Case Study: A Comparison of Immediate and Delayed Feedback, in the Context of Online Testing with Fourth Class Students

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Declaration

I declare that this thesis is entirely my own work and has been referenced properly to work done by or reported by others. It has not been submitted for any other academic award or part of, at this or at any other educational institution. I agree that this thesis may be made available by the University of Limerick to Future Students.

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Abstract

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New technologies are creating opportunities for online assessment not previously available to K-12 level teachers. However, most research into this particular aspect of education has focused on university level assessment. This case study placed online assessment into the context of an Irish fourth class primary classroom. To achieve this, focus was put on a comparison between immediate and delayed feedback for online tests. This particular comparison was selected in an attempt to better understand how and when feedback should be provided for frequent online assessments.

A review of the literature and practical research was carried out. The literature review looked at frequent testing as a formative assessment method. Specifically it focused on multiple choice format vocabulary tests conducted online. A key element of this focus was the timing of feedback for these tests. Two timing methods were looked at: immediate, answer until correct feedback and delayed feedback.

The literature review findings helped inform the research methodology. The research aspect of this study used online multiple choice vocabulary questions as the platform on which to compare the different timing methods. Online surveys of teachers, parents and students were also carried out and finally interviews with key staff members were conducted.

The literature review revealed that the optimal timing for feedback is an unresolved issue. This case study found that although there was a trend toward twenty four hour delayed feedback the difference with immediate, answer until correct feedback was not significant. Preparation for summative assessments emerged as an important advantage of frequent online tests for teachers, parents and students. Significant disadvantages to emerge related to technical, internet and resources issues. A positive attitude toward online testing in principle emerged from the surveys, although it was stronger with students and parents that with teachers. As a further study, it would be interesting to replicate these tests for students of different classes and over a longer time span to help further understand the emerging issues and findings of this case study.
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Table of Contents

CHAPTER ONE: INTRODUCTION .......................................................................................... 1

1.1 Background ............................................................................................................................. 1

1.2 Research Focus ....................................................................................................................... 2

1.3 Objectives ................................................................................................................................. 2

1.3.1 Research Objectives .......................................................................................................... 3

1.3.2 Literature Review Objectives ........................................................................................... 3

1.3.3 Final Objective .................................................................................................................. 3

1.4 Research Approach ................................................................................................................ 3

1.5 Scope and Limitations ........................................................................................................... 4

1.6 Ethical Considerations ........................................................................................................... 5

1.7 Case Study Structure ............................................................................................................. 5

CHAPTER TWO: LITERATURE REVIEW .............................................................................. 6

2.1 Introduction ............................................................................................................................. 6

2.2 Formative Assessment ........................................................................................................... 6

2.2.1 Definition ........................................................................................................................... 6

2.2.2 An Effective Methodology ............................................................................................... 7

2.2.3 An Effective Focus ............................................................................................................ 8

2.2.4 Testing Effect .................................................................................................................... 8

2.3 Feedback .................................................................................................................................. 9

2.3.1 Definition ........................................................................................................................... 9

2.3.2 Answer Feedback .............................................................................................................. 9

2.3.3 Attention Paid to Feedback ............................................................................................. 10

2.3.4 Effective Feedback .......................................................................................................... 11

2.3.5 The Link between Feedback and Learning .................................................................... 11

2.4 The Timing Issue .................................................................................................................. 12

2.4.1 Definition ........................................................................................................................... 12

2.4.2 Immediate Feedback, Answer until correct: Research .................................................... 12

2.4.3 Delayed Feedback Research ............................................................................................ 13

2.4.4 Behaviourism ................................................................................................................... 13

2.4.5 Delayed Retention Effect ............................................................................................... 14

2.4.6 Spacing Effect of Delayed Feedback ............................................................................ 14

2.4.7 Inconclusive Research ..................................................................................................... 14
2.4.8 Subject Specific ................................................................. 15
2.4.9 Summary (LRO1) ............................................................ 15

2.5 Multiple Choice Questions .................................................. 15
   2.5.1 Introduction .............................................................. 15
   2.5.2 Guessing ................................................................. 16
   2.5.3 Recognition Testing .................................................. 17
   2.5.4 Adoption of Lures ..................................................... 18
   2.5.5 Vocabulary and Multiple Choice Questions .............. 19
   2.5.6 Summary (LRO2) ..................................................... 20

2.6 Online Assessment ............................................................... 21
   2.6.1 Introduction .............................................................. 21
   2.6.2 Data Protection ........................................................ 21
   2.6.3 General Advantages and Disadvantages .................. 22
   2.6.4 Specific Advantages and Disadvantages ................. 23
   2.6.5 Drivers and Barriers ............................................... 24
   2.6.6 Summary (LRO3) ..................................................... 25

2.7 Conclusion ........................................................................... 26

CHAPTER THREE: METHODOLOGY ........................................... 27

3.1 Introduction ........................................................................... 27

3.2 Purpose of the Research ..................................................... 27

3.3 Research Strategy ............................................................... 27

3.4 Site and Sample Selection ................................................... 28

3.5 Research Tools ................................................................. 29
   3.5.1 Introduction .............................................................. 29
   3.5.2 Haiku LMS .............................................................. 29
   3.5.3 Survey Monkey ....................................................... 30
   3.5.4 Digital Voice Recorder ........................................... 31
   3.5.5 Excel and SPSS ...................................................... 31

