer use. They also suggest that learners' might not be prepared to persevere with computer activities which they find challenging.

Others expressed some concerns that computers are sometimes *restricted to indoor locations* and that they would prefer to be outside. The following comments illustrate their concerns:

"Sometimes I don't want to go on it at all and I want to go outside"

"I like them because I can learn throw [through] it [them]...but they do draw you away from outside"

"Because id [I would] rather spend my day outside having fun than sitting inside staring at a computor [computer] screen"

One respondent mentioned the *health and safety concerns* associated with computers, saying:

> *"I dont [don't] like the way computers can affect your eyes and your posture, but I like the way I can contact family and friends or surf the internet for educational purposes"*

It was not surprising to find that some learners think that their attraction to computers *depends on the activity at hand or their moods* at the time of the interaction. Some learners made it clear that:

> *"It depends [on] what im [I'm] doing"*
>
> *"[It] depends...If it is like taking [talking] to friends and stuff...I dont [don't] mind but if its [it's] not...I dont [don't] like it"*
>
> *"[It] depends on what kinda [kind of] mood im [I'm] in"*
>
> *"I don't like using computers if tair [there] is an alternative I am beater [better] at using"*
>
> *"Most things I do on computers are fun but sometimes, when I am just typing or just doing research, it can get boring"*
>
> *"It depends on what tasks I have to complete on them"*

Others have taken their stance on this issue further by making specific comments that they are *not attracted to learning activities* on the computer, explaining:

> *"I like speaking to my family and friends but I dont [don't] like uesing [using] them in school"*
>
> *"I only have to use the computer at school, and most of the time, its [it is] for boring use"*
>
> *"I like using them in free time for games, not in ICT [lessons]"*
>
> *"I like using them in my own time...I like to be independent and not get told what to do e.g. school"*

The learners appeared to be making a distinction between their use of computer in school and in their own time. They were suggesting that the school-based ICT was less interesting. Passey et al. (2004) highlighted the importance of using ICT to support both teaching and learning, perhaps using the computer's affordances of the multi-sensory approach to teaching and learning. An interesting aspect of the report by Passey et al. (2004) is the need to focus on using ICT to support internal cognitive processes. In other words, there needs to be a focus on internal processes (such as analysis and evaluation) in addition to engagement, sensory access and presentation of learning outcomes.

The factors that affect learners' attraction to computers were analysed in greater depth to show the prominence of each. The frequencies of themes relating to these factors affecting motivation are shown in **table 14**.

	School A Frequency of comments relating to this factor	School B Frequency of comments relating to this factor	School C Frequency of comments relating to this factor
The performance of computers	69	47	44
The nature of the activity and learners' mood	34	32	19
No comment was made	22	21	16
Learners' perceived level of proficiency	7	9	3
Restriction to indoor locations	1	1	2
Health and safety concerns	0	0	1
The comment made was unclear	0	0	0

Table 14: Frequencies of the factors affecting the attraction to computers

The frequencies of the factors affecting the attraction to computers suggest that the most important issue is the performance of the computers. It was not clear whether they were referring to the computers in their schools or computers in general. It was also unclear whether they were referring to a particular software or hardware. The wording of their comments however suggests that they have some intolerance towards any type of computer system that does not meet their expectations of speed. There were also many comments indicating that the nature of the computer activity and the learners' moods affect their attraction to computers.

6.3.3 FOCUS GROUP INTERVIEW FINDINGS

The focus group interview participants were questioned about the amount of time they spend on computers daily. This ranged from twenty minutes to four hours a day – one to three hours in School A, one to four hours in School B, and 20 minutes to 2 hours in School C. The participants also explained that most of their activities on computers involve social networking, games and online chat. Others indicated that they sometimes use computers for research. There was general agreement that they use computers for social networking more than other activities. This is consistent with the findings from the questionnaire.

During the focus group interviews, all the participants agreed that there was an attraction to computers. This is broadly consistent with the findings in the questionnaire where almost all respondents indicated that they like using computers. In fact, all the participants (except one) in the three schools indicated that computers were an essential part of their daily lives. Almost changing their position, the participant who indicated that computers were not essential later said:

> *"Last year I went nearly three months without a computer, but that was when I was younger"*

They were asked to explain the reasons for this attraction to computers. Across the three schools, their responses were similar to the open-ended responses in the questionnaire. The interviews however made it possible to probe into certain responses. For example, many learners who said that computers were *fun or entertaining* explained that:

> *"Computers have moving images and slideshows"*
>
> *"You can watch lots of videos and play music"*
>
> *"There are a lot of funny videos on YouTube"*
>
> *"I use the online games to pass time"*

"It is fun chatting with friends and getting your updates"

"You don't understand how important and exciting it is to keep in touch with friends on facebook and that [other similar systems]"

It seems their conception of fun is the presence of multimedia/games and the ability to communicate with other people. It also appeared that they were referring to specific websites (social networking, chat, games and video streaming), not computers in general. When asked whether they would still be attracted to computers if there were no multimedia or access to games, chat and social networking, some responded:

"That's all I go there for, so I will find something else to entertain me"

"What's the point? It will be boring then"

"I guess that's what people our age use computers for, so that's pretty much everybody thrown out"

Some however explained that (with or without the multimedia, games or communication) they might still consider computers because they provide *quick access to a wide variety of information*. They attributed their attraction to the fact that computers provide access to information and gossip. The comments below reflect this view:

"I usually go on something like Wikipedia to find out information"

"It is quick to find information from several places"

"If I wanted to know about a particular celebrity, say..., I can enter a few words and get the latest news about what they've been up to"

"It is easy to research stuff [carry out research]"

Some also explained that there is usually *less writing involved* when using computers and that the *outcomes are usually more presentable.*

"I like typing rather than writing"

"When you produce things, they normally look better. You don't need to worry about your handwriting or drawing"

Since all the participants in the focus group interviews said they were attracted to computers, it was impossible to gather reasons why they were not attracted to computers. Nonetheless, they were asked to explain whether there were times when they experienced little or no attraction to computers. The comments was relating to the performance of the computer being used. One explained:

"It's annoying when they are slow or when they freeze"

Another added:

"I don't have time for slow computers"

All the participants of the focus group interviews said they were attracted to computers. This is the view of a limited sample of six learners in each school. Hence, the findings from the questionnaire, that most learners are attracted to computers, should have more weight. Through the focus group interviews, it was possible to confirm some of the reasons for the attraction to computers. It was also possible to confirm one of the factors that can affect the attraction to computers, the performance of the computers. One significant revelation from the focus group interviews is their conception of fun: fun seems to be perceived as the presence of multimedia, games and the facility to communicate digitally.

6.4 ATTRACTION TO COMPUTERS AND MOTIVATION TO LEARN USING COMPUTERS

6.4.1 QUESTIONNAIRE FINDINGS

The evidence presented in the last section suggests that the majority of learners are attracted to computers. The reasons for the attraction and some factors that could affect the attraction were presented. The next step is to present findings relating to the possibility of motivation to learn due to learners' attraction to computers.

The respondents could have been asked to rate the extent to which computers motivate them to learn. However, a rating scale would not provide the opportunity to explore the factors that influence the motivation to learn using computers. Instead, the question "do you think computers motivate you to learn?" was used. The options were "yes", "no" and "sometimes". **Table 15** shows the responses to the question "do you think computers motivate you to learn?".

	School A Frequency and percentage	School B Frequency and percentage	School C Frequency and percentage
Yes	238 (41.9%)	381 (45.2%)	192 (45.1%)
No	106 (18.7%)	168 (12.8%)	38 (10.2%)
Sometimes	224 (39.4%)	423 (42.0%)	200 (44.7%)

Table 15: Do you think computers motivate you to learn?

There were varied responses in the three schools. The percentage of learners who believed that computers motivated them to learn was generally around the 45% mark. Interestingly, a similar percentage did not give a definite "yes" or "no" response; they selected "sometimes". The high percentage of "sometimes" suggests learners believe that there are instances where computers do not motivate them to learn.

The learners were also asked to indicate whether they enjoy learning using computers. **Table 16** shows the responses to the question "do you enjoy learning with computers?".

	School A Frequency and percentage	School B Frequency and percentage	School C Frequency and percentage
Yes	182 (32.0%)	252 (29.9%)	192 (44.7%)
No	146 (25.7%)	168 (19.9%)	38 (8.8%)
Sometimes	240 (42.3%)	423 (50.2%)	200 (46.5%)

Table 16: Do you enjoy learning with computers?

The percentages of positive responses (yes) varied from 29.9% to 44.7%. Negative responses (no) varied, from 8.8% to 25.7%. Middle responses (sometimes), however, ranged from 42.3% to 50.2%. An important finding was that the highest percentage of responses to this question in all three schools was "sometimes".

In order to determine whether there was a relationship between the attraction to computers and motivation to learn, the responses to the two questions ("do you think computers motivate you to learn?" and "do you enjoy learning with computers?") were compared against the responses to the question "do you like using computers?". **Table 17** shows the breakdown of the responses to "do you like using computers?" against "do you think computers motivate you to learn?" across the three schools.

School A			
Do you like using computers?	**Do you think computers motivate you to learn? YES**	**Do you think computers motivate you to learn? NO**	**Do you think computers motivate you to learn? SOMETIMES**
YES	222*	74	178*
NO	0	2	0
SOMETIMES	16	30	46*
The asterisk (*) has been used to highlight key data referred to in the text			
School B			
Do you like using computers?	**Do you think computers motivate you to learn? YES**	**Do you think computers motivate you to learn? NO**	**Do you think computers motivate you to learn? SOMETIMES**
YES	342*	78	273*
NO	0	3	0
SOMETIMES	39	27	81*
The asterisk (*) has been used to highlight key data referred to in the text			
School C			
Do you like using computers?	**Do you think computers motivate you to learn? YES**	**Do you think computers motivate you to learn? NO**	**Do you think computers motivate you to learn? SOMETIMES**
YES	166*	16	130*
NO	0	4	2
SOMETIMES	28	24	60*
The asterisk (*) has been used to highlight key data referred to in the text			

Table 17: Do you like using computers? vs. Do you think computers motivate you to learn?

Table 17 shows that most of the respondents who indicated they like using computers also believed that computers motivated them to learn: 222 out of the 474 in School A; 342 out of the 693 in School B; and 166 out of the 312 in School C. However, a considerable number of respondents who indicated that they like using computers (178, 273, 130 in Schools A, B and C respectively) did not give a definite "yes" or "no" response, indicating that computers sometimes motivate them to learn. These respondents were not necessarily motivated by computer-based learning though they were attracted to computers.

Similarly, the data gathered suggest that the attraction to computers does not necessarily mean that learners enjoy learning with computers, as shown in **table 18**. A large number of respondents who believed that they like using computers indicated that they sometimes enjoy learning with computers. Nonetheless, it must be pointed out that there were many learners who believed they like using computers and enjoy learning from them.

School A			
Do you like using computers?	**Do you enjoy learning with computers? YES**	**Do you enjoy learning with computers? NO**	**Do you enjoy learning with computers? SOMETIMES**
YES	170*	108	196*
NO	0	2	0
SOMETIMES	12	36	44*
The asterisk (*) has been used to highlight key data referred to in the text			
School B			
Do you like using computers?	**Do you enjoy learning with computers? YES**	**Do you enjoy learning with computers? NO**	**Do you enjoy learning with computers? SOMETIMES**
YES	219*	129	345*
NO	0	0	3
SOMETIMES	33	39	75*
The asterisk (*) has been used to highlight key data referred to in the text			
School C			
Do you like using computers?	**Do you enjoy learning with computers? YES**	**Do you enjoy learning with computers? NO**	**Do you enjoy learning with computers? SOMETIMES**
YES	154*	20	138*
NO	0	4	2
SOMETIMES	38	14	60*
The asterisk (*) has been used to highlight key data referred to in the text			

Table 18: Do you like using computers? vs. Do you enjoy learning with computers?

Another aspect of the data collected that caught the researcher's attention was the prevalence of "middle" responses (sometimes). A large number of responses to the question "do you think computers motivate you to learn?" was "sometimes" (see **table 15**). The most frequent response to the question "do you enjoy learning with computers?" was also "sometimes" (see **table 16**). This could mean that learners are not necessarily motivated to learn using computers or do not necessarily enjoy learning using computers. Another explanation, however, could be due to possibility that respondents are often inclined to select the more neutral "middle" options when they complete questionnaires (see Lietz 2010).

Could it be that they have simply selected the more neutral "middle" options? The data presented in **tables 17 and 18** provide evidence supporting the view that learners have not simply selected the "middle" options. **Table 17** shows that the number of respondents who selected "sometimes" in their response to both questions ("do you like using computers?" and "do you think computers motivate you to learn?") was quite low – only 46, 81 and 60 in Schools A, B and C respectively selected "sometimes" as their response to both questions.

This is consistent with the data on **table 18**, which show that very few respondents selected "sometimes" when they responded to the questions ("do you like using computers?" and "do you enjoy learning with computers?"). The number of "middle" responses to both questions was quite low, 44 in School A, 75 in School B, and 60 in School C.

There would have been a greater number of "middle" responses had the data been severely distorted by the respondents' inclination to select the middle options. Furthermore, more than 80% of respondents who selected the "middle" option (sometimes) to the question "do you think computers motivate you to learn" also included open-ended responses explaining their choices, showing that they had reasons for their choices. The open-ended responses are reported in later sections.

So far, the data suggest that the attraction to computers, which the majority of learners indicated they have, does not necessarily result in motivation to learning with them. It is however necessary to explore the views of the respondents in terms of motivational behaviours, such as choice, effort and attention.

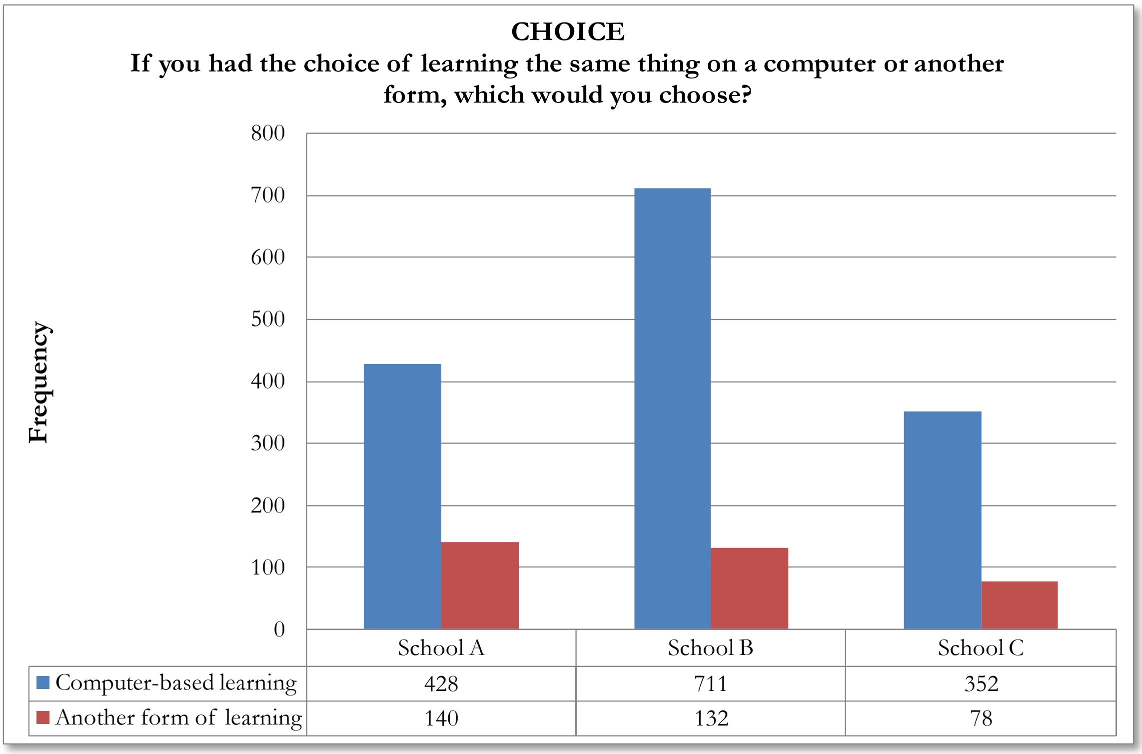
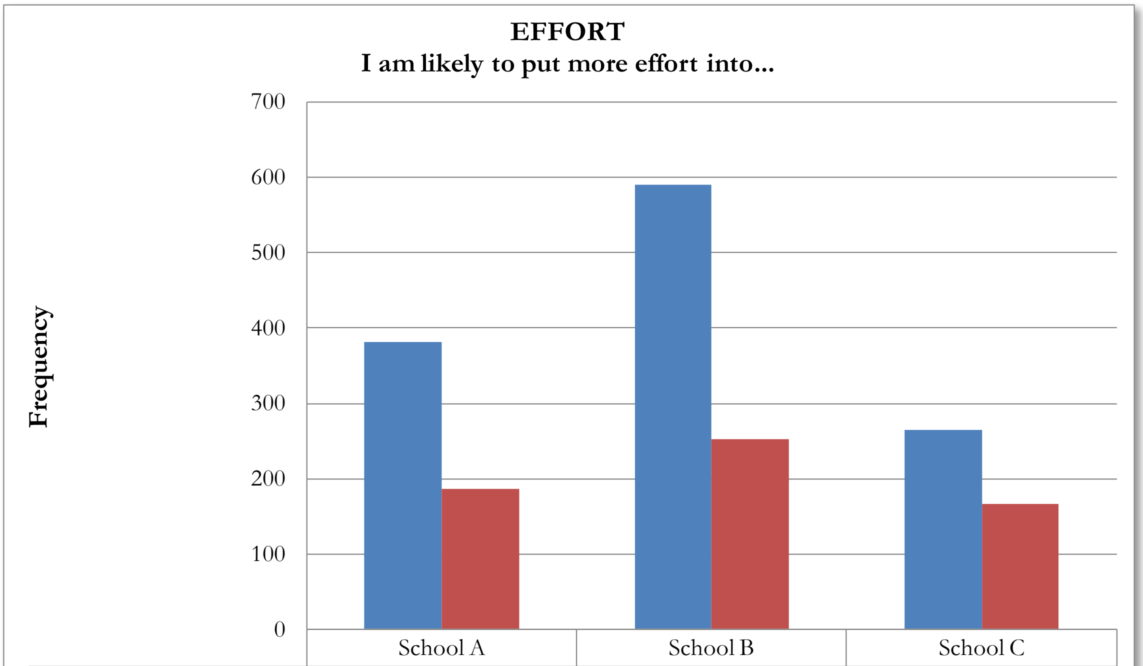


Chart 1: Computer-based learning vs. another form of learning (choice)

As shown in **chart 1**, an overwhelming majority across the three schools indicated that they would choose computer-based learning over other forms (such as books, worksheets etc). The reasons given for their responses are in the later sections, where the open-ended responses and interview findings are reported.



	School A	School B	School C
Computer-based learning	382	591	264
Another form of learning	186	252	166

Chart 2: Computer-based learning vs. another form of learning (effort)

Similarly, as shown in **chart 2**, the majority of respondents in the three schools indicated that they are likely to put more effort into computer-based learning than other forms (such as books, worksheets etc). Details of the reasons given for the choices are reported in later sections (open-ended responses and interview findings).

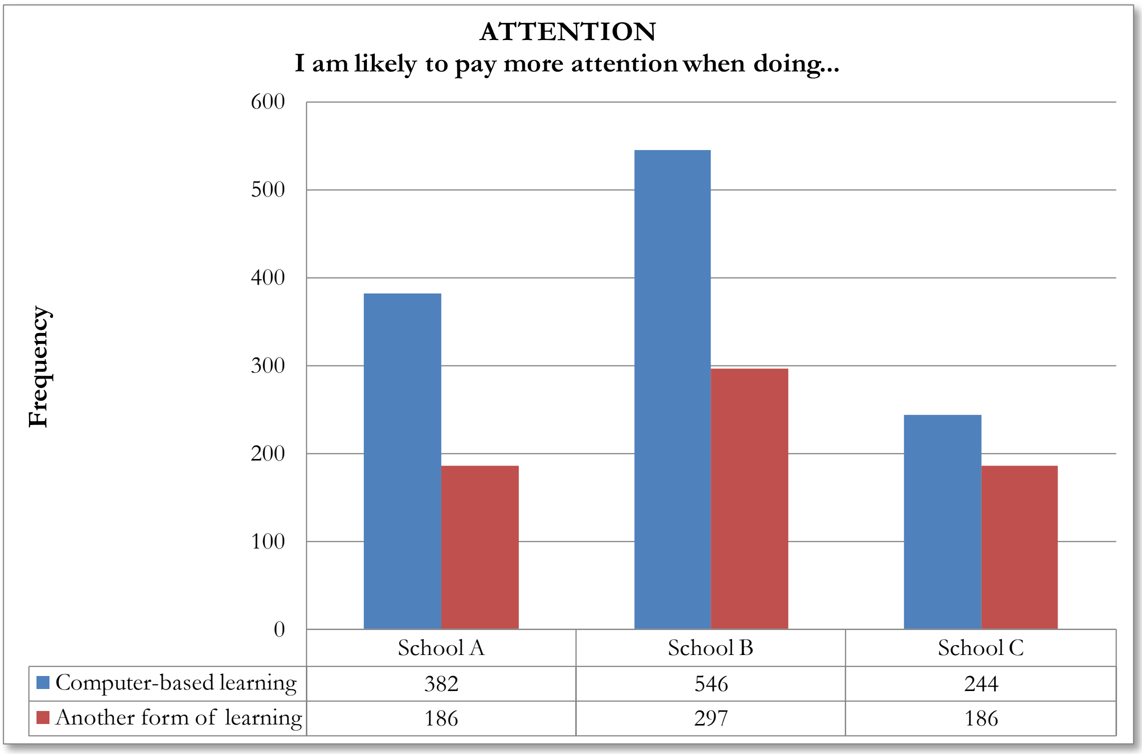


Chart 3: Computer-based learning vs. another form of learning (attention)

Furthermore, the majority of respondents also indicated that they are likely to pay more attention to computer-based learning activities than other forms. **Chart 3** shows the responses across the three schools. The later sections, open-ended responses and interview findings, report on the reasons given for the choices.

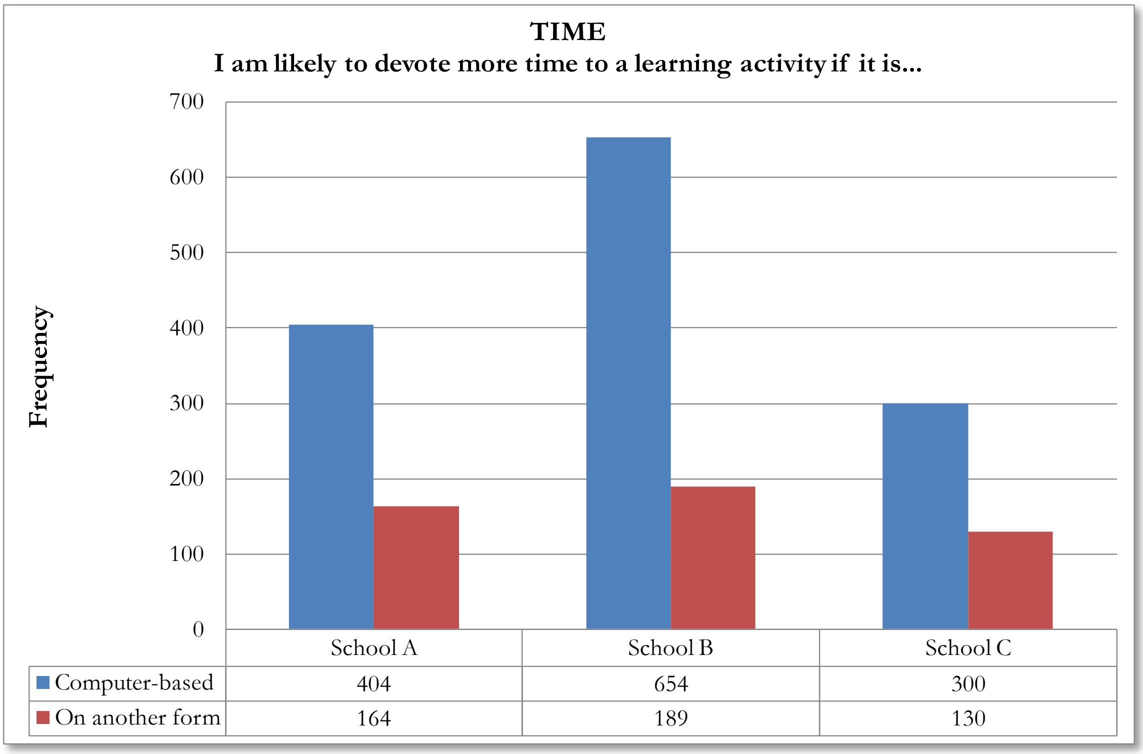
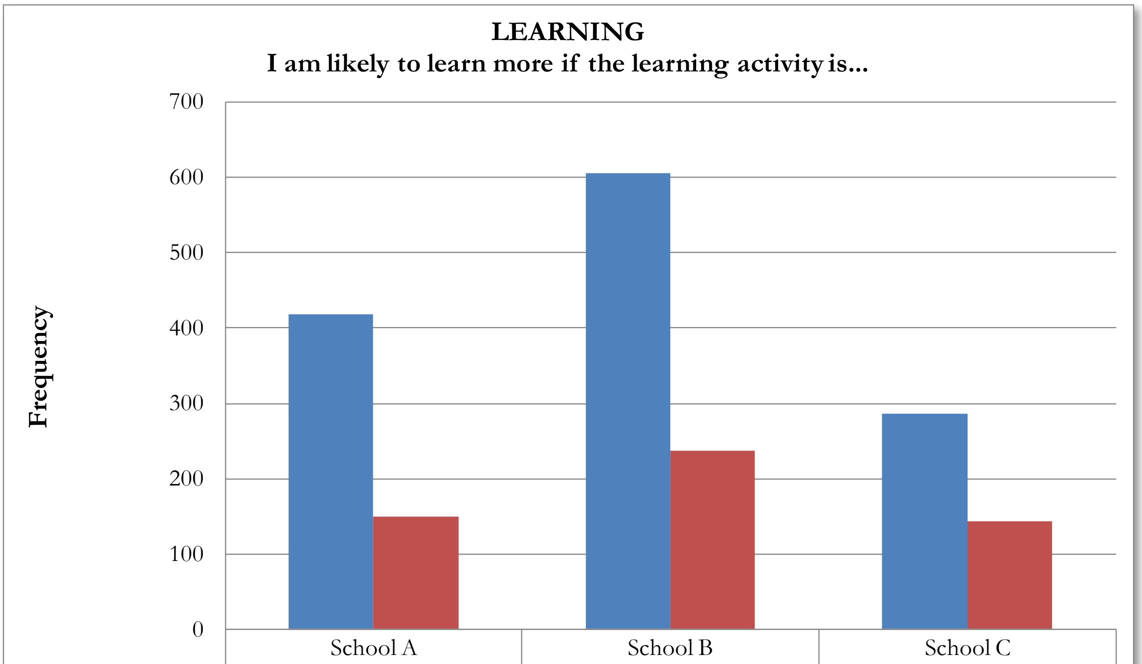


Chart 4: Computer-based learning vs. another form of learning (time)

Moreover, the responses also indicate that the learners are more likely to *devote time* to computer-based learning than other forms. **Chart 4** shows the responses across the three schools. The reasons for their choices are reported in later sections (open-ended responses and interview findings).



	School A	School B	School C
Computer-based	418	606	286
On another form	150	237	144

Chart 5: Computer-based learning vs. another form of learning (learning)

What is perhaps more interesting is that the majority of learners believed that they are likely to learn more from a computer than other forms (see **chart 5**). Information about the open-ended responses and interview findings are to follow in later sections.

Charts 1, 2, 3, 4 and 5 show the responses given when learners were asked to select whether they were more likely to exhibit certain motivational behaviours when using computers for learning compared to other forms. The majority indicated that they would choose computer-based learning over other forms. They also indicated that computer-based learning was more likely to lead them to put more effort, attention and time into learning. They even indicated that they felt they were more likely to learn more from computer-based learning.

However, the charts (**charts 1, 2, 3, 4 and 5**) show that a fairly large number of learners indicated that they were *not* likely to: choose computers over other forms of learning; put more effort, attention and time into computer-based learning; or learn more from computer-based learning activities. Their open-ended responses are reported later (in

tables 19, 20, 21, 22 and 23). The large number of "no" responses indicates that the attraction to computers does not automatically translate into motivation to learn.

How does this finding accommodate the responses to the other questions, "do you think computers motivate you to learn?" and "do you enjoy learning with computers?", which show high proportions of neutral responses (sometimes)? It seems the answer lies in the comparison. Most learners appeared to have a perception that computer-based learning was superior to other forms of learning. Hence, they responded positively to questions that compared them to other forms of learning. When asked to evaluate computers on their own, without the comparison, their responses clearly show that a large number believe there are instances when they are not motivated to learn with computers or do not enjoy learning with computers.

The data gathered suggest that an attraction to computers *does not necessarily* mean a motivation to learn with computers. In all three schools, many respondents (83.5% in school A, 82.2% in School B and 72.6% in School C) indicated that they were attracted to computers (see **table 10**). This did not always translate into motivation to learn using computers in any of the three schools. Many respondents did not agree that computers *always* motivate them to learn. The data however provide evidence that many learners consider computer-based learning to be superior to other forms of learning. This is shown in the responses relating to choice, attention to learning, effort towards learning, time devoted to learning, and perceived level of learning.

Whilst computer-based learning was considered more motivational than other forms of learning in all three schools, the data gathered from school C are quite interesting. They showed that the gap between computer-based learning and other forms was closer in some cases (see **charts 2, 3 and 5**). This again suggests that there might be a "school effect", in terms of learners' ability to discern the learning (rather than motivational) value of computers. It is possible that the learners in School C, an outstanding school with access to a wide range of learning resources and methods, are better equipped to discern whether computer-based learning will be beneficial to their learning.

6.4.2 QUESTIONNAIRE FINDINGS (OPEN-ENDED RESPONSES)

In the previous section, it was reported that the data gathered do not fully support the claim that the attraction to computers automatically translates into motivation to learn with computers. This section presents the open-ended responses to the questions "do you think computers motivate you to learn?", "do you enjoy learning with computers?", and those relating to motivational behaviours (choice, effort etc). The responses across the three schools were similar, so they are reported together.

It was interesting to find that the open-ended responses to the question "do you think computers motivate you to learn" were very similar to the responses to "do you enjoy learning with computers". Though the questions were different, one relating to motivation and the other enjoyment, it appears the learners did not make a distinction between the two. This could imply that the respondents' perception of motivation to learn and enjoyment is very close or interlinked. It could also signify a weakness in the questionnaire design; the questionnaire could have made the distinction between the questions more obvious. As their responses to both questions are very similar, they are reported together in this section.

THOSE WHO ANSWERED "YES" TO THE QUESTION "DO YOU THINK COMPUTERS MOTIVATE YOU TO LEARN?" OR "DO YOU ENJOY LEARNING WITH COMPUTERS?"

In most cases, respondents explained that they selected "yes" because they have an *expectation of fun* when learning on the computer. For example, some stated that:

> *"It is alot [a lot] more fun and interesting...you will do more"*
>
> *"It is fun then [so] I put more effort into it"*
>
> *"They are a lot more fun and will make people my age excited to lern [learn]"*
>
> *"Yes, because they are more fun and dont [don't] boar [bore] me much"*
>
> *"Because computers are realy [really] fun, so it could make work funner [more fun] and easiar [easier]"*

"Because it keeps you focussed but at the same time it is a fun way to learn without even knowing you are gaining skills each time"

"Because you can have fun learning on the computer"

Many of their comments seemed to focus on their expectation of fun, rather than the learning, suggesting that the respondents seem to consider motivation simply from the enjoyment perspective.

Many attributed the ease and fun to the *interactivity and multimedia* in some computer-based learning activities. For example, some expressed the opinion that:

"Because it is more interesting and interactive, you can watch video"

"Because it makes it better as it includes videos and stuff"

"It is more enjoyable because, on a computer, things are more visuall [visual] and I am a visuall [visual] learner. Also, sounds and animations add that extra touch"

"Sometimes there are games or videos to watch"

"The interactity [interactivity] makes it fun. You can select things and see things happen"

As explained earlier, there seem to be little reference to learning or cognitive engagement with learning. These responses further illustrate the point made by Haydn (2003a) that the "bells and whistles" of multimedia may take learners' focus away from the essence of learning.

Some learners indicated that they *expect computer-based learning to be easy/helpful*. Some of their comments are below:

"It is a lot easier learning on the computer"

"Computer[s] are sometimes easier than looking through a book"

"Because they are [an] easy way to learn information"

"Because they are an easy...and a quick way to learn"

There seems to be an expectation that learning on the computer will be easy or that their learning will be aided. Whilst this expectation could attract them to computer-based learning, Clark & Feldon (2005) warn that this expectation could lead learners to put less effort into learning. They explained that the expectation of ease and flexibility reduces the persistence and mental effort in the learning.

Referring to the World Wide Web, some respondents selected "yes" because computers make it *easy to access to a wide range of information*. They explained that:

"Computers help us to surf on the web and find information that aren't on [in] the books"

"Yes actully [actually,] they do because you can find new things faster and, unlike a book, you don't need to keep on looking for ages for information. Doing that just makes my mind switch off"

"I selected this answer because I always come to things I never knew of and can get more information about it [more]"

"I enjoy learning with computers as there are a range of sources within one object rather than having to have [use] many different books to fulfil my needs"

"Sometimes it is easier than looking in books because there is a wide varity [variety] of information"

"Because computers are the most useful, widely varied and easily accessable [accessible] way of learning"

"It is alot [a lot] faster to find information and you se [use] alot [a lot] less effort"

Another reason given for the belief that computers are motivating or enjoyable is that they perceive computers to be a *modern approach*. Some explained that:

"I think computers are the way forward and writing is out of date"

"Computers hold all the answers and are the future"

"They motivate me because they are newer"

Some respondents indicated that they are motivated to learn with computers because they are *alternatives to other forms of learning*. Some of them commented that:

> *"Its [It's] a relaxed and easy way of learning than having to loo [look] at a piece of paper everyday"*
>
> *"Because the activites [activities] are different than if you was [were] working on paper"*
>
> *"Its [It is] more of a pleasure to have a computer instead of something I associate lots of work with"*

Many respondents indicated that they are motivated to learn with computers because they offer *an alternative to writing by hand*. The comments below illustrate their views:

> *"I enjoy using computers and feel more free to write using keyboards"*
>
> *"Because the [they] are different to [from] writing and I hate writing!"*
>
> *"Schools should have laptops/copmputers [computers] instead of writing"*
>
> *"Because I dont [don't] like writing"*

THOSE WHO ANSWERED "NO" TO THE QUESTION "DO YOU THINK COMPUTERS MOTIVATE YOU TO LEARN?" OR "DO YOU ENJOY LEARNING WITH COMPUTERS?"

Conversely, there were some comments explaining why computers *did not* motivate students to learn or they did not enjoy learning with computers. Some respondents expressed the view that they *do not associate computers with learning*. They are attracted to computers, but not learning with computers. This is because most of their other activities (e.g. games and social networking) were considered more important or more enjoyable to them than learning.

> *"Because there are more resources on the computer that are more interesting, learning becomes second choice".*

"We mostly use the internet for facebook and have no intention to learning [learn] with them"

"Because social networking and games dominate learning website"

"Computers are for fun, not leatning [learning]"

"Because it is boring learning with computers. I would rather play games than lean [learn] with computers"

"When I use computers [for learning,] I feel really bored because I no [know] I could be on facebook or something, so it gets on my nerves"

Because I get fruasted [frustrated] when im [I'm] using the computer for learning when I could be looking at my social updates"

Some respondents expressed the view that they are not motivated to learn with computers because they *do not like computers*. They stated:

"No, I don't like computers. I don't learn with them because computers are not my cup of tea"

"I don't enjoy using computers, so I never learn with computers"

Some even expressed the view that that they are not motivated to learn because of certain *health and safety concerns*, explaining that:

"It can give you a headach [headache] if you are on it tooo [too] long"

"If im [I'm] on the computer for too long, my eyes will start going wierd [weird]"

"Prolonged use of a computer isn't healthy"

Some acknowledged that computers provide access to a wide range of information. They however believe that they were not motivated to learning with computers because of their *concerns about the reliability of the information*. Again, it appears that they were referring to web-based sources when they pointed out that:

> *"Because most information is false"*
>
> *"Because u [you] cant [can't] trust all the info [information] on the computers"*
>
> *"Because it comes with fake facts (lying) from random people that can comment on things. This way I have much difficulty trying to find the correct answer for homework"*
>
> *"Some of the info [information] is edited so it could be wrong"*
>
> *"It's quick and easy but sometimes the information is unreliable"*

Some learners seemed to have more mature or sophisticated understanding of the affordances and limitations of the internet as a source of information. However, it must be stressed that this was a small proportion of the sample. This finding is similar to other studies, such as Crook (2012), where learners seemed to appreciate the variety of information available through the World Wide Web, but have concerns about the factual accuracy and specificity of the information.

THOSE WHO ANSWERED "SOMETIMES" TO THE QUESTION "DO YOU THINK COMPUTERS MOTIVATE YOU TO LEARN?" OR "DO YOU ENJOY LEARNING WITH COMPUTERS?"

Many respondents acknowledged that whilst they are motivated to learn using computers, they *have to deal with a range of distractions*. The availability and their desire to switch to games, social networking etc, often interrupt their learning. This is consistent with the view expressed by Crook (2012) in his study on the tensions associated with importing Web 2.0 practices into schools. Their motivation to learn seems to be influenced by the appeal of other activities. The comments below illustrate this:

> *"Because it can also distract you from learning. You want to go on games"*
>
> *"They distract you or lead you away from the main focus of the work"*

> *"[I chose] sometimes because it makes me want to learn but sometimes it makes me want to go on games"*
>
> *"Because you have distractions like facebook"*
>
> *"Most times I am motivated to lear [learn], but sometimes I get pulled away by facebook...MSN, YouTube etc"*
>
> *"Sometimes I can get distracted by games sites and social networks"*
>
> *"Because it is easily [easy] for me to get distracted"*
>
> *"Sometimes I rush work on computers and go on gam,es [games] insted [instead]"*

Many respondents also indicated that their motivation to learn with computers is *dependent on the look and appeal* of the particular computer-based learning resource. They stated:

> *"Sometimes some sites are eye catching [eye-catching] and that gets me into the mood to learn"*
>
> *"It depends on how it looks. If [it] is boring I would not do it"*
>
> *"If there are colours and things like that, I will be engagd [engaged]"*
>
> *"They can have really good graphics which motivate me"*
>
> *"They have more animations so it grabs [they grab] my attention"*
>
> *"It depends on...how it is presented as to how it provokes my interest"*

This reinforces the importance of effective screen design, in particular the need to capture learners' attention (see Keller 1983) and stimulate their curiosity (see Malone & Lepper 1987).

Others explained that their motivation to learn with computers depends on *their judgement of how interesting the activity will be*. For example, they explained that:

> *"It depends of [on] what the topic is about. Some really motivate you and are easy to get along with"*

"They do motivate me most of the time, but it depends on what it is"

"It depends on what [is] on the computer I am learning [from]"

"Because if it is boring work then it won't motivate me"

"It depends on if it is a fun activity or a boring one. If its [it is] fun then it might but if not I wont [won't] want to do it at all"

"Because if I have to revise it [it's] boring, but if its [it's] a fun way to learn like games, its [it's] okay"

There seems to be further evidence here on the emphasis (or overemphasis) on fun when engaged in computer-based learning. It seems the expectation of (or desire for) fun seems even more powerful than the learning experience itself.

Yet, others pointed out that their motivation to learn or their enjoyment of learning using computers is sometimes affected by the *performance of the computer*. They explained that:

"Sometimes I spend more time waiting for the computer to load than learning, which is not enjoyable"

"When the computer is being stupid e.g. malfunctioning, it can be really annoying so I just give up"

"Sometimes, because I don't enjoy learning when the computer is slow or freezes"

"Because they can sometimes be slow"

"Becaus [Because] they can break"

"They make me angry when they freeze"

Others explained that it is not the computer that is more motivating or enjoyable, but the *topic/content* that is delivered through the computer. Their comments include:

"Because it depends if it my faverite [favourite] subject or not"

"It depends on what the topic is like. I enjoy french [French] homework for playing french [French] games, but if I have to do a diffrent [different] boring topic, I will not enjoy it"

"Because sometimes I don't like the subject and sometimes I do"

"Because it depends on if I find the subject I'm learning easy"

These suggest that some learners are able to look beyond the technology (including its "bells and whistles" and focus on the content. Mishra & Koehler (2006), for example, pointed out that teachers need to consider the interrelationships between technology, pedagogy and content. Their framework for educational technology, which they called Technological Pedagogical Content Knowledge (TPCK), reinforces the importance of knowledge of technology, pedagogy and content. These learners were making the point that focussing on the technology alone is incomplete as an explanation. Their comments place emphasis on the content and pedagogy. However, as with the case of learners who pointed to the inaccuracies of web materials, such learners were a minority of those surveyed.

OPEN-ENDED RESPONSES TO THE QUESTIONS RELATING TO MOTIVATIONAL BEHAVIOURS (CHOICE, EFFORT, ATTENTION, TIME AND LEARNING)

As shown in the previous section, the majority of learners indicated that they were more likely to choose a computer-based learning activity over other forms of learning. The majority also indicated that they were more likely to put more effort, attention and time into a computer-based learning activity compared to another form of learning. Moreover, most indicated that they were likely to learn more if the learning activity was computer-based.

Many of the reasons given are similar to those given to the questions "do you think computers motivate you to learn?" and "do you enjoy learning with computers?". Hence, their open-ended responses have been summarised and are shown in **tables 19 to 23**.

If you had the CHOICE OF LEARNING THE SAME THING on a computer or another form, which would you CHOOSE?
Summary of the reasons for selecting computer-based learning • Some learners prefer computer-based work to paper-based work • It is possible to multitask on the computer • Computers sometimes help with spellings and writing (or require less writing) • Computers provide access to a wider range of information • Some learners have an expectation of fun and ease of use • Some learners believe that computers are more likely to be used in the future • The use of multimedia and interactivity can make the computer more appealing
Summary of the reasons for selecting another form of learning • Performance issues (such as freezes) frustrate learners • Some learners are not proficient in the use of computers • There are some health and safety concerns associated with computers • Sometimes computer-based learning can be interrupted by other activities (e.g. social networking and games) • Some learners prefer other forms of learning or do not like computers

Table 19: Computer-based learning vs. other forms: summary of reasons (choice)

I am likely to PUT MORE EFFORT into…
Summary of the reasons for selecting computer-based learning • The expectation of fun makes some learners put more effort into computer-based learning • The outcome is likely to be more presentable or neater, so learners are prepared to put more effort into the task • Computers are considered more fun by some learners, so they put more effort into them
Summary of the reasons for selecting another form of learning • There are no distraction from games, social networking and other computer-based activities • Some learners prefer to be challenged, but think that computers make learning too easy or offer too much help • Some learners do not associate computers with learning, so less effort is put into computer-based learning • Some learners are not proficient in the use of computers; this limits the amount of effort they put into computer-based learning

Table 20: Computer-based learning vs. other forms: summary of reasons (effort)

I am likely to PAY MORE ATTENTION when doing…
Summary of the reasons for selecting computer-based learning • Computers are usually graphically appealing, so they generate more attention • Computers are usually more interactive, so they sustain attention for longer • Computers often have helpful features which learners can rely on for help if they get stuck • Some learners enjoy using computers and are more likely to pay more attention because of this preference
Summary of the reasons for selecting another form of learning • Learners are less likely to get distracted by (or switch to) other activities • Learners are less likely to get headaches, poor eyesight and other computer-related health problems • Some learners do not associate computers with learning, so will not pay full attention to computer-based learning • Performance issues (such as speed of the computer) puts some learners off computers • Computer-based learning is perceived easy by some learners, so they pay less attention to them

Table 21: Computer-based learning vs. other forms: summary of reasons (attention)

I am likely to DEVOTE MORE TIME to a learning activity if it is …
Summary of the reasons for selecting computer-based learning • Some learners find computers easier, more entertaining or more fun, so put more time into learning on them • Some learners already spend a lot of time on computers, so do not mind learning for a longer period • The wide variety of information of the computer (WWW) encourages learners to explore for longer
Summary of the reasons for selecting another form of learning • Some learners have a preference for other forms of learning • Some learners are not proficient in the use of computers, so will devote less time to them • Computer-based learning time is often cut short by distractions (social networking, games, chat etc) • There are no performance issues (e.g. freezes) which sometimes make learners abandon computer-based learning activities

Table 22: Computer-based learning vs. other forms: summary of reasons (time)

I am likely to LEARN MORE if the learning activity is ...
Summary of the reasons for selecting computer-based learning • There is often a lot more information available on the WWW • The use of multimedia often makes the learning activity easier to remember • Some learners believe they are proficient and can get into the learning task quicker
Summary of the reasons for selecting another form of learning • Some of the information obtained from the computer (WWW) can be unreliable • Some learners are not proficient in the use of computers, so do not try to learn with them • There is a higher likelihood of distraction compared to computer-based learning

Table 23: Computer-based learning vs. other forms: summary of reasons (learning)

6.4.3 FOCUS GROUP INTERVIEW FINDINGS

The focus group interview participants were asked whether their attraction to computers motivates them to learn with them. All the participants in School B agreed that the attraction to computers motivated them to learn with them. There were divided opinions in the other schools, though more agreed that there was a connection between their attraction to computers and their motivation to learn with them. Reflecting on the personalities and abilities of the participants, the researcher did not note any obvious qualitative differences between the participants who took each point of view.

Some explained that they feel that their use of computers is *predominantly for activities like social networking and games*. They further explained that they do not feel that computers should be used for learning. For example, some said:

> *"When I am on the computer, all I am thinking about is games and YouTube, not learning"*

> *"The computer, yeah, is for fun. I am not motivated to learn with them"*

It seemed some learners have already created a barrier against learning from computers. However, some learners believe that computers can motivate them to learn. They agreed that they associate computers with other activities (such as social networking and games).

When presented with computer-based learning, they *judge whether it will be as interesting as other non-educational activities*. Learning on computers is usually considered less interesting, so they are not motivated to learn. Some explained that:

> *"I am not so keen on learning with computers because there are other more interesting things online"*

> *"It depends on the activity. If it is as fun as making my own games, I will use it for learning"*

> *"There really is no problem with learning on the computer. It would be good it can be fun but mentally demanding as well. Then, me and my mates will take computer learning seriously"*

Others acknowledged that the computer has some potential to motivate them to learn. Referring to educational games, one said:

> *"I like the games on bitesize, you are learning but are having fun as well"*

In agreement, another said:

> *"The educational games help me to learn without even realising it"*

Expanding on the potential of computers to motivate learners, many agreed that the *use of multimedia can influence their motivation to learn* using computers. These comments illustrate their views:

> *"If it has things like moving images"*

> *"If it is graphically attractive, it will get me interested"*

> *"If you have a dull and black learning website, no sound, pictures, nothing, it puts me off. If you've got another website and they've put effort into it, it will get me motivated"*

> *"It depends on the presentation, whether they have animations and videos"*

One participant added that the *ability to personalise a learning resource* is likely to motivate them to learn using computers.

> *"Being able to create it on your own...add your own backgrounds and make it personal to you is motivating"*

On further probing, the participant pointed out that it is not just the ability to personalise the learning activity, it is the sense of *choice and control* that can make learning using computers motivating.

Another participant added that there is something motivating about *hyperlinks*. The participant explained that:

> *"Rather than just a lot of information, if it has interesting hyperlinks it will motivate me. It just makes you want to go there"*

The comments above have shown that the attraction to computers does not automatically lead to an attraction to learning using computers. Some learners do not associate computers with learning, so are not keen to engage in computer-based learning. Others compare computer-based learning to other activities and often find them less interesting. There are however some activities or features of computer-based learning that seem to motivate some learners to learn.

During the focus group interviews, some learners confirmed the responses from the questionnaire that certain factors can reduce their motivation to learn using computers. Referring to the *performance of computers*, some said:

> *"It's annoying when they freeze"*

> *"My interest in using computers for learning is affected by freezes. It takes up loads of time"*

> *"It freezes and then you literally forget. You go and do something else. Even though it's unfrozen you don't go and learn anymore"*

> *"When I'm at home I normally go outside and totally forget about it"*

"When I'm in school and they freeze, I usually talk"

Referring to the *possible distractions*, one respondent pointed out that:

"Sometimes it does [motivate me to learn] and sometimes it doesn't. Computers have games on them and I am more likely to be attracted to that"

Consistent with the questionnaire findings and open-ended responses, most of the participants explained that they were more likely to choose computer-based learning over other forms of learning. There was also general agreement that they were likely to devote more effort, attention and time to learning on the computer compared to other forms of learning. In addition, there was general agreement that they were likely to learn more from the computer. They explained that this choice is because computer-based learning is often *more fun*. Sometimes they explained that computer-based learning is a *more modern way of learning*.

It was necessary to tease out what they meant by fun. After probing into the concept of fun, they clarified that, to them, fun was an expectation of interactivity and multimedia. For example, the comments below from each school show their conception of fun:

"It usually looks better and makes you want to learn"

"The multimedia is more interactive and they attract you a bit more, especially if you are a visual learner"

"The computers can include videos, animations and sound. These are more fun that plain writing and inspire me to learn"

Some scenarios were used to clarify some of their ideas. In School C, all the participants of the focus group interviews could not decide whether they would devote more time, effort and attention or learn more from a computer, compared to learning from a magazine. Furthermore, in School B, they explained that the only benefit of an on-screen poster, compared to a printed poster, is the ability to email it around. They explained that there would only be a motivational benefit if the poster was animated.

In general, the findings of the focus group interviews are consistent with the questionnaire findings. The data collected suggest that, though many learners are attracted to computers, they are not always motivated to learn with them. The views expressed during the focus group interviews support the questionnaire findings that the motivation to learn using computers is not automatic, though they tend to have an expectation that computer-based learning will be fun. They also clarified that they conceptualise fun as the presence of interactivity and multimedia.

6.5 LEARNERS WHO ARE NOT ATTRACTED TO COMPUTERS

6.5.1 QUESTIONNAIRE FINDINGS AND OPEN-ENDED RESPONSES

The responses to the questionnaire indicated that very few learners were not attracted to computers. The number of respondents who indicated that they did not like using computers were only two, three and six in schools A, B and C respectively (see **table 10**).

In School A, both respondents indicated that they did not think computers motivate them to learn. They did not provide any open-ended response.

In School B, all three participants indicated that they did not think computers motivate them to learn. The only response was:

"I motivate my self [myself]"

In School C, two of the six respondents indicated that computers do not motivate them to learn, but did not provide any open-ended response. Another two indicated that computers sometimes motivate them to learn, but did not provide any open-ended response. The remaining two indicated that they did not think computers motivate them to learn. Below are their responses:

"Nuttin [Nothing] motivates me apart from money"

"Because they are machines and we should be in control of our own learning"

Their responses to the question “do you enjoy learning with computers?” were also considered. In School A, both respondents indicated that they do not enjoy learning with computers. They both used the word “boring”, but it was not clear whether they were referring to computers, the learning or something else. In School B, the three respondents indicated that they sometimes enjoy learning with computers. There was no specific explanation other than “sometimes it is good but other times it is not good”.

In School C, two respondents indicated that they sometimes enjoy learning with computers but did not provide any comment. Below is a summary of the open-ended responses from the remaining four (similar comments have been combined):

> *“Why would I learn when I can play games? You get me”*
>
> *“I just generally dislike computers”*

Another aspect that was analysed was their responses to the questions relating to motivational behaviours (choice, effort, attention, time and learning). Their responses to these questions varied. The majority of them did not provide any open-ended response, so it was not possible to understand the reasons for the choices. The few comments provided were:

> *“Computers are unreliable”*
>
> *“Because I am disinterested in computers”*
>
> *“Because I am terrible with computrse [computers]”*

The few responses and the brief comments make it difficult to make meaning of the responses provided by the respondents. Their comments do not provide any more information about how this affects their motivation to learn with them. Their comment shows possible links to: lack of interest in computers; lack of competency in the use of computers; the availability of alternatives to learning (e.g. games); the need to be in control on one's learning/motivation and other motivational interests (e.g. money). These findings cannot be relied upon because of the poor clarity of meaning and limited number of respondents.

6.5.2 FOCUS GROUP INTERVIEW FINDINGS

All the participants during the focus group interviews in the three schools said that they were attracted to computers. Hence, the views of learners who are not attracted to computers could not be gathered. However, they were asked hypothetical questions. They were asked to imagine how their motivation to learn with computers could be affected if they were not attracted to computers. They were also asked to explain how their friends who are not attracted to computers would react to learning through them.

One of the participants explained that:

> *"It affects their motivation in a bad way. My friend had to do homework on the computer and she really wasn't looking forward to it because she doesn't like computers. It is awkward relying on just textbooks"*

Another commented that:

> *"Usually, if you don't like something, you avoid it. Don't you?"*

The comments made during the focus group interviews were made by learners who said they were attracted to computers. Hence, the focus group interviews neither validate nor provide additional clarification of the data collected through the online questionnaires. In the three schools, only eleven learners indicated in the questionnaires that they are not attracted to computers. Unfortunately, the questionnaires were anonymous; it was impossible to identify and interview them. However, the data gathered suggest that a lack of attraction to computers is likely to affect their motivation in a negative way.

6.6 PROFICIENCY IN THE USE OF COMPUTERS AND MOTIVATION TO LEARN USING COMPUTERS

6.6.1 QUESTIONNAIRE FINDINGS

The respondents were asked to rate their levels of proficiency with computers using stars. The use of ratings, in particular the star ratings, was welcomed by all the participants during the pilot study. They seemed very familiar with the use of star ratings. However, the use of the word "proficiency" was found to be difficult for the target population. In response to the feedback, "please rate how good you think you are with computers" was used. There were also labels indicating that "1 star" meant poor, "3 stars" meant average and "5 stars" meant advanced.

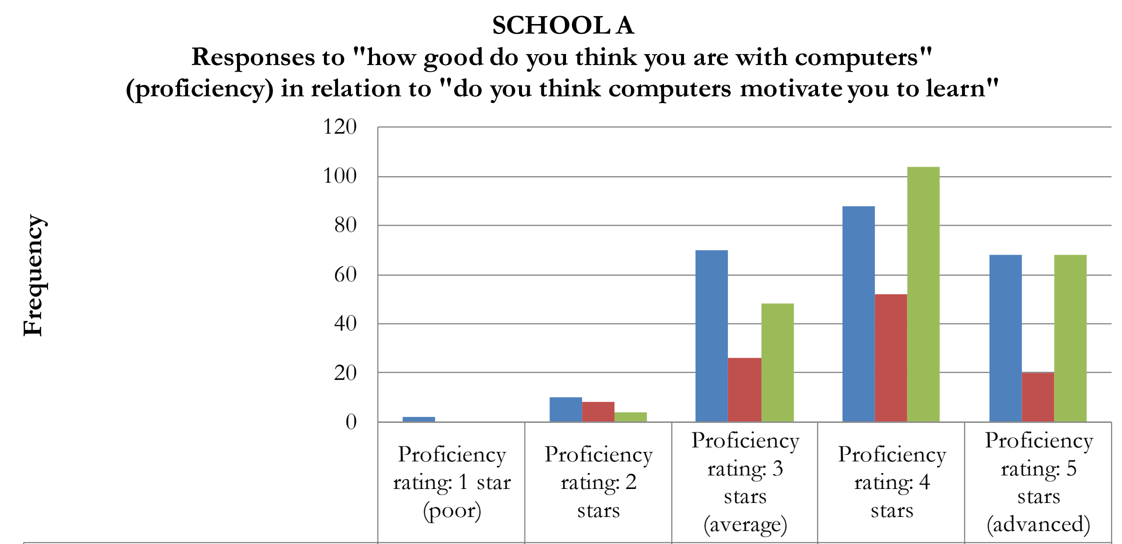
Table 24 shows the respondents' ratings of how good they believed they were with computers (proficiency). One weakness of this study is that it relies on learners' own ratings. The data gathered show their *perception of their proficiency*, not their proficiency. Even the information about how long they spend on computers (see **table 11**) or what they use computers for (see **table 12**) cannot be used as true measures of proficiency. A possible approach is to ask respondents to take some form of proficiency test; even this is impractical for this study. Asking the entire target population to take proficiency tests would be too time-consuming. There is also no guarantee that the proficiency test would be a reliable measurement tool.

Proficiency rating	**School A** **Frequency and percentage**	**School B** **Frequency and percentage**	**School C** **Frequency and percentage**
1 star (poor)	2 (0.4%)	3 (0.4%)	2 (0.5%)
2 stars	22 (3.9%)	27 (3.2%)	8 (1.9%)
3 stars (average)	144 (25.4%)	225 (26.7%)	140 (32.6%)
4 stars	244 (43.0%)	405 (48.0%)	212 (49.3%)
5 stars (advanced)	156 (27.5%)	183 (21.7%)	68 (15.8%)

Table 24: Please rate how good you think you are with computers

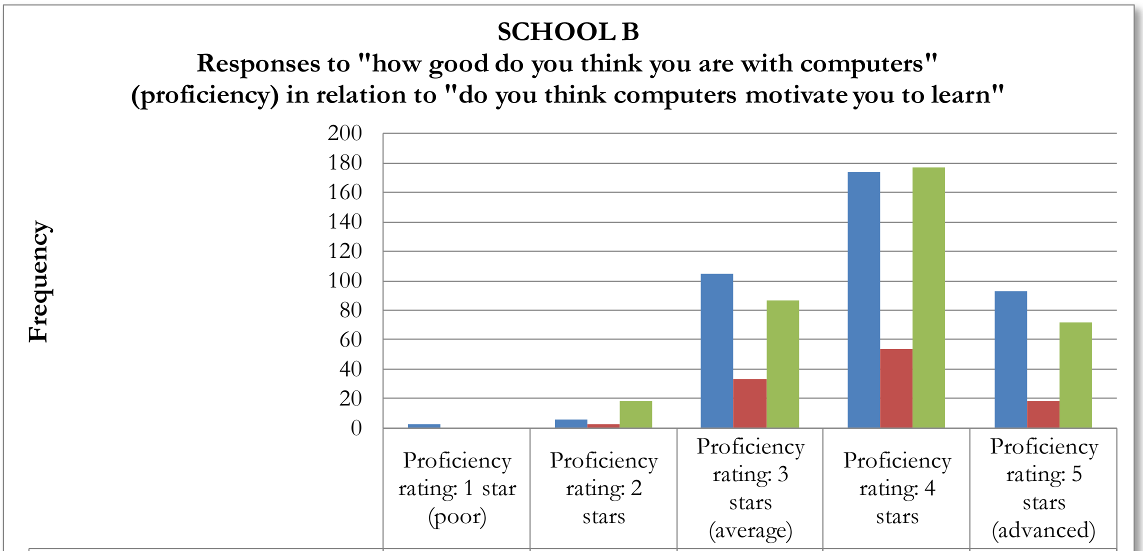
An interesting finding is that most learners rated themselves highly. In all three schools, a significant number of respondents rated themselves between average and advanced, 85.9%, 96.4% and 97.7% in Schools A, B and C respectively. It is not clear whether these high ratings show proficiency or self-confidence.

In order to determine whether the proficiency ratings provided by the respondents had any link to motivation to learn, their ratings were analysed in relation to whether they think computers motivate them to learn. **Charts 6, 7 and 8** show their proficiency ratings in the three schools against their responses to the question "do you think computers motivate you to learn?".



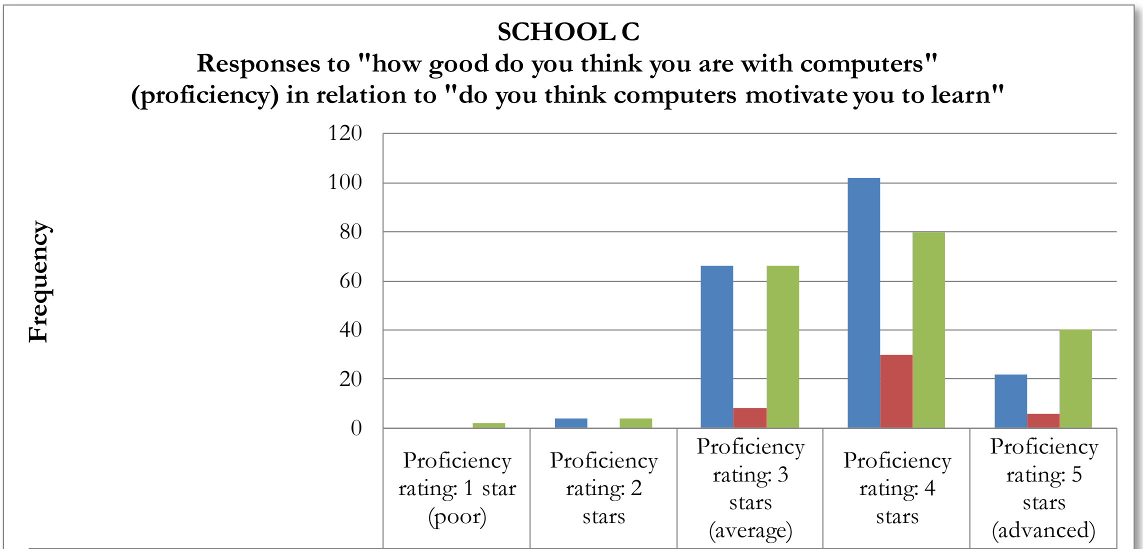
	Proficiency rating: 1 star (poor)	Proficiency rating: 2 stars	Proficiency rating: 3 stars (average)	Proficiency rating: 4 stars	Proficiency rating: 5 stars (advanced)
Do you think computers motivate you to learn: Yes	2	10	70	88	68
Do you think computers motivate you to learn: No	0	8	26	52	20
Do you think computers motivate you to learn: Sometimes	0	4	48	104	68

Chart 6: Proficiency ratings vs. Do you think computers motivate you to learn? (School A)



	Proficiency rating: 1 star (poor)	Proficiency rating: 2 stars	Proficiency rating: 3 stars (average)	Proficiency rating: 4 stars	Proficiency rating: 5 stars (advanced)
Do you think computers motivate you to learn: Yes	3	6	105	174	93
Do you think computers motivate you to learn: No	0	3	33	54	18
Do you think computers motivate you to learn: Sometimes	0	18	87	177	72

Chart 7: Proficiency ratings vs. Do you think computers motivate you to learn? (School B)



	Proficiency rating: 1 star (poor)	Proficiency rating: 2 stars	Proficiency rating: 3 stars (average)	Proficiency rating: 4 stars	Proficiency rating: 5 stars (advanced)
Do you think computers motivate you to learn: Yes	0	4	66	102	22
Do you think computers motivate you to learn: No	0	0	8	30	6
Do you think computers motivate you to learn: Sometimes	2	4	66	80	40

Chart 8: Proficiency ratings vs. Do you think computers motivate you to learn? (School C)

In all three schools, no obvious pattern emerged from the proficiency ratings and the response to the question "do you think computers motivate you to learn?". This is probably due to the subjectivity of comparing learners' own ratings of their proficiency. The researcher tried to compare the proficiency rating against the motivational behaviours (choice, effort, attention, and time). No obvious relationship emerged from this comparison.

Furthermore, a Pearson product-moment correlation coefficient was run to determine the relationship between the learners' proficiency ratings and their responses to the question "do you think computers motivate you to learn". The results from the data gathered in School A do not lend support to a relationship between their proficiency ratings and motivation to learn with computers ($r = .041$, $p > .05$). Similarly, the data from School B do not indicate a strong correlation between their proficiency ratings and motivation to learn with computers ($r = .034$, $p > .05$). Moreover, the data from School C show that the correlation between the proficiency ratings and the motivation to learn with computers is weak ($r = .038$, $p > .05$). Hence, it is unclear whether their proficiency ratings are directly related to their motivation to learn with computers.

The unclear outcomes could be because of the study's reliance on learners' ratings of their proficiency, which can be subjective. Furthermore, it reveals a possible weakness in the design of the questionnaire. The questionnaire could have been made more explicit by asking a follow-on question (e.g. tell us how this affects your motivation to learn using computer) once they select their proficiency rating. It would have been possible to link learners' perception of proficiency directly to its effect on motivation. It could also have generated more open-ended responses.

6.6.2 QUESTIONNAIRE FINDINGS (OPEN-ENDED RESPONSES)

In all three schools, very few respondents provided open-ended responses that linked their motivation or enjoyment to their perceived level of proficiency. **Table 25** shows the total number of comments from each school that attribute motivation or enjoyment to the level of proficiency.

School A			
Proficiency rating	Total number of ratings	Number of comments that attribute POSITIVE motivation or enjoyment to the level of proficiency	Number of comments that attribute NEGATIVE motivation or enjoyment to the level of proficiency
1 star (poor)	2	0	0
2 stars	22	3	2
3 stars (average)	144	4	4
4 stars	244	7	2
5 stars (advanced)	156	5	0
School B			
Proficiency rating	Total number of ratings	Number of comments that attribute POSITIVE motivation or enjoyment to the level of proficiency	Number of comments that attribute NEGATIVE motivation or enjoyment to the level of proficiency
1 star (poor)	3	1	1
2 stars	27	1	0
3 stars (average)	225	2	3
4 stars	405	5	0
5 stars (advanced)	183	5	0
School C			
Proficiency rating	Total number of ratings	Number of comments that attribute POSITIVE motivation or enjoyment to the level of proficiency	Number of comments that attribute NEGATIVE motivation or enjoyment to the level of proficiency
1 star (poor)	2	0	0
2 stars	8	0	1
3 stars (average)	140	8	1
4 stars	212	3	0
5 stars (advanced)	68	3	1

Table 25: Comments that attribute motivation/enjoyment to the level of proficiency

There was a mix of opinions from the respondents who indicated that their level of proficiency is low (1 or 2 star ratings). The comments below illustrate this:

> *"I find computers very confusing so i [I] dont [don't] enjoy learning with them"*

> *"im [I am] not good on computers but not good on books either"*

"I am not good with them [computers] but think it [they] can be motivating"

"They [computers] dont [don't] motivate me [. They are] too hard to use"

There was also a mix of comments from those who selected the higher proficiency levels (3, 4 or 5 star ratings). Below are some examples of their comments:

"I like learning on computers because im [I am] good at it"

"I guess I find it easy because I can do allot [a lot] of things on the computer"

"I am good on computers but find learning on the computer boring because they dont [don'] utiliz [utilise] all my skilld [skills]"

"I am ok [okay] with most things on the computer but don't get the learning part"

"[It] depends. If it's facebook Im [I'm] good, but nothing else"

From the views expressed, we still cannot be certain about the relationship between proficiency and motivation to learn. Some learners who believed they were not proficient in the use of computers indicated that their lack of proficiency tends to reduce their motivation to learn, as suggested by Hills (2003). This finding is similar to the study conducted by Deaney et al. (2003), who found that students feel hampered by a lack of proficiency in the use of ICT. In one instance, however, one learner who rated themselves as less proficient still believed that computers were motivating. Learners who believe they were proficient in the use of computers also made a mix of responses.

6.6.3 FOCUS GROUP INTERVIEW FINDINGS

The focus group interviews did not provide a great deal of additional information regarding the effect of proficiency in the use of computers and motivation to learn with them. This was because most participants in the three schools indicated that they were very proficient in the use of computers. When asked to give themselves ratings from one to five (one being poor and five being advanced) there was only one respondent who indicated that they would rate themselves as three (average). The others indicated that they were four or five.

Their views of their own proficiency did not match the proficiency profiles provided by their teachers (see **appendix 21**). According to their teachers, three of the participants were at below average level of proficiency, seven were at average levels of proficiency, and eight were above average. This could mean that learners' perception of their proficiency can be overrated. It could also mean that teachers sometimes underestimate learners' capabilities on the computer. For this and other studies, it illustrates how problematic and unreliable such subjective measures are. They might have a different idea about what it means to be "good at ICT".

In an attempt to uncover more about their levels of proficiency, they were asked to explain what they were capable of doing on the computer. They explained that they were competent in the use of the internet, office applications and graphic design. A few indicated that they were proficient in web and games programming. The researcher can confirm, from experience as a specialist ICT teacher, that these reflect the expected level of computer skills for the age group. However, it is still not a good indication of the levels of proficiency; it only tells us what they think they know and can do.

Some participants explained that their perception of their proficiency is connected to their motivation to learn. They explained that their perception of proficiency increases their confidence and willingness to engage in computer-based learning. They also explained that, when they believe they are not proficient, their confidence and willingness to engage in computer-based learning seem to reduce. These views are illustrated in the comments below:

> *"If you are an expert you will probably find it easier to do things [on the computer], so will be drawn to learning [with computer]"*
>
> *"[If you are proficient] you are likely to work faster, so you choose to get on with it"*
>
> *"If you haven't got many computer skills, you can, kind of, be put off in a way. If you're good at it, you will be like, right, I can do this"*
>
> *"If you type slowly, you will not be interested [in learning with computers]"*
>
> *"If you are bad [at using the computer], you just won't be bothered"*

Taking a positive approach, one commented:

"I think if you are not good [with computers], you should still try. The more you use them [computers], the more you learn about them"

Another explained that it was important to *have and use their computer skills*, stating that:

"I find it [computer-based learning] easy and I get to use my computer skills"

What emerged from the focus group interviews is that, for some learners, the *perception of proficiency* is what matters, not proficiency itself. Their comments were based on their beliefs about how proficient they were in using computers. This belief might be the result of actual proficiency, an overestimation or underestimation of their level of proficiency. What is most important is that these beliefs seem to increase or decrease their levels of confidence and willingness to take part in computer-based learning.

Consistent with the findings from the questionnaire, some explained that proficiency (or perception of proficiency) does not make learning on the computer attractive. One said:

"Just because you are good at it doesn't mean you want to use it for learning"

The focus group interviews provided additional information in two ways. Firstly, they clarified that the perception of proficiency is what sometimes influences motivation, not necessarily proficiency. Secondly, they provide evidence suggesting that proficiency (or the perception of proficiency) in the use of computers does not always mean an attraction to learning using computers.

6.7 CHAPTER SUMMARY

In this chapter, the findings of the data gathered through the online questionnaires and focus group interviews were presented. The focus group interviews broadly confirm the findings from the online questionnaires, and in some case, expand them.

It was found that most, but not all, learners are attracted to computers. Many reasons were given for the attraction to computers, for example, access to information, perception of proficiency and appreciation of benefits. However, the perception or expectation of fun and entertainment seemed to be the most prominent reason. Some of the evidence also suggested the possibility of some "school effects" in terms of learners' access to learning resources and their ability to discern the learning value of computers.

It was also found that the attraction to computers did not necessarily translate into motivation to learn with computers. Some learners explained that they were motivated to learn with computers. They provided several reasons for the motivation, such as, the expectation of fun and access to a variety of information. On the other hand, there were many reasons for a lack of motivation to learn with computers, such as the appeal of other activities like social networking and issues with the performance of computers.

An important message for researchers, as found during this study, is that learners tend to show preference for computer-based learning when asked to compare them to other forms of learning. It was discovered that their choice is often based on the expectation or perception of fun (interactivity and multimedia).

This study was unable to gather sufficient data from learners who are not attracted to computers. Very few learners indicated in the online questionnaires that they were not attracted to computers. As the questionnaires were anonymous, the respondents could not be identified. The open-ended responses were reported but were often not detailed or clear enough to allow meaningful conclusions to be reached. All the participants of the focus group interviews said they were attracted to computers, so hypothetical questions were asked. The little data gathered suggest that there is a negative effect on their motivation to learn with computers, but no further explanation can be provided.

One important finding from this study is that the perception of proficiency, not proficiency per se, can give learners the confidence and willingness to engage in computer-based learning. However, the relationship between proficiency (or perception of proficiency) and motivation to learn still remains unclear.

CHAPTER 7: FINDINGS OF THE MULTIPLE-CASE STUDIES (NOVELTY AND ACTIVITIES)

7.1 INTRODUCTION

This chapter presents the findings of the multiple-case studies investigating novelty and activities, the second and third facets of this study. During the pilot study, the participants explained that they were more comfortable with the word "newness". Hence, "newness" was used instead of novelty during the live study. In June/July 2011, six participants from each school were asked to interact with twelve e-learning activities.

A combination of observations, recording of on-screen interactions, self-report forms and focus group interviews were used to capture relevant data. The recordings of the interactions in Schools B and C were lost because the screen-recording software crashed. Hence, it was impossible to compare recordings of the interactions between the three schools. The researcher had to rely on the observations, self-report forms and focus group interviews.

The research questions relating to the **novelty** of e-learning activities are:

- How do learners react when novelty is diminishing or has ended?
- How long does the novelty of different e-learning activities last? What factors influence learners' perception of novelty?

The research questions relating to the e-learning **activities** themselves are:

- What are the motivational effects of different types of e-learning activities?
- Which features of e-learning activities affect motivation to learn?

The chapter starts with a reminder of the multiple cases, participants and selected activities. The rest of the chapter is organised in the order of the research questions. The next two sections report the findings to the research questions relating to novelty (the second facet of this study). This is followed by two sections presenting the findings to the research questions relating to activities (the third facet of this study). Where responses across the three schools are similar, they are reported together.

7.2 THE MULTIPLE CASES, PARTICIPANTS AND SELECTED ACTIVITIES

It is important that the contexts of the multiple-case studies are clear. Hence, before reporting the findings, this section serves as a brief reminder of the multiple cases. In chapter 5 (sections 5.4.3 and 5.3.1), the multiple cases and the profiles of the schools were discussed. **Figure 4** (below) shows an overview of the multiple-case studies:

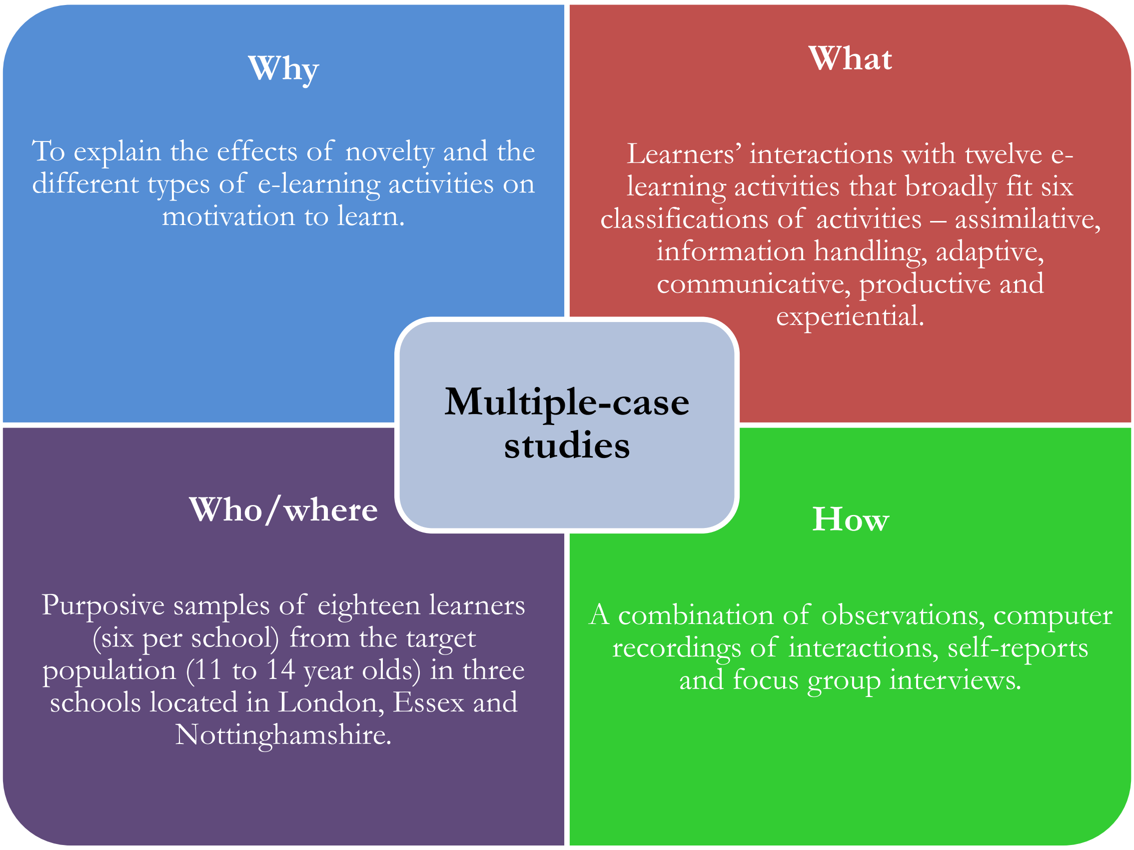


Figure 4: An overview of the multiple-case studies

Brief profiles of the participants were also given in chapter 6 (section 6.2.2). More detailed profiles – academic abilities, levels of proficiency in the use of computers, levels of motivation to learn and educational needs – are shown in **appendix 21**. These participants' profiles are based on their teachers' perceptions, judgements and knowledge of their pupils' prior attainments.

The selected activities are listed in **table 26** (below). Detailed descriptions of the activities can be found in chapter 5 (section 5.4.2) and **appendix 12**. In some cases, the activities did not fit perfectly into the classifications. There was an overlap between some of the activities, especially the adaptive and experiential activities.

Classification	Names of the selected activities
Assimilative (e.g. reading, viewing, listening and writing)	• Tour of Parliament • Culture Zone
Information handling (e.g. classifying resources, ordering data and manipulating data)	• Looking at Mutual Funds • Words with Multiple Meanings
Adaptive (e.g. modelling and simulation)	• MP for a Week • Energyville ™
Communicative (e.g. group-based discussions, debating, presenting and critiquing)	• Climate Wiki • Heated Debate
Productive (e.g. construction of artefacts, writing, drawing, composing and producing)	• FWG Bridge • Sketch2
Experiential (e.g. investigating, exploring, performing, mimicking and practising)	• Coffee Shop • Starting Out

Table 26: Names of the selected activities

7.3 DIMINISHING OR ENDED NOVELTY

7.3.1 NOVELTY: ITS EXISTENCE, EFFECTS AND DURATION

THE RESEARCH QUESTION: ARE WE MISSING SOMETHING?

The research question, *how do learners react when novelty is diminishing or has ended*, assumes that there is a phenomenon known as novelty. It also suggests that learners' motivation is positively influenced by novel e-learning activities. Some studies have suggested that learners might be positively motivated due to the novelty of activities and features (Keller & Suzuki 2004; Huk et al. 2002). Furthermore, it assumes that the phenomenon occurs for a limited time. Rather than make assumptions about what novelty is, it is important to examine the concept of novelty itself (its existence, effect and duration). Only then, can the effects of diminishing or ending of novelty be explored.

THE EXISTENCE, POSITIVE EFFECTS AND POSITIVE SIGNS OF NOVELTY

Although novelty was treated with scepticism at the start of the study, the researcher was quickly convinced of its existence. Several comments on the self-report forms and the focus group interviews point to the existence of novelty, a motivational influence that tends to occur at the beginning of the interaction with new e-learning activities. They often related it to words like "new", "energy", "fresh", "exciting" and "different".

Some of the comments from School A illustrate their perception of novelty:

> *"When you start doing the learning thing, there is some enjoyment. Since it is fresh, you expect a lot from it. This kind of motivates you. You want to know more"*

> *"I can't put a finger on it, but it is exciting to start with. You are curious to try it out. This doesn't mean you will want to continue, but at least it gets you going"*

> *"It's like when you open a new game. You have a rush of energy towards it. You spend ages on it at first, and then start getting bored of it"*

Similar ideas emerged from School B. They commented:

> *"At the start, I was like 'oh wow' and wanted to get into it. First, I was trying to discover the activity. That kept me glued to it. When I figured it out, it was just okay"*

> *"There is a short initial burst of fun and interest in the activity"*

> *"I think the beginning is the best time really. Many things are new. You are figuring things out, so you concentrate a lot on the task. There comes a time when it just becomes normal"*

Participants from School C also echoed the view that novelty exists:

"All the interest at the start will surely go down. I mean, it cannot be appealing forever because it will not be new forever"

"Learning is not my thing on the computers really, but I sometimes get excited at the start of it. There is some desire to get going"

"I think when it's something you have not seen before, you want to see the stuff in action"

"You spring into action at first, don't you? You are sometimes attracted to the fact that it is new. You might lose interest later, but you are interested to find out what it is all about"

The concept of novelty was further explained when a participant from School B related it to flowers. They explained that, like flowers, a learning activity is fresh and pleasant to start with. This freshness slowly fades away. Another participant in School C related their experience during interaction with e-learning activities to an aeroplane. They explained that a lot of energy is generated during take-off, representing the energy they put into e-learning due to novelty. In School A, one participant compared it to joining secondary school, explaining that their first few weeks were filled with excitement and positivity.

Ultimately, the participants were referring to an abstract concept; it was difficult to "touch" or measure novelty in terms of intensity or rate of dissipation. The fact that the comments came from all three schools suggests that novelty is a phenomenon that they all recognise. Rather than rely on the views of the learners across the three schools, data from the observations and the recording of interactions (in School A) were used for triangulation.

The observations and recordings of the interactions (in School A) suggest that, in addition to the existence of novelty, the participants sometimes exhibited some behaviours (signs) when responding positively to novel activities. For example, the following excerpts from the researcher's field notes and activity logs suggest that some of the positive signs of novelty could be excitement, curiosity, concentration and effort:

1 minute: C1 is really trying very hard to learn from the activity. C4 is concentrating fully on the task...4 minutes: C1 seems to be putting less effort into the activity. C4 appears to have given up and starts looking around.

2 minutes: A3 appears to be excited about the new activity...5 minutes: A3 seems less interested, but is still engaged in the activity.

0 minute: B6 said 'I can't wait to try this out'. B1 took the time to read the introduction screen (full concentration)...3 minutes: B6 and B1 seem to have lost concentration and are now 'clicking around'.

For triangulation purposes, it was necessary to verify the researcher's observations through the focus group interviews. Some of the participants verified the positive signs of novelty, explaining that:

"At the start, right, because you are not familiar with it, it makes you concentrate a bit. This is the most interesting point"

"You actually try hard at first because you are curious to find out what it is about"

"You start with some happiness, I mean, excitement"

Some of the behaviours described (excitement, curiosity, concentration and effort) can be explained by concepts from existing research models that influenced this study. For example, Malone & Lepper (1987) highlighted the importance of curiosity. Keller & Suzuki (2004) also point to the importance of curiosity as a way of stimulating attention to an e-learning activity. The participants were making the point that the perception that an activity is new seems to affect their motivation.

One interesting finding, however, is that the signs of novelty did not necessarily disappear when the activity was no longer considered new, as one of the participant clarified:

"It does not mean that the excitement and concentration ends when it is not that new anymore"

REASONS FOR THE POSITIVE INFLUENCE ON MOTIVATION

The participants also explained some of the *reasons* for their motivation when interacting with novel e-learning activities and features. Some participants explained that novelty generates *curiosity*. The curiosity seems to influence learners' motivation to learn in the initial periods of the interaction. For example, some participants in School A said:

"I was curious to see what would happen. I guess I will not feel the same way if I get to use it [the e-learning activity] next time"

"The effect of the newness on me is the curiosity to explore"

This is in agreement with the views of a participant in School B, who said:

> *"I actually didn't know if the activity will be enjoyable, but I was curious"*

One respondent from School C also commented that:

> *"The newness makes you eager to find out more"*

These views are consistent with those of Berlyne (1954, 1960), who explained that novelty arouses curiosity. In fact, the view that novelty generates curiosity is not new. For example, James (1890) explained that curiosity is aroused by seeing something new. Loewenstein (1994) also explained that curiosity arises from a perception of a gap in knowledge or understanding. In other words, they are curious because they perceive that there is a gap between what they know and what they ought to know. Hence, when they are faced with novel activities, they seem keen to approach and explore them.

It was interesting to note that some of the comments from the participants suggest that there might be more than one reason for curiosity when faced with novel activities. For example, the view expressed by the participant in School B suggests that they were curious to find out whether the activity would be enjoyable, not necessarily curious to learn. This could perhaps be explained by Malone's (1981) differentiation between sensory curiosity (to do with the use of animations, illustrations, music etc) and cognitive curiosity (when incomplete, ambiguous and incomplete information is used).

In addition to curiosity, the *expectation* that the activity will be worthwhile seems to be another reason for motivational influences. When learners have never experienced the activity or feature, they are optimistic that it will be beneficial. Although there appears to be a strong relationship with curiosity, expectation has been reported separately in an attempt to make a distinction between the desire to find out more (curiosity) and the optimism (expectation).

Some of their comments relating to expectation are shown below:

> *"I didn't know what it would be like, but the newness made me feel it might be useful"*

"People our age are always trying to get involved in new activities like this because we think it will be interesting. You'd never know until you try it"

"Because it is new, you have new expectation that it will be different from anything else you've worked on"

Another reason that emerged was that the *challenge* of a new activity has motivational influences. Some learners believed that new activities posed themselves as new challenges, which they found motivational. For example, one participant in School A explained:

"It's a bit like your computer game. Because it's new, you see it as a challenge. So you're motivated to get going"

Similar views were expressed in School C. They commented that:

"When I open a new 'computer learning', I want to master it very quickly"

"As I said, the newness is a challenge"

Another explanation that can be inferred from these comments relates to learners' perception of their ability to cope with the challenges during e-learning. It suggests that they believe that they have the right level of skill to deal with the challenges posed by the activity. Csikszentmihalyi & Nakamura (1989) proposed a theory that linked the level of challenge (as perceived by the learner) to the level of skill (as perceived by the learner). They predicted that optimum motivation would be achieved when the level of challenge and skill are perceived to be equal or when both are high. It is important to note that the perceived level of challenge and skill are the result of subjective evaluations of the individual learner.

NEGATIVE EFFECTS AND NEGATIVE SIGNS OF NOVELTY

It has been suggested that curiosity, expectation and challenge influence learners' motivation positively when they interact with novel e-learning activities. It cannot be assumed however that novelty always results in positive motivation. Some learners stressed that novelty can have negative effects on their motivation. Whilst some learners are curious and feel challenged, a few have some *anxiety* about whether they can cope with the challenge. Whilst some have expectations, a few are *uncertain* about whether it will meet their needs and whether they will be able to cope with the challenge. It was also interesting to note that these feelings of anxiety and uncertainty were not necessarily from learners who were deemed to be of the lower levels of proficiency in the use of computers.

The learners seemed to make initial appraisals when faced with novel activities or features. The outcome of the appraisal seemed to determine their reaction to the new e-learning activity. They were referring to their beliefs about their self-efficacy, their belief about their ability to learn through the activity and their likelihood of success (Bandura 1997). One participant from School B illustrated this point by referring to one of the e-learning activities:

> *"I found that the newness of...had a very negative effect on my motivation. It is quite difficult if, from nowhere, you are presented with a new activity. Instead of worrying about the learning, you start worrying about whether you will be able to cope. When I actually started, it wasn't too bad"*

One participant in School C argued concisely that:

> *"I guess, for some people, when the activity is new, they get excited. For me, it's different. I get very concerned about whether I will get it, whether it will help me in any way, [and] whether I will find it interesting"*

Another participant in School A expressed their anxiety when they start interacting with new e-learning activities saying:

> *"I don't know about these [the other participants], it can take me a long time to figure out new activities. When it's new, I lose some confidence in my ability. I soon get going, but I'm less motivated to start"*

The participant, getting the agreement of other participants, added:

> *"When they use sounds and videos [in the e-learning activity], they kind of help me feel it will not be too bad"*

This suggests that multimedia has the potential to address some learners' concerns about the negative effects of novelty.

Some of the *signs* of the negative influences of novelty (observed during the interactions) include apparent confusion, task/work avoidance and search for help. Below are some of the excerpts from the researcher's field notes and activity logs:

> *B2 attempted to press the F1 [help] key.*
>
> *A1 looked around for help (looking confused). A1 presses the guided play button (still looking confused).*
>
> *C4 is a bit reluctant to take part (seems unsure and looking uninterested).*
>
> *A3 looks unsure, then starts clicking around.*
>
> *B5 asked B1 a question (what to do/the point of the activity perhaps).*

Some of the participants verified these signs during the focus group interviews explaining that:

> *"It was different and I was quite confused. I knew I could learn with it, but didn't know how to go about it"*
>
> *"I was looking for something else to switch to. It does affect your confidence, you know"*
>
> *"When it's new and you're worried about it, you look to see if there is a help button or just click around and do nothing"*

Contrary to the researcher's expectation, it appears that novelty does not always have positive motivational influences on learners. Existing literature tends to suggest that novelty has positive influences on motivation (for example, Allen 2003; Keller & Suzuki 2004; Huk et al. 2002). The findings of this study challenge this view because some learners believed that novelty did not boost their motivation. Further questioning and investigation into the differences in reaction to novelty did not yield any answers, other than possible individual differences. Some studies have reported on the individual differences in learners' personalities and the extent to which they can be influenced (Arnone 2011; Brophy 2004; Hills 2003; Arnone & Small 1999).

Though not specific to the e-learning context, some studies have suggested that novelty does not always have positive influences on motivation. For example, Smock & Holt (1962, p. 632) explained that: "it is apparent from these findings that the motivational properties of 'novelty' are not always 'positive'". They concluded that novelty generally evokes positive motivation, but point out that the motivational influences vary among individuals. Hence, the findings of Smock and Holt (1962), though based on a different context, bear some similarities with this study's findings.