3.6 Data Collection ................................................................. 32
   3.6.1 Vocabulary Multiple Choice Tests ............................. 32
   3.6.2 Timing of Feedback (RO1) ....................................... 33
   3.6.3 Guessing ............................................................... 34
   3.6.4 Pre tests ............................................................... 34
   3.6.5 Pilot Tests ............................................................. 35
   3.6.6 Instruction Stage ..................................................... 35
   3.6.7 Immediate, Delayed and Final Tests ....................... 36
4.4 Conclusion ............................................................................................................................. 67
  4.4.1 Tests ................................................................................................................................. 67
  4.4.2 Surveys and Interviews ................................................................................................. 67

CHAPTER FIVE: DISCUSSION .............................................................................................. 68

5.1 Introduction ........................................................................................................................... 68

5.2 Structure ............................................................................................................................... 68

5.3 Part 1: Testing ....................................................................................................................... 68
  5.3.1 Introduction ..................................................................................................................... 68
  5.3.2 Optimum Timing ............................................................................................................. 69
  5.3.3 Summary (RO1) .............................................................................................................. 70

5.4 Part 2: Primary Classroom Context ................................................................................ 71
  5.4.1 Introduction ..................................................................................................................... 71
  5.4.2 Formative Assessment .................................................................................................... 71
  5.4.3 Feedback .......................................................................................................................... 72
  5.4.4 Optimum Timing of Feedback ....................................................................................... 73
  5.4.5 Summary (LRO1) ............................................................................................................ 74
  5.4.6 Multiple Choice Question Format .................................................................................. 74
  5.4.7 Summary (LRO2) ............................................................................................................ 75
  5.4.8 Assessments Online ........................................................................................................ 75
  5.4.9 Introduction ..................................................................................................................... 75
  5.4.10 Positive Forces .............................................................................................................. 76
  5.4.11 Negative Forces ............................................................................................................. 77
  5.4.12 Summary (LRO3) .......................................................................................................... 78
  5.4.13 The Future ...................................................................................................................... 79

5.5 Conclusion ............................................................................................................................. 79

CHAPTER SIX: CONCLUSION ............................................................................................... 80

6.1 Introduction ........................................................................................................................... 80
  6.1.1 Research Objectives ........................................................................................................ 80
  6.1.2 Literature Review Objectives ......................................................................................... 80
  6.1.3 Final Objective ................................................................................................................ 80

6.2 Objectives: Outcomes ......................................................................................................... 81
  6.2.1 RO1: Optimal Timing of Feedback ................................................................................ 81
  6.2.2 RO2: Classroom Context ................................................................................................ 81
  6.2.3 LRO1 Formative Assessment ......................................................................................... 82
  6.2.4 LRO1 Feedback ............................................................................................................... 82
  6.2.5 LRO1 Optimal Timing .................................................................................................... 83
APPENDICES

Appendix A: Drumcondra Reading Versus National Average

Appendix B: Words Used In Testing

Appendix C: Feedback And Teaching Methodology

Appendix D: Student Test Data

Appendix E: Survey Questions

Appendix F: Survey Answers

Appendix G: Interview Transcripts

Appendix H: Themes To Emerge From The Surveys

Appendix I: Haiku Assessment Screen Shots

Appendix J: Student And Parent Permission Slip
# Definitions

**Answer Until Correct:** A method that allows a student to continue answering a multiple choice question until they select the correct response.

**CERI:** Centre for Educational Research and Innovation (part of the OECD).

**Delayed Feedback:** Delayed feedback for this case study refers to a delay of twenty four hours.

**Immediate feedback:** Immediate feedback for this case study refers to feedback provided on the submission of each answer.

**INTO:** Irish National Teachers Organisation.

**K-12:** Primary and secondary school level in Ireland. In America it refers to elementary, middle and high school.

**Haiku LMS:** Haiku is the name of the Learning Management System (LMS) used in this case study. An LMS is a software application for the administration, documentation, tracking, reporting and delivery of e-learning education courses or training programs.

**Lures:** Incorrect answer options for multiple choice questions.

**NCCA:** National Council for Curriculum and Assessment.

**OECD:** Organisation for Economic Co-operation and Development.

**P value:** Is a probability value. It is a measure of the strength of evidence against the null hypothesis.

**PISA:** Programme for International Student Assessment (part of the OECD).

**SPSS:** Statistical Package for the Social Sciences. A computer programme used for statistical analysis.

**T test:** Is a statistical test to determine if the mean values of two sets of data are significantly different from each other.
List of Figures