It appears that the motivational influence of novelty is double-edged. The reasons given for motivation due to the novelty of the activities (e.g. curiosity and challenge) sometimes provoke positive and negative motivational behaviours. Take curiosity, for example, Day (1982) describes the optimal level of motivation as the "Zone of Curiosity". In this zone, learners exhibit excitement, interest and exploratory behaviour. He explained that when there is too much uncertainty, the individual becomes overwhelmed and enters the "Zone of Anxiety". This leads to behaviours like disinterest and avoidance. They can also exhibit disinterest and a lack of motivation if there is little stimulation of curiosity, believed to be the "Zone of Relaxation". Similarly, for optimum motivation, the perceived level of challenge should be just above the learner's level of skill (see Csikszentmihalyi & Nakamura 1989).

Apart from the likelihood of both positive and negative influences on motivation, the self-study nature of the activities used in this study introduces a new dimension – the relationship between control and novelty. The learners had full control over the e-learning activities. They could decide whether to end the interaction with the activities, how to engage in the activities and what aspects of the activities were worth exploring. Some learners explained that the control over some e-learning activities extended their perception of the novelties of the activities. Their ability to control the activities appeared to give them choice over their own novelty. Some of their views are reported in section 7.4, but the comment below has been provided as an example:

> *"It [Energyville™] felt like a new activity throughout because it was changing as I was deciding on what to do"*

Furthermore, the particular age group being studied appear to display certain motivational behaviours. It has been discussed in section 3.2.6 that learners of this age group tend to seek novel experiences and believe that they are unique (see Elkind 1967; Berk 2010). It has also been discussed that they start to push for freedom and independence (see Bee 1998; Coleman 1980). This particular age group are perhaps faced with the challenge of balancing the quest for novelty with the need to have choice and freedom in how they interact with the activities. The outcome of this balancing act is probably what results in the likelihood of positive and negative motivational responses when they interact with novel activities.

7.3.2 WHEN NOVELTY IS DIMINISHING OR HAS ENDED

THE "NOVELTY PERIOD" (THE PERCEIVED DURATION OF NOVELTY)

The term *"novelty period"* will be used loosely in this thesis to represent the period when participants (or the researcher) perceive that an e-learning activity is still new. The participants were asked to complete a self-report form after each interaction. The self-report form sought to collect data about the motivational effects of the newness of the activity, their perceptions of how long the activity remained new to them ("novelty period"), and their views on their level of motivation when the activity was no longer perceived to be new.

Their responses on the self-report forms were compared to the observation data gathered by the researcher. These were reviewed during the focus group interviews to identify and discuss any inconsistencies between the researcher's and the participants' perceptions. The participants' responses on the self-report forms and during the focus group interviews indicate differences in each learner's estimate of the "novelty period" of each activity. These differences were attributed to individual preferences.

WHEN NOVELTY IS DIMINISHING

Although the "novelty periods" were observed with some degree of accuracy (based on participants' confirmations), it was difficult to detect the point when learners perceived that novelty was diminishing. There were no easily observable signs or "thunderclap moments" of diminishing novelty. The comments from the participants during the focus group interviews also suggest that they did not feel different when the "novelty period" was ending.

When asked whether the novelty of the activities wore off over time or suddenly, most of the responses seemed to suggest that the novelty suddenly wore off. Those that suggested the novelty of the activities wore off over time were unable to explain what happened when the novelty was diminishing. Some of the comments across the three schools illustrate the uncertainty:

> *"Suddenly, I think"*
>
> *"I don't know. I don't think it happened slowly though"*
>
> *"I really don't think it happened suddenly. How can it? But I felt it was sudden"*
>
> *"It makes sense for the newness to wear off over time, but I don't think that happened to me"*

When asked about the point when they felt the novelty of the activities started wearing off, some participants (across the three schools) said:

> *"It all happened so quickly. I can't really say"*
>
> *"All I know is that it was no longer new to me after some time"*
>
> *"To be honest, I didn't feel any different"*
>
> *"I think it is either new to you or not"*

It seems the consciousness that the novelty of an activity has worn off occurs only in retrospect. Some of the comments also suggest that the perception of novelty might end suddenly or so quickly that it was very difficult to pinpoint the period of diminishing novelty.

To probe further, the participants were asked to cast their minds to two minutes before the point when they felt the activities were no longer novel. They were asked to describe what they felt and did. The participants in the three schools gave similar responses. For example, they said:

> *"I did everything as normal really, no major difference"*
>
> *"When you're excited, you're excited. Two minutes before the newness finished, I was just as excited as before"*
>
> *"If you ask me to rate my level of motivation, I would say it is '4' [rate it as 'four'] two minutes before [the novelty ended] and after [the novelty ended]"*
>
> *"The only difference was the two minutes. Nothing else"*

Why is it that learners recognised the "novelty period" but could not detect when it was ending? Could it be that there is no such thing as "diminishing novelty" and novelty simply ends abruptly? Could it be that "diminishing novelty" does exist but cannot be recognised? It is unclear from the evidence gathered during the multiple-case studies whether learners react in a particular way when novelty is diminishing. Although some learners indicated that there should be a difference when novelty is diminishing, there was very little discernible evidence of observable motivational behaviour.

This is an area of further research, perhaps using electronic methods to analyse learners' physiological states during their interaction. Although some parents might object to this approach because it is quite intrusive, it is likely to generate data which observations, focus group interviews and self-reports cannot. Another possibility is to ask learners to self-report on their perception of novelty during the interaction; this will disrupt the learning process and could have an effect on motivation.

WHEN NOVELTY HAS ENDED

It was impossible to precisely identify the instant at which "diminishing novelty" commenced or its existence in behaviouristic terms, in spite of the fact that participants seemed to acknowledge the existence and reality of "novelty effects". It was hoped that this study would provide findings that are useful for instructional designers who might want to vary activities before their novelties end. Nevertheless, the observations and responses from the learners themselves indicate that there is a "novelty period". There is also evidence suggesting that the "novelty period" can have both positive and negative effects on motivation (as reported in section 7.3.1).

The researcher observed that there were certain reactions to the end of the "novelty period". It was important to use the self-report forms and focus group interviews to verify the observed behaviours. The self-report forms and the focus group interviews also helped to explain some of the behaviours that were observed during the interactions. Some of the reactions to the end of the "novelty period" are discussed below.

The researcher observed that, in some cases, the apparent confusion they started with turned to engagement by the end of the "novelty period". During the focus group interviews, some participants confirmed this observation. They often attributed it to increase in their confidence. They explained that:

> *"By that time [after the 'novelty period'], my confidence in my ability had increased"*

> *"You kind of decide to just get on with it, so you pay attention to what it's saying to you"*

> *"It wasn't that bad. You've had a go by then and have sussed it out"*

> *"I was able to learn something because I was no longer unsure about the activity"*

Furthermore, some of the participants who were avoiding the tasks or searching for help turned to active engagement with the learning activities. During the focus group interviews, they explained that they started to see the activity as a challenge.

> *"I think I am just a slow starter. I was getting worried about the activity in the beginning. Come on, it was new. Later on, I wanted to prove to myself that I could do it"*

> *"The newness part [period] is the worrying part. You soon rise up and try to conquer your fears. You actually make an attempt to learn something"*

One participant admitted that their peers had some influence on their switch to engagement. They commented that:

"I got on with it because I saw everyone and didn't want to look dumb. I soon realised it's okay"

When asked whether they would have persisted if they were on their own, they clarified that:

"Don't get me wrong, I would try it anyway. I just think your mates influence your choices sometimes"

Whilst the "novelty period" seems to increase confidence and provide a desirable level of challenge to the learners, some explained that it has the opposite effect on them. They explained that their motivation did not increase during the "novelty period" because of concerns about their competence and the relevance of the activity to their needs. By the end of the "novelty period", they had become frustrated and had lost interest completely. Below are comments from the three schools:

"By then, I was either totally frustrated or just not interested in the activity"

"I thought about what I was likely to gain from the activity and couldn't see much"

"In my head, I was thinking 'this is a waste of my time'. I was not too keen"

"I gave up on it. I couldn't be bothered to try"

"I kept trying to figure it out. I did not enjoy the activity at all, so I closed it"

This reinforces the importance of establishing the relevance or appropriateness of e-learning materials and providing opportunities for learners to feel competent enough to stay engaged in e-learning activities. Competence and relevance are explained in the research models that influenced this study. Competence, for example, is a key concept in Wlodkowski's (1985) Time Continuum Model. Relevance is also a key feature of the Keller's (1983) ARCS model. In fact, Wlodkowski's (1985) suggested that, at the beginning and during interaction, instruction should focus on experiences that are relevant to the attitudes and needs of the learners.

The comments also indicate that the learners continue to evaluate the e-learning activities during the "novelty period". When the "novelty period" ends, they decide whether the activity is relevant to their needs. Some even describe this period as a "test". The comments below from the three schools illustrate this point:

"The time when it is new is a high-risk time. You wonder if you will gain anything from it. By the time the newness finishes, you are able to say [decide] whether to continue or stop"

"I had finished testing out the activity. It was not so interesting, so I stopped learning"

"When it's new, I lurk around to see if it's worth it. If it passes my test, I get stuck in"

When asked about what the activity needs to have to pass their "test", they indicated that it had to be fun. Fun seemed be associated with the use of multimedia. For example, one insisted that:

"They need to include videos, animations and so on"

Most of the learners agreed that their motivation reduced after the "novelty period". Across the three schools, they explained that:

"I think the excitement of the activity took a bash"

"Obviously, there is something about it being new, which was lost"

"You can feel the excitement go down"

"We're often excited about new things, you start looking for something else later"

"Basically, you still want to learn with it, but don't have the thrill any more"

"The activity didn't become boring, it just was not the same"

When asked about their reaction when they felt the reduction in their motivation, they responded:

"I think this is the time for real learning"

"My excitement now depends on how much interest I have in the content"

"It didn't stop me from continuing with it"

"I am prepared to try any new learning activity. When I feel it is no longer new, I decide on what to do – stay or go"

When asked about the criteria they use to determine whether the activity is worth sticking to after the "novelty period", they said:

"It depends on whether it is fun or not"

"If it looks nice and fun, I will continue"

"It depends on how well they have explained the topic. If they have made it fun, I will continue"

"It depends on whether I learnt anything when it was new to me"

It was interesting to note that, for many learners, their perception of the level of fun seemed to affect their decision to stick to an e-learning activity after the "novelty period", rather than intellectual "connection" with the content. For a few learners, however, the level of learning and content is sufficient to make them stick to the activity after the novelty period.

As shown in the comments above, there are various reactions to the end of the "novelty period". Some learners have pointed out that, by the end of the "novelty period", they have developed confidence and the willingness to take on the challenge associated with the task. A few explained that by the end of the "novelty period", they have developed some concerns about their competence and the relevance of the activity, sometimes ending the learning process. The majority agreed that their motivation reduced after the "novelty period", though they might be prepared to continue with the learning. Their decision to stop or continue with the learning is based on their expectation of fun, the content and how much they learnt during the "novelty period".

7.4 NOVELTIES OF DIFFERENT TYPES OF ACTIVITIES

7.4.1 NOVELTIES OF DIFFERENT TYPES OF E-LEARNING ACTIVITIES

This section takes the investigation further by reporting on findings relating to the research question – *how long does the novelty of different e-learning activities last? What factors influence learners' perception of novelty*? The emphasis is on the duration of the "novelty period" of different e-learning activities and the factors that influence learners' perception of novelty.

In order to determine the "novelty periods" of the different activities, the participants were observed as they interacted with each activity. The researcher looked for the signs of novelty (see section 7.3.1). The signs of the "novelty period" did not necessarily disappear when the novelty of the activity is over; the researcher's perception is therefore an unreliable measure of the "novelty period".

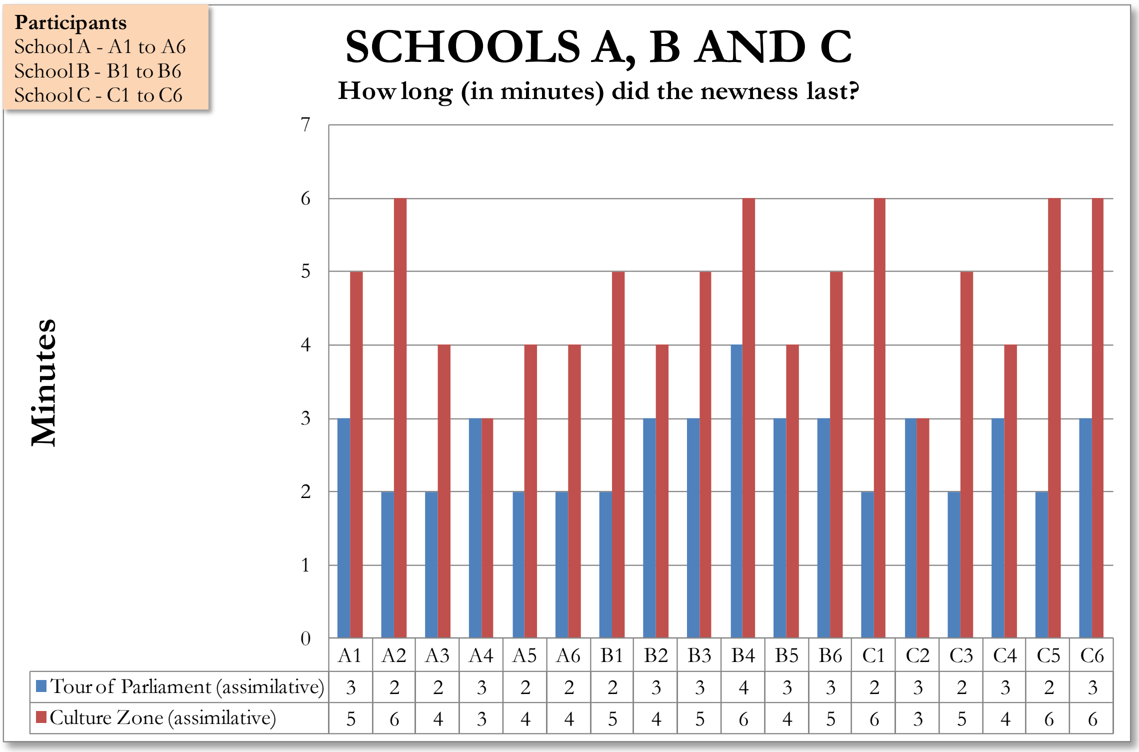
Due to concerns about the reliability of observation alone, the researcher's observation data had to be compared against participants' estimate of the "novelty periods", which they wrote on the self-report forms after each interaction. The reasons for the indicated "novelty periods" were discussed during the focus group interviews. The findings from the three schools were compared and were largely consistent with each other.

7.4.2 ASSIMILATIVE ACTIVITIES

The researcher observed the six participants in each school and estimated the "novelty periods" based on the signs of novelty (see section 7.3.1). The researcher observed that the "novelty period" of the first assimilative activity (Tour of Parliament) was *between two and four minutes* across the three schools – between two and three minutes in School A, between two and four minutes in School B, and between two and four minutes in School C.

The researcher observed that the novelty of the second assimilative activity (Culture Zone) lasted *between three and five minutes* across the three schools – between three and four minutes in School A, between four and five minutes in School B, and between three and five minutes in School C.

Not only was the researcher's estimates of the "novelty periods" of the activities generally consistent between the schools, it was generally consistent with the participants' perceptions across the three schools. **Chart 9** shows all the participants' estimates of the "novelty periods" of the assimilative activities as shown on the self-report forms.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Tour of Parliament (assimilative)	3	2	2	3	2	2	2	3	3	4	3	3	2	3	2	3	2	3
Culture Zone (assimilative)	5	6	4	3	4	4	5	4	5	6	4	5	6	3	5	4	6	6

Chart 9: Perceptions of the "novelty periods" of assimilative activities

The learners explained that the novelty of the assimilative activities wore out relatively quickly because they quickly worked out what they were about. The fact that they were simply required to listen or view information shortened the "novelty periods". One participant from School A said:

> *"These activities are quite straightforward really. The newness goes away quickly because you figure it out quickly"*

Similar views were expressed in School C:

> *"All you have to do is to click away at the information, so it no longer new"*

> *"The excitement went away almost immediately. It was easy to find what it was about"*

Referring to their own expectation, one participant from School B said:

> *"If it is going to be new to me, it has to encourage more from me. I mean, it has to have more going on, not just reading"*

It appears that some of the participants saw novelty simply as how long it took to "work out" the activities, rather than cognitive engagement in the activities. They appeared to be more concerned about knowing what the activities were about, rather than the content. For them, novelty appeared to be about the features and the affordance of the activities. Hence, it is unlikely that the learners will find new novelties if the activities were repeated again. The lack of focus on the content reinforces the importance of the application of sound knowledge of technology, pedagogy and content during instructional design, as highlighted by Mishra & Koehler (2006).

It was noted that the "novelty periods" of the two assimilative activities were generally different. Culture Zone was often rated higher than Tour of Parliament. The participants were asked to explain the reasons for the differences in the "novelty periods". They explained that:

> *"It stayed new to us for longer because the moving texts kept flashing at you"*

> *"It has animations and sounds. They appeal to you"*

> *"The sound, though it got annoying after some time, added to the initial excitement"*

> *"The newness [of Culture Zone] is longer because the flashing texts made me more curious"*

> *"It [the 'novelty period'] is down to the way it looks and sounds. One [Tour of Parliament] has pictures and text. The other [Culture Zone] has moving pictures, text, sound and pop-ups"*

The participants felt that the assimilative activity that was multimedia-rich had a longer "novelty period". When asked to explain why the multimedia did not result in very *significant* differences in the novelty of the two activities, some participants clarified that:

> *It's [Culture Zone] only better, I was still able to figure it out quickly"*

> *"Culture Zone is more exciting initially because it has animations and sound. They give you an expectation, something that quickly went out of the window with the other one [Tour of Parliament]. You could still figure both out easily"*

These comments suggest that the use of multimedia has the potential to extend learners perception of the "novelty period". It could also be an indication that the participants saw "novelty" from an enjoyment perspective, rather than cognitive engagement in the content itself. Furthermore, the comments show that they seem to perceive novelty as "working out" the activity, not necessarily cognitive engagement.

The researcher asked whether their interest in the subject matter had any influence on the "novelty periods". Although the participants did not agree that the subject matter influenced their perceptions of the "novelty periods", one participant used the opportunity to point out the value they attach to multimedia saying:

> *"It [Tour of Parliament] would have been nice if they used the same animations as Culture Zone. It was a nice topic"*

7.4.3 INFORMATION HANDLING ACTIVITIES

The researcher observed the participants in the three schools as they interacted with the information handling activities, Looking at Mutual Funds and Words with Multiple Meanings. The "novelty periods" observed for both activities were *between two and three minutes* across the three schools.

The participants also wrote similar estimates in their self-report forms. Their perceptions of the "novelty periods" were *between two and four minutes* for the first activity (Looking at Mutual Funds). Similarly, they perceived that the second activity (Words with Multiple Meanings) was novel for *between two and three minutes*. **Chart 10** shows all the participants' perceptions of the "novelty periods" of the information handling activities as shown on the self-report forms.

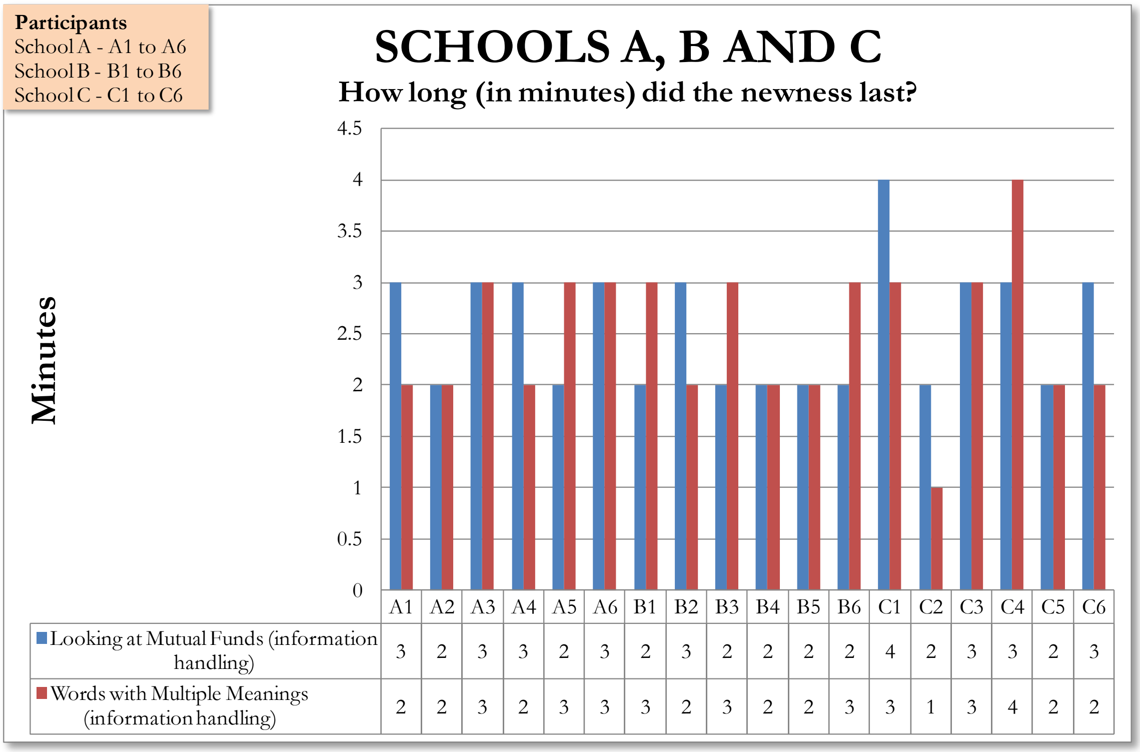


Chart 10: Perceptions of the "novelty periods" of information handling activities

The participants were asked to provide reasons for their estimates of the "novelty periods". The participants in School C agreed that the novelty levels were low because the activities did not draw them in. By this, they were referring to the presentation and appeal of the activities. When asked to expatiate on this point, they said:

> *"First of all, the colours were quite whack [dull]. It was easy to work out where they were going with it"*

> *"They could have tried to use animations to draw you in more"*

Another participant corrected them saying:

> *"There were animations and a nice game [in Looking at Mutual Funds], but it came very late. They should have put them at the beginning to use that first-start properly"*

Others in Schools A and B had similar comments, for example:

> *"It's [Words with Multiple Meanings] okay, but they could have used videos or animations to keep me curious"*

"At first glance, you are keen to find out. You soon realise what it is all about because it is plain and predictable"

Like the assimilative activities, the participants explained that their perception of the novelty of the activities were low because they were easy to work out. They also seemed to believe that multimedia can be used to extend the "novelty periods". This further supports the interpretation that their perception of novelty might be based on the "working out" and enjoyment of the activity, rather than intellectual engagement. Like the assimilative activities, their comments suggest that they are not likely to find new novelties if they had to interact with the activities again.

Some explained that the lack of variety and the predictability seemed to reduce the "novelty periods" of the activities. Some explained that:

"It [Words with Multiple Meanings] was sussed out in the first two minutes. There was nothing to continue the excitement. Maybe they should have several options, rather than one single style"

"There is something about activities like these. The tasks do not match the initial excitement. They are quite predictable"

"You quickly get the picture of it, so you lose the curiosity"

The participants were suggesting that they were not content with the limited options in an activities. They were also stressing the importance of varying instruction as a way of stimulating engagement. Wlodkowski (1985) suggested the varying of modes of instruction, whilst Keller & Suzuki (2004) highlighted that a key aspect of stimulating attention is variability since learners adapt and lose interest over time.

There were some slight differences in the "novelty periods" of the two activities, so the researcher asked whether there were any reasons for the differences. Some said:

"They are pretty much the same thing"

"They lack the same thing. They need to be jazzed up with some flash stuff"

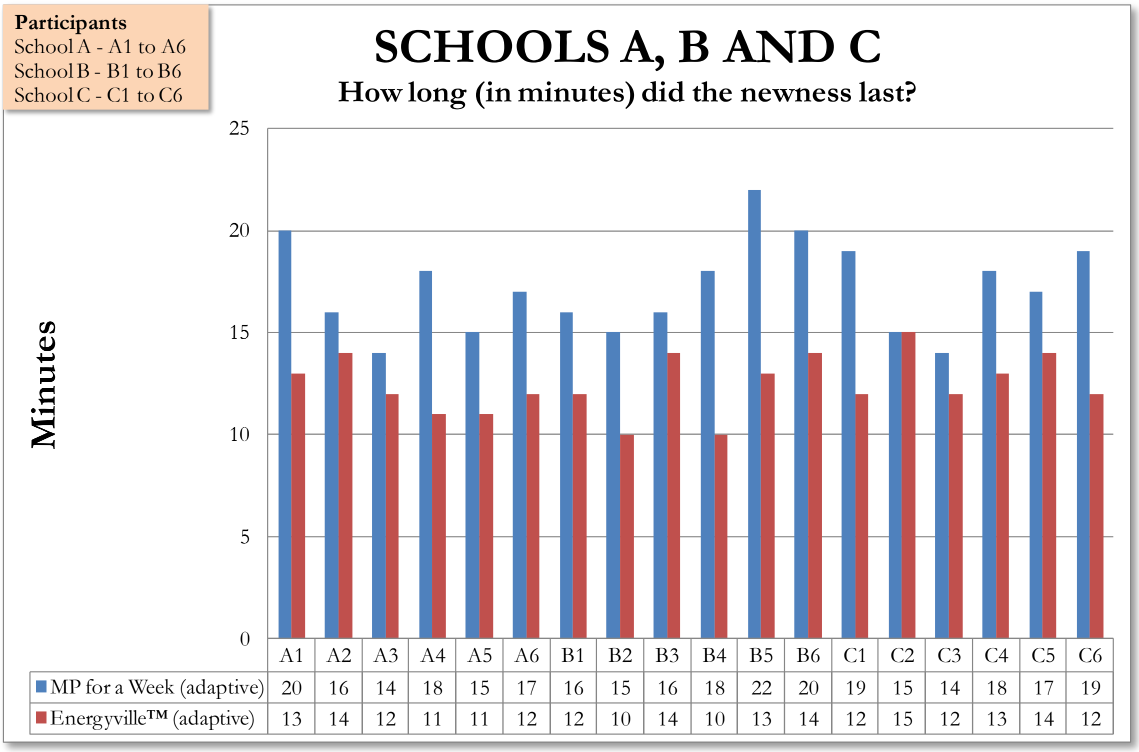
Many of the participants did not believe that the subject matter had any influence on their perceptions of the "novelty periods".

7.4.4 ADAPTIVE ACTIVITIES

The researcher estimated that the "novelty period" of the first adaptive activity (MP for a Week) was *between six and ten minutes* across the three schools – between six and ten minutes in School A, between seven and nine minutes in School B, and between eight and ten minutes in School C.

The researcher's estimation of the "novelty period" of the second adaptive activity (Energyville™) was between *six and nine minutes* across the schools – between six and eight minutes in School A, between six and eight minutes in School B, and between six and nine minutes in School C.

As shown in **chart 11**, the participants' perceptions of the "novelty periods" were significantly different from the researcher's estimates. For the first adaptive activity (MP for a Week), the researcher's observation of *between six to ten minutes* was inconsistent with the participants' perceptions of *between fourteen and twenty-two minutes*. Moreover, the researcher's observation of the novelty of the second activity (Energyville™) was also inconsistent with the participants' perceptions – *six to nine minutes* compared to *ten to fifteen minutes*.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
MP for a Week (adaptive)	20	16	14	18	15	17	16	15	16	18	22	20	19	15	14	18	17	19
Energyville™ (adaptive)	13	14	12	11	11	12	12	10	14	10	13	14	12	15	12	13	14	12

Chart 11: Perceptions of the "novelty periods" of adaptive activities

The responses during the focus group interviews seemed to explain the discrepancies. Across the three schools, the learners explained that the "novelty periods" of the adaptive activities were extended by the choice, control and changes that occurred during the interactions. They explained that, due to the nature of the activities, the novelties "refreshed" at various times during the interaction. The comments from participants across the three schools illustrate this:

> *"You can say that it is new again because anything can happen or change at any time"*

> *"These activities give you more choice. When you have choice, you can do things which keep the newness going"*

> *"[Referring to MP for a Week] You can be a popular MP now and be unpopular pretty quickly. The decisions and changes you make change everything, so the activity feels new again"*

> *"Because you can control the activity and it changes every time, the newness lasts for longer"*

> *"I think potentially the newness of activities like this can go on for a long time because it is ever changing"*

> *"You can do things and see the results. It feels new to you still"*

> *"It [Energyville™] felt like a new activity throughout because it was changing as I was deciding on what to do"*

These comments explain the reasons for the differences between the researcher and the learners' perceptions of the "novelty periods" of the adaptive activities. This is a significant finding because it suggests that adaptive activities, where learners have choice and control, can "regenerate" novelty. In other words, the adaptive nature of the activities can give a sense of renewed novelty, effectively extending the "novelty period". It also suggests that learners are likely to find new novelties if they interact with the activities later.

The concept of "regenerative novelty" was first suggested in School A. It resulted in a dilemma during the other observations in this school and the other schools: should the researcher take the possibility of "regenerative novelty" into consideration during observations or not? For consistency, the researcher decided to continue the observations as normal.

The participants were also asked to explain the variance between the "novelty periods" of the two adaptive activities. The participants responded that the first adaptive activity (MP for a Week) had more variety. They also denied any influence of the subject matter on their perception of the "novelty periods", though many admitted that MP for a Week was more relevant to them. It could mean that novelty (or "regenerative novelty") can be extended by variety and relevance.

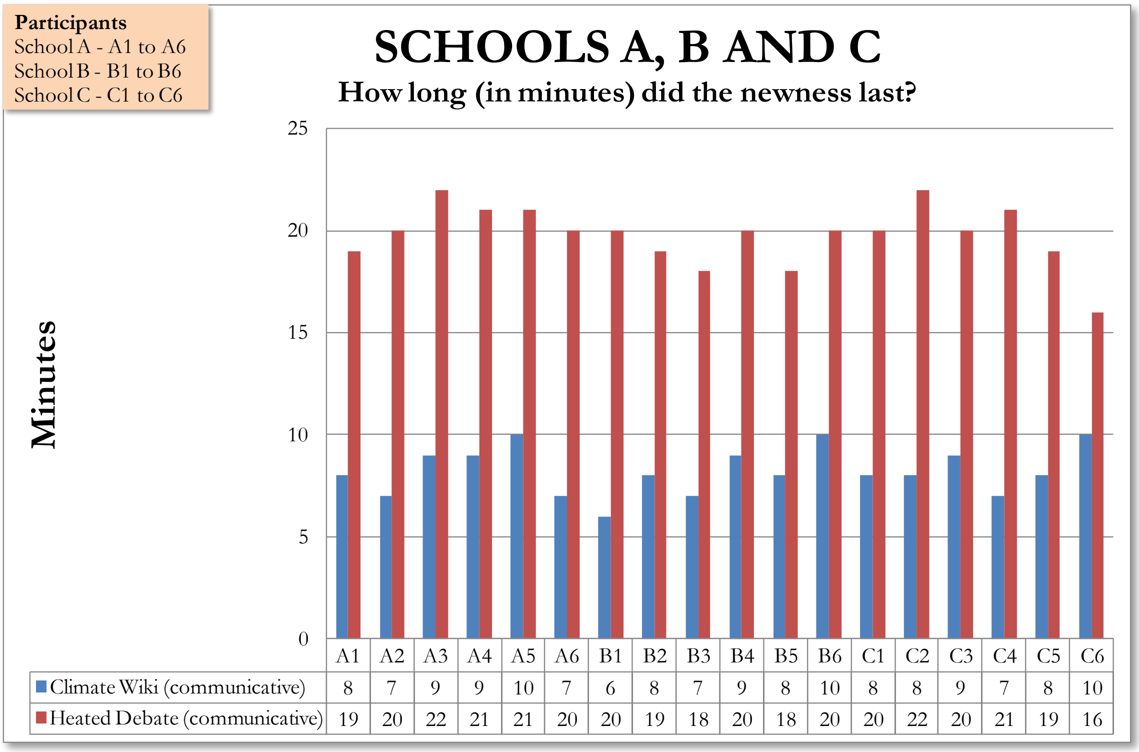
The adaptive activities (MP for a Week and Energyville™) were rich in multimedia, which they suggested increases the "novelty period". It was necessary to verify whether their views were because of the multimedia or the type of activities. There was general agreement that multimedia sometimes extends the "novelty period". They however stressed that the long periods of novelty was because the adaptive activities adjusted to their choices.

7.4.5 COMMUNICATIVE ACTIVITIES

During the observations, the "novelty period" of the first communicative activity (Climate Wiki) was thought to be *between four and seven minutes* – between four to five minutes in School A, between five and seven minutes in School B, and between five and six minutes in School C.

During the observations, the second communicative activity (Heated Debate) appeared to have a slightly longer "novelty period", *between five and nine minutes*. In School A, the "novelty period" of Heated Debate was estimated to be between five and eight minutes during the observations. In School B, it was estimated at between five and seven minutes. It was estimated at between five and nine minutes in School C.

These were inconsistent with the responses on the self-report forms, where the participants reported significantly longer "novelty periods". These participants' perceptions are shown in **chart 12**.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Climate Wiki (communicative)	8	7	9	9	10	7	6	8	7	9	8	10	8	8	9	7	8	10
Heated Debate (communicative)	19	20	22	21	21	20	20	19	18	20	18	20	20	22	20	21	19	16

Chart 12: Perceptions of the "novelty periods" of communicative activities

The immediate explanation is that the activities also have potential for "regenerative novelty", as reported with the adaptive activities. The participants affirmed that occurrences during the activity "regenerated" the novelties of the activities. They however pointed out that the "regenerated novelty" was due to the comments from other people. In this case, it was not really about the choice, control and the changes in the activities; it was the changes in the *ongoing discussion*. Participants from the three schools commented about this saying:

> *"Just when the newness is about to expire, the discussion changes direction"*
>
> *"The fact that someone else can rubbish or even delete what you write has an effect on you. The activity is newer than when you started"*
>
> *"It remains new because you're constantly waiting to see the comments by other people"*
>
> *"Before you even finish typing your comments, someone else has said something. So the newness is kept alive by the debate"*
>
> *"The newness did not go away quickly. You expect others to put their posts up"*
>
> *"The activity itself is not new, but the messages are"*
>
> *"The expectation that someone will add to what you have written. Sometimes they even correct what you have written. Providing people add to it, the activity will stay new"*

The view that novelty is renewed during communicative activities gives strength to the concept of "regenerative novelty". The researcher suspected that the learners perceived that the adaptive activities had extended novelty because they were rich in multimedia. The communicative activities, however, had little multimedia. Yet, the learners reported that there was "regenerative novelty" based on the changes in the discussions during the interactions with the communicative activities. Their comments also suggest that they were likely to experience new novelties if they interact with the same activities again.

They were also asked to clarify why their perceptions of the "novelty periods" of the first activity (Climate Wiki) was lower than the second activity (Heated Debate). Many indicated that the differences were because Climate Wiki was not as "instant" as Heated Debate;

Climate Wiki is an online wiki whilst Heated Debate is an online chat. They seemed to be making the point that instantaneousness increased the likelihood of "regenerative novelty" in communicative activities. Others indicated that shorter comments could be put in the Heated Debate, which would probably not be appropriate in Climate Wiki. Some of the comments across the three schools are shown below:

> *"The online chat [Heated Debate] is quick. We all see what others are typing straightaway. That way it stays newer more quickly"*

> *"Well, I can instantly respond quickly to the discussions [when using Heated Debate] than the wiki [Climate Wiki]"*

> *"Climate Wiki requires a lot more waiting, the newness disappeared because you're waiting for too long. You have to wait, spend time reading other people's stuff, then write your own"*

> *"You don't have to write too much in the Heated Debate, so it's quicker"*

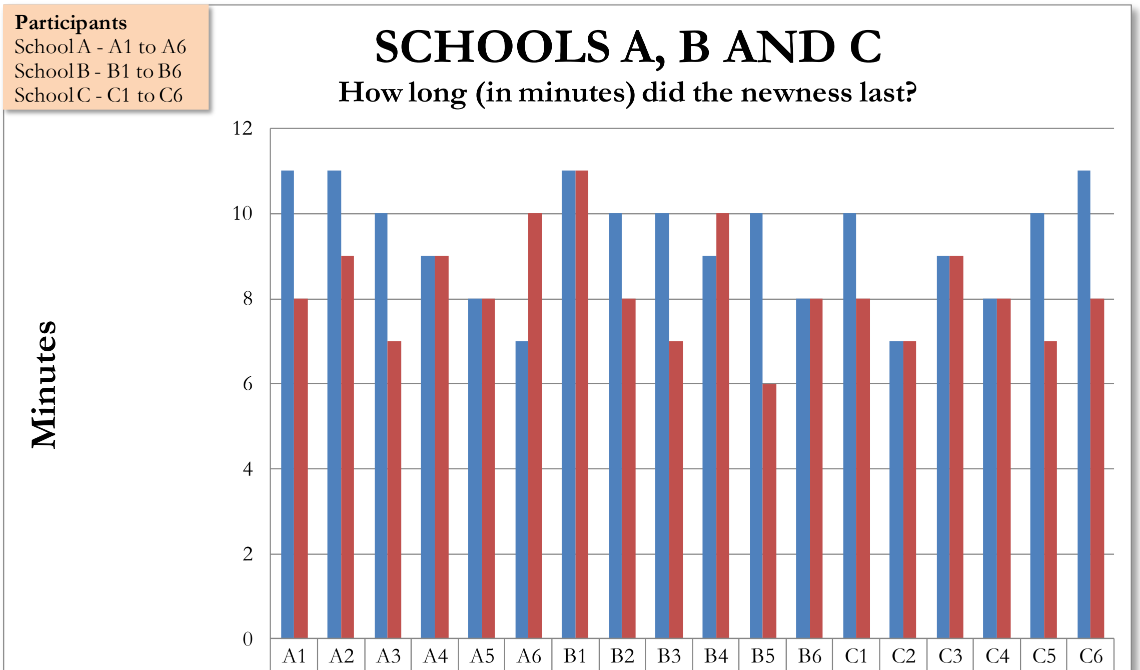
The participants were asked about the possible influence of the subject matter. They did not believe there was any influence of the subject matter on their perceptions of the "novelty periods".

7.4.6 PRODUCTIVE ACTIVITIES

The researcher observed that the "novelty period" of the first productive activity (FWG Bridge) was *between six and ten minutes* across the three schools – between seven and ten minutes in School A, between six and nine minutes in School B, and between eight and nine minutes in School C. The researcher's perception of the "novelty periods" was consistent across the three schools. This was also consistent with the participants' perceptions, which ranged *from seven to eleven minutes* across the three schools.

For the second productive activity (Sketch 2), the researcher observed "novelty periods" of *between six and nine minutes* across the three schools – between six and seven minutes in School A, between six and nine minutes in School B, and between seven and nine minutes in School C. In addition to being generally consistent across the three schools, the observation of the "novelty period" was similar to the learners' perceptions.

Chart 13 shows all the participants' perceptions of the "novelty periods" of the productive activities as shown on the self-report forms.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
FWG Bridge (productive)	11	11	10	9	8	7	11	10	10	9	10	8	10	7	9	8	10	11
Sketch 2 (productive)	8	9	7	9	8	10	11	8	7	10	6	8	8	7	9	8	7	8

Chart 13: Perceptions of the "novelty periods" of productive activities

The explanation given for the "novelty period", which lasted longer than some other types of activities, was that the productive activities present themselves as a challenge. Others explained that the productive activities involve some planning or thinking time, which contributed to their "novelty periods". Below are comments across the three schools:

> *"[Referring to FWG Bridge] I set myself the task of completing the bridge. The first step was thinking about how to do it. I then had a go. All together, the total newness time was a lot"*

> *"They [the productive activities] were awesome. They required you to do things. You sometimes get it wrong, but it's a challenge. It's new because of the initial challenge"*

> *"[Referring to FWG Bridge] It is new to you until you get to a decent level of constructing the bridge. You are constantly planning and strategising. The activity is new during all this time"*

> *"As soon as you see the activities [productive activities], you get challenged. You want to show yourself you can do it. When something is challenging, yeah, the newness will stay for longer"*

Unlike some of the other activities, the participants appeared to be spending time thinking and planning during the "novelty period". This suggests that productive activities might be useful for the encouragement of cognitive activity. From an instructional design perspective, the productive activities might be more beneficial than the other activities where learners appeared to be preoccupied with the "working out" and enjoyment.

The participants felt the subject matter did not have any influence on their perceptions of the "novelty periods" of the two activities. They also could not explain why there were some slight differences in their perceptions of the "novelty periods" of the activities.

7.4.7 EXPERIENTIAL ACTIVITIES

For the first experiential activity (Coffee Shop), the observed "novelty periods" were *between five and ten minutes* across the three schools – between five and eight minutes in School A, between seven and ten minutes in School B, and between five and ten minutes in School C.

The observation data of the second experiential activity (Starting Out) suggest "novelty periods" of between *six and seven minutes* across the schools – between six and seven minutes in School A, six minutes in School B, and between six and seven minutes in School C.

Chart 14, shows learners' perceptions of the "novelty periods" at *between eleven and fifteen minutes* for Coffee Shop and *eight to thirteen minutes* for Starting Out.

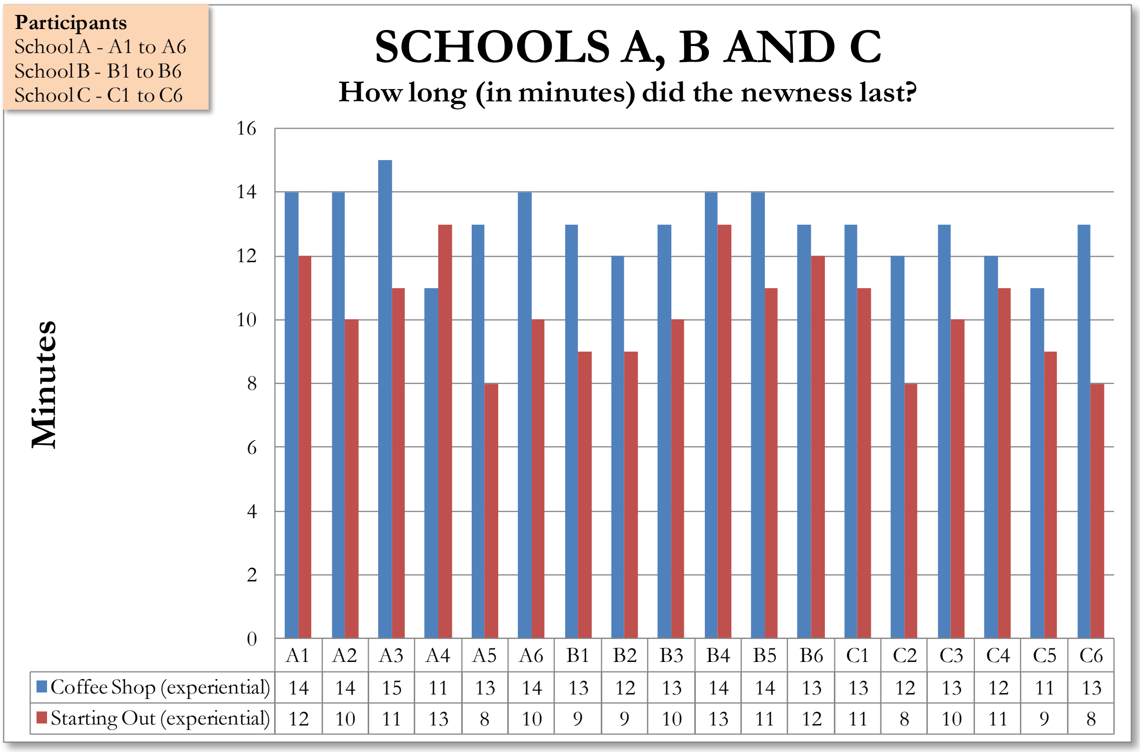


Chart 14: Perceptions of the "novelty periods" of experiential activities

As expected, the participants explained that the novelties of the experiential activities were extended because the "novelty periods" were renewed at various times during the interactions. In fact, their views were similar to those made for the adaptive activities. Like the adaptive activities, the participants referred to "regenerative novelty" because the experiential activities gave them choice and control which resulted in changes during the interactions. This suggests that the experiential activities are also likely to provide new novelties if the activities are interacted with later.

It should be noted that the experiential activities were also adaptive in nature. Whilst participants were able to experience (explore) the operations of the Coffee Shop and the realities of Starting Out, the activities adapted to their choices. An important question emerged from this: were the "novelty periods" renewed because the activities were experiential or because they were adaptive? It seemed that there were no clear boundaries between the two activities; the experiential activities were adaptive and vice versa. In order to deliver experiential experiences, the activity had to be adaptive.

They were asked why they perceived the first experiential activity (Coffee Shop) as having a longer "novelty period" than the second (Starting Out). They explained that the wider variety in Coffee Shop made the "novelty period" longer. They seemed to suggest that the greater the variety of options, the longer the "novelty periods".

As with the adaptive activities, the participants believed that the subject matter did not affect their perceptions of the "novelty period".

7.4.8 COMPARING THE "NOVELTY PERIODS"

This section reported the findings of the investigation into the "novelty periods" of the different types of activities. One of the significant findings is that learners perceive "regenerative novelty", where choice, control and changes during the interactions "refresh" the novelties of the activities. Another finding was that multimedia and variety can increase their perception of the "novelty period".

The researcher was keen to give an indication of the "novelty periods" of the different types of activities. The participants' perceptions of the "novelty periods" were analysed and organised to show the average "novelty period" of each type of activity. Novelty ratings (high, medium and low) were then allocated to each type of activity, based on the average "novelty periods". These are shown in **table 27**. This table can be used as a *guide*, as it gives instructional designers a general indication of the "novelty periods" of the different types of activities. It must be noted that it refers to the "novelty periods" of the activities used during the multiple-case studies. It must also be noted that each participant had a different perception of the "novelty period" of each activity.

Average "novelty period"	Type of activity	Novelty rating	Notes
14.8 minutes	Adaptive	High	The adaptive activities had many experiential features. The "novelty period" is "regenerated" due to the choice, control and changes during the interaction. The use of a variety of options and relevant materials are likely to extend the "novelty period" further. Average perception of the novelty of MP for a Week was 17.2 minutes whilst Energyville™ was 12.4 minutes.
14.0 minutes	Communicative	High	The "novelty period" is "regenerated" due to the changes in the discussion/comments during the interactions. Average perception of the novelty of Heated Debate was 19.8 minutes whilst Climate Wiki was 8.2 minutes.
11.6 minutes	Experiential	High	The experiential activities had many adaptive features. The "novelty period" is "regenerated" due to the choice, control and changes during the interaction. Greater variety of options is likely to extend the "novelty period" further. Average perception of the novelty of Coffee Shop was 13.0 minutes whilst Starting Out was 10.3 minutes.
8.8 minutes	Productive	Medium	The challenge and planning/thinking time associated with productive activities extends the "novelty period". Average perception of the novelty of FWG Bridge was 9.4 minutes whilst Sketch 2 was 8.2 minutes.
3.7 minutes	Assimilative	Low	Multimedia can extend the "novelty period" of assimilative activities. Novelty appears to be perceived from an enjoyment or "working it out" perspective, rather than cognitive engagement. Average perception of the novelty of Culture Zone was 4.7 minutes whilst Tour of Parliament was 2.6 minutes.
2.5 minutes	Information Handling	Low	Multimedia can extend the "novelty period" of information handling activities. Novelty appears to be perceived from an enjoyment or "working it out" perspective, rather than cognitive engagement. Average perception of the novelty of Looking at Mutual Funds was 2.6 minutes whilst Words with Multiple Meanings was 2.5 minutes.

Table 27: The "novelty periods" and ratings of the different types of activities

7.5 THE MOTIVATIONAL EFFECTS OF DIFFERENT TYPES OF ACTIVITIES

7.5.1 MOTIVATIONAL EFFECTS OF DIFFERENT TYPES OF ACTIVITIES

The last section focussed on how long the novelty (newness) of the e-learning activities lasted. Novelty ratings were devised, based on learners' perceptions, to give a rough indication of the "novelty periods" of the different types of activities. This section focuses on the *motivational effects* of the different types of activities. The findings relating to the research question, *what are the motivational effects of different types of e-learning activities*, are reported in this section.

The participants were observed as they interacted with the e-learning activities. They completed the self-report forms after each interaction. The self-report forms allowed them to evaluate each activity and rate how much the activity motivated them and kept them on task. The self-report forms were also used to indicate how much they believed they learnt from the activity (though this is not the focus of the study). Furthermore, the self-report forms served as aide-mémoires during the focus group interviews, where more detailed explanations were collected. The findings from the three schools were, in most respects, very similar.

7.5.2 ASSIMILATIVE ACTIVITIES

The participants were observed whilst they interacted with the assimilative activities (Tour of Parliament and Culture Zone). They seemed interested in the facts that were presented to them. They also seemed interested in exploring the different aspects of the activities. Some appeared to enjoy the independence and choice of navigating around the activities, perhaps curious to visit every aspect of the activity. Some participants put some effort into reading the information contained in the activities.

In some cases, they moved around the activities rather quickly, either skim reading or not paying attention to the text presented to them. During the interactions with Culture Zone, some seemed to just click on the flying words to reveal the pop-ups but paid no attention to the information.

The responses in the self-report forms and focus group interviews confirmed the researcher's observations. The assimilative activities seemed to motivate some learners to learn. Some of the comments from the self-report forms and the focus group interviews (across the three schools) are shown below:

"It gives you freedom because you can choose which one you want to read about"

"It [Tour of Parliament] kind of motivated me to learn because it showed all the basic places and you could choose where you wanted to see"

"They were simple to follow. You click and read. Simple!"

"I like the idea of the maps so you could actually choose what you wanted"

"I could sit there all day. Not really all day. There was plenty of information on it"

"It showed information that [I] never knew"

"The information and images [in Tour of Parliament] were very interesting and they encouraged me to read on. The map helped with looking around"

"Yes, it had the information that I didn't know before, so it was motivating"

"All the facts [in Culture Zone] were interesting. It was information, after information, after information"

"Yes, because the good ongoing information kept me interested"

"There was a lot of interesting facts. You make an effort to understand them"

Through these and other comments, the participants indicated that the assimilative activities had positive motivational effects because they provided them with choice. They were motivated by the freedom to choose which aspects they wanted to explore. Some explained that the simplicity, which one participant described as "click and read" contributed to their motivation to learn. Some participants explained that the information presented motivated them to learn. The availability of new information seemed to get their attention and persuaded them to put more effort into understanding the facts.

Notwithstanding, there were some comments across the three schools indicating that there were some learners whose motivation was affected in a negative way. The comments below illustrate their views:

> *"No, I was more obsessed with fiddling with the music, rather than actually bothering to open the words and learn things. I read the bit at the start but, other than that, I was obsessive"*
>
> *"I didn't learn much because...it was all facts and I pretty much lost attention"*
>
> *"I was going through them quickly and wasn't finishing reading"*
>
> *"I was clicking onto the next part, because it was quite boring"*
>
> *"I read all of them. But with some of them I didn't read the whole lot. I just read a little bit because it got so boring. So I moved on to something else"*
>
> *"At some point, I started yawning and was not really focussing"*
>
> *"Some of them I didn't even read"*
>
> *"There was a lot of information to take in. I gave up trying to understand it"*
>
> *"We could...have a questionnaire to test whether we read it properly or something like that"*

As observed by the researcher, some of the participants went through the information quickly but did not really feel motivated to learn. They explained that the assimilative activities involved taking in a lot of information, which they did not find motivating. They were unable to explain why some participants were motivated by the abundance of information and some were not. They attributed it to individual preferences. However, some participants in School B clarified that their motivation was reduced by the amount of reading involved. They explained that:

> *"The information itself is not bad, but reading is not motivating"*

"Listening would be better than reading on the screen"

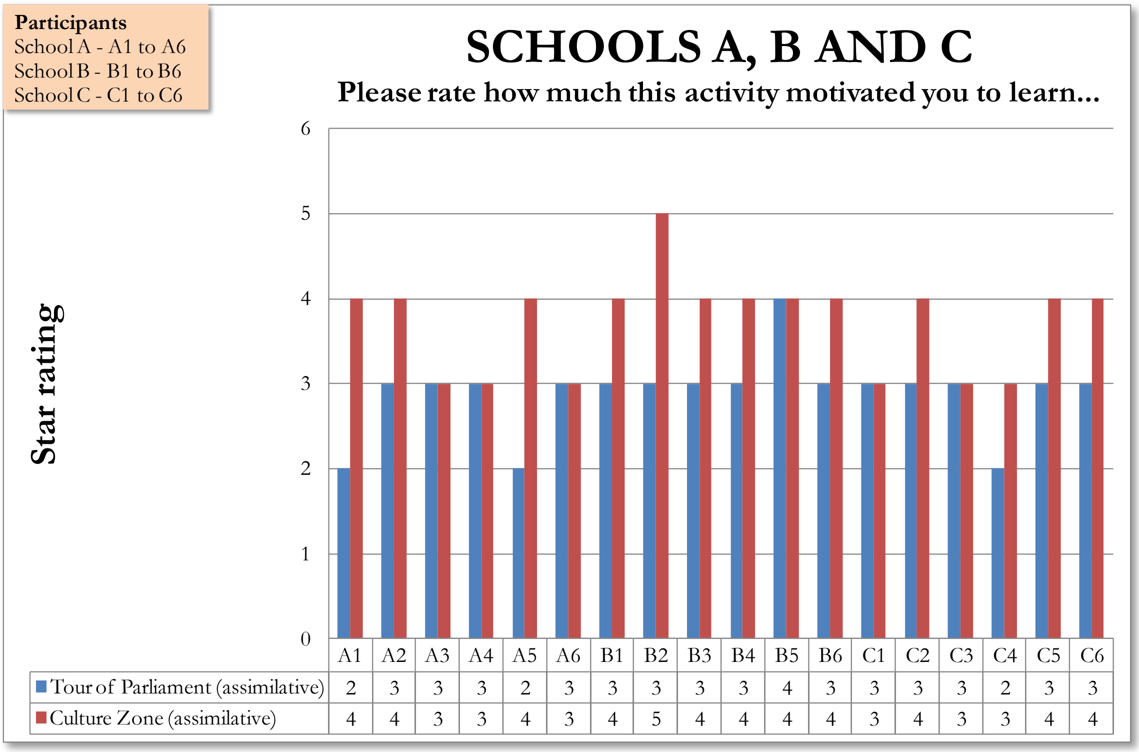
"I think if they showed it on a video, it will be better [more motivation]"

Another participant in School C supported this view, commenting that:

"This one [Culture Zone] is more interesting than Tour of Parliament because it has music. You keep listening to the music, and at the same time, you have the words presented in front of you. The only problem is that you are still reading"

The responses suggest that the assimilative nature of these activities is motivating to some learners and not to others. For some, the assimilative activities seemed to stimulate interest and attention because of the choice, simplicity and their curiosity to take in new information. For others, they seemed to reduce their effort towards the learning because they were reluctant to take in the information. Some of the comments suggest that the learners objected to the reading involved in the activities, rather than their assimilative nature. Both assimilative activities used for the multiple-case studies involved some reading, so it was not possible to see whether videos or audio playback would have made any difference. The issue of onscreen reading versus on-screen viewing/listening was not considered until it was discussed during the focus group interviews in School B. This is therefore a limitation of this study which might be worthy of further exploration in the future.

A general idea of the motivational influence of the activities can be found in the star ratings participants gave each activity for the extent to which they were motivated to learn. The participants gave star ratings to the two activities in the self-report forms, based on how much the activities motivated them to learn. The star ratings available were between one and five, one being the lowest and five being the highest. As shown in **chart 15**, their ratings for Tour of the Parliament were *between two and four stars*, three being the most frequent rating. Culture Zone was given star ratings which ranged *from three to five stars*, four being the most frequent rating. **The mean of the ratings for Tour of the Parliament was 2.9, whilst Culture Zone was 3.7.**



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Tour of Parliament (assimilative)	2	3	3	3	2	3	3	3	3	3	4	3	3	3	3	2	3	3
Culture Zone (assimilative)	4	4	3	3	4	3	4	5	4	4	4	4	3	4	3	3	4	4

Chart 15: Learners' ratings of how the assimilative activities motivated them

Another indicator of the motivational influence of the activities was participants' ratings of how much the activities kept them on task. Again, using the star ratings scale of one to five stars (one being the lowest and five the highest), the participants rated the activities in terms of how much they kept them on task. **Chart 16** shows they mostly rated Tour of Parliament as three, but the ratings ranged *from two to four stars*. Culture Zone was rated *between three and five stars*, with four being the most frequent rating. **The mean of the ratings for Tour of the Parliament was 2.9, whilst Culture Zone was 4.2.**

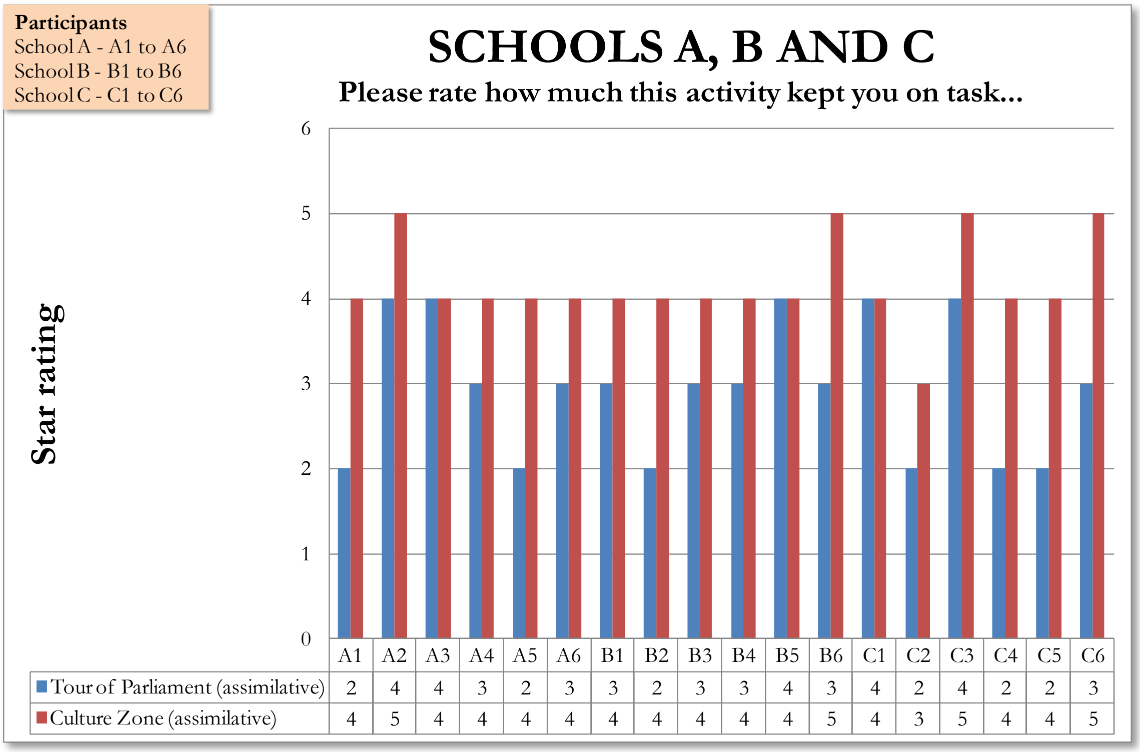


Chart 16: Learners' ratings of how the assimilative activities kept them on task

The participants explained that Culture Zone was rated higher than Tour of Parliament in both areas because of the presence of multimedia and its presentation. They seemed to suggest that multimedia and good presentation can make the activities more appealing. Some said:

> *"Because of the music they put in [Culture Zone], they made it sound like they had a DJ"*
>
> *"It [Culture Zone] had music so we were enticed to continue using it, though the music got annoying after some time"*
>
> *"The animation and music in Culture Zone makes it more child-friendly. It makes you more interested in it"*
>
> *"The text wasn't really laid out in the way that you would want to read it, there wasn't any music"*
>
> *"If there was music, it would have made it more motivating to somebody"*

Some participants however explained that the subject matter had some influence on their motivation. For example, some commented that:

> *"The subject they have chosen wasn't the most interesting, so I was less motivated to learn it"*

> *"It's because it is the Parliament. If it was a tour of...and shows you all the rides, that would make you more interested"*

The participants had mixed opinions about how much they actually learnt from the assimilative activities. Some believed they learnt a lot and others believed they learnt a little.

7.5.3 INFORMATION HANDLING ACTIVITIES

The observations of the participants as they interacted with the information handling activities did not have the same outcomes across the three schools. In School A, most participants seemed to be quite engaged in the information handling activities. This was different from Schools B and C, where most participants seemed frustrated or uninterested. In fact, some abandoned the activities at rather early stages of the interactions.

The self-report forms and the focus group interviews suggest differences to the attitudes of the participants to difficulty. The participants in the three schools expressed concerns about the difficulty of the information handling activities. Although there was general agreement across the three schools that the tasks were quite difficult, most participants in School A responded in a different way.

The participants in School A perceived the difficulty of the activities as challenges. They said:

> *"It's a challenge. I couldn't help celebrating when I got it right"*

> *"Yeah, I see it as a competition"*

> *"Personally, I like challenges better because if it's a fun challenge then I'll fight till I get it"*

> *"They were getting harder, so we wanted to see if there was more of a challenge coming up"*

Some participants from School A also added that challenge kept them focused on the activities and increased their thinking. Their views are shown below:

> *"The activities motivate you because they are more challenging and focus you more, a lot more than the others"*

> *"The activities make you think more, which is what makes me continue learning"*

> *"Yeah, they are more motivating and better...because you have to think. And if you think about it, it makes you continue and sticks in your head better"*

These participants in Schools B and C mostly believed that the difficulty of the activities resulted in a reduction of their motivation. They said:

> *"It was a bit complicated. I kept skipping the tasks. It didn't motivate me a lot"*

> *"I got to number three and four and then kept clicking 'skip activity' because it was too hard"*

> *"I don't know, it was just that I just didn't understand it. Like the angel question, I kept typing in my answers and they were wrong, so I gave up"*

> *"The only one I liked was the fortune-teller at the start. That was the only bit that gave me a giggle. They should have made it slightly easier"*

> *"I just quit. The questions they were asking had no logic behind them!"*

In fact, some participants from School C protested that the activities were not suited for computers. They complained that:

> *"This is the sort of thing you would do in a Maths lesson, not on a computer"*

> *"Words with Multiple Meanings would be less confusing if it was on a worksheet"*

"This is definitely something we don't want to do on computer. Working on the charts [in Looking at Mutual Funds] is better on paper"

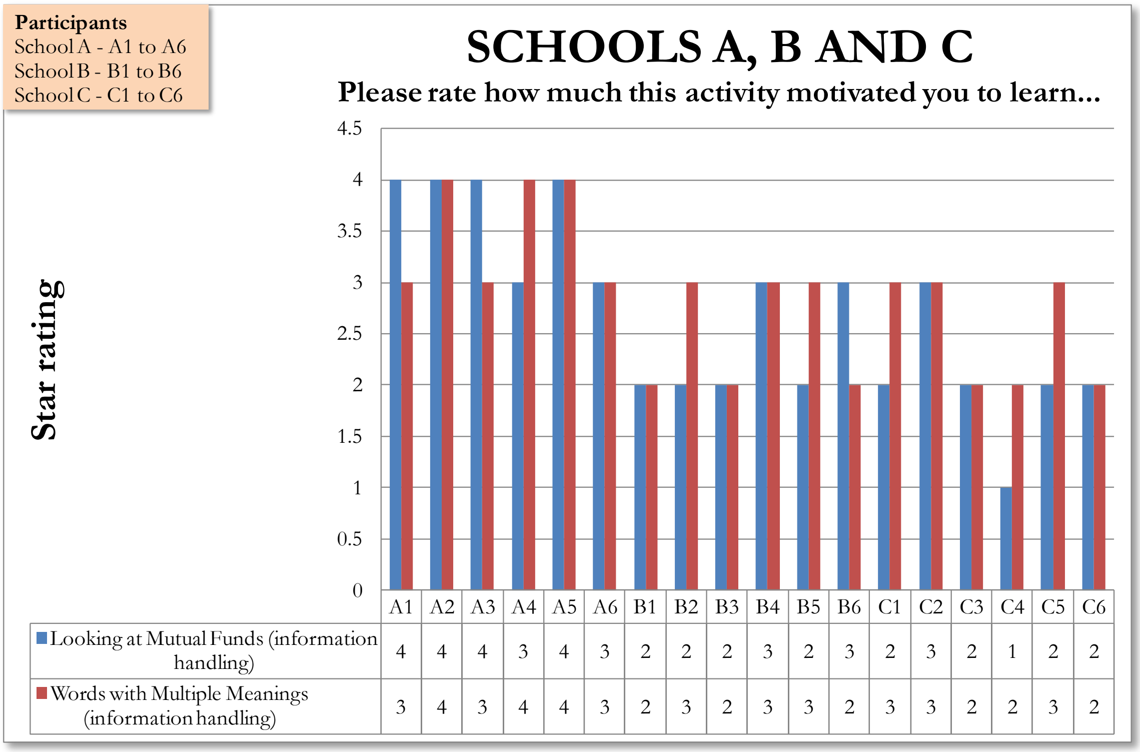
One participant from School C recommended that:

"I think the activities should be difficult enough for you to be able to do it, but it can't [should not] be unbearable [too difficult]"

The researcher had to take the participants' concerns that the information handling activities were difficult seriously. The researcher compared the information handling activities against the other activities but felt that they were not more difficult than the activities in the other classifications. Moreover, the participants in the pilot study did not have the same concerns, though they were from School A. It is possible that the participants simply assumed that the information handling activities were difficult.

The differences in their responses to difficulty is perhaps more significant. Some learners (in School A) were motivated to persist with difficulty, seeing it as a challenge. This implies that instructional designers must aim for the right level of challenge, as highlighted by Malone & Lepper (1987). It also implies that efforts have to be made to discourage task avoidance by building up learners' confidence and self-efficacy (see Keller 1983; del Soldato & du Boulay 1995; Wlodkowski 1985; Bandura 1994; Schunk 1989a).

The star ratings given to Looking at Mutual Funds (the first information handling activity) for motivation to learn were *between one and four stars* (two being the most frequent rating). Words with Multiple Meanings (the second information handling activity) was rated *between two and four stars* (three being the most frequent rating) for motivation to learn. The star ratings given to the two activities for how much they motivated them to learn are in **chart 17**. **The mean of the ratings for Looking at Mutual Funds was 2.7, whilst Words with Multiple Meanings was 2.8.**



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Looking at Mutual Funds (information handling)	4	4	4	3	4	3	2	2	2	3	2	3	2	3	2	1	2	2
Words with Multiple Meanings (information handling)	3	4	3	4	4	3	2	3	2	3	3	2	3	3	2	2	3	2

Chart 17: Learners' ratings of how the information handling activities motivated them

They also rated how much the activity kept them on task. As shown in **chart 18**, the ratings were skewed by the very high number of stars awarded by the participants in School A who persisted with the "difficulty". Looking at Mutual Funds was rated *between one and five stars* (three was the most frequent rating). The ratings of Words with Multiple Meanings were *between two and four starts* (four was the most frequent rating). **The mean of the ratings for Looking at Mutual Funds was 2.5, whilst Words with Multiple Meanings was 3.2.**

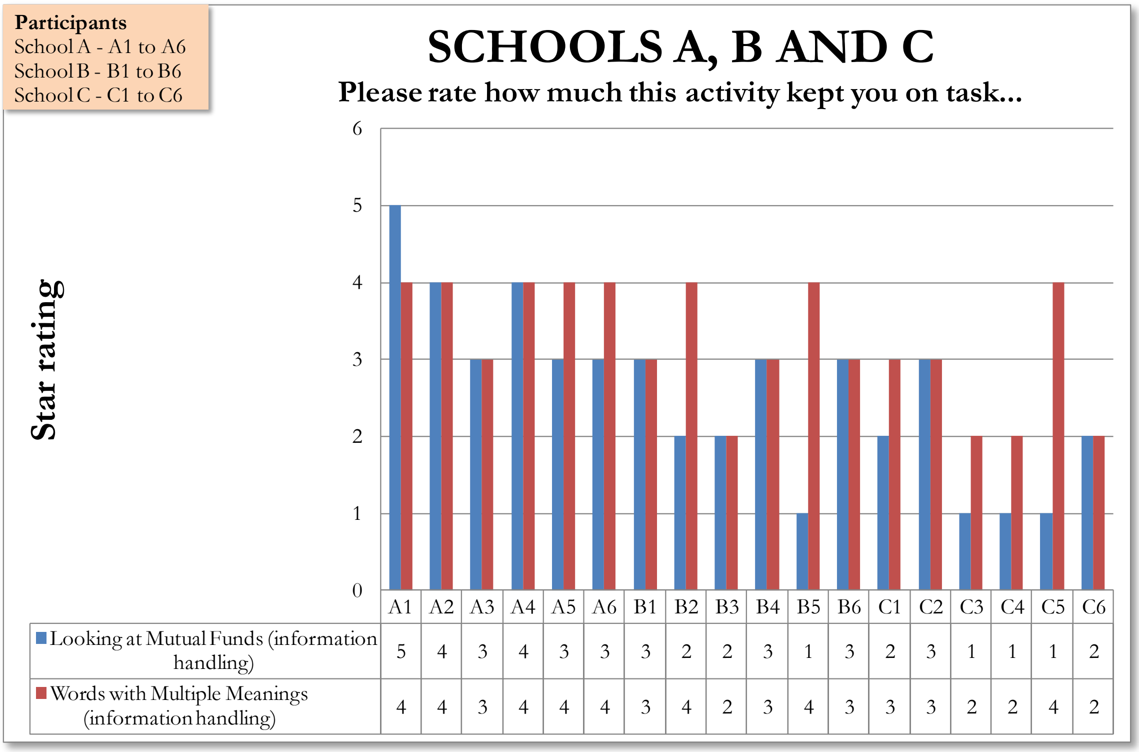


Chart 18: Learners' ratings of how the information handling activities kept them on task

According to the star ratings, Words with Multiple Meanings was generally considered more motivating and more likely to keep learners on task than Looking at Mutual Funds. Some participants explained that the subject matter influenced their motivation and likelihood to stay on task. One participant from School B said:

> *"The calculation graph [in Looking at Mutual Funds] came up eight times and I don't like topics like that"*

Similar views from School C were:

> *"I don't think I'm at the stage where I want to learn about finance and stuff like that"*

> *"I didn't like all the maths and finance questions"*

Most participants indicated that they did not learn a lot from the information handling activities, although a few said they learnt a little.

7.5.4 ADAPTIVE ACTIVITIES

During the observations, all the participants appeared to be actively engaged as they interacted with the adaptive activities. They seemed interested in learning from the activities. Their attention was sustained for long periods in the three schools. They seemed to enjoy the interactivity and their ability to make decisions. The activities had variety and this seemed to contribute to the engagement.

None of the participants mentioned any negative effect of the activities on their motivation. They however explained that they preferred the MP for a Week to Energyville™ because it had more variety. The participants explained that the adaptive activities motivated them to learn because they gave them the freedom to decide and strategise, whilst the activities adapted to their decisions. Some of the comments across the three schools were:

> *"Yeah, it [MP for a Week] does motivate you a lot and teaches you the right decisions that need to be made and the wrong decisions. I like the fact that you are in control and can decide, but they show you the consequences as well"*
>
> *"You have freedom over the activities, which I liked"*
>
> *"It was motivating because it [Energyville™] wasn't just a drag and drop thing. It wasn't like you could put anything anywhere, you had to think about where you put things. This will motivate anybody to continue"*
>
> *"Because it was fun and you had the freedom. It was like one of those path games where you get to choose where you want to go"*
>
> *"I found them motivating, because they were yours and nobody else's. You decide where you go and what you do"*
>
> *"They were motivating because they help you make decisions. If you do one thing, it will change another"*
>
> *"They adjust to what you do, which is very motivating. I deliberately did the wrong thing, just to see what happens"*

"I enjoyed the freedom [of Energyville™] because you can build your own stuff and see how it works out"

One participant, explaining that they were likely to return to the adaptive activities, commented that:

"'l would finish it [Energyville™], then come back to it and try to do it in a different way"

Many concepts from the research models that influenced this study are reflected in these comments. For example, the feelings of control and independence during learning are reflected in the comments. These are key concepts in Malone & Lepper's (1987) taxonomy, del Soldato & du Boulay's (1995) motivational planner, Keller's (1983) ARCS model and Wlodkowski's (1985) Time Continuum Model. They also explained that the adaptive activities provoked curiosity, key features in Malone & Lepper's (1987) taxonomy and Keller's (1983) ARCS model.

The learners were also making it clear that they were motivated to think and make decisions, suggesting that these activities provoked both emotional and cognitive activity. The adaptive activities encouraged them to explore, experiment, see the consequences of their decisions, and take different approaches to tackle the same problem.

Some participants added that the adaptive activities modelled real-life scenarios, indicating that the activities were also experiential. Some of the comments from participants in the three schools were:

"I really liked it because you could experience what it is like and it would keep you on task as you were in the game"

"It's more like real life as opposed to sticking to the same path. That makes it worth sticking at"

"They used a real-life scenario in the sense that people are managing energy, which was motivational"

"[Referring to MP for a Week], it was good having a real-life scenario because MPs are actually real. It was good to know that you could try out their lifestyle"

"Yeah [it was motivating], because you know the importance of the job as you know that one day you could be an MP, even though it is not the most desirable job. But it is motivational because it isn't just made up. It is really what people do on a day to day basis"

"I was motivated [by MP for a Week] because I could experience what being an MP is like"

"[Referring to MP for a week], you are motivated because it puts you in the footstep of a normal person who does those sorts of things. [Referring to Energyville™], you put the electricity in and choose what sort of things you turn on in the city. You don't lose interest easily with these things [activities]"

The participants were making the point that the adaptive nature of the activities helped to establish the relevance of the activities. Relevance, a key concept of Keller's (1983) ARCS model and Wlodkowski's (1985) Time Continuum Model, is an important aspect of motivation. Furthermore, these activities evoked fantasy, a key element of Malone & Lepper's (1987) taxonomy. The activities allowed them to put themselves in imaginary contexts (fantasy), which encouraged learning and experimentation in a low risk environment (see Malone & Lepper 1987).

Participants in each school pointed out that the variety of options in the activities contributed to their motivation to learn. They explained that:

"There were so many features to choose from, so there is a lot to do"

"There were loads of different things, and it didn't make you bored, and you wanted to keep doing it"

"They wouldn't have been that motivating if they didn't have many things to choose from"

"[You could put your point across with a megaphone, you had messages you get and you would have to write back to them to say what you would do about it. You could get the train, go somewhere and talk to different MPs. You could do all sorts"

Some participants explained that the graphic and multimedia appeal of the activities contributed to their motivation to learn. The comments below are some of the responses on the self-report forms and the focus group interviews from the three schools:

"The colours, the pictures, everything they used [in MP for a Week] was attractive"

"[Referring to Energyville™], the graffics [graphics] was nice. [There was a] nice song in the background"

"[Referring to Energyville™], I found the sound effects of the city motivational as they redeemed my interest in managing the city"

"[Referring to MP for a week], I found the graphical aspects of the activity, as well as the audio very realistic which was motivational"

"[Referring to MP for a week], there are a lot [lots] of animations, transitions and sounds. It doesn't get boring"

"The music [in MP for a Week] makes you want to use it more"

It was not surprising that the adaptive activities were highly rated for how much they motivated them to learn and kept them on task. As shown in **chart 19**, the participants rated the activities as *four or five stars* (five was the more frequent rating). **The mean of the ratings for MP for a Week was 4.8, whilst Energyville™ was 4.6.**

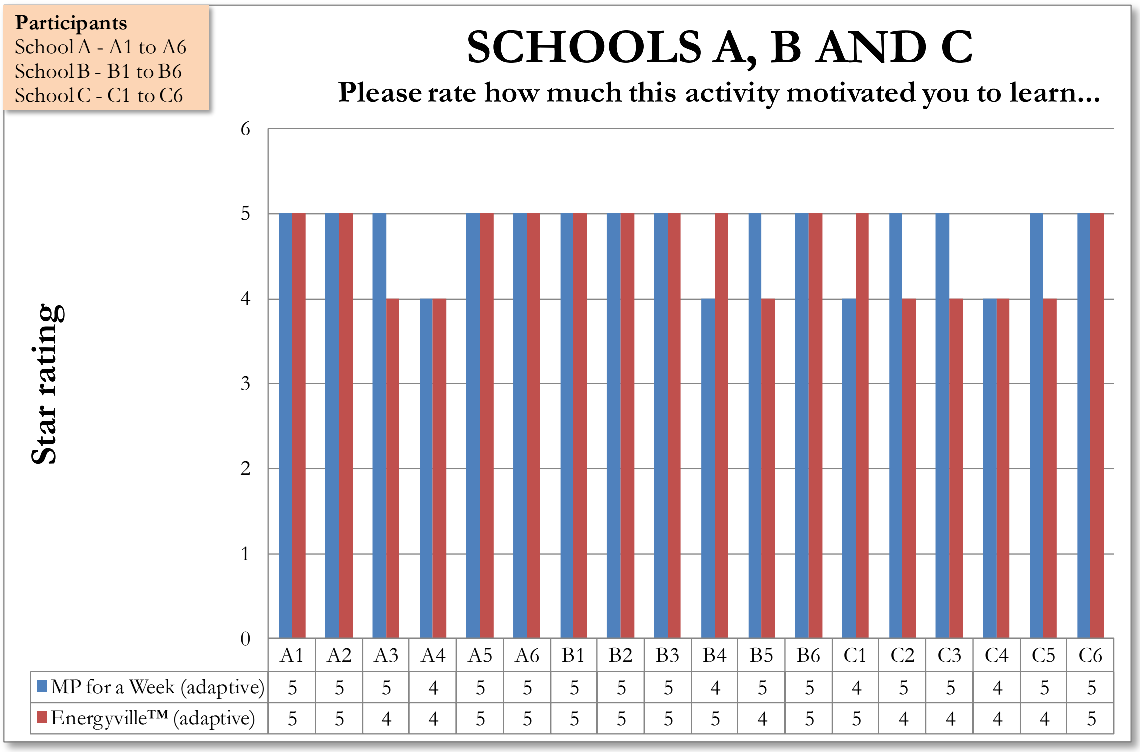
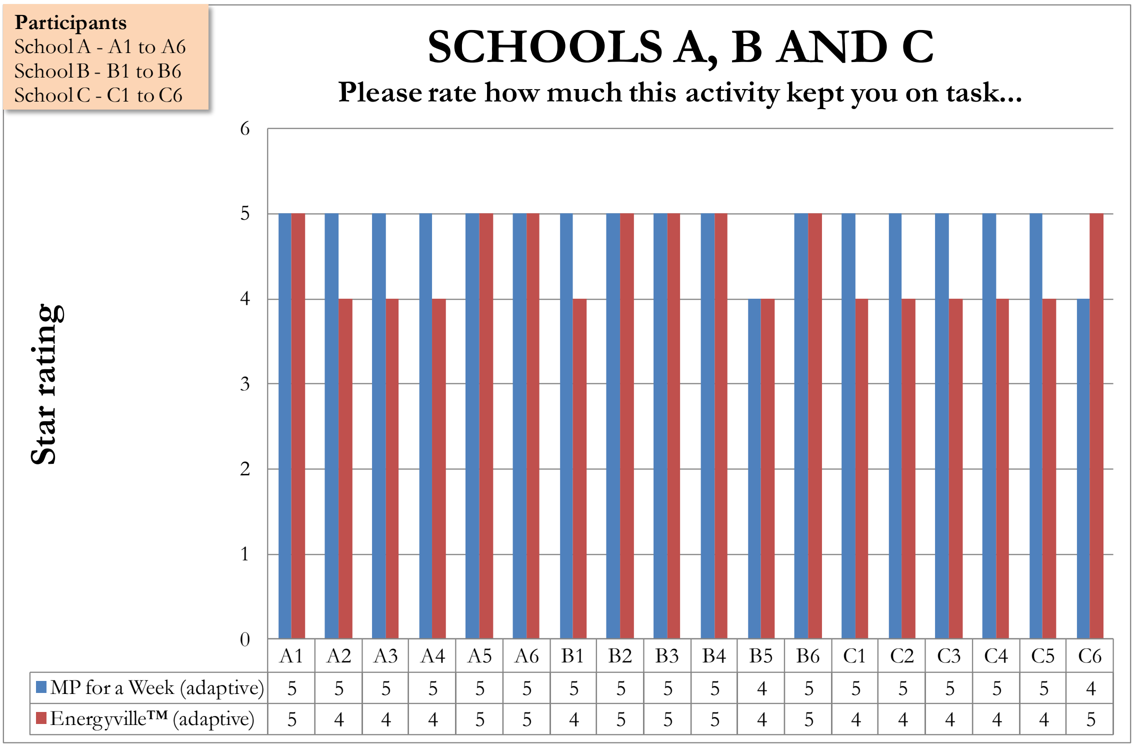


Chart 19: Learners' ratings of how the adaptive activities motivated them

Similarly, the activities were rated as *four or five stars* for how much they kept them on task. The more frequent rating was five stars. **The mean of the ratings for MP for a Week was 4.9, whilst Energyville™ was 4.4.** Their ratings are displayed in **chart 20**.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
MP for a Week (adaptive)	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	4
Energyville™ (adaptive)	5	4	4	4	5	5	4	5	5	5	4	5	4	4	4	4	4	5

Chart 20: Learners' ratings of how the adaptive activities kept them on task

The majority of participants believed they learnt a great deal from the adaptive activities. They also indicated that the subject matter did not influence their motivation to learn. At this stage, however, the extent to which their motivation to learn was affected by the graphic and multimedia appeal is unclear. It is not clear whether all adaptive activities would be considered motivating if they were not as multimedia-rich as the ones selected for the multiple-case studies.

7.5.5 COMMUNICATIVE ACTIVITIES

The participants in the three schools appeared to be very interested in the communicative activities, especially the online chat (Heated Debate). There were visible signs of excitement (e.g. giggles and smiles). They were eager to contribute to the discussions and respond/react to other participants' comments.

The participants were all keen to comment and read other people's comments on the Climate Wiki (the online wiki). In general, they did not attempt to proofread or polish their comments. In some cases, the comments posted were not accurate. They were sometimes corrected by their peers. Some participants revised their comments in light of other people's comments. The participants collaborated well, though some participants added irrelevant comments.

They were more engaged in the Heated Debate (the online chat). In spite of this level of engagement, some of the participants appeared to be off-task. Off-task refers to behaviours that suggest that learners are not attentive, distracted and/or fail to complete the set work (see Roberts 2001). In this case, the discussions sometimes went away from the original topic (animal testing). Sometimes the discussions turned into social discussions. In some cases, some participants did not take the discussion seriously. For example, one participant pretended to be a cat and posted:

> *"Meow, I think animal testing is really cruel. I lost half [of] my family to the testers"*

Another participant posted:

> *"SPAMSPAMSPAMSPAMSPAMSPAMSPAM..."*

When the discussions went off topic, other participants seemed to bring them back to the topic with posts like:

> *"Debate???"*

> *"So we have come to an agreement that animal testings [testing] is a good and bad thing?"*

> *"lol [Laugh Out Loud]. dats [That is] so random. Wats [What has] dat [that] got to do with d [the] topic again?"*

The observation of their interaction with the communicative activities (Climate Wiki and Heated Debate) was different from the other observations. It seemed the participants took on different "personalities" as they interacted with the communicative activities. They were happy to comment on or criticise other people's views. They were willing to develop or alter their views in response to the comments from the other participants. It seemed the communicative activities encouraged them to express their views (even those that were not really meant) and consider other people's views.

During the focus group interviews, the participants confirmed the findings from the observations that the communicative activities encouraged them to express their views. The comments below are from the three schools:

"In a normal debating class, some people might not want to talk much, but on the computer it's easier"

"You get the feeling that no one knows who you are on the computer, even though they are sitting right next to you"

"The computer gives you a second life. These activities make that happen"

"It [Heated Debate] is good because you don't stand the risk of being identified. You feel easy to express your point"

"[Referring to Climate Wiki], it is easy to just write what you think, even if you're not sure it is correct. If someone else feels it's wrong, let them change it"

"It [Heated Debate] was motivating because of the freedom of speech. What was good was that you felt there were no restrictions. You can talk about anything"

The participants also confirmed that they found the communicative activities motivating, especially Heated Debate. They seemed to attach some value to the ability to share ideas and interact with others. The comments below are responses from the self-report forms and focus group interviews in the three schools:

"Yes it [Climate Wiki] was motivating because people comment on what they think about the toppic [topic]"

"I liked the fact that you can edit the wiki with other people"

"I really enjoyed learning on the Heated Debate because you can talk about it and see what other people thought, as people have different views"

"It was nice because other people could participate in my learning. You feel the urge to work at it, sometimes to impress and sometimes to learn from others"

"I found the idea of editing the wiki to my beliefs motivational. I also think it is motivating because I can get my views heard"

"I liked it. It was very motivational because I could read what my friends had put and I could read their views. I liked the idea of editing the wiki to my beliefs and the fact that it was available for public viewing, so they know what I'm thinking"

"Knowing that someone is going to listen to my ideas made me carry on writing"

"You could have a little debate...which is quite good"

"I found the wiki motivating because you know that someone is going to listen to what you think"

"It [Climate Wiki] keeps you interested because you are constantly trying to see what others have written. You have some control over it [what they have written] too"

"I found adding on things [adding things on] motivating"

The participants seemed to value the ability to share their views and believed the communicative activities allowed them to do so. Interpersonal motivation, one of the concepts from Malone & Lepper's (1987) taxonomy provides some insight into their motivational behaviours. They indicated that interpersonal motivation depends on other people. In other words, the social context, which supports collaboration with peers, tends to stimulate engagement. The three dimensions of cooperation, competition and recognition are featured, to some extent, in the participants' views. Through the dialogic nature of these activities, the participants were cooperating and competing with their peers through their contributions. They were also gaining recognition amongst their peers for their efforts.

Furthermore, during the focus group interviews, the participants confirmed that the communicative activities lend themselves to off-task activity. Some said:

"[Referring to Heated Debate], it's easy to go off-task. Even when you are seriously talking about the topic, you can always stray off the task"

"It's very easy to start talking about something else. In Climate Wiki, you could change from talking about climate change, to how it affects polar bears and then switch to animals in general"

> *"Because there are no restrictions, it sometimes makes you feel as if you should go off-task because nobody is saying you can't"*

Some participants recommended that some steps needed to be taken to reduce the likelihood of off-task activity. One participant from School C said:

> *"To reduce going off topic, you could include some kind of filter that would only allow discussions relating to the topic"*

Another added:

> *"And they might even give you a one-minute ban or something"*

Another participant from School B suggested a moderator, commenting:

> *"You can have one person on it [Heated Debate] and if anybody does anything wrong, that person brings us back into the argument. So at the start of it, you pick someone to say something that gets us back on task"*

The participants were asked to comment on how the off-task activity affected their motivation to learn. Participants in the three schools clarified that:

> *"Just because you stray off the topic does not mean we are not motivated still. The discussion just needs to change direction again"*

> *"Overall, I was more motivated by Climate Wiki and Heated Debate than most of the other activities. I prefer the fact that you can work with other people and bounce ideas off each other. Being off-task is a small problem"*

> *"Off-task is not a terrible issue. I mean, in class, discussions stray in every direction. We're still learning, we're still keen to learn"*

> *"What you gain from the being motivated by the different views is more than what you lose from doing other things [being off-task]"*

The participants' agreed that being off-task was an issue when interacting with communicative activities. They however did not accept that their motivation to learn was affected by it. They thought off-task activity was integral to the communicative experience. They seemed to think that the motivational benefits of the communicative activities outweigh the problems of off-task behaviour. The researcher's own perception of off-task activity as sign of a reduction in motivation levels was challenged; the learners clarified that a holistic view of motivation needs to be taken when evaluating communicative activities.

It was also interesting to observe them realigning themselves back to the tasks without the researcher's intervention. This indicates that whilst off-task activity is likely to occur, learners have the capability to detect it and refocus on the topic of interest.

The participants across the three schools were also asked to explain why they did not attempt to proofread or polish their comments. Suggesting that they did not see the need to do so, they explained:

> *"You are so keen to get your point across, you don't bother with the checking"*

> *"Does it matter? They got [understood] what I meant"*

> *"That [Proofreading and polishing comments] takes time"*

They were also asked why they used text talk in their posts. Some of their responses were:

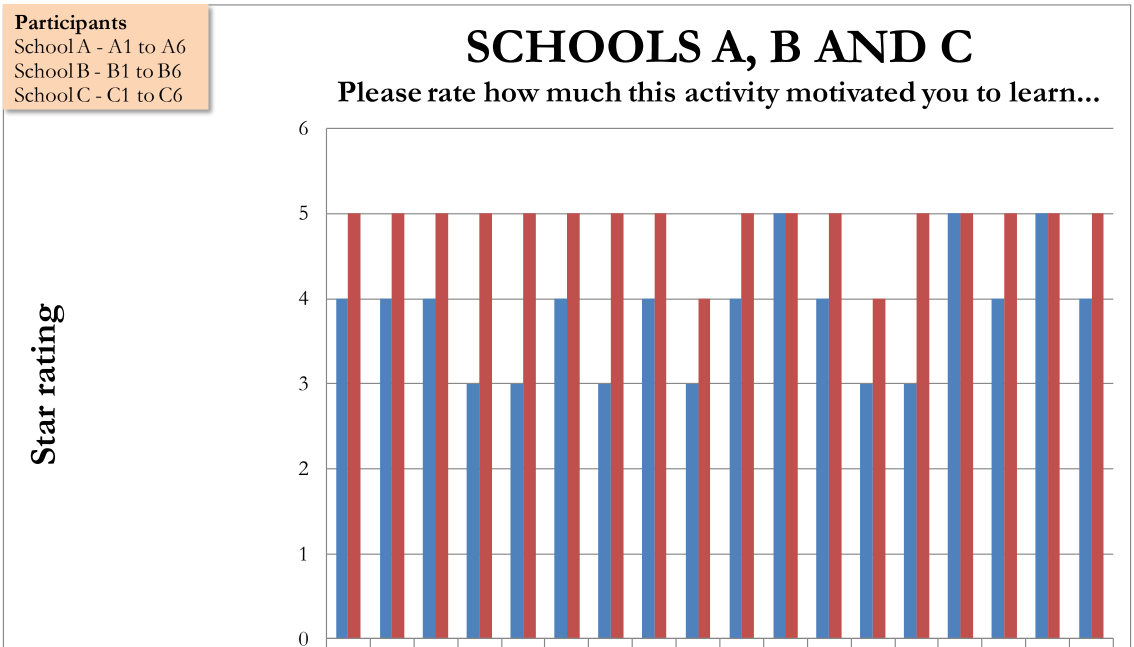
> *"[Referring to Climate Wiki] Text language is okay as long as everybody can understand it. I think it is acceptable"*

> *"If you're doing something formal, you use normal writing. You don't really want to use slang in a letter to the government or something like that. In this case [Heated Debate], I know I am chatting with people my age"*

> *"When you are writing to higher authority and you are putting your points across, you don't really want to include any colloquialisms or abbreviated things. If we are just having a chat like this [Heated Debate], even though the topic is quite serious, I think it is still acceptable to use text talk"*

> *"As soon as I see it is a chat, I assume it's not formal, so I use text talk. When dealing with Climate Wiki, I am tempted to make it formal, but know it's only for us [the participants]"*

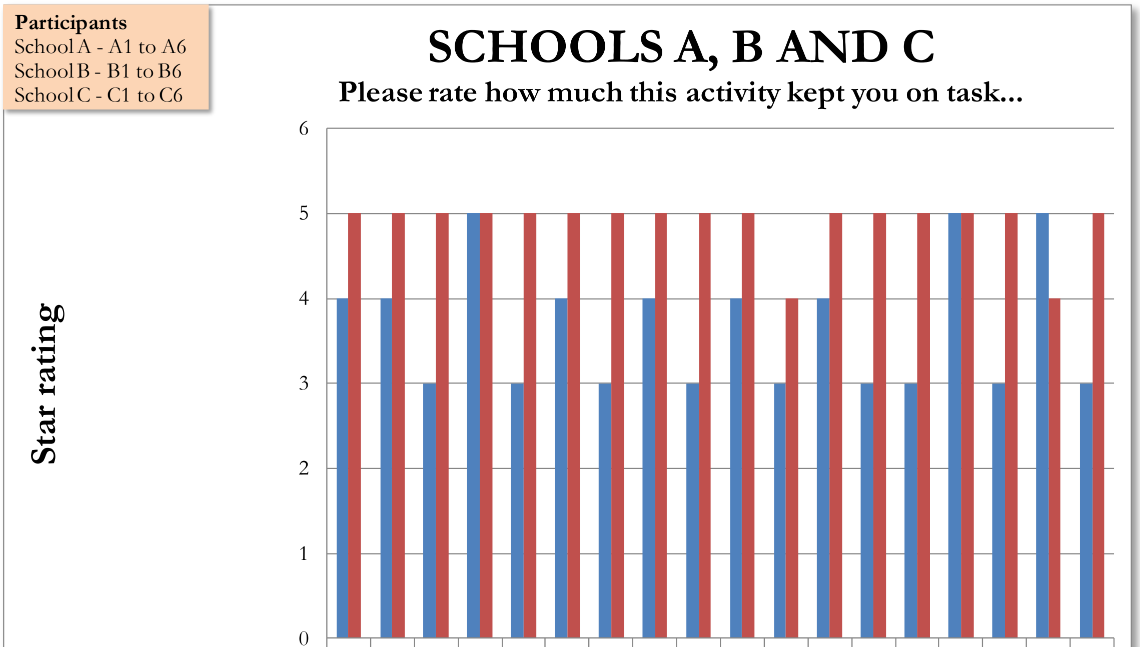
The star ratings awarded to the communicative activities were quite high. Climate Wiki was rated *between three and five stars* for how much it motivated learners (four was the most frequent rating). Heated Debate was rated *between four and five stars* for how much it motivated learners (five was the more frequent rating). **The mean of the ratings for Climate Wiki was 3.8, whilst Heated Debate was 4.9.** The participants ratings of how much the activities motivated them to learn can be found in **chart 21**.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Climate Wiki (communicative)	4	4	4	3	3	4	3	4	3	4	5	4	3	3	5	4	5	4
Heated Debate (communicative)	5	5	5	5	5	5	5	5	4	5	5	5	4	5	5	5	5	5

Chart 21: Learners' ratings of how the communicative activities motivated them

In terms of how much the activities kept them on task, Climate Wiki was rated *between three and five stars* (three was the most frequent rating). Heated Debate was rated between *four and five stars* (five was the more frequent rating). **The mean of the ratings for Climate Wiki was 3.7, whilst Heated Debate was 4.9.** The ratings are shown in **chart 22**.



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Climate Wiki (communicative)	4	4	3	5	3	4	3	4	3	4	3	4	3	3	5	3	5	3
Heated Debate (communicative)	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	4	5

Chart 22: Learners' ratings of how the communicative activities kept them on task

The participants also explained that the more instant nature of the Heated Debate made it more motivating than Climate Wiki. This comment from one of the participants in School B sums up their views:

> *"With the Climate Wiki, when you put your belief across, you had to wait until someone else edits or adds to it. That might take a while. But with this [Heated Debate], it's pretty much instant messaging, so you can get a reply back easily and quickly. You are more motivated that way"*

They did not believe the subject matter affected their motivation to learn, but there were some differences in opinions of how much they learnt from the communicative activities. Still maintaining that the communicative activities were very motivational, they commented about their benefits and drawbacks. For example, some explained that the communicative activities gave them opportunities to learn from other people. Participants in the three schools commented that:

> *"If you don't know what something is, it helps if someone can explain it to you. Also, other people can edit it and carry on where your ideas stop"*

> *"We've got six voices as opposed to one. So we can learn more. It's better to have too much information than have too little"*

> *"I think you could learn a lot by having two sides of the argument"*

> *"It [Heated Debate] makes you look at different points of view that you haven't thought before"*

> *"You may be a bit biased and say only the good points that support your side. Other people could point out the bad things as well. At the end, you would have learnt more"*

> *"A couple of people might think something but another couple might think something else really. You can compare and make your own decisions"*

Others in Schools A and C pointed out concerns about the reliability of the information presented by other learners. They said:

> *"It's useful for learning because we can all put our thoughts down. It's bad at the same time because anyone can put anything down. They can make themselves sound really smart but can be talking rubbish [passing on inaccurate information]"*

> *"Some people don't actually know the truth, they just write what they think is right and wrong"*

One participant in School C explained that the activities were not suited for all types of learning. They pointed out that:

> *"I can imagine that this would only be useful when you already know a thing or two about the topic. If we all did not know anything about climate change, we wouldn't learn anything"*

These comments highlight the limitations of communicative activities, in spite of their potential to encourage collaborative learning. Whilst they might rate highly in their potential to keep learners motivated, they offer no guarantees in terms of the depth and accuracy of learning. They are also likely to be unsuitable when learners have very little or no prior knowledge of the content.

7.5.6 PRODUCTIVE ACTIVITIES

The first productive activity (FWG Bridge) required participants to construct a bridge. The second productive activity (Sketch 2) required participants to produce sketches and paintings. The researcher observed that the participants seemed to enjoy interacting with the activities. The participants persisted when they faced the challenges of constructing the bridge and producing the sketches and paintings.

In general, they indicated on the self-report forms that they found both activities challenging. During the focus group interviews, they also explained that they found the productive activities challenging. They explained that they visualised what the outcomes would be and were keen to achieve them. Some explained that:

> *"There is a thing about creating things. You want to make it and you immediately set yourself a challenge"*
>
> *"I wanted to complete the sketches. I continued because I was hoping for a time when I would finally figure it out"*
>
> *"I wasn't even looking at the colours. I was too busy trying to build the bridge. The goal had to be achieved"*
>
> *"As soon as you start the activities, you have in your head a picture of what the finished product would look like. It's not easy to get this out of your mind until you have achieved it"*
>
> *The activities were challenging. Your brain is focussed when you want to build or draw things. So it's like you're focussing on it and you're not coming away from it until you complete it"*
>
> *"I was motivated by the activity because I wanted to get to the end and see the bridge. It was challenging and made you think 'what am I doing wrong'. Because you want to see yourself complete it, you continue"*
>
> *"Every time I tried, I failed miserably. Still, I wanted to keep trying. You want to make the bridge stay, so you keep trying"*
>
> *"The productive stuff [activities] make you feel like you need to succeed. I felt that if I didn't finish it, I wasn't going to see tomorrow"*

The participants in Schools B and C were asked to explain why, unlike the information handling activities, they were prepared to persist with the challenge of the productive activities. They explained that the challenge of the productive activities was slightly different. They explained that there was a clear objective (e.g. to build a bridge) which helped them visualise the outcomes. All the other participants from School B agreed with this response:

> *"You are shown the finished bridge at the start. You know exactly what to do. So even though it is difficult, they have set your mind on the target. So you have something you're working towards."*

There was general agreement in School C with this comment:

> *You are set a task. You see what you are supposed to draw. If you have an idea of what is expected, you are more focussed and concentrate more on doing it"*

The productive activities provided the learners with clear objectives. Having clear objectives is one of the strategies that could enhance motivation, especially at the beginning of the interaction (see Wlodkowski 1985). The participants were able to visualise what was required of them. This seemed to make it easier for them to persist with challenges of the task.

A few participants explained that the subject matter affected their motivation. In particular, they were referring to their perception of their level of skill when they explained that:

> *"I was not as motivated because I can't draw and the activity [Sketch 2] was drawing"*

> *"As I said on the sheet [self-report form] I couldn't draw. I knew I wasn't going to be able to do it [succeed in Sketch 2]. Why give myself the hassle of doing it?"*

The star ratings awarded to FWG Bridge for how much it motivated them to learn were *between three and five stars* (four was the most frequent rating). Sketch 2 was rated *between three and four stars* for motivation to learn (three was the more frequent rating). **The mean of the ratings for FWG Bridge was 4.3, whilst Sketch 2 was 3.4.** The participants' ratings are in **chart 23**.

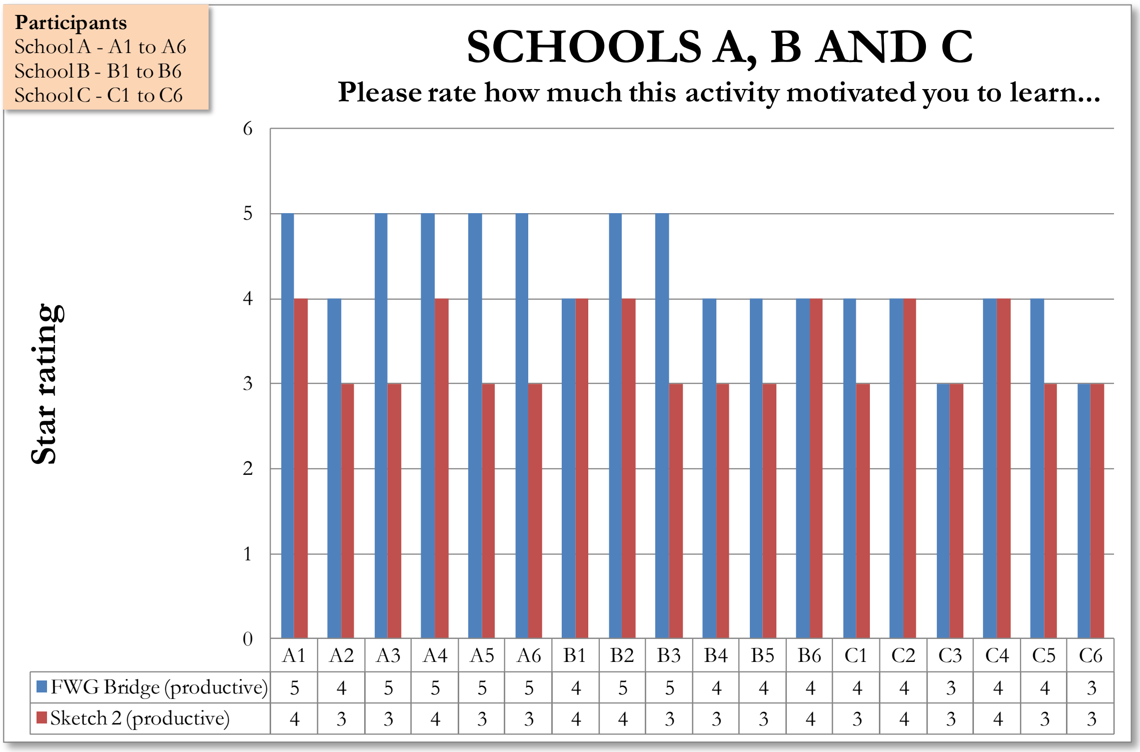
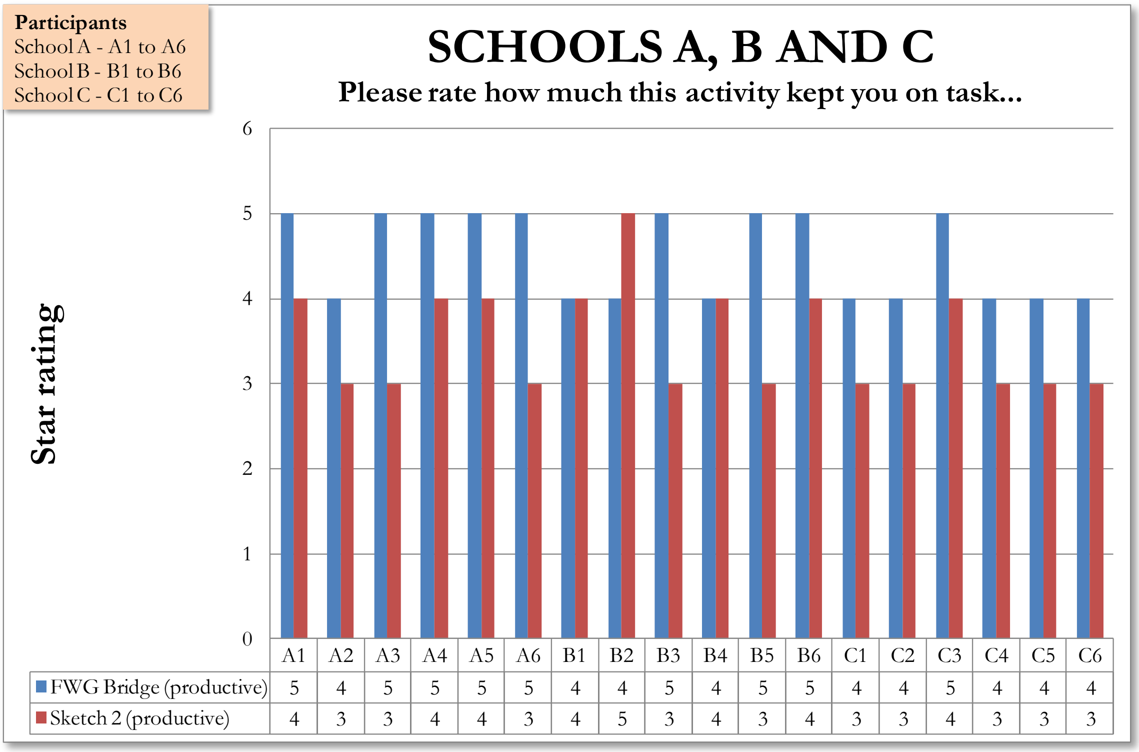


Chart 23: Learners' ratings of how the productive activities motivated them

As shown in **chart 24**, the participants awarded *between four and five stars* to FWG Bridge for how much it kept them on task (five was the more frequent rating). Sketch 2 was rated *between three to five stars* (three was the most frequent rating). **The mean of the ratings for FWG Bridge was 4.5, whilst Sketch 2 was 3.5.**



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
FWG Bridge (productive)	5	4	5	5	5	5	4	4	5	4	5	5	4	4	5	4	4	4
Sketch 2 (productive)	4	3	3	4	4	3	4	5	3	4	3	4	3	3	4	3	3	3

Chart 24: Learners' ratings of how the productive activities kept them on task

The ratings provided for FWG Bridge were higher than Sketch 2. The participants explained that FWG Bridge was more challenging. The challenge seemed to increase their effort towards the activity and their desire to persist in the activity. In spite of motivational benefits generated by the challenges, many participants indicated that they did not feel that they learned much from the activities. This was perhaps because they did not succeed at constructing the bridge or completing all the drawings. This suggests that the participants' placed greater emphasis on task achievement, rather than the learning process, when engaged in the productive activities.

7.5.7 EXPERIENTIAL ACTIVITIES

As the participants interacted with the experiential activities, Coffee Shop and Starting Out, the researcher observed behaviours that were similar to the adaptive activities. They seemed delighted to try out the different options and see the possible outcomes. It seemed that being able to make risk-free decisions helped them to focus on the activities.

The responses on the self-report forms and focus group interviews explained the behaviours that were observed. They explained that they found the activities very motivating because they were able to practise real-life scenarios. The ability to take risks, learn from mistakes and be immersed in the situation made the activities motivating. The comments from the participants in the three schools illustrate this:

"[Starting Out was motivating because] you've got to make loads of different choices about real-life situations. It's realistic. It's what might happen to me later in life"

"I think it [Starting Out] was good. I stayed on it because you can explore a bit. It gives you real-life scenarios, say when your phone got lost and you had to make a real decision like pay for a new one...so real-life situations"

"I found Coffee Shop really interesting. I think it's because you can try things out and see the things [the results] for yourself. I went bankrupt three times! You realise you don't have a big enough budget to buy all you want, so you have to focus on how much your recipe is. You can risk things and you stay learning that way"

"[Referring to Coffee Shop], I like the fact that I can practise real-life things out and learn from my mistakes"

In addition to the ability to practise real-life events, they found the experiential activities motivating because they gave them choice and control. Participants in the three schools said:

"I was very motivated because it [Starting Out] allowed you to live the life of a teenager, decide what you want to do...and see the result for yourself. You're the boss"

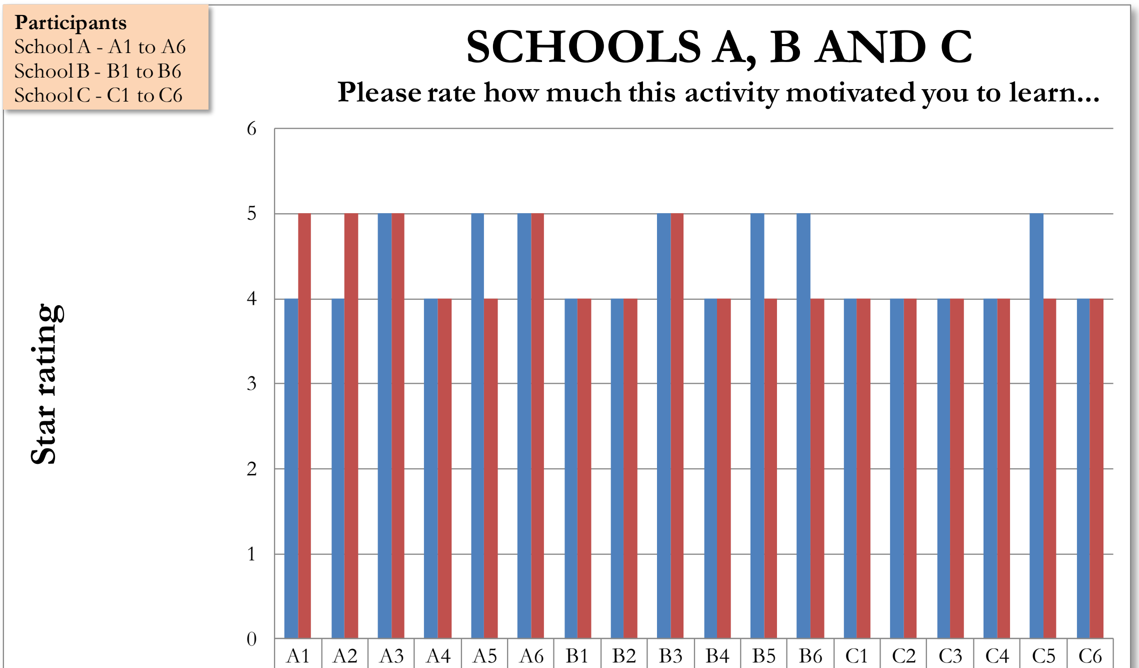
"It [Coffee Shop] was motivating because you could choose what you wanted to sell...so it gave you a sense of control that you need"

"It [Starting Out] was nice and interesting to use. I liked the idea of having different selections that you could choose for yourself"

"[Referring to Coffee Shop], I enjoyed being able to experiment with it. When it is hot, I put the price down because many people will not buy it [the coffee]. When it is cold, I put the price up"

Similar to the adaptive activities, the participants seemed to appreciate the fantasy environments provided by the experiential activities. The similarities in their comments further show the overlap between the adaptive and experiential activities.

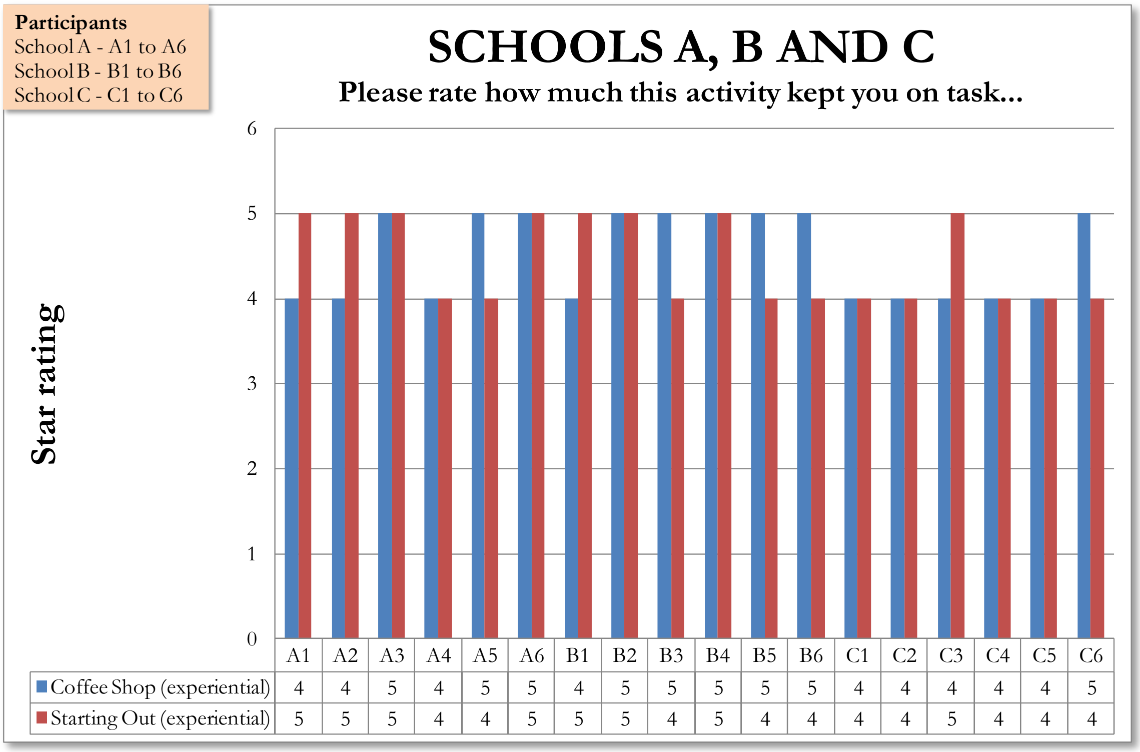
The star ratings awarded to the experiential activities were generally high. As shown in the **chart 25**, Coffee Shop and Starting Out were awarded *between four and five stars* for how much they motivated them to learn. The more frequent rating for both activities was four. **The mean of the ratings for Coffee Shop was 4.4, whilst Starting Out was 4.3.**



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Coffee Shop (experiential)	4	4	5	4	5	5	4	4	5	4	5	5	4	4	4	4	5	4
Starting Out (experiential)	5	5	5	4	4	5	4	4	5	4	4	4	4	4	4	4	4	4

Chart 25: Learners' ratings of how the experiential activities motivated them

As shown in the **chart 26**, Coffee Shop and Starting Out were awarded *between four and five stars* for how much they kept them on task (four was the more frequent star rating for both activities) . **The mean of the ratings for Coffee Shop was 4.5, whilst Starting Out was 4.4.**



	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6
Coffee Shop (experiential)	4	4	5	4	5	5	4	5	5	5	5	5	4	4	4	4	4	5
Starting Out (experiential)	5	5	5	4	4	5	5	5	4	5	4	4	4	4	5	4	4	4

Chart 26: Learners' ratings of how the experiential activities kept them on task

Most of the participants believed that they learnt a lot from the experiential activities. They also did not believe the subject matter had any influence on their motivation to learn. The motivational effects of the experiential activities and the reasons given for their motivation were similar to the adaptive activities. This could be because the experiential and adaptive activities used during this study both had adaptive and experiential elements. The activities were experiential because they could adapt; by being adaptive activities, they were also experiential.

7.5.8 COMPARING THE DIFFERENT TYPES OF ACTIVITIES

In this section, the motivational effects of each type of activity were reported. The participants generally believed that the adaptive, experiential and communicative activities were the most motivating. The choice, control and the simulation of realistic situations motivated the participants to learn with the adaptive and experiential activities. They believed the communicative activities were motivating because of the ability to interact with and share ideas with other learners. They often went off-task, but vehemently denied that this was an indication of a reduction of in their motivation to learn. A summary of the motivational effects of the different types of activities are shown in **table 28**. The motivation ratings (high, medium and low) are based on the participants' ratings of how much the activities motivated them to learn and how much they kept them on task. The learning ratings are based on the *participants' perceptions* of how much they felt they learnt (there were no attempts to test the accuracy of their perceptions). Although the information in the table is based on the activities selected for this study, it provides some ideas that could be considered during instructional design.

Type of activity	Motivation rating	Learning rating	Notes
Adaptive	High	High	Learners appeared to be motivated by the choice, control and real-life scenarios. Variety and multimedia seemed to have positive effects on motivation.
Experiential	High	High	Learners appeared to be motivated by the choice, control and real-life scenarios. Variety and multimedia seemed to have positive effects on motivation.
Communicative	High	Medium	These activities encouraged learners to present their views and consider those of others. Off-task behaviour was common, but learners believed their motivation to learn did not reduce. These activities are probably unsuitable when learners have little or no prior knowledge of the content. Moreover, the activities did not provide any guarantees in terms of depth and accuracy of what was learnt.
Productive	Medium	Low	Learners found the productive activities motivating because they helped them to set themselves challenge at the start. Being able to visualise the desired outcomes was motivating. Learners seemed focussed on task achievement, rather than the learning process. Sometimes, motivation was hampered by the belief that they are not capable of producing the artefacts.
Assimilative	Low	Medium	Learners' motivation was affected by the amount of information that needed to be read. It is not clear whether watching videos or listening to audio would be more motivational than reading text. Multimedia seemed to increase their motivation to learn when using assimilative activities.
Information Handling	Low	Low	The participants believed that the activities selected for this study were difficult. There were various responses to the perceived difficulties; sometimes learners were motivated by the challenge and sometimes they were put off. Some participants believed that the information handling activities are not suited for learning on the computer.

Table 28: Motivational effects and ratings of the different types of activities

7.6 FEATURES THAT AFFECT MOTIVATION TO LEARN

7.6.1 FEATURES THAT AFFECT MOTIVATION

The previous section reported on the motivational effects of the different types of activities. It reported the motivational effects and the reasons for the motivation experienced when learners interacted with the different types of activities. Although it focussed on the *types* of activities, it became clear that the activities and their features were inseparable. In some cases, the motivation associated with the activity seemed to be linked to the features. For example, the participants acknowledged that the multimedia appeal of the adaptive activities contributed to their motivation. In an attempt to answer the research question, *which features of e-learning activities affect motivation to learn*, this section focuses on the features of the selected e-learning activities.

The learners were observed as they interacted with the activities. They also wrote down their views about the features of the activities on the self-report forms. Moreover, they discussed the features that were motivating or less motivating during the focus group interviews. Although this section is limited to the activities that were selected for the multiple-case studies, it is hoped that the findings will help instructional designers understand some of the features that increase or reduce motivation to learn. It should add to existing guidelines and principles (see **appendices 3, 4 and 5** for some examples).

7.6.2 PRESENTATION AND USER INTERFACE

The participants attributed great importance to the presentation and the user interface of the e-learning activities. They believed that the way the learning is presented and the user interface had some effect on their motivation to learn. This statement from one of the participants from School A seemed to sum up their views:

> *"It's all about the wow factor. You watch TV, play games or go on the internet. You see a lot of interesting things. They are made to draw you in. Not only that, they get addictive because they are designed well. Now you go on a computer to learn and if it doesn't have all those wicked [nice/interesting] things, you think: what's the point?"*

The similar views in School B can be summarised through the words of one participant:

> *"I like history, yeah. But I wasn't really motivated because of the way they presented it. If I am reading a [history] book, fine. But when I'm doing it [learning history] on computer, I expect it to be presented better. The power of the computer can be used to make it appealing to use and learn from"*

These views were put in other words by two participants in School C. The first participant said:

> *"Picture it with me. You are told you will learn about …You expect that it will be exciting because the computer can do many amazing things. Can you imagine the annoyance if it doesn't meet your expectations? You quickly lose interest because there is nothing exciting about the appearance"*

The second participant added:

> *"It's simple really. The way it is presented determines how boring you will find it"*

There was general acceptance that the presentation and the user interfaces had some effect on their motivation. Their comments also suggest that they have come to expect e-learning activities to have an appealing appearance. They seem to be aware of the potential of computers and expect that its full potential will be exploited.

Perhaps the most important issue is what aspects of the presentation and user interface affects their motivation in a positive or negative way. Most comments related to the *graphic appeal* of the activities. They explained that they expected bright colours and good quality pictures. They did not show any particular preference for cartoon-style pictures. Some of their comments (across the three schools) are below:

> *"I wasn't motivated because the colours were dull"*

> *"You look at the graphics and decide whether it will be boring to learn with or not"*

> *"The colour scheme was very inviting. Many of my mates will appreciate this type of thing"*

> *"I wasn't motivated because there were very few pictures"*

> *"They could have used better quality pictures"*

"When you see something as [graphically] appealing as this, you know they have put an effort into it. Your motivation increases as well"

These learners were making the point that the graphic appeal affects the level of attention and effort they will put into the e-learning activity. It also appears that their expectation of appealing graphics is not limited to the initial stages of the interaction.

Some of the participants explained that the *layouts* of the activities affected their motivation. For example, some commented about the layouts of some of the activities saying:

"It's the layout really. I thought it was all over the place. It put me off learning"

"It was not laid out in a way that would want you to read it, so you are not motivated to even try"

"I think the layout is good, it is easy to understand because it is well organised"

Some participants explained that the *ease of navigating around* the activities affected their motivation to learn. They seemed to prefer activities that allowed them to choose their navigation paths to those that guided them through a particular path. For example, some explained that:

"The map was a motivating feature. You could see a simple map that helped you to know where you have been and where you need to go. It was also nice because you could choose where to go"

"I liked the idea of the maps, so you could actually choose what you wanted"

"I had the freedom to select the words I wanted before it loads the pop-ups"

"You keep pressing next, next, next. This was very silly. You feel like you will be learning more if you are allowed to explore yourself"

The sense of control, according to Malone & Lepper's (1987) taxonomy of Intrinsic Motivations, is useful for empowering learners. Malone & Lepper (1987) proposed that learners should have opportunities for contingency, choice and power. The participants seemed to place an importance to this feature and believed it empowered them to engage in the activities.

Another aspect of presentation and user interface that they commented about was the use of *text*. Some explained that there should not be too much text. The commented:

> *"There was too much writing and this got me fed up"*
>
> *"I lost interest because there was too much reading"*
>
> *"There was too much text. In this day and age, you would expect that text will be kept to the minimum or replaced with sound"*
>
> *"There was plenty of writing. I never give anything that has a lot of writing any attention"*

Others explained that the text should be easy to read. Referring to the need for appropriate size and colour of the text, they explained:

> *"They put the white text on the picture. You actually try to read it, but give up because it cannot be seen well [clearly]"*
>
> *"The descriptions were small. You had to lean forward to see what it had to say"*
>
> *"I couldn't really see the writing. There was no point looking at it because you just couldn't see it"*
>
> *"I was motivated a little bit, it was just that the writing was quite small"*

The comments indicate that some learners expect the quantity of text to be minimal. This could be because of some level of intolerance towards reading or the opinion that sound or images are preferable to text. Some of the comments, however, are about the readability of the text, rather than quantity.

Others explained that they expect a *range of media* to be present when learning from the computer. They seemed to be less interested when activities made use of text and graphics alone. Some of the views expressed by participants in the three schools are below:

"Pictures and writing is not enough to motivate me. I want rollovers, sound, animation, music and other effects"

"The activity did not motivate me because all it had was writing and some pictures. You get them [pictures and text] everywhere. Look around you, the posters, the leaflets, the books, they all have pictures and text"

"Why would I like...when I can have...I am not likely to learn with it because it is too boring. The pictures could be animated. They could have added some music or something"

They were asked to explain the motivational benefits of multimedia, other than text and graphics. They explained that the multimedia, especially animations, sounds and videos, makes the activities more appealing. Some of their comments (across the three schools) are below:

"There is a difference between a picture and a moving picture. One begs 'use me please' and the other says 'you will be missing out if you don't use me'"

"If the map was an animated map, it would make you want to explore more"

"You have a picture and text, what is missing is the music. It will make it more enticing"

"It would be more motivating if it had a video about..."

"I was motivated to continue reading because I wanted to continue listening to the music. At the same time, the information was presented in front of me. The music kept me going"

"It gives you inspiration to use it because they have included music and animation"

"They have already done well. They have pictures to help you visualise what the writing is about. To take it to another level, they need to add music to the pages to help you explore better"

"It is too texty [text-based]. The pictures are also not many. They need to learn from...Videos can be used to keep young people like us glued to it"

Although they wanted the activities to go beyond pictures and text, some explained that multimedia could have adverse effects on their motivation to learn. This is illustrated in the views from the three schools below:

"The music was a bit catchy but could get on your nerves after a while"

"The video went on for too long. I started losing interest. They should just go straight to the point"

"Make the music less annoying or make sure it can be stopped. At some point I thought, 'either it stops or I stop'"

"I spent all the time looking at the animation. I got carried away"

"I wouldn't have been so distracted if there was just plain simple text and a couple of photos"

It appears that some of the learners accept that the "bells and whistles" of multimedia might actually hinder their motivation and learning. Whilst they were not recommending the removal of multimedia from e-learning, they seemed to be highlighting that the *effective* use of multimedia is paramount. This is similar to the views expressed by Haydn (2003a) who stressed that multimedia should be used purposefully to stimulate cognitive engagement and provide access to resources that would otherwise be inaccessible.

The participants were asked to explain whether there were points during the interaction where presentation and interface had greater effects on their motivation to learn. They explained that the presentation and user interface greatly influences their initial interest in the learning activity. They however explained that good presentation and user interfaces were important *throughout* the interaction. All the participants in the three schools shared this view.

7.6.3 INTERACTIVITY, VARIETY AND COGNITIVE LOAD

The majority of participants believed that they were motivated by activities that gave them control and responded to their actions. Some of them described this as interactivity. Their comments (below) illustrate that the *control and response* kept them motivated to learn:

"I like when you place your mouse over the button, it changes colour and the sound comes on...It makes you feel that there is something interesting there"

"You feel you are in charge. You make your choices and the scenes change right before you"

"It's motivating because it's interactive. You get instant response. As you wiggle your mouse, you get the speaker's attention. You're not just reading, you're doing something"

"The drag and drop thing was motivating. You are motivated to read, think about where things go, drag and drop them in the right place. It would have been less interesting if all you had to do was read"

Tang (2005) identified four types of interactivity: control, response, manipulate and co-construct. More detailed explanations of these classifications are in section 4.2.5. Going by Tang's (2005) classifications, all the activities used for the multiple-case studies had some level of interactivity. The question is whether they showed any preference to the different types of interactivity. The participants' comments suggest the activities that went beyond control and response (e.g. communicative, adaptive and experiential activities) were considered more motivating. The ability to manipulate the environment and the unpredictability of these features were considered motivating.

Commenting on the communicative activities, some explained that:

"There is a particular type of response [interactivity] from these activities. You get a response from the computer, but you get responses from your peers too"

"You are not just taking in information. You are getting your views heard at the same time. When you are talking [typing] and others are listening [reading], you get a certain level of motivation to keep going on"

Commenting on the adaptive and experiential activities, some said:

"You can explore better. You know your decision changes a lot of things. You keep at it because you want to see the output [outcome]"

"It is motivating because it is less predictable. You don't just click through next. You choose something and you see the effects straightaway on the screen and the headset. Then you realise it was a good or bad choice"

In addition to interactivity, most participants explained that their motivation was increased by activities that had *variety*. They seemed to have a perception that variety made the activities more motivating. The comments from participants in the three schools illustrate this:

"I was not so motivated because it only had limited locations. There was not a lot to explore. I would have liked more choice"

"If they wanted to make me stick at it more, they should have added more options"

"I was not too keen because you were forced to stick to the few items you were presented with"

"When you see a lot of options, you think 'choice'. That can't be a bad thing"

"It was boring because there was a lot of the same sort of thing"

"There were loads of different things...it didn't make you bored and you wanted to keep doing it"

"There were loads of features to choose from: pick up messages, attend a debate, travel to constituency and so on"

One participant however explained that variety could result in confusion. They said:

"You can't say that variety is a clear positive, not every time anyway. I found...a bit confusing because there was too much variety. You feel a bit overwhelmed and start going around, not paying attention to the task"

Whilst many of the comments suggest that learners are motivated by variety, instructional designers must be aware of its limitation. They should ensure that the variety of options provided is meaningful. The variety provided should not be excessive such that it hampers motivation.

Some participants also commented about having to process too much information at the same time. Their comments suggest that they experienced some cognitive overload during the interaction with some of the activities. This seemed to reduce their motivation to learn. Some explained that:

"It gave you a lot of information, but it was in big chunks. I couldn't cope, so I ended it"

> *"Too many facts just got thrown at you. It was too much to take in. They could have helped by putting a quiz or game in the middle to sweeten it up a bit"*

Apart from the quantity of information, some explained that the cognitive overload was due to the poor design of the activities. Some of their comments were:

> *"I got very confused. It was all over the place. You had the explanations on the left, the questions at the top, the answer thing in the middle and another box at the bottom. You're supposed to take all that in?"*

> *"It was too much. You have all those options flying at you. You don't know which one to click. Even when you click, the information is not in order. You then have to read it all, try to remember it all and put it in order in your brain"*

7.7 CHAPTER SUMMARY

This chapter has reported on the findings of the multiple-case studies, which relied mainly on observations, self-report forms and focus group interviews. There are limitations in relying on the researcher and participants' perceptions of "novelty periods" and motivation to learn. However, combining the methods often provided some degree of verification and expatiation of findings.

This study not only provides evidence suggesting that novelty affects learners' motivation to learn, it clarifies that there can be positive or negative effects of the "novelty period" in an e-learning context. The assumption that novelty effects result in positive motivation has been challenged. This study found that some learners experience uncertainty and anxiety during the "novelty period". This affects their motivation in a negative way.

Moreover, there seemed to be various reactions to the end of the "novelty period". By the end of the "novelty period", some learners appeared to have developed confidence and the willingness to embrace the challenges of the activity. Others seemed to experience a reduction in their motivation because, by the end of the "novelty period", they had developed concerns about their competence and the relevance of the activity to their needs. Most of the learners explained that their decision to continue learning after the "novelty period" was based on the expectation of fun, the topic and how much they learnt during the "novelty period". Furthermore, the "judging criteria" used by learners to determine the "novelty period" seems to be, in many cases, based on two factors – enjoyment and "working out" the features of the activity. Apart from the productive activities, there was little reference to cognitive activity or the content during the "novelty periods".

An interesting and significant finding is the concept of "regenerative novelty". The participants spoke of the perception that the novelty of certain activities were extended by the choice, control and changes during the interaction with the activity. This was particularly the case with the experiential and adaptive activities. The "regenerative novelty" experienced during the communicative activities was due to the changes in the direction of the discussions/comments during the interaction. It also seems likely that learners will find new novelties if they engage in the communicative, experiential and adaptive activities during another session. This however cannot be confirmed, as the activities were not repeated during the study.

The motivational effects of the different types of activities were reported. Some types of activities (adaptive, experimental and communicative) were considered highly motivating, based on the observations and learners' perceptions. The adaptive and experiential activities were considered highly motivating because of the choice, control and the way they modelled real-life scenarios. The communicative activities, in spite of the off-task behaviours observed, were considered highly motivating because they encouraged learners to take on different "virtual personalities" and contribute their ideas.

Table 27 (in section 7.4.8) draws together the findings of the study relating to the novelty of the different types of activities. **Table 28** (in section 7.5.8) summarises the findings of the study relating to the motivational effects of the different types of activities. Together, they provide indications of the "novelty periods" and the motivational effects of the different types of activities.

It was sometimes difficult to separate the motivational effects of the types of activities from their features. Sometimes, learners explained that their motivation was not affected by the type of activity alone, but also by the features. During the multiple-case studies, the participants commented on the motivational effects of a range of features (graphic appeal, layout, navigation, use of text, multimedia appeal, interactivity, variety and cognitive overload) on their motivation. They seemed to expect that e-learning activities would appeal to them, possibly matching other non-academic activities (such as games).

There were however some areas that are still unclear from the study. It is unclear whether novelty diminishes suddenly or over time. It was difficult to determine the period of "diminishing novelty" (or its existence). An understanding of reasons for individual differences in perceptions of the novelty and motivation associated with each activity would also advance knowledge in this area. These areas might be worth investigating in the future.

CHAPTER 8: DISCUSSION AND CONCLUSION

8.1 INTRODUCTION

This chapter brings together and discusses the findings of the surveys and multiple-case studies, in relation to the research questions and existing research. The first section of this chapter is a brief reminder of the research focus. It then discusses the findings by focussing on and addressing each of the research questions.

Regarding the **attraction** to computers, it is accepted that the vast majority of learners are attracted to computers. However, this thesis challenges the view that this attraction automatically translates into motivation to learn with computers, as portrayed in some media and political rhetoric (for example, Becta 2003; Means et al. 1997). It is also argued that many of today's learners have certain attitudes and expectations of e-learning, which are based around the idea of "fun". There were many responses from both the online questionnaires and focus group interviews suggesting that their judgement of the effectiveness of e-learning is often based around the extent to which it provides fun, rather than serious intellectual engagement with the content (see Mishra & Koehler 2006).

One possible construction that could be placed on this finding is that the motivation to learn in an e-learning context requires a balanced combination of fun and "serious learning" (cognitive engagement). Delivering fun without cognitive engagement serves no useful purpose, but attempting to deliver cognitive engagement without an attempt to "entice" pupils into learning (fun) is ignoring the learning attitudes and expectations of many learners. Another response to this finding is that instructional designers need to find ways of getting learners to engage intellectually by intriguing them with problems and choices inherent in the content, rather than the "bells and whistles" of multimedia and presentation alone.

The thesis also argues that the *perception* of proficiency in the use of computers is a more important influence on learners' ideas about e-learning activities than proficiency itself. It is accepted that the perception of proficiency can affect learner confidence and willingness to learn with computers. This study did not find clear evidence suggesting that the perception of proficiency always influences the motivation to learn with computers.

There are three main arguments in relation to the **novelty** of e-learning activities. The first argument is that novelty does not always influence learners' motivation in a positive way, as often assumed in existing literature (for example, Allen 2003; Fry & Love 2008; Yan 2004; Keller & Suzuki 2004). It is also suggested that the "novelty period" is very volatile, hence, research efforts should focus on the improvement of learners' self-regulation capabilities, and motivationally adaptive and personalised e-learning systems. Secondly, it is argued that multimedia and variety can influence learners' perceptions of novelty. Finally, the view that the perception of novelty is short-lived and only useful for attracting attention is challenged, as evidence from this study suggests that novelty can be "regenerated" during the interaction.

Concerning e-learning **activities**, it is argued that the different types of activities have different motivational effects. Hence, it should not be assumed that all e-learning activities are motivating, or result in the same type or level of motivation. However, there was evidence that certain types of self-study e-learning activities, particularly those involving experiential, adaptive and communicative learning, were identified as being more effective at sustaining attention and engagement. However, it must be pointed out that this study was carried out using a limited selection of self-study activities, with time limits on the interactions with each activity, and no opportunities for repeat interactions with the activities. Another argument is that features (such as good presentation and interfaces) are no longer features, but *requirements* which learners have come to expect.

The discussion of the findings of this study is followed by an evaluation of the limitations of the study, to ensure elucidated understanding of the findings. This chapter then concludes the thesis by highlighting the implications of the study and its contribution to knowledge in the field, identifying limitations and areas of further research, putting forward some recommendations, and presenting the central argument of the thesis.

8.2 THE FOCUS OF THE STUDY: A REMINDER

This study is an investigation of three facets (attraction, novelty and activities) relating to e-learning and motivation. Surveys in three schools were used to investigate learners' attraction to computers. Multiple-case studies in the three schools were also used to investigate the effects of novelty and the types of activities on motivation to learn.

The research questions are in chapter 1 (section 1.2.1). The first set of research questions relate to *attraction*. These questions focus on learners' attraction to computers, their attraction to learning with computers, and the motivational effects of proficiency in the use of computers. The research questions pertaining to *novelty* aim to examine the existence of novelty effects, learners' reaction to ending novelty, the duration of the perception of novelty, and the effect of the novelty of different e-learning activities. Finally, the research questions relating to *activities* focus on the motivational effects of different types of e-learning activities and the features that affect motivation. Several theoretical frameworks and models were integrated to provide a broad set of variables that are relevant and useful as the basis of the inquiry.

The intention was to conduct an investigation that meets the demands of an academic inquiry, whilst maintaining relevance to educational practice. By examining the attraction to computers and its relationship to motivation to learn, the study aimed to inform the practice of teachers and policy makers. The findings of this study might influence their decisions about the use of computers for learning. The insights about the effects of novelty and the type of activity on motivation might also benefit instructional designers during the development and evaluation of e-learning activities.

8.3 ATTRACTION: DISCUSSION OF FINDINGS

8.3.1 THE ATTRACTION TO COMPUTERS

Research question: Do learners *actually* have an attraction to computers, as is often assumed (for example, Kim et al. 2007; Broady et al. 2010; Prensky 2001a)? What are the reasons for this attraction?

Many research reports have suggested that learners are generally attracted to computers because of their familiarity with computers (see, for example, Helsper & Enyon 2010; Prensky 2001a; Teo 2006; Pektaş & Erkip 2006; Bovée et al. 2007). The finding from this study is consistent with the view that young people are familiar with computers. A very small minority, less than 2% in each school, indicated that they do not use computers. The survey also revealed that the majority of learners, over 75% in each of the three schools, spend an hour or more a day on computers.

A possible interpretation is that learners must be attracted to computers because of their familiarity with computers and the frequency with which they use them. Why would they use computers regularly if there were not attracted to them? There seems to be an assumption that familiarity with computers results in an automatic attraction to them. However, there is a possibility that people are not attracted to an object in spite of their familiarity with it. For example, some teenagers are not necessarily interested in engaging with school materials and processes, though, by that age, they will be familiar with school (see Gardner 1995; Papert 1998).

There is already some evidence suggesting that this familiarity with computers does not necessarily mean they are attracted to them. For example, Broady et al. (2010) explained that peer and social pressures affect young people's attitudes towards computers. This implies that their regular use of the computers is not necessarily because of an attraction per se; there are other reasons for regular use of the computers, such as the need to "feel among". The finding from this study, that the majority of learners use computers for social networking, could support the view that peer and social pressures are partly responsible for the frequency of use and familiarity with computers.

However, it is difficult to find any study denying the existence of an attraction to computers. Instead, the studies try to provide reasons for the attraction. For example, some studies suggest that learners believe they are proficient in the use of computers, even when this is not a true reflection of their abilities (Helsper & Enyon 2010; Gardner et al. 1993; Houtz & Gupta 2001). Furthermore, some studies suggest that learners believe computers are tools required for everyday life (Teo 2006; Pektaş & Erkip 2006; Bovée et al. 2007).

Rather than accepting the claim that young people are attracted to computers, this study sought to verify whether there really is an attraction. The participants were asked during the survey to indicate whether and why they "like using computers". The phrase "like using computers" was used because "attracted to computers" was considered inappropriate for the target audience during the pilot study. An overwhelming majority of learners confirmed that they like using computers (83.5%, 82.2% and 72.6% in Schools A, B and C respectively). In fact, very few learners (0.4%, 0.4% and 1.4% in Schools A, B and C respectively) indicated that they did not like using computers. This supports the claim that the majority of learners are attracted to computers. This goes beyond familiarity to computers; it suggests that that they like using computers.

Several reasons were given for the attraction to computers, including the perception of proficiency and the appreciation of the benefits. The most popular reason given was that computers are considered fun and entertaining. The responses during the focus group interviews suggest that the learners believe that the presence of multimedia, games or the ability to communicate with other people are fun, making computers attractive. Interestingly, many learners explained that they would not use computers if the multimedia, access to games, chat and social networking were absent. The comment below illustrates this point of view:

"I guess that's what people our age use computers for, so that's pretty much everybody thrown out"

The next most popular reason for the attraction to computers was that they had an appreciation of the benefits of the computer, particularly for social networking and other types of communications. They also included comments explaining that computers provide access to a wide variety of information, assistance with spellings, and better-looking outcomes.

The two most popular reasons, expectation of fun and appreciation of benefits, may be related. It can be interpreted that one of the benefits (or the most important benefit) that learners appreciate is the provision of fun through multimedia, games and communication. Carroll et al. (2002) indicated that young people evaluate technology and decide whether it will be suitable for their needs. These young people seem to have evaluated computers and decided that the benefits (such as fun through multimedia, games and communication) make them suitable for their needs.

The fact that some learners (16.2%, 17.4% and 26% in Schools A, B and C respectively) indicated that they *sometimes* like using computers supports the idea that learners evaluated computers and made decisions about their suitability for their needs. These learners explained that their attraction depends on other factors, such as the performance of the computer, their perceived level of proficiency, and the nature of the computer-based activity. These percentages represent quite a substantial proportion of the sample. One interpretation could be that these learners can be "converted" to being attracted to computers if their concerns (performance, nature of the activity and perception of proficiency etc) are addressed. On the other hand, it suggests that they will lose their attraction to computers if the concerns are not addressed.

To sum up, although this study treated the assumption that young people are attracted to computers with scepticism, the result of the surveys is consistent with the view that most learners are attracted to computers. However, there is evidence suggesting that the attraction is not automatic; learners tend to make evaluative judgements about whether (and in what ways) the computer will be beneficial to them. For example, some participants indicated that the performance of the computer or the nature of the computer-based task can influence their attraction to computers. Access to multimedia, games and communication, which they consider as fun, seem to be a major part of what attracts young people to computers. The next section will explore the impact of this attraction on their motivation to learn.

8.3.2 ATTRACTION TO COMPUTERS AND MOTIVATION TO LEARN USING COMPUTERS

Research question: Does the attraction to computers (if it exists) have any relationship to motivation to learn using computers, as it is sometimes portrayed in media coverage and political rhetoric (for example, Becta 2003; Means et al. 1997)?

As discussed in the last section, the evidence gathered during this study suggests that most learners are attracted to computers. There is, however, fierce debate about the claim that computers can motivate students to learn. For example, a former government agency, Becta (2003), analysed various research evidence and concluded that ICT is able to motivate learners by improving their enjoyment, sense of achievement and commitment during learning. Other reports suggest the opposite, that computers actually reduce effort towards learning (Underwood & Underwood 2001; Wirth & Klieme 2004; Clark & Feldon 2005).

There are several explanations for the existence of these debates. Convery (2009) explained that studies in ICT research have not always been evidence-based and constructively critical. According to Convery (2009), some researchers seem to overstate the potential of technology by using abstract language or rebutting unwelcomed findings, rather than presenting balanced evidence-based accounts of their findings. Convery (2009) also explained that the contexts of the studies are often ignored and broad generalisations are made from isolated events, views or experiences. In addition, Cox & Marshall (2007) explained that this might be due to the lack of large-scale and comprehensive studies that addresses the multifaceted nature of e-learning. Another explanation is that research into educational technology seems to be dominated by technologists themselves, hence, their views become privileged (Selwyn 2006).

During this study, the learners were asked to indicate whether they believe computers motivate them to learn. The entire population of eleven to fourteen year olds in the three schools had the opportunity to respond. Nearly half of the respondents, between 40% and 45%, indicated that computers motivate them to learn. Interestingly, a similar percentage of respondents indicated that computers *sometimes* motivate them to learn.

The simplistic interpretation is that computers do not automatically result in motivation to learn. However, more substantive interpretation can be drawn from this finding. Firstly, it suggests that the learners who indicate that computers sometimes motivate them to learn were making the point that their position regarding the motivational influence of computers can sway between "yes" and "no". They indicated that their motivation to learn with computers can be influenced by the look and appeal of the activity, their judgement of how interesting the activity will be, the performance of the computer, and, in a few cases, the subject/topic. Hence, their motivation to learn with computers is likely to depend on their judgement about how well these factors are addressed.

Furthermore, the rather high percentage of participants (roughly 40% to 45%) who indicated that they are sometimes motivated to learn has implications for research. Their views can affect the reliability of data gathered during studies. For example, such learners might indicate that computers motivate them to learn because they are engaged in activities that are graphically appealing or are using computers with high specifications. On the other hand, the absence of the graphic appeal or the use of computers with low specifications could make the same learners believe that computers do not motivate them to learn.

There is also some evidence of "technocentrism" in many of their comments – some learners' judgements about ICT and learning were based on technological features with little reference to content (Papert 1987; Mishra & Koehler 2006). The learners seemed to place emphasis on the features of computers, rather than how well they are persuaded to engage in learning.

So far, there has been emphasis on the views of respondents who indicated that they are sometimes motivated to learn with computers. The views of the other respondents also need to be considered. The respondents who indicated that computers *do not* motivate them to learn explained that: they do not associate computers with learning and believe that other computer-based activities are more fun; they are not interested in computers; they have some concerns about the reliability of information on computers; they sometimes get distracted whilst learning on computers; they are concerned about the health and safety issues associated with the use of computers.

The respondents who indicated that they *were* motivated to learn with computers provided a variety of reasons for their opinion:

- learning on the computer is usually fun and easy
- multimedia has some motivational effects
- computers provide easy access to a wide range of information
- computers represent a modern approach to learning
- computers make it possible to personalise learning
- computers are more attractive than other forms of learning or writing by hand

Fun and other associated words (like enjoyment, cool, interesting etc) seem to be very prominent in their responses. The most popular reason for the motivation to learn with computers was the view that computers were fun to use. Interestingly, the most popular reason for a lack of motivation to learn with computers was also related to fun; they believed other computer activities (such as social networking and games) were more fun than learning. Their views were reported in chapter 6 (sections 6.4.2 and 6.4.3), but the following comments have been selected to illustrate this point:

> *"They are a lot more fun and will make people my age excited to lern [learn]"*

> *"It is alot [a lot] more fun and interesting...you will do more"*

> *"Because there are more resources on the computer that are more interesting, learning becomes second choice".*

> *"Computers are for fun, not leatning [learning]"*

Where do they get the perception that computers are fun or that learning activities on computers ought to be fun? It seems this perception comes from their regular use of computers for activities that are considered fun, such as social networking and games. This study found that roughly 75% of the learners use computers for social networking and communicating with friends. Approximately 60% of learners use computers for non-educational games, consistent with the findings of Livingstone & Bovill (2005). Moreover, about 60% of the respondents use computers to download or view media. When faced with computer-based learning, they seem to expect that the level of fun would match those of social networking, games and other non-academic activities.

The expectation of fun can be problematic because the level of interest experienced through non-academic computer-based activities exceeds those of academic ones (Gee 2008; Steinberg 2001; Loveless & Ellis 2001). This could be because educational technology has simply been used to support traditional modes of teaching and learning (Laurillard 2007). Although it seems (from this study and others) that learners are generally attracted to computers, this does not seem to translate necessarily into the motivation to learn with computers. The learning activities do not seem to match the level of fun experienced through other activities (such as social networking and games).

It is hardly surprising that some learners made comments like these:

> *"When I am on the computer, all I am thinking about is games and YouTube, not learning"*

"The computer, yeah, is for fun. I am not motivated to learn with them"

"It depends on the activity. If it is as fun as making my own games, I will use it for learning"

These views suggest that many learners expect computer-based activities, including learning, to be fun. It also suggests that they might not be motivated to learn on computers if the activity does not appear to offer the level of fun that is comparable to non-academic use of computers. At one level, it suggests that instructional designers should make efforts to incorporate fun into e-learning in order to make it interesting enough to match non-academic activities (such as games and social networking). For example, Gee (2008) recommended that educationalists should learn the techniques used by game designers. He argued that long, complex and difficult games manage to keep young people engaged for hours.

However, Gee (2008) seemed to ignore the fact that the purpose of gaming is entertainment whilst the purpose of learning is acquisition of knowledge or understanding. Although adapting gaming techniques might deliver motivation and engagement, educationalists have other issues to deal with. Educationalists have schemes of work, broken down into individual learning objectives, which must be delivered within a certain time. These issues are not always compatible with gaming paradigms. Whilst it is possible that some gaming techniques can be adapted for learning, ultimately, the objectives of gaming and learning systems are different.

Notwithstanding, the data gathered from this study suggest that learners have a particular attitude and expectation towards learning with computers: fun seems to be an expectation in most cases. Their responses to the question relating to enjoyment of learning with computers were similar to the responses to the question about motivation to learn with computers. This suggests that their interpretation of both questions were similar. The majority of responses to both questions were also relating to fun.

The incorporation of fun into e-learning is often regarded as "edutainment", "sugar-coating" or "technotainment" (see Buckingham & Scanlon 2000; Resnick 2004; Haydn 2003a; Okan 2003; Papert 1998; McKenzie 2000). This often refers to the use of animations and other multimedia to attract and hold learners' attention. This approach is often criticised for being heavy on entertainment but essentially light on learning (McKenzie 2000). The approach is also criticised for trivialising "serious learning", learning which involves cognitive effort and perseverance (Olson & Clough 2001; Bloom & Hanych 2002). As suggested by Clark & Feldon (2005) and Bernard et al. (2004), the learners expect e-learning to be fun and easy, so they tend to devote less mental effort and attention to learning. They do not necessarily persist with the content to be learnt in the cognitive territory.

On the one hand, we have the finding of this study that suggests that the learners have attitudes and expectations that are based around fun. On the other hand, we have warnings about the risks associated with "sugar coating" and its effects on mental effort. What is the solution? The way forward, as suggested by one of the more mature participants, could be to create e-learning materials that merge fun and "serious learning". The participant explained that:

> *"There really is no problem with learning on the computer. It would be good if it can be fun but mentally demanding as well. Then, me and my mates will take computer learning seriously"*

There needs to be a focus on the use of cognitive stimulus, in addition to sensory ones (such as the use of multimedia). The learners' expectation of fun seems to be so common that they may not engage in e-learning activities that do not appear to offer fun (see section 6.4.2 and 6.4.3). Instructional designers need to encourage them to engage and persist in the intellectual challenge of the content. For example, instructional designers could consider ways of drawing learners into thinking about content and providing intellectual challenge, perhaps by "problematising" the content to make them think (Haydn 2003a). This might shift the perception of fun to the content, rather than the "bells and whistles" of multimedia and other technological features.

In conclusion, the evidence from this study suggests that the attraction to computers does not always result in motivation to learn. The motivation to learn in an e-learning context depends on a range of factors, such as the activity, the perception of fun and the performance of the computer. However, there seems to be a widespread attitude towards learning, in which learners have an expectation of fun. The implication of this finding is that there must be a balance between affective considerations and cognitive engagement during e-learning. The expectation of fun should not be underplayed; the importance of intellectual engagement in learning should not be ignored either. The challenge is how to combine them effectively.

8.3.3 LEARNERS WHO ARE NOT ATTRACTED TO COMPUTERS

Research question: Are there learners who are not attracted to computers? How does this affect their motivation to learn using computers?

This study found that very few learners are not attracted to computers, two (0.4%) in School A, three (0.4%) in School B and six (1.4%) in School C. None of these respondents believed that computers motivate them to learn. The respondents only provided few comments, which were often unclear or lacking in detail. The few comments, however, suggest that they are not motivated to learn because of: their lack of interest in computers; issues relating to their perceived proficiency in the use of computers; the feeling that there are other more appealing alternatives to learning on the computer; the need to be in control of their own motivation and learning.

All the participants who took part in the focus group interviews in the three schools said that they were attracted to computers. Hence, the discussions about the lack of attraction to computers and the motivation to learn were not based on their experiences, but on hypothetical scenarios. In general, they suggested that learners who are not attracted to computers would not be motivated to learn with computers. For example, one participant recounted their friend's experience of anxiety towards computer-based learning. Another explained that they would expect such learners to avoid computer-based learning.

Many researchers have written about the existence of computer anxiety, the discomfort or apprehension when considering computer use (Chua et al. 1999; Cambre & Cook 1985; Herdman 1983; Howard 1986; Torkzadeh & Angulo 1992). Some studies also suggest that this anxiety causes computer avoidance, which ultimately affects learning (Bohlin 1999; Harrington et al. 1990; Rosen et al. 1987; Weil & Rosen 1995). Some of the comments from this study suggest learners who are not attracted to computers might exhibit computer anxiety or avoidance. However, the data gathered in this study, due to the very limited number of respondents who fall into this category, are too little to confirm this.

It is important to note some learners indicated that they are *sometimes* attracted to computers, 16.2%, 17.4% and 26.0% in School A, B and C respectively. It is possible that these learners would "lose" their attraction to computers if certain factors, such as the performance of the computer, the computer-based activity and their perception of proficiency, are not in their favour. Thus, they can potentially join the group of learners who are not attracted to computers.

In summary, it appears that the few learners who are not attracted to computers are not likely to be motivated to learn with them. There is a possibility that such learners would have some anxieties towards the computers, and as a result, would be anxious about learning with computers. However, there is insufficient evidence to ascertain whether this claim is correct. It was not possible to identify and interview the (few) learners who are not attracted to computers. Hence, their reasons for not being motivated to learn with the computer (proficiency, lack of interest, other motivational interests, better alternatives to learning on the computer etc) should be considered with caution when interpreting their responses or generalising to other contexts.

8.3.4 PROFICIENCY AND MOTIVATION TO LEARN USING COMPUTERS

Research question: How does proficiency in the use of computers affect the motivation to learn with computers?

There are many claims that young people are proficient users of computers (Livingstone & Bovill 2005; Fee 2009; Oblinger & Oblinger 2005; Livingstone & Bober 2005). This view is consistent with the learners' responses during this study. The majority of learners rated their levels of proficiency in the use of computers between average and advanced (85.9%, 96.4% and 97.7% in Schools, A, B and C respectively). This is also consistent with the studies conducted by Nachimas et al. (2001), who found that 90% of students consider themselves to be ICT proficient.

Other than questions about learners' computer skills during the focus group interviews, there has been no attempt to verify the proficiency of the learners. This study is based on their *perceptions* of their proficiency, not on actual proficiency. The subjectivity of perceptions is illustrated by the differences between the proficiency levels stated by participants during the focus group interviews and those provided by their teachers. The teachers' perceptions of their proficiency were generally lower that the participants' perceptions. It could mean that the teachers underestimated the capabilities of their students, or the students overestimated their capabilities. The researcher can confirm that they were reasonably proficient, since none of them had any problems with using the selected activities. It could simply mean that gauging the perception of proficiency is very subjective.

In any case, it is difficult to determine the exact level of proficiency. The first issue is how to determine what should constitute proficiency – a technology, a mindset, years of experience or some other factor. The question, "what does being proficient in the use of computers really mean", is a complex one. As Haydn (2011, p. 75) stated: "being good at ICT is often expressed in fairly vague and inchoate terms". Although it is not the central focus of this study, it is germane to this sub-question within the research.

The second issue is how to find suitable and reliable measures or tests for proficiency. Some attempts have been made to tackle this issue. For example, Gilster (1997) uses the term "digital literacy" and listed four competencies – knowledge assembly, evaluating information content, searching the internet, and navigating hypertext. Lanham (1995) refers to the ability to effectively process graphic and audio information as well as text. More recently, the Educational Testing Service (2007) proposes a framework that presents proficiency as the integration and application of cognitive and technical proficiencies. They explained that cognitive proficiencies are the desired foundational skills of everyday life, such as problem solving, literacy and numeracy. Technical proficiency refers to foundational knowledge of hardware, software, networks and elements of digital technology. The variety of ideas about what constitutes proficiency and how to measure it exemplifies the problems associated with estimating and measuring proficiency.

During the study, the learners' comments were based on self-evaluations of their abilities (their perceptions of their proficiency), not the outcome of "proficiency tests". They were making the point that their perception of their proficiency is what sometimes influences their motivation. Their perception of proficiency is essentially a motivational belief (see Stipek 2002, Bandura 1997, Eccles & Wigfield 2002; Pintrich et al. 1993; Boekaerts 2002). Some theories of motivation, such as self-efficacy (see Bandura 1997) and control theories (see Skinner 1995; Rotter 1966; Crandall 1965; Connell & Wellborn 1991), offer explanations of how learners' perceptions can determine their motivation to learn. These have been discussed in section 3.2.2.

So far, the discussion has attempted to establish that proficiency is not only difficult to measure, it is also not as important as the perception of proficiency (as far as motivation to learn is concerned). The discussion now turns to the learners' view regarding the effect of their perceptions of proficiency on motivation to learn with computers.

In this study, there was a mix of responses. It was difficult to establish a clear link between learners' perceptions of proficiency in the use of computers (based on their ratings of their proficiency) and motivation to learn with computers. The responses from each proficiency rating were very mixed. Some believed that their proficiency positively influences their motivation to learn with computers, whilst others thought the opposite.

The participants who rated themselves as low on proficiency (one or two stars) had varied responses to the question relating to their motivation to learn with computers. They commented that they find computers confusing or too hard to use. This is consistent with the views of Hills (2003), who highlighted that engagement in computer-based learning is more difficult for the less proficient learners. In this study however, some learners, in spite of their low proficiency rating, believe that computers motivate them to learn.

The learners who rated their proficiency highly (three, four or five stars) had similar views. Some expressed the view that their proficiency makes learning on computers accessible and easy. Others explained that they are not interested in *learning* with computers, in spite of their high rating of proficiency. The rest of the respondents explained that their motivation to learn would depend on the activity and their expectation of fun.

All the learners who took part in the focus group interviews believed they were proficient users of computers and had similar views. They were not convinced that proficiency *necessarily* affects their motivation to learn. They however explained that, when it does, it increases or decreases their confidence and willingness to engage in computer-based learning. Some of their views were:

> *"If you are an expert you will probably find it easier to do things [on the computer], so will be drawn to learning [with computer]"*

> *"If you haven't got many computer skills, you can, kind of, be put off in a way. If you're good at it, you will be like, right, I can do this"*

> *"If you are bad [at using the computer], you just won't be bothered"*

Some of the participants however commented that:

> *"Just because you are good at it doesn't mean you want to use it for learning"*

> *"It [computer-based learning] just isn't as fun, so you are less motivated"*

In closing, the evidence from this study suggests that most learners believe they are proficient in the use of computers, which is consistent with the findings of Nachimas et al. (2001). It was argued that the actual level of proficiency is less important than the *perception* of proficiency, which is essentially a motivational belief. The perception of proficiency is what tends to affect learners' confidence and willingness to engage in computer-based learning. However, the evidence from this study suggests that learners' perception of proficiency does not necessarily influence motivation to learn with computers.

8.4 NOVELTY: DISCUSSION OF FINDINGS

8.4.1 DIMINISHING OR ENDED NOVELTY

Research question: How do learners react when novelty is diminishing or has ended?

There are many references to novelty in e-learning. For example, Yan (2004, p. 86) refers to novelty as a "psychological phenomenon when individuals initially have positive emotional responses to new technology but gradually lose their initial excitement". In a study on computer simulations, Fry & Love (2008) also explained that the effect of novelty positively affected students' levels of engagement with the learning process. Furthermore, Baylor et al. (2004) indicated that the novelty effect of using pedagogical agents for the first time increased learner attention and focus during their study. Other researchers have explained that gains associated with increased effort or persistence tend to diminish as students become more familiar with a new medium (Clark & Sugrue 2001; Keller & Suzuki 2004).

In addition to views associating novelty with an initial increase in motivation, some references to novelty in e-learning appear to be warnings. For example, Horton (2001) pointed out that much of what is measured in e-learning research is the novelty effects.

Huk et al. (2002) expanded on this by pointing out that researchers can be led to false conclusions during the initial phase of research. This is because the initial phase is likely to have some novelty effects, which is not a true reflection of the later phases. The same view was echoed by Clark (2001) who described novelty as a common source of confounding in research because it tends to disappear over time.

These references portray novelty as an initial emotional response that diminishes over time as learners become accustomed to the newness. At this stage, it is important to note that references to e-learning have different meanings. For example, some refer to the novelty of new media or technologies (Clark 2001; Yan 2004; Clark & Sugrue 2001). Some refer to the novelty of learning environments (Fry & Love 2008; Baylor et al. 2004). Yet, some refer to the novelty of the features employed for e-learning instruction (Keller & Suzuki 2004). It must also be pointed out that this study focuses on the novelty of e-learning activities, the motivational effects of the newness of the different types of activities.

Firstly, there is the need to provide evidence that the novelty of e-learning activities is a recognised phenomenon. Though a very abstract concept, the learners provided ample evidence of its existence. This includes the use of words like "energy", "freshness", "newness", "exciting", "fresh" and "different". They used these words to point out that their motivation to learn was influenced by the novelty (newness) of the activities. These comments have already been presented in chapter 7 (section 7.3.1). This comment, however, summarises their views:

> *"I can't put a finger on it, but it is exciting to start with. You are curious to try it out. This doesn't mean you will want to continue, but at least it gets you going"*

This learner was emphasising that novelty is an abstract concept, something they formulate in their heads. The learner was also pointing out that novelty provokes an emotional response, similar to the definition of novelty provided by Yan (2004). According to this learner, the emotional response is generated at the start of the interaction, but is not necessarily sustained throughout the interaction. In other words, the newness of the e-learning activity provokes an initial response.

Some participants in the three schools likened novelty to everyday situations – the freshness and newness of a flower which fades away over time, the energy generated by an aeroplane before take-off, and the excitement of the first few weeks at school. The participants were convinced that, during interaction with new e-learning activities, there was an initial period of emotional response, which is different from other times during the interaction. The researcher also observed these responses (signs) during the initial periods of the interactions. The signs were sometimes positive (concentration, curiosity and effort). Other times they were negative (confusion, task avoidance and search for help).

The views of the participants who interacted with the e-learning activities and the researcher's observation support the view that novelty is a phenomenon that learners can identify. Whilst this study might establish the existence of novelty as an abstract concept relating to motivation, which in itself is not new, it disagrees with some common opinions on novelty. For example, it is often assumed that novelty results in *positive* emotional responses, which fade away over time. This is illustrated in the quote below:

> "The reaction to novelty, almost by definition, will be one of instant interest and enthusiasm. Novelty draws attention and energises exploration" (Allen 2003, p. 196)

This study, however, contradicts this view. Some of the participants during this study expressed the view that novelty of new e-learning activities actually reduces their level of motivation. This quote, like many others in chapter 7 (see section 7.3.1), illustrates this:

> *"I guess, for some people, when the activity is new, they get excited. For me, it's different. I get very concerned about whether I will get it, whether it will help me in any way, [and] whether I will find it interesting"*

For this learner, novelty resulted in anxiety and uncertainty. Indeed, these are emotional responses, but they are different from the positive emotional responses often portrayed in existing literature. As with proficiency, which has been discussed in previous sections, the explanations provided by self-efficacy and control theorists seem to apply when they are confronted with novel e-learning activities (see Bandura 1997; Skinner 1995; Rotter 1966). The learners seem to make judgements about the possible outcomes, their chances of success, their ability to do what is necessary to succeed in the new e-learning activity.

Revisiting the research question, this study aimed to determine learners' response to diminishing or ended novelty. The learners were able to identify when the e-learning activities were no longer perceived to be new to them, but found it difficult to pinpoint the time when the novelty started to wear off. They also found it difficult to determine whether the novelty of the activities wore off gradually or abruptly. Even attempts to make them cast their minds back to two minutes prior to the time they perceived that novelties had ended did not generate additional information. This suggests that learners are only conscious that the novelties of activities have worn off in retrospect.

It could also be a limitation in the approach taken in this study. The self-report forms were completed after each interaction. This made it impossible to work out the point and the rate at which novelty diminished. An alternative approach would be to use onscreen or paper-based self-report form *during* the interactions. That would have interrupted the learning process, due to the time that would be spent completing the forms. The use of electronic methods to determine physiological states or track eye movements would be unsuitable for this study. It would also be more difficult to secure parental permission for the participants to take part.

Nonetheless, the participants were able to indicate and discuss how long the activities were perceived to be new ("novelty periods") and their reactions at the end of the "novelty period" of each activity. There were various reactions to the end of the "novelty periods". For example, some learners' anxieties, concerns and confusion had been transformed into active engagement by the end of the "novelty periods". Others had become less engaged, or even frustrated with the e-learning activities. Some explained that the "novelty period" was a time to evaluate the level of fun, the content and their learning. Their views have already been reported in chapter 7 (see section 7.3.2). The research evidence does not show any particular pattern in the participants' reactions to novelty and their motivational behaviour after the "novelty period" is over. The key message is the volatility of the "novelty period". During this time, learners' motivation can be affected in many ways, as some explained:

> *"Obviously, there is something about it being new, which was lost"*

> *"I think I am just a slow starter. I was getting worried about the activity in the beginning. Come on, it was new. Later on, I wanted to prove to myself that I could do it"*

> *"The time when it is new is a high-risk time. You wonder if you will gain anything from it. By the time the newness finishes, you are able to say [decide] whether to continue or stop"*

In addition to showing the volatility of the "novelty period", these comments highlight the importance of developing self-regulation capabilities in learners. Learners need to be able to understand and control the complexities associated with the "novelty period". As suggested by Zimmerman (1989), learners need to be metacognitively, motivationally and behaviourally active in their own learning processes and in achieving their own goals. In fact, Azedevo (2005) pointed out that learners do not benefit from computer use except when they apply effective self-regulating strategies. They need to be trained to deal with any emotional difficulties during the "novelty period" and adopt appropriate cognitive and motivational strategies to ensure that effective learning takes place (Zimmerman 1994; Schunk & Zimmerman 1994).

Some studies have found that self-regulation capabilities are lacking in many learners (see, for example, Greene et al. 2010; Paris & Paris 2001). Therefore, it is not surprising that there are several recommendations for the development of self-regulation in e-learning. Lee (2004), for example, explained that learners are required to make their own decisions during the interaction with e-learning materials, which makes high levels of self-regulated learning capabilities important. Furthermore, Sharma et al. (2007) point out that, in an e-learning context, where there might not always be direct interaction between learners and teachers, learners have to develop individual capacities to take charge of their own learning. Moreover, Kinzie (1990) recommended that learners be trained in the strategies required for effective interactions with e-learning activities.

These recommendations seem valid, but are hardly practicable. Self-regulation is the desire of every educationalist regardless of the environment, e-learning or traditional. In spite of extensive research and theories relating to self-regulation (for example, Oettingen et al. 2000; Schunk & Zimmerman 1994; Zimmerman 1994), it appears to be a wider challenge of education. Zimmerman (2000, p. 34) highlights this issue stating that: "an essential issue confronting all theories of self-regulation is how this capability or capacity can be developed or optimised".

The implication of this is that relying on learners' capacity to regulate their learning is not realistic, at least for now. It would therefore make sense to combine efforts in developing learners' self-regulation capabilities with good instructional design. In particular, adaptive systems could be used to personalise learning to motivational and learning needs. Efforts in the area of adaptive and personalised e-learning continues to gain ground (see, for example, Azevedo et al. 2011; Chang 2010). Combining research efforts in adaptive systems and the development of self-regulation capacity in learners might improve learner engagement in the future.

To summarise, an important finding of this study is that novelty does not always have positive effects on motivation; this study suggests that it sometimes has negative effects. For most learners, novelty increases their curiosity, expectation and challenge. For some learners, however, novelty means anxiety and uncertainty, which they exhibit in the form of confusion, task avoidance and search for help. The study also points to the volatility of the "novelty period", the period when participants (or the researcher) perceive that the e-learning activity is still new. Therefore, research efforts in the development of self-regulation in learners, and adaptive and personalised e-learning should continue. It was however, difficult to determine the period of diminishing novelty. The learners' perceptions of the duration of novelties of different types of activities and the factors that influence these perceptions will be discussed in the next section.

8.4.2 NOVELTIES OF DIFFERENT TYPES OF ACTIVITIES

Research question: How long does the novelty of different e-learning activities last? What factors influence learners' perception of novelty?

Table 27 (in section 7.4.8) reported on the average "novelty periods" of each activity used during the multiple-case studies. The information in this table must act only as a guide. With such a small sample and limited number of activities, caution must be applied, as the details might not be transferable to other contexts. It should also be understood that the averages and ratings are based on learners' perceptions of novelty, and that there were differences in each learner's perception of the novelty of each activity. What can be taken from this table, however, is that some types of activities (adaptive, experiential and communicative activities) generally had longer "novelty periods" than others. Learners seemed to believe they remained new for longer periods, meaning they had some potential which can be exploited by instructional designers. The factors that contribute to learners' perception of novelty will now be discussed.

There was overwhelming evidence that multimedia appeal has an impact on learners' perception of the novelty period. For example, multimedia was attributed to the differences in the "novelty periods" of the assimilated activities. Culture Zone was perceived to have a longer "novelty period" than Tour of Parliament because of the multimedia. The comments below illustrate that multimedia affects their perception of the "novelty period":

"The newness [of Culture Zone] is longer because the flashing texts made me more curious"

"It [the 'novelty period'] is down to the way it looks and sounds. One [Tour of Parliament] has pictures and text. The other [Culture Zone] has moving pictures, text, sound and pop-ups"

"Culture Zone is more exciting initially because it has animations and sound. They give you an expectation, something that quickly went out of the window with the other one [Tour of Parliament]"

More evidence about how multimedia influences the "novelty period" is illustrated in the reasons learners gave for providing low novelty estimates for both information handling activities (Looking at Mutual Funds and Words with Multiple Meanings). They commented:

"It's [Words with Multiple Meanings] okay, but they could have used videos or animations to keep me curious"

"They need to be jazzed up with some flash stuff"

Similar comments were made in relation to the adaptive and the experiential activities. Looking at the comments from the participants in their totality, there are strong reasons to believe that multimedia influences learners' perceptions of the "novelty period". Their comments suggest that multimedia can increase curiosity and give a sense of expectation. This is consistent with the views of various researchers (for example, Kim et al. 2007 and Sun & Cheng 2007) who have noted the importance of multimedia in the initial stages of the interaction. However, it cannot be inferred from the learners' comments that *any* type of multimedia would extend the "novelty period".

In addition to multimedia appeal, the presence of a variety of options seems to increase the novelty periods of e-learning activities. For example, the learners explained that their perception of novelty of the information handling activities (Looking at Mutual Funds and Words with Multiple Meanings) were low because they had limited options. Their opinion was quite the opposite when they referred to the experiential activities (Coffee Shop and Starting Out), which they pointed out had high "novelty periods" because of the variety of options. In fact, they explained that Coffee Shop had more variety than Starting Out, hence longer "novelty period".

There were many comments from participants that variety energises them to continue exploring, which in turn extends their perceptions of novelty. The learners maintained that the absence of variety makes the activity predictable and easy to work out, which affects their perceptions of novelty. As one explained:

> *"It [Words with Multiple Meanings] was sussed out in the first two minutes. There was nothing to continue the excitement. Maybe they should have several options, rather than one single style"*

An area of concern is that, in most cases, novelty seemed to be considered from an enjoyment or "working the activity out" perspective, rather than cognitive engagement. The only time when the participants referred to intellectual engagement during the "novelty period" was when they interacted with the productive activities. They suggested that the productive activities encouraged thinking and planning during the "novelty period". This further reinforces the need to provide more opportunities for cognitive effort, rather than just enjoyment (and in this case, "sussing it out"). Using the words of Counsell (2000), instructional designers need to "clear away the clutter" and get learners to "think, ponder, and reconsider". Instructional designers should consider using incomplete, ambiguous and incomplete information to improve cognitive engagement with the content of e-learning activities (see Malone 1981; Haydn 2003a).

Perhaps the most significant finding relating to novelty is the concept of "regenerative novelty", the possibility of extended "novelty periods" because changes during interactions "refresh" the newness of the activities. The adaptive and experiential activities seemed to "regenerate" because learners had some sense of control over the activities and were able to make choices. The activities changed in response to their choices. One participant explained:

> *"The decisions and changes you make change everything, so the activity feels new again"*

There are many comments like the above (see sections 7.4.4 and 7.4.7), providing compelling evidence that the experiential and adaptive activities provided them with choice and control and changed during the interaction, thereby extending learners' perception of the newness of the activities.

Apart from the adaptive and experiential activities, the concept of "regenerative novelty" was found in the communicative activities (Climate Wiki and Heated Debate). The learners explained that the changes in the discussions "refreshed" their perception of the novelty of the communicative activities. In other words, the dialogic learning environment provided opportunities for "regenerative novelty". In a way, this strengthens the validity of the concept of "regenerative novelty" because it was suspected that the presence of multimedia in the experiential and adaptive activities influenced their perceptions of novelty. The communicative activities were not multimedia-rich, yet learners indicated that the newness of the activities were "refreshed" (see section 7.4.5 for their comments).

It must be pointed out, however, that "regenerative novelty" is effectively supported where the activity involves instant action from learners and instant response to learners' actions. It was noted that the "novelty period" of one of the communicative activities (Climate Wiki) was rather low. The other communicative activity (Heated Debate) and the experiential and adaptive activities had longer "novelty periods". The learners clarified that Climate Wiki did not provide them with the opportunity to instantly make their choices or post their comments, whereas Heated Debate did. The rate and extent of "regeneration" could depend on the instantaneity of the e-learning system and the learners' participation.

The concept of "regenerative novelty" is in contrast with many opinions on novelty. The opinion that is often portrayed is that the emotional response to novelty has a limited lifespan and "when it's gone it's gone" (for example, Clark 2001; Baylor et al. 2004; Yan 2004; Keller & Suzuki 2004; Fry & Love 2008). The following quotes characterises these opinions:

> "Novelty has a single short life – too short to sustain much learning and involvement" (Allen 2003, p. 196)

> "Because novelty loses its value quickly, its use is well suited to attracting attention" (Allen 2003, p. 204)

As with the assumption that novelty always has positive influences on motivation, the data gathered during this study contradict this popular opinion. This study's findings suggest that the perception of novelty can be "refreshed". The extended perceptions of novelty of the experiential, adaptive and communicative activities, combined with comments from the learners (see sections 7.4.4, 7.4.5 and 7.4.7) provide strong evidence to support the concept of "regenerative novelty". The findings suggest that the perception of novelty can be "refreshed" at various points during the interaction, as illustrated in **figure 5**.

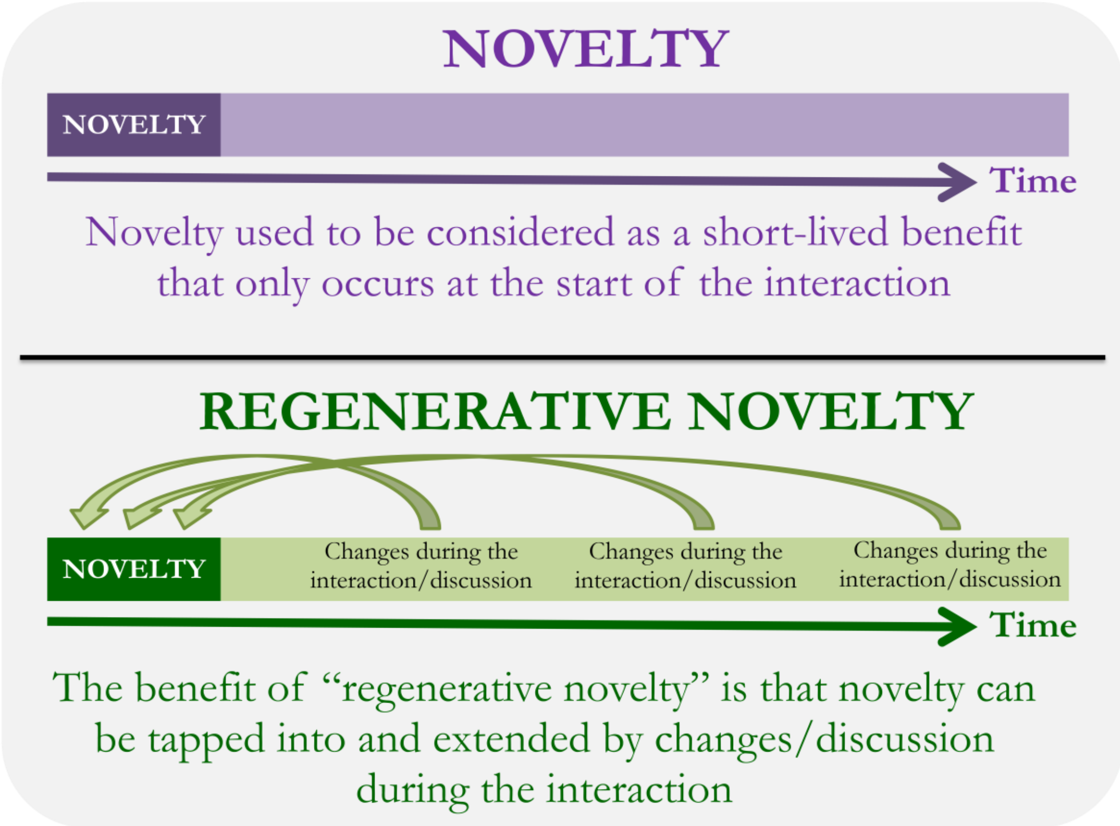


Figure 5: "Regenerative novelty"

What exactly is the motivational or learning value of "regenerative novelty"? "Regenerative novelty" takes novelty beyond the realms of sole use as a tool for gaining attention, as portrayed in existing literature (see Keller 1987b; Small 1997; Allen 2003). "Regenerative novelty" can extend the novelty of e-learning activities. The curiosity and expectation often associated with novelty can be extended for longer periods to sustain engagement, if adaptive, experiential and communicative elements are included in e-learning activities. Furthermore, "regenerative novelty" can encourage ownership of learning tasks, as learners' choices and comments made by the learners determine the changes during the interactions. There is also the likelihood that certain types of activities (the communicative, experiential and adaptive ones) will give learners' the opportunities to generate new novelties if they interact with the same activities again (although this was not specifically tested in this study).

In conclusion, the findings of this study suggest that multimedia appeal and variety can influence learners' perceptions of novelty. This study also suggests that learners' perceptions of novelty can vary, depending on the type of e-learning activity. One of the important findings of this study is "regenerative novelty", where the perception of the newness of an activity is "refreshed" by the changes or discussions during an interaction with the e-learning activity. With the evidence from this study, the researcher challenges the idea that novelty is lost after a short while. Instead, the researcher believes that "regenerative novelty" can be harnessed to create opportunities for extended periods of engagement and give learners the feeling of control over their own learning.

8.5 ACTIVITIES: DISCUSSION OF FINDINGS

8.5.1 THE MOTIVATIONAL EFFECTS OF DIFFERENT TYPES OF ACTIVITIES

Research question: What are the motivational effects of different types of e-learning activities?

The basic goals of learning (retention, understanding and active use of knowledge) though simple-sounding, are remarkably difficult to achieve (Perkins 1992). Instructional designers have been producing various e-learning activities with the desire to motivate learners and promote effective learning (Keller 2006). It would be overambitious to study learners' interaction with every single e-learning product. Following a review of various classifications of activities, this study used the classifications specified by Conole (2007a, 2007b) to investigate the motivational effects of different types of activities.

In chapter 2, where the debates about e-learning and motivation were explored, it was argued that "any old e-learning activity" is unlikely to motivate learners. This section continues this argument because this study found that there are differences in learners' motivational responses to the different types of e-learning activities. Before discussing the different motivational effects, it is important to establish the basis for the argument.

Firstly, the learners' perceptions of how long the different types of activities kept engaged in learning were different, suggesting that the type of activity had some effect on their attention, persistence and effort towards learning. Secondly, learners experienced and described different motivational responses, which were attributed to the nature of the e-learning activities. Furthermore, their perceptions of how much they learnt from the activities, were different. The discussion about the differences in motivational effects, which learners attributed to the nature of the activities, will now follow.

The *adaptive and experiential activities* were rated highly for their ability to motivate learners. In fact, there was greater overlap between these activities than the others. The experiential activities had to adapt to learners' choices. Likewise, the adaptive activities provided experiential experiences. The key motivational effect of these activities was that they generated high levels of motivation because they gave learners choice and control. Furthermore, the adaptive and experiential activities established relevance whilst providing a fantasy environment, because they allowed learners to be immersed in real scenarios. Finally, the adaptive and experiential nature of the activities stimulated curiosity, because they enabled learners to explore a variety of scenarios and take risks.

The key concepts that emerged from learners' perceptions of the motivational effects of adaptive and experiential activities are choice, control, fantasy and curiosity. The value of these concepts have been highlighted in various studies. For example, Cordova & Lepper (1996) found that choice dramatically increased students' motivation, depth of engagement in learning, level of aspiration, perception of competence and learning. Instruction in a fantasy environment has also been shown to increase learners' interest and learning (Garris et al. 2002; Malone & Lepper 1987).

The adaptive and experiential activities have strong relationship to ideas of knowledge construction. As learners engage in the adaptive and experiential activities, knowledge is continuously created and recreated rather than being acquired or transmitted (see Kolb 1984). Constructivists believe that learners actively create meaning by discovering and develop their own knowledge (Bruning et al. 2003; de Kock et al. 2004). This discovery of knowledge in a risk-free environment was considered motivating, as expressed in their comments:

> *"Yeah, it [MP for a Week] does motivate you a lot and teaches you the right decisions that need to be made and the wrong decisions. I like the fact that you are in control and can decide, but they show you the consequences as well"*

> *"I found Coffee Shop really interesting. I think it's because you can try things out and see the things [the results] for yourself. I went bankrupt three times! You realise you don't have a big enough budget to buy all you want, so you have to focus on how much your recipe is. You can risk things and you stay learning that way"*

The *communicative activities* were also considered highly motivating. This study found that they had three unique motivational effects. Firstly, the collaborative nature of the activities encouraged the sharing and development of ideas, and sometimes, the revision of ideas in light of other learners' views. Secondly, their "virtual personalities" seemed to generate confidence and freedom to engage in collaboration with others. Thirdly, even when "off task", the learners believed that their motivation to learn was intact.

In this context, a variant of constructivism, social constructivism, is at work. Social constructivism, which is often associated with Vygotsky, introduces an additional element to the learning process, the other learners. The belief is that the knowledge is constructed, not by the individual alone, but through joint endeavours in social and cultural contexts (Woolfolk et al. 2008; Felix 2005; Salomon & Almog 1998; Roberts 1998). Some efforts have been made to explain that knowledge is individually constructed but also socially mediated (Windschitl 2002). Holmes et al. (2001) coined the term, "communal constructivism", to illustrate that today's technology can store the constructed knowledge and make it available later.

This study found that the learners, empowered by their "virtual personalities" and the ongoing construction of knowledge, were willing to engage in the communicative e-learning activities for extended periods. There are many comments in chapter 7 (section 7.5.5) illustrating this, but the comment below summarises the views:

> *"It was nice because other people could participate in my learning. You feel the urge to work at it, sometimes to impress and sometimes to learn from others"*

Apart from their ability to empower learners to engage in learning, some studies suggest that dialogic learning of this type is likely to be a motivator for critical thinking (Daloz 1986; Reiter 1994). Moreover, Paris & Turner (1994) highlighted that social interaction, a feature of the communicative activities, is motivational in several ways. They explained that curiosity and the desire for further exploration are generated through peer comments and ideas. According to them, learners are also likely to persist and put more effort in communicative activities because they attach value to the standard and feedback of their peers. Another interesting learning benefit is the opportunity for learners to shape and reshape each other's views. The discursive platform meant that the learners were working as "agents", using each other's knowledge to create and develop new meanings (see Carr 2008; Davies 1991; Kettle 2005). All of these motivational benefits are also associated with the potential of e-learning 2.0 (which was evaluated in section 2.3.3).

However, the learners noted that the communicative activities lent themselves to off-task behaviour or off-topic discussions, though they maintained that their motivation to learn did not reduce during this time. They also did not try to proofread or polish their comments. Whilst meaningful learning can take place during interaction with communicative activities, a holistic approach must be taken when evaluating their effectiveness. According to the learners, the social interaction (including the off-task behaviour) is part of the learning experience. Furthermore, as recommended by one of the learners, it would be beneficial to have one or more moderators. Another participant highlighted a limitation of communicative activities; they are only useful when at least one learner has some knowledge of the topic (or access to a source of knowledge like the internet).

The *productive activities* were also found to have distinctive motivational effects, though they were not believed to be as motivating as the other activities discussed so far. In particular, the learners explained that the activities were challenging because they were able to visualise what the intended outcomes would look like. In this study, the participants explained that this challenge increased their effort and persistence towards the learning activities. For example, one learner said:

> *"The productive stuff [activities] make you feel like you need to succeed. I felt that if I didn't finish it, I wasn't going to see tomorrow"*

However, care must be taken to ensure that the appropriate level of challenge is provided, as some learners were unable to engage in the productive activities because of their perception of their level of skill. The learning activity will be considered boring or frustrating if an appropriate level of challenge is not provided (Moreno 2010b; Snowman et al. 2009; Csikszentmihalyi & Nakamura 1989). Some studies suggest that learning experiences should be moderately challenging if they are to stimulate cognitive growth (Vygotsky 1978; Vygotsky 1986; Piaget 1950). Vygotsky (1978) also introduced the concept of the Zone of Proximal Development (ZPD), the gap between what a learner can do and what is beyond them, suggesting the learners should be provided with experiences within this zone.

The importance of moderate challenge was also illustrated through participants' responses to the *information handling activities*. In most cases, the participants expressed concerns about the difficulty of the information handling activities. What is important, however, is the difference in their attitudes to the difficulty. Some learners (those in School A) considered the difficulties as a challenge, which helped them to focus on the activities and increased their thinking. For others, the difficulties resulted in frustration, avoidance of the task or outright refusal to engage in learning. In addition to different responses to difficulties, it could be an indication of certain "school effects" in their approach to such activities.

The *assimilative activities* were similar to the information handling activities in many respects. Like the information handling activities, they were considered less motivating than the other types of activities. The learners' perceptions of how much they learnt were also generally lower than the other types of activities. However, the assimilative activities had some distinctive motivational effects. The nature of the assimilative activities, which is based around taking in information, was found to be motivating because they provided the choice, simplicity and new information. These were believed to generate curiosity whilst stimulating interest and attention. In spite of these positive motivational effects, they were sometimes believed to lead to reduced efforts towards learning. Some learners did not pay sufficient attention to the information presented to them.

So far, the discussion has been on the motivational effects of the different types of activities. There are however two areas of uncertainty. Firstly, there was no attempt to verify whether learners' perception of how much they learnt was accurate. Although the focus is motivation to learn, it would have been useful to know the impact of their motivation on learning. Secondly, most learners believe that the subject matter did not affect their motivation when they interacted with the adaptive, experiential and communicative activities. In order words, they claimed that their motivation to learn would have remained the same had other topics been presented through these activities. There is some uncertainty about this view, as it is difficult to reconcile it with the overwhelming evidence connecting interest in the subject matter to motivation (see Boekaerts 2002; Schiefele, 1991; Ames 1990; Brophy 1986; Lee & Brophy 1998; Deci & Ryan 1985).

Nonetheless, this study has found that the different types of activities have distinctive motivational effects. A summary of the motivational effects is in **table 28** (in section 7.5.8). In the researcher's opinion, the adaptive, experiential and communicative activities are more likely to result in "flow", the mental state of full focus and engagement in learning (Csikszentmihalyi 1990). The researcher is keen to point out that this study is not suggesting that the type of activity is the only factor that motivates learners. Other factors, such as their intrinsic tendencies, goals and expectations affect their learning (Deci & Ryan 1985; Ames 1992). As summarised in the literature review (section 3.2), learners ask questions such as: "*can I* achieve the task?", "*why should I* engage in the task?", "*how do I* accomplish the task?", and "what will *make me* do this task".

The key finding is that learners experience different motivational effects due to the nature of e-learning activities. The data gathered from this study, showing differences in motivational effects of different activities, highlight that it is unlikely that learners will find "any old e-learning activity" motivating. The study shows that there are different levels and types of motivation generated through the different types of e-learning activities. Care must be taken to not give the impression that motivation is automatic in an e-learning context, as portrayed by generalised views such as these:

> "There appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning" (Trucano 2005, p. 6)

> "The research about ICT's capacity to improve learning and teaching shows that it can play a key role in the complex task of better engaging young people in the learning process" (Toomey 2001, p. 1)

Instead, good design principles, based on astute knowledge of technology, pedagogy and content should be the basis of instructional design (see Mishra & Koehler 2006). The findings of this study, showing the motivational effects of different types of e-learning activities, can contribute to such knowledge and inform the practice of instructional designers.

8.5.2 FEATURES THAT AFFECT MOTIVATION TO LEARN

Research question: Which features of e-learning activities affect motivation to learn?

In chapter 4 (section 4.2.2), it was argued that the terminology, "motivational design", is unnecessary. The main area of contention is that motivation, though extremely important, is just one of the many factors that affect learning. It was argued that consideration should be on the entire process of e-learning, not just on motivation. What is needed is e-learning that is *effective* – delivering appeal, but also the learning goals (Keller 2006; Cheng & Yeh 2009; Herrington et al. 2003). This discussion about the features that affect motivation is considered from this perspective – appeal whilst delivering learning goals.

The learners seem to have an expectation that e-learning systems will have good presentation and interface. One learner explained the frustration and the loss of interest if this expectation is not met:

> *"Picture it with me. You are told you will learn about ...You expect that it will be exciting because the computer can do many amazing things. Can you imagine the annoyance if it doesn't meet your expectations? You quickly lose interest because there is nothing exciting about the appearance"*

Essentially, this comment refers to the graphic and multimedia appeal. However, as illustrated in chapter 7 (section 7.6.2), their expectation of good presentation includes layouts, ease of navigation and minimal text. Many studies have explained the importance of good interfaces and presentation to motivation and learning (Dix et al. 2006; Le Doux 1998; Schank & Cleary 1995; McNeil 2009; Yeomans & Arnold 2006; Cook & Kazlauskas 1993). This finding is consistent with these studies.

However, the consistency of the finding is not as significant as the emerging issue – the learners seem to have *expectations* of e-learning environments. This study found that learners expect to see appealing features (good interfaces, presentation etc). They seem to believe that appealing features are essential in e-learning. They are not just "motivational features", they seemed to see them as "minimum requirements".

How have learners come to expect good presentation and interfaces? One possible reason is that they have become so exposed to non-academic computer-based activities that are well-presented. Hence, they have come to expect it from e-learning. Another possibility is that they are very aware that computers can provide quality interfaces, so do not expect e-learning to be different. These views summarise the two reasons:

> *"...Now you go on a computer to learn and if it doesn't have all those wicked [nice/interesting] things, you think: 'what's the point'?"*

> *"... I expect it [the activity] to be presented better. The power of the computer can be used to make it appealing to use and learn from"*

Furthermore, they tend to expect more than just text and graphics. They expect multimedia. One participant made the distinction between a static picture and an animated picture. The static picture was believed to "beg for attention" whilst the animation is believed to generate attention. One even described the use of multimedia as a source of inspiration to continue learning. Another interesting issue that arose from the study of the assimilative activities was the suggestion that an onscreen video or audio would be more motivating than just onscreen text.

However, they explained that multimedia, in some cases, negatively affected their motivation. They explained that multimedia can be a distraction from learning or a source of annoyance. These conflicting views have been expressed in other studies. Liu et al. (2009) found that media-rich presentation or interface generates higher levels of perceived usefulness and concentration than other interfaces. On the other hand, Matarazzo & Sellens (2000) reported of the possibility of "distraction effects" when engaged in rich media. These conflicts simply show that careful thought must be applied during instructional design; multimedia should be used to support learning, not for decorative purposes (Najjar 1998).

The learners also tied in multimedia with the provision of interactivity and variety. By interactivity, they seemed to be referring to the amount of control they had over learning, and the manner and the speed at which the computer responded to their actions. By variety, they were referring to the availability of options. Essentially, they had an expectation of choice and control over their learning. Although most learners explained that choice and control were highly motivating, two important quotes highlight potential detrimental effects on motivation and learning. The first quote is from one of the learners, who reported frustration and loss of attention:

> *"You cannot say that variety is a clear positive, not every time anyway. I found...a bit confusing because there was too much variety. You feel a bit overwhelmed and start going around, not paying attention to the task"*

The other is from Taylor (2000), who explained that choice and control can result in avoidance of challenge and difficulty:

> "We certainly need to keep their attention and keep them going when they're learning, but if they think it's all to do with trial and error, pressing this button, that button, that's not learning, that's not getting the knowledge into their minds in an integrated way, in a way they can make use of, that's just mucking about" (Taylor 2000, p. 24)

These quotes suggest that choice and control can have positive and negative motivational influences. This mix of motivational influences has been reported in other studies. Some studies have reported positive motivational influences of choice and control (for example, Ertelt et al. 2005; Schwier 1995; Becker & Dwyer 1994). Other reports, such as Reeves (1993) and Clark & Mayer (2008), point out the negative motivational influences. Like the debates about the effectiveness of multimedia, these arguments about the motivational value of choice and control would probably never end. Perhaps what is more important is an awareness of the motivational effects of these features and the purposeful deployment by instructional designers.

As required by the research question, this study has reported on the features that learners believe affect their motivation to learn (in positive and negative ways). Many of these features have been reported in other reports. An example is Lee & Boling's (1999) "expansive and restrictive guidelines for screen design". The emerging finding from this study is that learners expect e-learning activities to appeal to them. They know that computers are able to provide appealing features. They have experience in the use of computers for non-academic activities, many of which are designed to appeal to them. They are aware of the motivational influences that these non-academic activities (such as games and social networking) have on them. They tend to expect the same from e-learning systems. Hence, as suggested previously, appeal is not merely a motivational feature, but a requirement. Instructional designers must however remain mindful of the learning goals.

8.6 IMPLICATIONS AND RECOMMENDATIONS

Significant findings have emerged from the discussions about the three facets of this study – attraction, novelty and activities. In some cases, the findings shed light on areas where there is little knowledge. In other cases, they update the existing body of research. This section will now identify the findings that are of significance, discuss their implication for educationists, and, where possible, make some recommendations.

The first significant finding is the *learning attitudes and expectations* of many of the eleven to fourteen year olds. Their attitudes towards learning seem to be directed towards fun. They seem to expect computer-based learning to be fun. They also tend to expect the same level of presentation and variety that is experienced from non-academic activities, like social networking and games. The problem is that e-learning instruction that is perceived to deliver little or no fun is likely to be considered unimportant.

It was interesting to note that very few of the learners' comments related to strategies they employed to ensure they were engaged in the content of the activity. In chapter 3 (section 3.2), the theories of motivation were summarised into four areas: "can I?", "why should I?" "how do I?" and "make me!". During this study, the learners made very few comments relating to the "how do I?" strand (e.g. how they managed their effort towards success, how they managed their time and how they ensured they retained the information). One interpretation is that many of the learners' were not always conscious of the motivational strategies that they adopt during learning. Another interpretation, which seems more likely, is that many of the learners were more concerned about the features of the activities and the level of fun generated than the cognitive processes of learning.

In chapter 1 (section 1.4.2), the researcher expressed strong concerns about the dangers of "sugar-coating" of learning for motivational purposes. The evidence of learners' attitudes is so compelling that there has to be an admission that "sugar-coating" might be necessary for e-learning, especially self-study contexts. It is probably too late to discuss changing this attitude; they seem to experience fun whenever they use computers for non-academic activities. These non-academic computer-based activities already generate higher levels of interest than academic ones (Loveless & Ellis 2001; Gee 2008; Steinberg 2001).

What are the dangers of "sugar-coating" learning? The first issue is that "sugar-coating" might stimulate interest but might deliver little or no learning (McKenzie 2000; Keller 2006). The other issue is that "sugar-coating" gives the impression that learning is a bitter experience (Resnick 2004; Papert 1998). Furthermore, it undermines genuine motivation to learn, especially when the "artificial sweeteners" are no longer available (Setzer & Monke 2001).

The implication is that educationalists must now aim for a middle ground, where e-learning delivers both fun and "serious learning". Educationalists now need to concentrate efforts into e-learning that delivers "hard fun", deep engagement in highly challenging activities (Papert 1998; Walker 2001; Haydn 2003b). This can be achieved by focussing educational practice and research efforts on ways of engaging learners in e-learning content, perhaps "problematising" the task in order to get learners to exercise mental effort (Haydn 2003a). The focus needs to move from just the enjoyment aspects provided by technological features, to those that come from the content.

Another significant finding relates to the *motivational effects* of self-study e-learning activities. Educationalists need to be cautious about the "hype" of e-learning. This study has found that learners are not necessarily motivated to learn on computers. Moreover, the different types of e-learning activities have been found to have very different motivational effects. The implication of this is that the motivational and learning goals should be considered during instructional design.

It cannot be assumed that *any* e-learning activity will motivate learners because they are attracted to computers. It also cannot be assumed that one type of activity is better or more motivational than the other. Whilst this study found that the adaptive, experiential and communicative activities were perceived to be more motivational in self-study contexts, they are not necessarily suitable for all learning goals. For example, the communicative activities require some prior learning or access to information sources to be effective because it would be difficult to socially construct knowledge from nothing. Furthermore, the adaptive and experiential activities might not be suitable when learners are simply required to assimilate information.

This study has provided evidence of some of the motivational effects of different types of activities. Equipped with this knowledge, educationalists can now choose which is most appropriate for their learning goal. They can also choose to combine the different types of activities. They can even choose to blend them with traditional methods. Educationalists are more likely to engage their learners in meaningful learning if their choice (or combination) of activities are based on the learning goals and the needs of learners.

In practice, there are some difficulties with this approach. The problem lies in the existence of a "fixed" curriculum. The curriculum seems to put pressure on teachers and instructional designers to deliver content in a certain amount of time. This pressure is likely to push much of e-learning towards assimilative activities because they are generally quicker to produce and can cover the curriculum material in shorter time. Thus, the potential of other types of activities, such as experiential and adaptive activities, are likely to be ignored or underutilised.

To base selection of a type of activity solely on curriculum pressures is, to borrow a term used by Kay (1991), "junk learning". Convenience should not be valued over quality education. We should slow down the learning process if it is necessary for full immersion in learning (Counsell 2000). Unless policy makers consider and implement a more flexible approach towards the curriculum, decisions about the most engaging e-learning activities would be influenced by convenience and speed rather than quality.

The final, and perhaps the most significant finding, relates to *novelty, in particular "regenerative novelty"*. This study clarified that novelty does not always result in positive motivational influences. It also clarified that, in some cases, novelty can be "refreshed" by changes in the interaction and discussions. This has been called "regenerative novelty". This finding has some implications for research. There are few studies into the effects of novelty on motivation. Most of these studies suggest that novelty results in positive motivational influences for limited periods. Further research into novelty must now consider the findings of this study – the perception of novelty is not necessarily short-lived and does not always have positive motivational influences on learners.

The findings relating to novelty are of direct practical relevance. An understanding of "regenerative novelty" can help teachers and instructional designers develop targeted interventions for learners who have low attention spans. The "regenerative novelty" of activities can be harnessed to extend their perception of newness of the activities. Apart from sustaining their engagement, "regenerative novelty" is likely to give them a sense of control over the learning. The ability to control their own novelties is likely to be beneficial to eleven to fourteen year olds, who are believed to be selective in what they pay attention to (Berk 2010).

8.7 A REVIEW OF THE STUDY

In addition to the noteworthy contributions to knowledge in the field, the researcher believes there are several lessons to be learnt from this study. The first lesson stems from the decision to choose what was believed to be the most appropriate methodological approach and methods for this study, rather than be restricted to a single paradigm. The success of this study can be attributed, in part, to the decision to use the "best tools for the job". It would have been difficult to examine this multifaceted study without taking a pragmatic and purposeful approach. The researcher has joined the group of researchers who advocate the removal of the categorisation of research approaches and methods (for example, Symonds & Gorard 2010; Hammersley 2005; Gorard 2007; Johnson & Onwuegbuzie 2004).

Furthermore, the integration of various theoretical explanations of motivation was found to be beneficial. Research into a complex subject, such as motivation, requires an amalgamation of various theoretical explanations, the pieces of the motivation "puzzle" (Ormrod 2011). The integration of the various theories and their simplification into four categories (see section 3.2) was found to be beneficial. They fostered comprehensive understanding of motivation, thereby ensuring that the researcher took a well-rounded view of the phenomenon. The benefit of the integration of the theoretical explanations became more obvious during the study, when it was realised that many learners' comments often did not include the cognitive strategies relating to the third category, "how do I?" (see section 3.2.4). This significant finding might otherwise have gone unnoticed.

Likewise, taking an integrated approach and merging the various concepts from existing e-learning research models was found to be beneficial to this study. The models themselves are based on various theories of motivation. In general, the ARCS model (Keller 1983) was found to be particularly beneficial to the study. The concepts of gaining and sustaining attention, establishing relevance, building confidence and enhancing satisfaction seemed to make it a workable model. Moreover, the model is based on a range of relevant theories of motivation.

Nonetheless, the other models were found to be beneficial. For example, the taxonomy of Intrinsic Motivations (Malone & Lepper 1987) brought the concepts of fantasy and interpersonal motivations into the "collection of concepts". These concepts were particularly useful during the evaluation of the adaptive, experiential and communicative activities. The Social Cognitive Learning Theory (SCLT) approach, proposed by Cocea & Welbelzhal (2006), also highlighted the importance of concepts like self-regulation, which this study identified as invaluable especially during the "novelty period".

Perhaps the most important lesson that has been learnt through this study is the "how and why" of carrying out substantial and rigorous academic enquiry. This doctoral study is only the beginning of the journey in the "world of research", but through it, the researcher's capacity to carry out an advanced academic enquiry and generate new knowledge has been developed.

8.8 THE LIMITATIONS OF THE STUDY

8.8.1 THE LIMITATIONS: WHY DECLARE THEM?

Following a critical evaluation of the results of the study and the research process, it is necessary to acknowledge certain limitations of the study. Some of the limitations were recognised at the beginning stages of the research process and steps were taken to limit their impact on the findings. However, some limitations became apparent during or shortly after the research process. Like any piece of academic research, the findings of this study needs to be considered in view of its limitations. Hence, it is important to declare all the known limitations of this study, define the potential impact on the findings, and suggest ways in which future studies can address them.

8.8.2 LIMITATION DUE TO THE SIZE OF THE STUDY

The study focused on three facets – attraction, novelty and activities. During the research process, it became apparent that each facet was very significant. It was a challenge for one researcher to investigate all the three facets. Although there were valid reasons and benefits for carrying out research in three schools, the multisite data capture and analysis also added to the researcher's workload. Carrying out such a multifaceted study in multiple locations was an ambitious research project for one researcher.

From one angle, it could be argued that it is an indication that significant work that contributes to existing knowledge has been carried out. From another angle, however, the size of the study could have affected the *depth* of the study. Although steps were taken to ensure that the thesis reports on all the data collected, it is possible that some significant findings could have been underreported. Hence, the impact of this potential limitation due to the size of the study is unclear. The three facets would perhaps have been better tackled by a team of researchers or, perhaps, as separate studies.

8.8.3 LIMITATIONS DUE TO THE RESEARCH APPROACH

It would be interesting to know whether similar findings would emerge if the study was tackled using alternative approaches. Although the study was conducted in three schools, it would be interesting to know whether replicating the study in other schools would yield similar results. Regardless of the possibility of differences in the findings, there are some limitations in the selected approach to this study.

As discussed in the literature review, it is difficult to objectively measure motivation (see Whitehead 1976; Smith 2008; de Vicente & Pain 1998; Picard 1995). The multiple-case studies relied upon observations, self-report forms and focus group interviews. These approaches cannot provide objective measures of motivation, although combining them can improve accuracy (Weibelzahl & Kelly 2005). This poses two main problems. Firstly, the data gathered were based on the *perceptions* of the participants and the researcher.

Secondly, all of these methods are inevitably dependant on the *researcher's interpretation* of events and views.

More importantly, motivation is believed to be unstable during the interaction with e-learning activities (de Vicente & Pain 2002; de Vicente & Pain 2003). In this study, it was impossible to detect and monitor the varying levels of motivation; the self report forms were completed at the end of the interactions and the focus group interviews took place afterwards. Hence, it was difficult to capture the varying motivational states during the interactions. Another issue that emerged from this limitation is that it was impossible to detect and collect data about diminishing novelty. The researcher would argue that the alternative measurement approaches (such as the detection of physiological states, eye tracking and the use of self-report forms *during* the interactions) are costly, impractical and not suited to this study. Nonetheless, it is conceded that the study has not been specifically designed to analyse the varying motivational states, the reasons for the varying states, and the effects of the varying states on the data collected.

Furthermore, some limitations in the research design became apparent during the data collection process. The two assimilative activities required participants to read. Some of the participants in Schools B and C expressed a dislike for onscreen reading compared to onscreen viewing/listening. In other words, their responses might have been different if they were asked to assimilate information presented in video or audio form. Unfortunately, both assimilative activities involved reading, so the possible differences between onscreen reading and onscreen viewing/listening could not be explored.

Another limitation that became apparent during the data collection process was in relation to the questionnaire design. The open-ended responses to the questions "do you enjoy learning with computers" and "do you think computers motivate you to learn" were similar, suggesting that the participants did not necessarily make a distinction between the two questions. The questionnaire could have been presented in a way that would highlight the subtle, yet important, differences between the two questions.

Another aspect of the questionnaire design that could be improved is connected to learners' perception of their proficiency and the views about whether they believed computers motivated them to learn. Analysing their ratings of their proficiency against their response to the question "do you think computers motivate you to learn" was quite cumbersome. It could have been simplified to a question on the proficiency rating and a follow-on question on how their level of proficiency affects their motivation to learn with computers.

Finally, the sampling strategy and size could be seen as limitations of this study. The questionnaires were administered to all the eleven to fourteen year olds in the three schools. There was a high likelihood that the views captured were representative of the population because the response rates were high (97.4%, 89.2% and 87% in Schools A, B and C respectively). However, the participants for the focus group interviews and interaction with the e-learning activities were selected based on a purposive sampling strategy, which relied upon the researcher's view of typical characteristics of the population and teachers' judgements. This study cannot guarantee that the personalities and views of the participants, especially when only six were selected in each school, were truly representative of the entire population. As the impact of the sampling strategy is unknown, caution must be applied when making broad generalisations of the findings of the study.

8.8.4 LIMITATION DUE TO THE CHALLENGES FACED DURING THE STUDY

Although the researcher hoped that the research process would be "hassle-free", there were some challenges along the way. Some limitations emerged from these challenges. The researcher was unable to analyse the recordings of the interactions with the e-learning activities in Schools B and C. The screen-recording software crashed and the recordings could not be recovered. The recordings were to be analysed in conjunction with data gathered through the other methods, especially the observations. The impact of the data loss is quite significant because it was difficult to observe and record the interactions of the six participants at the same time. The screen recordings would have shown interactions that were missed during the observations. Although there was significant and relevant data from the observations, self-report forms and focus group interviews, the screen recordings would have been an additional source of valuable data.

Another challenge was the researcher's attempt to restrict the responses of the participants to the scope of this study. The researcher had to select computer-based learning, rather than all forms of e-learning, to make the study manageable and focussed. However, it was difficult to make participants focus on the computer-based learning. They often wanted to comment about or make comparisons to other technologies, such as mobile phones, games consoles and tablets. It was sometimes necessary to clarify whether their responses were relevant to computer-based learning. It is inevitable that some responses could have alluded to other types of e-learning.

8.8.5 LIMITATION DUE TO THE GENERALISABILITY OF THE STUDY

The study was conducted in particular schools, using particular activities, at a particular time, and involving particular participants; this effectively makes the context of the study difficult to replicate. As explained by Robinson & Norris (2001), applied researchers are concerned about the applicability of the findings to cases that go beyond the immediate study. Although steps were taken to strengthen the generalisability of this study (for example, the multisite studies and the census surveys), the researcher's main goal was to conduct an academic study that demonstrates the level of rigour appropriate for the award of a doctorate.

What is the value of a study that only reports on a unique context? The value of this study is that the several *insights* that have emerged can inform the practice of instructional designers, teachers and other educationalists. It is hoped that readers will consider the context of this study, in relation to their own experiences and knowledge of other cases, and make decisions about aspects of the study that informs their practice. For example, the concept of "regenerative novelty" can be understood in context and considered during the development of e-learning activities when and where it is considered applicable.

The judgement of the generalisability of the study lies with the readers, who would be empowered to consider the context of the study in relation to their own experiences and knowledge of other cases (Robinson & Norris 2001). The description of the schools, the profiles of the participants and the selected activities have been provided to ensure that the context is understood. The "thick descriptions" would enable the reader to make "naturalistic generalisations" – that is, identify aspects of the studies that are applicable and comparable to their own contexts (see Lincoln & Guba 2005; Melrose 2010; Stake 1995; Robinson & Norris 2001).

However, there are some known limitations relating to the incompatibility of the context of the study with current school practice. For example, many students learn a topic or module in smaller chunks over a period. In many cases, the learning activities build on recollection or knowledge of the previous activity. The multiple-case studies focussed on the interactions and do not reflect learning of smaller chunks over a period. Similarly, many school activities require essay writing or explanations to demonstrate understanding or aid assessment. The activities used in this study did not require essay writing. Hence, there are likely to be limitations in what can be generalised.

8.9 AREAS OF FURTHER RESEARCH

This study, like many others, ends with recommendations for further research work. The study has provided a broad overview of the novelty and motivational effects of different types of activities, based on classifications. This overview is only a starting point. It is anticipated that other studies will investigate each classification in greater depth, in order to discover ways of optimising the novelty and motivational effects. Specifically, such studies could focus on the possible motivational differences of onscreen reading versus onscreen viewing/listening in assimilative activities. Another possible area of research would be the effects of group dynamics or learners' participation on motivation during interaction with communicative activities. In addition, the view that the subject matter has little or no influence on learners' motivation when engaged in adaptive, experiential and communicative activities needs to be investigated.

Furthermore, this study has not taken the instability of motivation during the interactions into full consideration (see de Vicente & Pain 2002; de Vicente & Pain 2003). This is perhaps the reason why the point when learners perceived that the novelty of the activities started to diminish could not be detected. Future studies could take alternative approaches, particularly those that can capture learners' varying physiological states, to verify the findings of this study and capture additional data. Such studies would be useful for adaptive e-learning systems where motivational strategies might need to be introduced at various times during the interaction.

This study could perhaps be advanced by an investigation into "school effects". During the study, there was evidence that suggests that learners in one of the three school responded in a different way to the difficulty of one of the activities. There was also evidence suggesting that learners in one of three schools are better at searching for relevant information and discerning the learning value of computers. These "school effects" need further exploration to determine their impact and identify ways of developing or nurturing the beneficial capabilities.

This study has been kept within the realm of computer-based learning environments. It would also be beneficial if future studies investigate other e-learning environments. For example, it is not clear whether the findings relating to the novelty and motivational effects of different types of activities are only relevant to computer-based learning or can be extended to m-learning (mobile learning).

This study has relied on *perceptions* of motivation levels and learning, but has not attempted to verify the extent of the learning that actually took place. Hence, the study can be extended to include some measure of the actual learning, perhaps through testing. It would be interesting to assess the correlation between the reported levels of motivation and actual learning (retention, understanding and active use of knowledge).

8.10 CONCLUDING REMARKS

The central argument of this thesis is that computers per se are unlikely to motivate learners: it takes considerable skill and ingenuity to design activities that are attractive, intriguing and worthwhile, and at the same time, moving pupils beyond the idea that learning has to be "fun" into the realms of cognitive engagement with the content. There are dangers in assuming that "any old e-learning activity" will motivate learners. There are also dangers in assuming that, because young people use computers in out-of-school contexts, there will be a straightforward transfer to learning contexts (Selwyn 2012; Crook 2012).

As in traditional classroom contexts, good teaching is important for motivation and learning. Likewise, good instructional design is needed for motivation and effective e-learning. Instructional designers must continually focus on marrying up the knowledge of technology, pedagogy and content to deliver significant learning experience, as suggested by Mishra & Koehler (2006).

Technology seems to have found its way into education and our day-to-day activities (and there seems to be no going back). It should not be seen as the "magic bullet" solution to the issue of learner motivation, or indeed any of the other issues in education. Neither should it be seen as a problem. Instead, we should keep up with the developments and continually evaluate its potential. We should keep an open mind and allow research evidence, not hype or ideologies, to shape and reshape our opinions. Only then, can we be free from the hype of technology or the ideologies that seem to restrict us.

By taking this approach, the researcher's views of e-learning, learners' attitudes and best practices have changed. For example, the researcher now believes there is room for "sugar-coating" in e-learning, though it should be complemented with strategies which lead to cognitive engagement with the content of the activity. Sometimes these changes have been difficult because they challenged fundamental beliefs that have been harboured for a long time. The consolation is that they are based on research evidence, not merely on hype or ideology. This open-minded approach is recommended to all.

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APPENDICES

APPENDIX 1: E-LEARNING TERMINOLOGIES AND WHAT THEY OFTEN MEAN

These terminologies and their meanings were obtained from Wikipedia (http://en.wikipedia.org) on 15th August 2010. Wikipedia is collaboratively written and largely anonymous. The website was chosen because it was likely to reflect the understandings of the general public. The terminologies and their meanings will therefore be different from formal definitions.

Blended Learning
Blended Learning refers to a mixing of different learning environments. A blended learning approach can combine face-to-face instruction with computer-mediated instruction

Computer-Aided Assessment
Computer-Aided Assessment (also but less commonly referred to as E-assessment or also known as Computer-Based Testing (CBT)), ranging from automated multiple-choice tests to more sophisticated systems is becoming increasingly common. With some systems, feedback can be geared towards a student's specific mistakes or the computer can navigate the student through a series of questions adapting to what the student appears to have learned or not learned.

Computer-Based Learning (CBL)
Computer-Based Learning (CBL) refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes.

Computer-Based Training
Computer-Based Trainings (CBTs) are self-paced learning activities accessible via a computer or handheld device. CBTs typically present content in a linear fashion, much like reading an online book or manual.

Computer-Supported Collaborative Learning (CSCL)
Most recent developments in CSCL have been called E-Learning 2.0, but the concept of collaborative or group learning whereby instructional methods are designed to encourage or require students to work together on learning tasks has existed much longer. It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills.

E-learning (or any of elearning, Elearning, eLearning or E-Learning)
E-learning comprises all forms of electronically supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Acronyms like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms to e-learning.

Information and Communication Technology (ICT)
Information and Communication Technologies in Education deal with the use of Information and Communication Technologies (ICTs) within educational technology. ICT in education can be broadly categorized in the following ways: ICT as a subject (computer studies), ICT as a tool to support traditional subjects (e.g. computer-based learning, presentation, research), ICT as an administrative tool (Education Management Information Systems – EMIS)

Learning Management System (LMS) and Learning Content Management System (LCMS)
A Learning Management System (LMS) is software for delivering, tracking and managing training/education. LMSs range from systems for managing training/educational records to software for distributing courses over the Internet and offering features for online collaboration.

A Learning Content Management System (LCMS) is software for authoring, editing and indexing e-learning content (courses, reusable content objects). An LCMS may be solely dedicated to producing and publishing content that is hosted on an LMS, or it can host the content itself.

M-Learning
The term M-Learning, or "mobile learning", has different meanings for different communities. Although related to e-learning and distance education, it is distinct in its focus on learning across contexts and learning with mobile devices.

Networked Learning
Networked Learning is a process of developing and maintaining connections with people and information, and communicating in such a way to support one another's learning.

Technology Enhanced Learning (TEL)
Technology Enhanced Learning (TEL) refers to the support of any learning activity through technology.

Ubiquitous Learning (U-learning or ULearning)
Ubiquitous Learning is equivalent to some form of simple mobile learning, e.g. that learning environments can be accessed in various contexts and situations. The Ubiquitous Learning Environment (ULE) may detect more context data than elearning.

Virtual Education
Virtual Education refers to instruction in a learning environment where teacher and student are separated by time or space, or both, and the teacher provides course content through course management applications, multimedia resources,
the Internet, videoconferencing, etc

Virtual Learning Environment (VLE) and Managed Learning Environment (MLE)
A Virtual Learning Environment (VLE) is a system designed to support teaching and learning in an educational setting, as distinct from a Managed Learning Environment, (MLE) where the focus is on management.

APPENDIX 2: PREVIOUS APPROACHES VS. SOCIAL COGNITIVE LEARNING THEORY APPROACH

Cocea & Weibelzahl (2006) explains how social cognitive learning theory approach differs from previous approaches and how it can improve them.

Previous approaches	**Social Cognitive Learning Theory Approach**
Enhance motivation through design	Assess learner's motivational beliefs/cognitions and use them for personalised intervention
Motivational states	Self-beliefs
Infer motivation from the learner's interaction with the system	Involve the learner in the "evaluation" of his/her motivation => more accurate learner models => more effective interventions
Machine "knows better"	Learner is the main source of information about his/her motivation => empower the learner
Teacher-focus – a certain repertoire of teaching actions	Learner-focused; considering different reactions to same teaching actions => personalisation
Challenge as an important motivational state	Challenge – beneficial or not, depending on the learner's self-beliefs (low self-efficacy learners are not likely to engage in a highly challenging task)
Performance – just a learning outcome	Performance – viewed not only as outcome, but also in terms of impact on the learner's motivation level, self-beliefs about the learning process, and personal abilities
Feedback – based on performance; little work in associating it with motivation	Feedback – based on performance plus beliefs about performance (the performance was due to effort/luck/difficulty/ability) and other self-beliefs (e.g. self-efficacy)
Reduced or absent relation between motivational state and cognitive processes	Close relation between motivational state and content/ learning activities => correlate knowledge models with motivational modules (open learner models)

Source: Cocea, M.; Weibelzahl, S. (2006) "Motivation – Included or Excluded From E-learning", Cognition and Exploratory Learning in Digital Age, CELDA 2006 Proceedings, pp. 436-437, Barcelona

APPENDIX 3: EXPANSIVE AND RESTRICTIVE GUIDELINES FOR SCREEN DESIGN

Element	Expansive guidelines	Restrictive guidelines
Typography	Use graphical fonts to catch viewers' attention because of their size and unusual shape.	Use high contrast between letters and backgrounds. Use both upper and lower cases. All upper cases, should be used only occasionally for emphasis. Use highlighting techniques conservatively. Be consistent in addressing textual cues and signals to the learner.
Graphical Images	Consider the overall standard of imagery that meets learner expectations for style.	Use simple, clear images. Use graphical images for instructional, motivational or attention-focusing effects, not simply for the sake of including them.
Colour	Make colour coding aesthetically pleasing and logical according to lesson objective.	Use colour in a conservative way. Keep colour coding consistent. Carefully select colours for all visual devices, such as touch screens, buttons, menus and titles. Use colour selectively to manipulate attention. Use a bright colour to cue the learner to new information or to highlight text or graphics.
Animation and Audio	Use voice or speech to provide information. When speech is used as the mainstream provider of information, text of spoken words should appear on the screen. Use animation as a substitute or aid for verbal communication.	Use animation sparingly. Small and simple animation may be more effective than large complex ones. Avoid unnecessary or gratuitous animation on the screen so as not to distract.
Integrative	Use aesthetically pleasing screen designs.	Get the message across as simply and clearly as possible.

Source: Lee, S. H.; Boling, E. (1999) "Screen Design Guidelines for Motivation in Interactive Multimedia Instructions: A Survey and Framework for Designers", Educational Technology, vol. 39, pp. 20-21

APPENDIX 4: BASIC PRINCIPLES OF MULTIMEDIA LEARNING

Multimedia principle – People learn better from words and pictures than from words alone.

Split-attention principle – People learn better when words and pictures are physically and temporally integrated.

Modality principle – People learn better from graphics and narration than graphics and printed text.

Redundancy principle – People learn better when the same information is not presented in more than one format.

Segmenting, pretraining, and modality principles – People learn better when a multimedia message is presented in learned-paced segments rather than as a continuous unit, people learn better from a multimedia message when they know the names and characteristics of the main concepts, and people learn better from a multimedia message when the words are spoken rather than written.

Coherence, signalling, spatial contiguity, temporal contiguity, and redundancy principles – People learn better when extraneous material is excluded rather than included, when cues are added that highlight the organization of the essential material, when corresponding words and pictures are presented near rather than far from each other on the screen or page or in time, and people learn better from graphics and narration than from graphics, narration, and on-screen text.

Personalisation, voice, and image principles – People learn better when the words of a multimedia presentation are in conversational style rather than formal style and when the words are spoken in a standard-accented human voice rather than a machine voice or foreign-accented human voice; but people do not necessarily learn better when the speaker's image is on the screen.

Source: Mayer, R.E. (2005a) "Introduction to Multimedia Learning", in Mayer, R.E. (ed.) The Cambridge Handbook of Multimedia Learning, Cambridge: Cambridge University Press, pp. 6-7

APPENDIX 5: ADVANCED PRINCIPLES OF MULTIMEDIA LEARNING

Guided-discovery principle – People learn better when guidance is incorporated into discovery-based multimedia environments.

Worked-out example principle – People learn better when they receive worked-out examples in initial skill learning.

Collaboration principle – People can learn better with collaborative online learning activities.

Self-explanation principle – People learn better when they are encouraged to generate self-explanations during learning.

Animation and interactivity principles – People do not necessarily learn better from animation than from static diagrams.

Navigation principles – People learn better in hypertext environments when appropriate navigation aids are provided.

Site map principle – People can learn better in an online environment when the interface includes a map showing where the learner is in the lesson.

Prior knowledge principle – Instructional design principles that enhance multimedia learning for novices may hinder multimedia learning for more expert learners.

Cognitive aging principle – Instructional design principles that effectively expand working memory capacity are especially helpful for older learners.

Source: Mayer, R.E. (2005a) “Introduction to Multimedia Learning”, in Mayer, R.E. (ed.) The Cambridge Handbook of Multimedia Learning, Cambridge: Cambridge University Press, p. 7

APPENDIX 6: BROAD CLASSIFICATION OF LEARNING ACTIVITIES

Recall and comprehend (building knowledge)
Cloze Computer-marked quizzes Concept maps and mindmaps Crosswords Decision-making trees Games Label and identify diagrams Matching and sequencing Pronunciation
Apply and collaborate (building skills and performance for competence)
Blogs (weblogs) Case studies Chat sessions Concept maps and mindmaps Debates Discussions Email E-portfolios Journals Portable applications Problem-based learning Project-based learning Research Roleplays (online) Scavenger hunts Student presentations Virtual classrooms Virtual laboratories Virtual Worlds WebQuests

Source: Australian Flexible Learning Framework [Commonwealth of Australia] (2008) Designing and Implementing E-learning: Prepare Activities, 15th September 2008, [Online], Available: http://designing.flexiblelearning.net.au/gallery/activities.htm [Accessed on 30th August 2010]

APPENDIX 7: ANOTHER CLASSIFICATION OF LEARNING ACTIVITIES

Learning design focus	Learning Tasks	Learning Resources	Learning Supports
Rule-based processes	Closed tasks, logical and bounded tasks in authentic settings, procedural sequence of manipulations, projects and inquiry-based forms.	Case-based materials, authentic resources, multiple sources, algorithmic descriptions and tutorials.	Collaborative learning, teacher as coach/guide, opportunities to articulate and reflect.
Incident-based processes	Story-based tasks with disambiguate variables, case analysis tasks.	Incident /event descriptions and scenarios, case materials, theoretical underpinnings	Collaborative learning, opportunities to articulate and reflect, teacher as coach/guide.
Strategy-based processes	Complex and ill-defined tasks, decision-making tasks, troubleshooting tasks, diagnosis solutions, strategic performance tasks.	Authentic resources, multiple perspectives, expert judgements, theoretical underpinnings sample tasks and solutions.	Teacher as coach, collaborative learning, peer assessments, opportunities to articulate and reflect.
Role-based interactions	Assumption of roles within real-life settings, assuming the role, playing the role in scenarios.	Procedural descriptions, role definitions, resources to define and guide role, scenarios, theoretical underpinnings.	Learners assume individual roles, teacher as moderator, opportunities to articulate and reflect.

Source: Oliver, R.; Harper, B.; Wills, S.; Agostinho, S.; Hedberg, J. (2007) "Describing ICT-Based Learning Designs That Promote Quality Learning Outcomes", in Beetham, H. and Sharpe, R. (ed.) Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning, Abingdon, Oxon: Routledge, p. 69

APPENDIX 8: TAXONOMY OF LEARNING ACTIVITIES

Context	
Context	***Aims*** ***Pre-requisites*** ***Subject*** ***Environment*** Computer-based, Lab-based, Field-based, Work-based, Audio-based, Simulator, Video, Lecture-based, Seminar-based ***Time*** ***Difficulty*** ***Skills*** Creativity, Critical analysis, Critical reading, Group/team work, IT, Literacy, Numeracy, Oral communication, Practical, Problem solving, Research, Written communication, Ability to learn, Commercial awareness, Computer literacy, Criticism, Data modelling, Decision making, Foreign languages, Information handling, Information literacy, Interpersonal competence, Management of change, Negotiating, Planning and organising, Self management, Self reflection, Synthesis, Study skills, Critical analysis and logical argument, Writing style, Library, E-literacy, Listening and comprehension, Making notes, Oral presentation, Reading, Referencing, Research reading, Inference and synthesis of information, Selecting and prioritising information, Summary skill, Time management and organisation
Learning outcomes	***Cognitive*** ***Knowledge*** State, Recall, List, Recognise, Select, Reproduce, Specify, Draw, Finding out/discover, Pronounce, Recite ***Comprehension*** Explain, Describe reasons, Identify causes of, Illustrate, Question, Clarify, Identify, Understand ***Application*** Use, Apply, Construct, Solve, Select, Hypothesize, Infer, Calculate, Investigate, Produce, Construct, Translate, Assemble, Demonstrate, Solve, Write ***Analysis*** Break down, List component parts of, Compare and contrast, Differentiate between, Predict, Critique, Analyse, Compare, Select, Distinguish between ***Synthesis*** Summarise, Generalise, Argue, Organise, Design, Explain the reasons for

	Evaluation Judge, Evaluate, Give arguments for and against, Criticise, Feedback, Reflect, Affective, Listen, Appreciate, Awareness, Responsive ***Aesthetic*** Appreciation, Commitment, Moral awareness, Ethical awareness ***Psychomotor*** Draw, Play, Make, Perform, Exercise, Throw, Run, Jump, Swim
Pedagogical approaches	***Associative*** Instructional system design, Intelligent tutoring systems, Elaboration theory, Didactic, Behaviourist, Training needs analysis ***Cognitive*** Active learning, Enquiry-led, Problem-based, Goal-based scenarios, Reflective practitioner, Cognitive apprenticeship, Constructivist-based design ***Situative*** E-moderating framework, Dialogue/argumentation, Experiential learning Collaborative learning, Activity theory, Apprenticeship, Action research, Reciprocal teaching, Project-based learning, Vicarious learning
Task taxonomy	
Type (What)	***Assimilative*** Reading, Viewing, Listening ***Information Handling*** Gathering, Ordering, Classifying, Selecting, Analysing, Manipulating ***Adaptive*** Modelling, Simulation ***Communicative*** Discussing, Presenting, Debating, Critiquing ***Productive*** Creating, Producing, Writing, Drawing, Composing, Synthesising, Re-mixing ***Experiential*** Practising, Applying, Mimicking, Experiencing, Exploring, Investigating, Performing
Technique (How)	***Assimilative*** ***Information Handling*** Concept mapping, Brainstorming, Buzz words, Crosswords, Defining, Mindmaps, Web search ***Adaptive*** Modelling

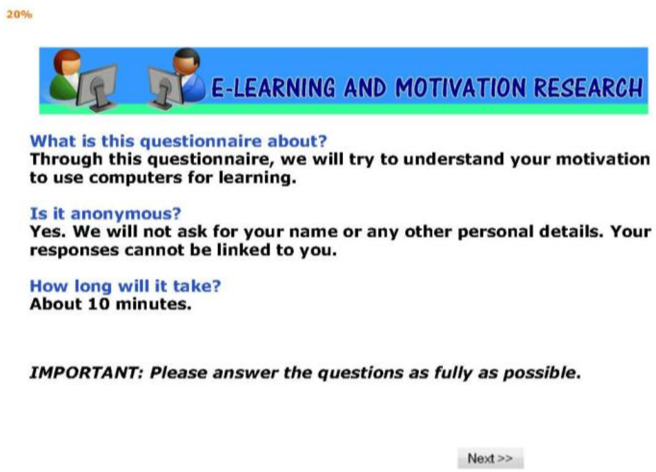
	Communicative Articulate reasoning, Arguing, Coaching, Debate, Discussion, Fishbowl, Ice breaker, Interview, Negotiation, On the spot questioning, Pair dialogues, Panel discussion, Peer exchange, Performance, Question and answer, Rounds, Scaffolding, Socratic instruction , Short answer, Snowball, Structured debate ***Productive*** Artefact, Assignment, Book report, Dissertation/thesis, Drill and practice, Essay, Exercise, Journaling , Presentation, Literature review, MCQ, Puzzles, Portfolio, Product, Report/paper, Test, Voting ***Experiential*** Case study, Experiment, Field trip, Game, Role play, Scavenger hunt, Simulation
Interaction (Who)	Individual, One to one, One to many, Group based, Class based
Roles (Which)	Individual learner, Group leader, Coach, Group participant, Mentor, Supervisor, Rapporteur, Facilitator, Deliverer, Pair person, Presenter, Peer assessor , Moderator
Tools and resources	***Assimilative*** Word processor, Text, image, audio or video viewer ***Information handling*** Spreadsheet, Database, SPSS, NVIVO, Bibliographic software, Microsoft exchange PDAs, Project manager, Digital image manipulation software, Mind mapping software, Mind mapping software, Search engines, Libraries ***Adaptive*** Virtual worlds, Models, Simulation, Modelling ***Communicative*** Electronic whiteboards, Email, Discussion boards, Chat, Instant messaging, Voice over IP, Video conferencing, Access grid, Blogs, Wikis ***Productive*** CAA tools, VLEs
Assessment	Not assessed, Diagnostic, Formative, Summative

Source: Conole, G. (2007b) "Resources: Appendix 7 (Taxonomy of Learning Activities)", in Beetham, H. and Sharpe, R. (ed.) Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning, Abingdon, Oxon: Routledge, pp. 235-237

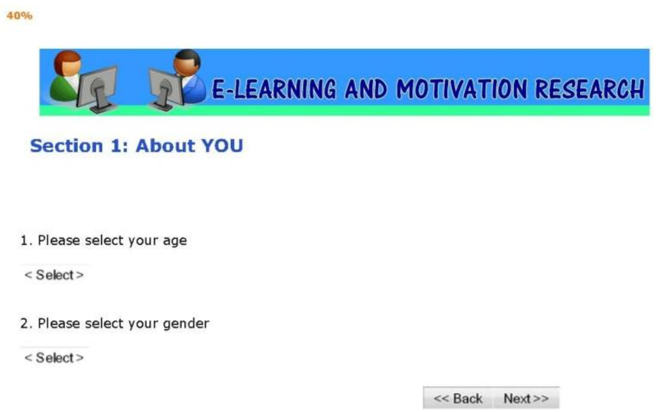
APPENDIX 9: ONLINE QUESTIONNAIRE (SURVEY)

ONLINE QUESTIONNAIRE (ON-SCREEN SCREENSHOTS)

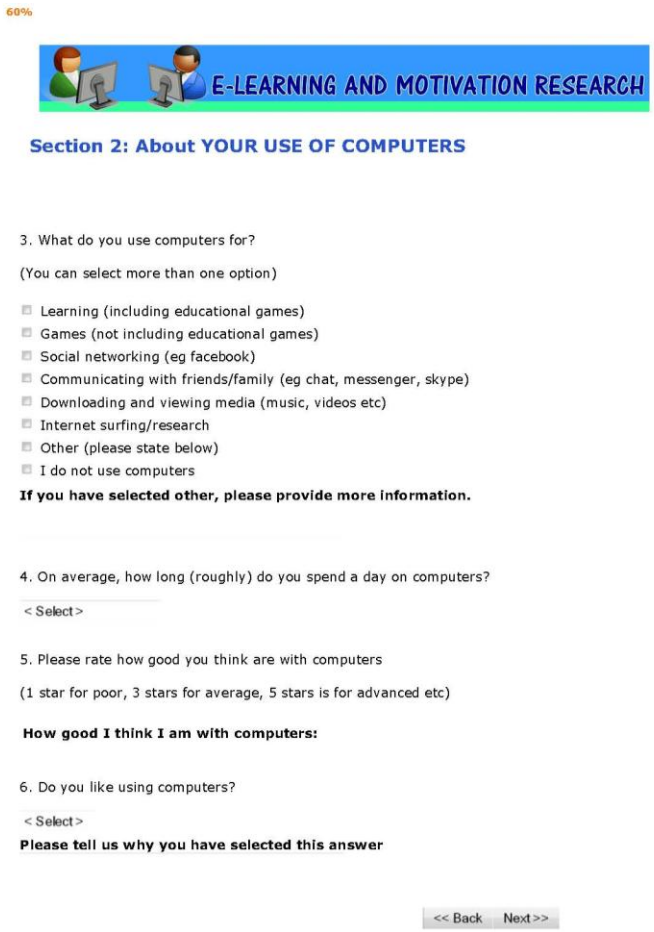
Page 1 (Introduction)



Page 2 (About you)



Page 3 (About your use of computers)



60%

E-LEARNING AND MOTIVATION RESEARCH

Section 2: About YOUR USE OF COMPUTERS

3. What do you use computers for?

(You can select more than one option)

- ☐ Learning (including educational games)
- ☐ Games (not including educational games)
- ☐ Social networking (eg facebook)
- ☐ Communicating with friends/family (eg chat, messenger, skype)
- ☐ Downloading and viewing media (music, videos etc)
- ☐ Internet surfing/research
- ☐ Other (please state below)
- ☐ I do not use computers

If you have selected other, please provide more information.

4. On average, how long (roughly) do you spend a day on computers?

< Select >

5. Please rate how good you think are with computers

(1 star for poor, 3 stars for average, 5 stars is for advanced etc)

How good I think I am with computers:

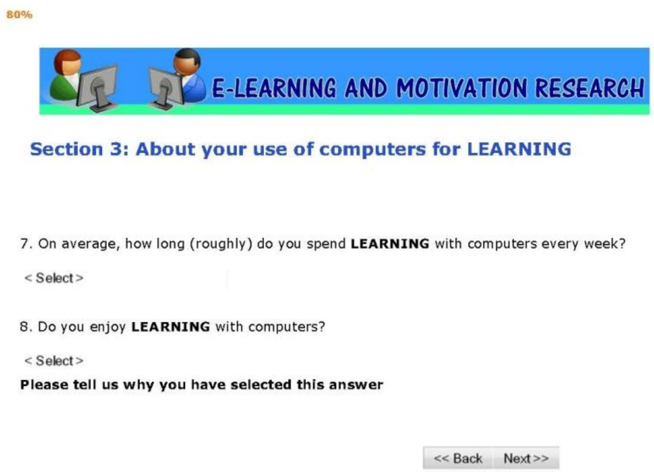
6. Do you like using computers?

< Select >

Please tell us why you have selected this answer

<< Back Next >>

Page 4 (About your use of computers for learning)



80%

E-LEARNING AND MOTIVATION RESEARCH

Section 3: About your use of computers for LEARNING

7. On average, how long (roughly) do you spend **LEARNING** with computers every week?

< Select >

8. Do you enjoy **LEARNING** with computers?

< Select >

Please tell us why you have selected this answer

<< Back Next >>

Page 5 (Comparing computer-based learning with other forms of learning)

100%

E-LEARNING AND MOTIVATION RESEARCH

Section 4: Comparing computer-based learning with other forms of learning (eg books, worksheets etc)

9. If you had the **CHOICE OF LEARNING THE SAME THING** on a computer or another form (eg book, worksheet etc), which would you **CHOOSE**?

< Select >

Please tell us why you have selected this answer

10. I am likely to **PUT MORE EFFORT** into

< Select >

Please tell us why you have selected this answer

11. I am likely to **PAY MORE ATTENTION** when doing

< Select >

Please tell us why you have selected this answer

12. I am likely to **DEVOTE MORE TIME** to a learning activity if it is

< Select >

Please tell us why you have selected this answer

13. I am likely to **LEARN MORE** if the learning activity is

< Select >

Please tell us why you have selected this answer

14. Do you think computers **MOTIVATE YOU** to **LEARN**?

< Select >

Please tell us why you have selected this answer

<< Back | < Finish Survey>

Page 6 (Thank you)

E-LEARNING AND MOTIVATION RESEARCH

Thank you for completing the questionnaire.

ONLINE QUESTIONNAIRE (SHOWING ALL THE OPTIONS)

What is this questionnaire about?
Through this questionnaire, we will try to understand your motivation to use computers for learning.

Is it anonymous?
Yes. We will not ask for your name or any other personal details. Your responses cannot be linked to you.

How long will it take?
About 10 minutes.

IMPORTANT: Please answer the questions as fully as possible.

Section 1: About YOU

1. Please select your age

- ○ 11
- ○ 12
- ○ 13
- ○ 14
- ○ 15

2. Please select your gender

- ○ Male
- ○ Female

Section 2: About YOUR USE OF COMPUTERS

3. What do you use computers for?

(You can select more than one option)

- ☐ Learning (including educational games)
- ☐ Games (not including educational games)
- ☐ Social networking (eg facebook)
- ☐ Communicating with friends/family (eg chat, messenger, skype)
- ☐ Downloading and viewing media (music, videos etc)
- ☐ Internet surfing/research
- ☐ Other (please state below)
- ☐ I do not use computers

If you have selected other, please provide more information.

4. On average, how long (roughly) do you spend a day on computers?

- ○ I do not use computers
- ○ Less than 1 hour a day
- ○ About 1 hour a day
- ○ About 2 hours a day
- ○ About 3 hours a day
- ○ Over 3 hours a day

5. Please rate how good you think are with computers

(1 star for poor, 3 stars for average, 5 stars is for advanced etc)

How good I think I am with computers:

6. Do you like using computers?

- Yes
- No
- Sometimes

Please tell us why you have selected this answer

Section 3: About your use of computers for LEARNING

7. On average, how long (roughly) do you spend **LEARNING** with computers every week?

- I do not use computers for learning
- Up to 1 hour a week
- Between 1 and 3 hours a week
- Between 3 and 5 hours a week
- Between 5 and 7 hours a week
- Over 7 hours a week

8. Do you enjoy **LEARNING** with computers?

- Yes
- No
- Sometimes

Please tell us why you have selected this answer

Section 4: Comparing computer-based learning with other forms of learning (eg books, worksheets etc)

9. If you had the **CHOICE OF LEARNING THE SAME THING** on a computer or another form (eg book, worksheet etc), which would you **CHOOSE**?

- Computer-based learning
- Another form (eg book, worksheet etc)

Please tell us why you have selected this answer

10. I am likely to **PUT MORE EFFORT** into

- Computer-based learning
- Another form of learning (eg book, worksheet etc)

Please tell us why you have selected this answer

11. I am likely to **PAY MORE ATTENTION** when doing

- Computer-based learning
- Another form of learning (eg book, worksheet etc)

Please tell us why you have selected this answer

12. I am likely to **DEVOTE MORE TIME** to a learning activity if it is

- Computer-based
- On another form (eg book, worksheet etc)

Please tell us why you have selected this answer

13. I am likely to **LEARN MORE** if the learning activity is

- Computer-based
- On another form (eg book, worksheet etc)

Please tell us why you have selected this answer

14. Do you think computers **MOTIVATE YOU** to **LEARN**?

- Yes
- No
- Sometimes

Please tell us why you have selected this answer

Thank you for completing the questionnaire.

APPENDIX 10: FOCUS GROUP INTERVIEW SCHEDULE (SURVEY)

Welcome: Welcome participants, get to know them and make them feel at ease. Start by explaining the purpose of the focus group interview and that they can opt out at any time.

Conversation starter: Get a conversation started by introducing yourself telling them three facts about yourself. Ask them to introduce themselves and state three facts that they don't mind discussing.

Research questions	Interviewer questions and further prompts
Do learners actually have an attraction to computers, as is often assumed (for example, Kim et al. 2007; Broady et al. 2010; Prensky 2001a)? What are the reasons for this attraction?	**Main questions:** Do you like using computers? Do you like spending time on them? What are the REASONS for this? Further prompts: Do you use computers? Tell us what you use them for? How often and for how long do you stay on computers daily? What do you do on computers? Why do you use them? Can you do without computers?
Does the attraction to computers (if it exists) have any relationship to motivation to learn using computers, as it is sometimes portrayed in media coverage and political rhetoric (for example, Becta 2003; Means et al. 1997)?	**Main questions:** Are you attracted to computers? If so, does this attraction MOTIVATE YOU to LEARN WITH COMPUTERS? In what ways does it motivate you to learn? Do you enjoy <u>learning</u> with computers? Why? Compare learning on a computer to other forms, which do you think will help you learn more? Which is more engaging? Which are you likely to stick at? Which is likely to keep your concentration? Why? Looking specifically at other forms of learning (books, worksheets, magazines*), what are their effects on your motivation to learn? Compare learning on a computer to other forms, which do you think ACTUALLY helps you learn more? Why?

	Further prompts: Are you interested in learning with computers? Why? Tell us about a time when you have been motivated to learn using a computer? How much importance do you give to learning with computers? When would you enjoy learning with computers? What can make motivate you to learn on the computer? What other forms of learning (e.g. textbooks) do you use for learning? What do you think about the individual forms of learning? How well do them compare with learning on a computer? What will make you learn more on the computer?
Are there learners who are not attracted to computers? How does this affect their motivation to learn using computers?	**Main questions:** Are you attracted to LEARNING using computers? Why/Why not? If you are not attracted to learning using computers, what effect does a computer have on your motivation to learn? If you are not attracted to learning using computers, what effect does a computer have on WHAT YOU LEARN and HOW MUCH YOU LEARN? Why? Further prompts: How much do you actually learn on computers? At what point does the learning take place?
How does proficiency in the use of computers affect the motivation to learn with computers?	**Main questions:** How good are you with computers? What exactly can you do on computers? What exactly do you do on computers? Do you find it easy to learn with computers? Comparing computers to other forms of learning, which do you find more enjoyable? Further prompts: In what ways does being good or not good on a computer make a difference to your motivation to learn? If your use of computer improves, will your motivation to learn also improve?

Closing: Thank them for giving up their time.

APPENDIX 11: QUESTIONNAIRE, INTERVIEW AND RESEARCH QUESTIONS (SURVEY)

A survey was used to tackle the first facet of this study (attraction). The data collection methods used were online questionnaires and focus group interviews.

Below are the questions in the online questionnaire and interview schedule. They have been mapped to the research questions
.

Research question: Do learners *actually* have an attraction to computers, as is often assumed (for example, Kim et al. 2007; Broady et al. 2010; Prensky 2001a)? What are the reasons for this attraction?	
Questionnaire questions	6. Do you like using computers? 4. On average, how long (roughly) do you spend a day on computers? 3. What do you use computers for?
Interview questions	Do you like using computers? Do you like spending time on them? What are the REASONS for this?

Research question: Does the attraction to computers (if it exists) have any relationship to motivation to learn using computers, as it is sometimes portrayed in media coverage and political rhetoric (for example, Becta 2003; Means et al. 1997)?	
Questionnaire questions	3. What do you use computers for? 6. Do you like using computers? 7. On average, how long (roughly) do you spend **LEARNING** with computers every week? 8. Do you enjoy **LEARNING** with computers? 9. If you had the **CHOICE OF LEARNING THE SAME THING** on a computer or another form (eg book, worksheet etc), which would you **CHOOSE**? 10. I am likely to **PUT MORE EFFORT** into 11. I am likely to **PAY MORE ATTENTION** when doing 12. I am likely to **DEVOTE MORE TIME** to a learning activity if it is 13. I am likely to **LEARN MORE** if the learning activity is 14. Do you think computers **MOTIVATE YOU** to **LEARN**?

Interview questions	Are you attracted to computers? If so, does this attraction MOTIVATE YOU to LEARN WITH COMPUTERS? In what ways does it motivate you to learn? Compare learning on a computer to other forms, which do you think will help you learn more? Which is more engaging? Which are you likely to stick at? Which is likely to keep your concentration? Why? Looking specifically at other forms of learning (books, worksheets, magazines*), what are their effects on your motivation to learn? Compare learning on a computer to other forms, which do you think ACTUALLY helps you learn more? Why?

Research question: Are there learners who are not attracted to computers? How does this affect their motivation to learn using computers?	
Questionnaire questions	8. Do you enjoy **LEARNING** with computers? 9. If you had the **CHOICE OF LEARNING THE SAME THING** on a computer or another form (eg book, worksheet etc), which would you **CHOOSE**? 10. I am likely to **PUT MORE EFFORT** into 11. I am likely to **PAY MORE ATTENTION** when doing 12. I am likely to **DEVOTE MORE TIME** to a learning activity if it is 13. I am likely to **LEARN MORE** if the learning activity is 14. Do you think computers **MOTIVATE YOU** to **LEARN**?
Interview questions	Are you attracted to LEARNING using computers? Why/Why not? If you are not attracted to learning using computers, what effect does a computer have on your motivation to learn? If you are not attracted to learning using computers, what effect does a computer have on WHAT YOU LEARN and HOW MUCH YOU LEARN? Why?

Research question: How does proficiency in the use of computers affect the motivation to learn with computers?	
Questionnaire questions	5. Please rate how good you think are with computers 8. Do you enjoy **LEARNING** with computers?

	14. Do you think computers **MOTIVATE YOU** to **LEARN**? 3. What do you use computers for? 4. On average, how long (roughly) do you spend a day on computers? 9. If you had the **CHOICE OF LEARNING THE SAME THING** on a computer or another form (eg book, worksheet etc), which would you **CHOOSE**? 10. I am likely to **PUT MORE EFFORT** into 11. I am likely to **PAY MORE ATTENTION** when doing 12. I am likely to **DEVOTE MORE TIME** to a learning activity if it is 13. I am likely to **LEARN MORE** if the learning activity is
Interview questions	How good are you with computers? What exactly can you do on computers? What exactly do you do on computers? Do you find it easy to learn with computers? Comparing computers to other forms of learning, which do you find more enjoyable?

Other aspects that can provide relevant information (e.g. possible differences in the views of different genders and ages and schools).	
Questionnaire questions	1. Please select your age 2. Please select your gender School/location
Interview questions	Age, gender and school/location

APPENDIX 12: SELECTED ACTIVITIES AND THEIR SOURCES (MULTIPLE-CASE STUDIES)

Classification	Name and brief description of the activity	Topic(s) covered	Owner and details of permission	Source
Assimilative (e.g. reading, viewing, listening and writing)	Tour of Parliament – a learning activity based on a tour of the Houses of Parliament, where learners click on areas of interest and view information and pictures about it.	Citizenship History Politics	The UK Parliament Permission to use this resource was granted on 27th April 2011	http://services.parliament.uk/education/online-resources/Tour_of_Parliament/ (Last accessed on 25th July 2012)
	Culture Zone – a learning activity that uses multimedia to present a timeline of the history of Britain, with a focus on the impact of other nationals on the British culture.	History Culture Citizenship	Channel 4 Learning/ Espresso Education Permission to use this resource was granted on 20th April 2011	http://www.channel4learning.com/learning/microsites/L/lifestuff/content/citizens/culture.html (Last accessed on 25th July 2012)
Information handling (e.g. classifying resources, ordering data and manipulating data)	Looking at Mutual Funds – a learning activity where learners gain an understanding of mutual funds vocabulary, calculate average return on investments and use charts to analyse past fund performance.	Investments Mathematics Personal Finance	Adult Literacy Media Alliance (ALMA)/ Education Development Centre Permission to use this resource was granted on 4th April 2011	http://www.tv411.org/lessons/cfm/math.cfm?str=math&num=35&act=1 (Last accessed on 5th March 2012 - the web resource was no longer available online as at 25th July 2012)

	Words with Multiple Meanings – a learning activity where learners consider the context of various sentences, recognise the multiple meanings of words and select the appropriate words for the context.	English Vocabulary	Adult Literacy Media Alliance (ALMA)/ Education Development Centre Permission to use this resource was granted on 4th April 2011	http://www.tv411.org/lessons/cfm/vocabulary.cfm?str=vocabulary&num=11&act=1 (Last accessed on 5th March 2012 - the web resource was no longer available online as at 25th July 2012)
Adaptive (e.g. modelling and simulation)	MP for a Week – a simulation activity that allows learners to step into the shoes of an MP, meet constituents and other ministers, deal with the media, plan and make speeches etc.	Politics Citizenship	The UK Parliament Permission to use this resource was granted on 27th April 2011	http://www.parliament.uk/education/online-resources/games/mp-for-a-week/ (Last accessed on 25th July 2012)
	Energyville ™ – a simulation activity that places the learner in charge of an average industrialised city, requiring them to make decisions and create safe energy sources in the present to create a sustainable future.	Economics Environment	Chevron/ The Economist Group Energyville ™ is a third party tool owned by Chevron. Permission to use this resource was granted on 11th April 2011	http://www.willyoujoinus.com/energyville/ (Last accessed on 25th July 2012)

Communicative (e.g. group-based discussions, debating, presenting and critiquing)	Climate Wiki – an online wiki created for the collaborative production of an article/document about climate change.	Environment Science Citizenship	The researcher	For testing and evaluation purposes: http://e-learningtest.wikispaces.com/ For live study: http://elearningresearch1.wikispaces.com/ http://elearningresearch2.wikispaces.com/ http://elearningresearch3.wikispaces.com/ (Last accessed on 25th July 2012)

	Heated Debate – an online chat room created for a debate about the pros and cons of animal testing.	Citizenship Science (Biology) Science (Chemistry)	The researcher	For testing and evaluation purposes: http://www.themotivationtolearn.com/chat/test.html For live study: http://www.themotivationtolearn.com/chat/1.html http://www.themotivationtolearn.com/chat/2.html http://www.themotivationtolearn.com/chat/3.html (Last accessed on 5th March 2012 - the online chat rooms were provided by Meebo, which has now been acquired by Google. Hence, the chat facility has been retired)
Productive (e.g. construction of artefacts, writing, drawing, composing and producing)	FWG Bridge – an activity that focuses on physics and finance, where learners are required to construct a solid bridge to an allocated budget.	Science (Physics) Finance	Free World Group Permission to use this resource was granted on 2nd April 2011	http://www.freeworldgroup.com/games8/gameindex/fwgbridge.htm (Last accessed on 25th July 2012)

	Sketch2 – a learning activity where learners produce sketches and paintings of pictures which disappear shortly afterwards.	Art	Zattikka Limited Permission to use this resource was granted on 27th April 2011	http://www.gimme5games.com/play-game/sketch2 (Last accessed on 25th July 2012)
Experiential (e.g. investigating, exploring, performing, mimicking and practising)	Coffee Shop – a learning activity that teaches business principles by allowing learners to explore and investigate the effects of product pricing, profits, sales, inventory, business reputation, demand and supply on the stability of businesses.	Business Studies Economics	Armor Games Permission to use this resource was granted on 15th April 2011	http://armorgames.com/play/57/coffee-shop (Last accessed on 25th July 2012)
	Starting Out – a learning activity that focuses on personal finance, where learners explore and predict what life could be like when they finish school.	Personal Finance	Museum of London Permission to use this resource was granted on 4th April 2011	http://www.museumoflondon.org.uk/museumoflondon/media/microsites/learning/startingout/startingout.html (Last accessed on 25th July 2012)

APPENDIX 13: ACTIVITY LOG (MULTIPLE-CASE STUDIES)

The log below has been reduced to 70% of the actual size.

E-learning and motivation

Activity log

Observation / recording of interaction with the e-learning activities
Participant(s):
School:
Date: Start time: End time:

Time	Description of events (include names and activities)	Reflective notes

Affect
Attention
Attitudes
Challenge
Competence
Confidence
Control
Curiosity
Effort
Fantasy
Independence
Interpersonal motivations
Needs
Reinforcement
Relevance
Satisfaction
Self-cognitions
Stimulation

Page ____ of ____

APPENDIX 14: FOCUS GROUP INTERVIEW SCHEDULE (MULTIPLE-CASE STUDIES)

Welcome: Welcome participants, thank them for their time and make them feel at ease. Start by explaining the purpose of the focus group interview and that they can opt out at any time.

Conversation starter: Get a conversation started by asking them to re-introduce themselves and tell the group about their initial thoughts of the e-learning activities.

Research questions	**Interviewer questions and prompts**
NOVELTY: How do learners react when novelty is diminishing or has ended? NOVELTY: How long does the novelty of different e-learning activities last? What factors influence learners' perception of novelty?	**Questions after interaction with each type of activity:** • What did you find new about the activity? • What effect did the newness of the activity or its features have on you? What were you thinking or doing during this time? • Did the newness end? How long did this newness last? Why do you think it lasted this amount of time? • What did you do or think when the newness was ending? • What did you do or think when the newness ended? **General questions:** • Tell me what you think and do when you see new e-learning activities. • How long do they stay new to you? • How do you react when they are losing their newness? • How do you react when they are no longer new? **Possible prompts:** How do you act when activities are new? Tell me how you felt when you started using the new activity. Tell me how you felt later on, when it was no longer new to you.
ACTIVITIES: What are the motivational effects of different types of e-learning	**Questions after interaction with each type of activity:** • Did the activity motivate you to learn? Why? • What made it motivating/not motivating?

activities? ACTIVITIES: Which features of e-learning activities affect motivation to learn?	• Which features did you find motivating? Why? • Which features did you find less motivating? Why? • What/how much did you actually learn? • Did you at any point lose interest? At what point? Why? • Why do you think the activity stopped becoming interesting? • What did you do when you started losing interest? • What can be done to make you stick to the activity? **General questions:** • What types of activities motivate you to learn? • What types of activities keep you interested for longer? • What factors affect how and when you lose interest in an e-learning activity? • What effect does the topic have on your motivation to learn? How did the topic affect your motivation to learn? Would you respond in the same way if the topic was different? • What effect does the ease of use have on your motivation to learn? • What effect does ease of navigation have on your motivation to learn? • What effect does the use of multimedia have on your motivation to learn? • What effect does the amount of information you had to deal with at the same time have on your motivation to learn? **Possible prompts:** Did you find any of the activities particularly motivating? Why? Which ones did you find less motivating? Why? What do you think is most important when using e-learning activities? Which of the e-learning activities held your attention the longest? Why? Which features held your attention the longest? Why? Which features of the e-learning activities helped with keeping you motivated? Do you have any preference in the type of activity? Do you have any preference in what you see or hear?

Closing: Thank them for giving up their time.

APPENDIX 15: SELF-REPORT FORM (MULTIPLE-CASE STUDIES)

The form below has been reduced to 70% of the actual size.

E-learning and motivation

Self-report form

Name:
School:
Date:
E-learning activity:

What effect (if any) did the **NEWNESS** of the activity or its features have on you?

How long did this newness last (in minutes)? What happened after this period?

Please rate how much the activity:

motivated you to learn

kept you on task

Did **THE ACTIVITY** motivate you to learn? What did you find motivating?

Which **FEATURES** did you find motivating? Why?

Which **FEATURES** did you find less motivating? Why?

Did you at any point lose interest? At what point? Why?

What/how much did you actually learn?

APPENDIX 16: SELF-REPORT, INTERVIEW AND RESEARCH QUESTIONS (MULTIPLE-CASE STUDIES)

Multiple-case studies were used to tackle the second and third facets of this study (novelty and activities). The data collection methods used were observation, recording of interactions and a series of focus group interviews. Participants also completed self-report forms, which aided the focus group interviews.

The research questions have been mapped to the questions in the self-report form and interview schedule. The mapping is illustrated below.

<table>
<tr><th colspan="2">Research questions:
NOVELTY: How do learners react when novelty is diminishing or has ended?
NOVELTY: How long does the novelty of different e-learning activities last? What factors influence learners’ perception of novelty?</th></tr>
<tr><td>Self-report form questions</td><td>• What effect (if any) did the newness of the activity or its features have on you?
• How long did this newness last (in minutes)? What happened after this period?</td></tr>
<tr><td>Interview questions</td><td>Questions after interaction with each type of activity:

• What did you find new about the activity?
• What effect did the newness of the activity or its features have on you? What were you thinking or doing during this time?
• Did the newness end? How long did this newness last? Why do you think it lasted this amount of time?
• What did you do or think when the newness was ending?
• What did you do or think when the newness ended?

General questions:

• Tell me what you think and do when you see new e-learning activities.
• How long do they stay new to you?
• How do you react when they are losing their newness?
• How do you react when they are no longer new?</td></tr>
</table>

Research questions: ACTIVITIES: What are the motivational effects of different types of e-learning activities? ACTIVITIES: Which features of e-learning activities affect motivation to learn?	
Self-report form questions	• Please rate how much the activity motivated you to learn. • Please rate how much the activity kept you on task. • Did THE ACTIVITY motivate you to learn? What did you find motivating? • Which FEATURES did you find motivating? Why? • Which FEATURES did you find less motivating? Why? • Did you at any point lose interest? At what point? Why? • What/how much did you actually learn?
Interview questions	**Questions after interaction with each type of activity:** • Did the activity motivate you to learn? Why? • What made it motivating/not motivating? • Which features did you find motivating? Why? • Which features did you find less motivating? Why? • What/how much did you actually learn? • Did you at any point lose interest? At what point? Why? • Why do you think the activity stopped becoming interesting? • What did you do when you started losing interest? • What can be done to make you stick to the activity? **General questions:** • What types of activities motivate you to learn? • What types of activities keep you interested for longer? • What factors affect how and when you lose interest in an e-learning activity? • What effect does the ease of use have on your motivation to learn? • What effect does ease of navigation have on your motivation to learn? • What effect does the use of multimedia have on your motivation to learn? • What effect does the amount of information you had to deal with at the same time have on your motivation to learn?

APPENDIX 17: PERMISSION LETTERS SENT TO THE HEADTEACHERS

School of Education and Lifelong Learning
University of East Anglia
Norwich
NR4 7TJ
Email: **<email address>**

<date>

<address>

Dear **<name>,**

I am undertaking research as part of my PhD at the University of East Anglia. The focus of this study is e-learning and motivation. Motivation is considered one of the major factors affecting learning. This study focuses on the motivational influences that e-learning can have on learners. After discussions with the ICT teachers, **<school>** has been selected for this study.

I would like all years 7, 8 and 9 pupils to spend 10 minutes to complete online questionnaires in April and June 2011. This will take place during their ICT lessons, with their teachers supervising their activities. Students can opt out of this activity. Parents and guardians can also request their children to be opted out by signing the attached form.

In addition, I would like to observe and interview about six students in years 7, 8 and 9 in June 2011. They will be provided with several e-learning products and will be observed learning with them. They will also be interviewed. I will work with the ICT teachers to select the students. The students will be asked to complete and sign the attached parental information/consent form.

Would you please confirm that you are happy for this study to take place at your school by emailing <email adddress>. If you have any concerns or questions about this study, please do not hesitate to contact me at the above address or at **<email adddress>**.

Thank you for your support.

Olutayo Popoola
Researcher (under the supervision of Professor Terry Haydn)

Cc: **<Head of Department>**

APPENDIX 18: PERMISSION LETTERS SENT TO THE TEACHERS

School of Education and Lifelong Learning
University of East Anglia
Norwich
NR4 7TJ
Email: **<email address>**

<date>

<address>

Dear **<name>,**

I am undertaking research as part of my PhD at the University of East Anglia. The focus of this study is e-learning and motivation. Motivation is considered one of the major factors affecting learning. This study focuses on the motivational influences that e-learning can have on learners.

I would like your support in conducting this research. Below is the list of activities for this study:

- April 2011 – Ten-minute online questionnaires will be completed by all years 7, 8 and 9 (except those who opt out)
- June 2011 – Repeat ten-minute online questionnaires will be completed by all years 7, 8 and 9 (except those who opt out)
- June 2011 – Selected students will take part in some computer-based learning activities
- June 2011 – Selected students will take part in some group interviews

Students can opt out of the online questionnaire activities taking place in April and June 2011. Parents can also sign the attached forms to indicate that they do not want their children to take part.

I will work with teachers to select students who will take part in the computer-based activities and interviews in June 2011. The selected students will be required to complete the parental consent form attached.

Would you please confirm that you are happy to assist with this study by emailing **<email address>**. If you have any concerns or questions about this study, please do not hesitate to contact me at the above address or at **<email address>**.

Thank you for your support.

Olutayo Popoola
Researcher (under the supervision of Professor Terry Haydn)

APPENDIX 19: INFORMATION SHEET AND OPT-OUT FORM

The form below has been reduced to 70% of the actual size.

E-learning and motivation

What is this about?

My name is Olutayo Popoola. I am a doing a doctorate course at the University of East Anglia. My research aims to explain the relationship between e-learning and motivation.
I would like your child to take complete an online questionnaire in April and June 2011. This will be in the first ten minutes of their ICT lesson, with their ICT teacher supervising their activities.

Are our details safe?

The online questionnaires are anonymous. Your child cannot be identified from the responses. Other than school, age and gender, no personal information will be collected.
Your child's responses will not be disclosed to anyone else. The results of the research may be presented at a professional meeting or published.

Is it voluntary? How do I take part?

Your child can opt out of this study for whatever reason. If you do not want your child to take part, please complete the form below.
Please return the form to the school office.

Opt-out form

Student's name : ____

Parent/guardian's declaration:

I do not want my child to take part in this research (e-learning and motivation).

Name: ______________________ Signature: __________ Date: __________

APPENDIX 20: INFORMATION SHEET AND CONSENT FORM

The form below has been reduced to 70% of the actual size.

E-learning and motivation

What is this about?

My name is Olutayo Popoola. I am a doing a doctorate course at the University of East Anglia. My research aims to explain the relationship between e-learning and motivation.
I would like your child to take part in some group computer-based learning activities and group interviews in June 2011. These activities will take place in your child's school during class time.

Are our details safe?

Your child's personal details will not be disclosed to anyone else. The results of the research may be presented at a professional meeting or published, but your child's personal information or responses will not be revealed.

Is it voluntary? How do I take part?

You do not have to take part. To take part, just complete the form below. We need a parent or guardian to sign the form.

Please return the form to your school office.

Consent form

I would like to take part in this research (e-learning and motivation).

Participant's name : ________________________ Age: ________ Date: ____________

Parent/guardian's permission:

I give my permission for my child named above to take part in this research.

Name: ______________________________ Signature: __________ Date: __________

APPENDIX 21: PARTICIPANTS IN THE SURVEY INTERVIEWS AND MULTIPLE-CASE STUDIES

The table below shows the profiles of the students who took part in the focus group interview for the survey and the multiple-case studies. The data are based on teachers' perceptions, judgement and knowledge of the students' prior attainment.

School A						
Student	**Age**	**Gender**	**Academic Ability**	**Proficiency in the use of computers**	**Level of motivation to learn**	**Other**
A1	12	Female	Above average	Below average	Average	
A2	12	Male	Average	Above average	Average	
A3	13	Female	Above average	Average	Above Average	
A4	13	Male	Below average	Average	Average	SEN
A5	14	Female	Above Average	Average	Above Average	
A6	14	Male	Below average	Average	Below average	EAL
School B						
Student	**Age**	**Gender**	**Academic Ability**	**Proficiency in the use of computers**	**Level of motivation to learn**	**Other**
B1	11	Female	Average	Average	Average	
B2	12	Male	Below average	Above average	Below average	
B3	12	Female	Average	Above average	Below average	
B4	13	Male	Above average	Above average	Above average	EAL
B5	13	Male	Average	Above average	Average	SEN
B6	13	Female	Above average	Below average	Above average	EAL
School C						
Student	**Age**	**Gender**	**Academic Ability**	**Proficiency in the use of computers**	**Level of motivation to learn**	**Other**
C1	12	Male	Average	Above average	Average	SEN
C2	12	Female	Above average	Below average	Below average	SEN
C3	13	Male	Above average	Above average	Above average	
C4	13	Female	Below average	Average	Average	
C5	14	Male	Above average	Above average	Above average	
C6	14	Female	Above average	Average	Above average	

APPENDIX 22: SUMMARY OF THE RESPONSES TO THE QUESTIONNAIRES

The online questionnaire was administered in April 2011. The same questionnaire was administered in June/July 2011 to verify the findings. Below is a summary of the responses received.

How long (roughly) do you spend a day on computers?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
I do not use computers	1.4%	0.4%		0.4%	0.3%		0.0%	0.0%
Less than 1 hour a day	9.9%	11.9%		17.1%	18.6%		21.9%	16.1%
About 1 hour a day	26.4%	23.1%		25.6%	20.1%		23.3%	15.6%
About 2 hours a day	19.4%	20.6%		25.3%	27.0%		29.8%	28.3%
About 3 hours a day	18.0%	16.9%		14.9%	12.9%		14.0%	20.1%
Over 3 hours a day	25.0%	27.1%		16.7%	21.1%		11.0%	19.9%

What do you use computers for?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Learning (including educational games)	50.4%	56.3%		42.7%	52.3%		48.4%	59.0%
Games (not including educational games)	58.1%	56.1%		64.1%	66.8%		61.9%	63.9%
Social networking	74.6%	84.6%		77.2%	80.1%		80.5%	89.3%
Communicating with friends / family	58.1%	66.4%		65.8%	70.1%		65.6%	69.4%
Downloading / viewing media	59.2%	64.0%		68.3%	79.4%		68.8%	72.3%
Internet surfing / research	10.6%	32.7%		8.2%	19.4%		80.5%	82.0%
Other	10.6%	11.7%		1.8%	2.0%		7.0%	6.2%
I do not use computers	1.8%	0.0%		1.8%	0.0%		0.0%	0.0%

Do you like using computers?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Yes	83.5%	86.1%		82.2%	80.6%		72.6%	81.4%
No	0.4%	0.0%		0.4%	0.7%		1.4%	0.3%
Sometimes	16.2%	13.9%		17.4%	18.7%		26.0%	18.3%

Do you think computers motivate you to learn?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Yes	41.9%	49.6%		45.2%	42.9%		45.1%	43.7%
No	18.7%	20.2%		12.8%	17.3%		10.2%	11.3%
Sometimes	39.4%	30.2%		42.0%	39.8%		44.7%	45.0%

Do you enjoy learning with computers?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Yes	32.0%	40.5%		29.9%	35.6%		44.7%	51.1%
No	25.7%	21.9%		19.9%	17.6%		8.8%	11.8%
Sometimes	42.3%	37.6%		50.2%	46.8%		46.5%	37.1%

If you had the CHOICE OF LEARNING THE SAME THING on a computer or another form (eg book, worksheet etc), which would you CHOOSE?	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Computer-based learning	75.4%	78.2%		84.3%	79.8%		81.9%	80.5%
Another form of learning	24.6%	21.8%		15.7%	20.2%		18.1%	19.5%

I am likely to PUT MORE EFFORT into ...	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Computer-based learning	67.3%	66.5%		70.1%	68.2%		61.4%	70.9%
Another form of learning	32.7%	33.5%		29.9%	31.8%		38.6%	29.1%

I am likely to PAY MORE ATTENTION when doing ...	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Computer-based learning	67.3%	70.1%		64.8%	67.9%		56.7%	62.6%
Another form of learning	32.7%	29.9%		35.2%	32.1%		43.3%	37.4%

I am likely to DEVOTE MORE TIME to a learning activity if it is ...	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Computer-based learning	71.1%	78.2%		74.9%	75.7%		69.8%	70.6%
Another form of learning	28.9%	21.8%		25.1%	24.3%		30.2%	29.4%

I am likely to LEARN MORE if the learning activity is ...	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
Computer-based learning	73.6%	67.5%		71.9%	64.7%		66.5%	60.7%
Another form of learning	26.4%	32.5%		28.1%	35.3%		33.5%	39.3%

Please rate how good you think you are with computers	School A - Percentage of responses in April 2011	School A - Percentage of responses in June / July 2011		School B - Percentage of responses in April 2011	School B - Percentage of responses in June / July 2011		School C - Percentage of responses in April 2011	School C - Percentage of responses in June / July 2011
1 star (poor)	0.4%	0.2%		0.4%	0.0%		0.5%	0.0%
2 stars	3.9%	7.0%		3.2%	4.9%		1.9%	3.4%
3 stars (average)	25.4%	23.9%		26.7%	23.2%		32.6%	35.8%
4 stars	43.0%	40.2%		48.0%	49.7%		49.3%	44.6%
5 stars (advanced)	27.5%	28.7%		21.7%	22.2%		15.7%	16.2%