Figure 4.1 Delayed Feedback Bar Chart ................................................................. 45
Figure 4.2 Immediate Feedback Bar Chart ............................................................. 45
Figure 4.3 Box Plot Comparing Test Results .......................................................... 46
Figure 4.4 Teachers Daily Internet Usage ............................................................... 48
Figure 4.5 Students Daily Internet Usage ............................................................... 48
Figure 4.6 Parents Daily Internet Usage ................................................................. 49
Figure 4.7 Teacher Enthusiasm For Online Testing ............................................... 49
Figure 4.8 Student Enthusiasm For Online Testing ............................................... 50
Figure 4.9 Parent Enthusiasm For Online Testing .................................................. 51
Figure 4.10 Student Enthusiasm For Online Testing – Parent Opinion .................. 51
Figure 4.11 Advantages Of Online Testing In General ........................................... 54
Figure 4.12 Value Of Classroom Online Testing – Teacher View ......................... 55
Figure 4.13 Disadvantages Of Online Testing In General ..................................... 57
Figure 4.14 Advantages Of Online Practice Tests .................................................. 58
Figure 4.15 Value Of Online Practice Tests – Teacher View ................................. 59
Figure 4.16 Disadvantages Of Online Practice Tests ............................................. 61
Figure 4.17 Optimum Timing Of Feedback – Teacher View ................................... 62
Figure 4.18 Optimum Timing Of Feedback – Parent View ..................................... 62
Figure 4.19 Optimum Timing Of Feedback – Student View ................................... 63
Figure 4.20 Barriers To Online Assessment – Teacher View .................................. 65
Figure 4.21 Drivers To Online Assessment – Teacher View ................................. 66
List of Tables

Table 3.1 Timing Of Feedback – Definitions ................................................................. 33

Table 3.2 Online Tests Timetable .............................................................................. 36

Table 4.1 Paired Samples Statistics ......................................................................... 46
Chapter One: Introduction

1.1 Background

In America online instruction and assessment has seen rapid growth at all levels of education in recent years (Picciano and Seaman 2009). Challis (2005) says that new technologies have provided unprecedented opportunities to consider what is possible for assessment at classroom level. In Ireland there is a clear understanding of the importance of preparing students for the challenges of 21st century learning and working (ICT in Schools Advisory Group 2009). However despite this rapid growth in America and official acknowledgement in Ireland of the importance of technology in schools there is a paucity of research into online assessment at the K-12 level (Means et al 2010).

Ireland seems at least adequately equipped to make use of these technological opportunities. It is known that Irish students benefit from digital infrastructure and connectivity levels that are around the European Union average (European Schoolnet & University of Liege 2012). In addition the report notes that the use of digital technology in the Irish classroom by teachers is above the European Union average.

This school is well resourced with computer equipment. The subjects of this case study are experienced with using online tests. They have completed their end of week tests online for approximately half an academic year leading up to this research. However the online assessment options available offer a lot more versatility than what was being used. In light of the lack of research into online assessment at this level of education an opportunity was available here to take a deeper look at the issues relating to online assessment in a primary classroom.

This case study is an in-depth study of just one of the options available. The option chosen was to compare immediate and delayed feedback using online tests. This was done in order to provide a better understanding of which timing might provide a superior formative assessment procedure. This also provided an opportunity to delve deeper and investigate the views and opinions of teachers, parents and students.
1.2 Research Focus

As the literature will demonstrate, there is almost unanimous agreement on the benefits of formative assessment and the need for feedback. However there is little agreement on the optimal timing of feedback. Adjusting the timing of feedback is now easier than ever with accessible online assessment tools. This raises a question. Is the optimal timing of feedback for online testing something teachers should be concerned with? Is one method clearly superior to the other? Taking advantage of these new technological tools this case study seeks to compare test scores when feedback is provided to every response (answer until correct) as opposed to delayed feedback (one day) in the context of a primary school classroom. This primary classroom context refers to testing that can be completed both in and out of school by members of the class. Multiple choice vocabulary questions are used to conduct this part of the research.

The narrow scope of this case study does not allow for a definitive answer to this question. It instead sets out to investigate how these two timing methods compare relative to each other. The process of researching this issue helps deepen the understanding of formative assessment and feedback using online tools in and out of the classroom.

This study aims to go beyond feedback timings and use this opportunity to delve deeper into the peripheral issues associated with online testing in and out of the classroom. The views and opinions of the main stakeholders will to be considered. Timing of feedback is unlikely to be the single most important issue for online testing. The views of stakeholders regarding online testing may help deepen the understanding of what is found in the literature review. In addition it may highlight pertinent issues not previously considered.

1.3 Objectives

This research asks a question. Is there a significant difference between multiple choice vocabulary test scores when feedback is provided to every response (answer until correct) as opposed to delayed feedback (one day) in the context of a primary school classroom? The following case study objectives will assist in answering the components of this question. The research objectives combine with a review of the literature in an attempt to gain a deeper understanding of the issues involved.
1.3.1 Research Objectives

1. Compare the immediate feedback timing method (answer until correct) with delayed feedback (twenty four hours) for online multiple choice vocabulary questions.
2. Explore key stakeholder views related to online testing both in and outside the classroom.

1.3.2 Literature Review Objectives

1. Identify and outline the issues surrounding formative assessment and feedback to students with emphasis on the optimum timing of feedback.
2. Evaluate critically the issues around multiple choice format questions.
3. Examine the forces influencing the use of online assessment in the classroom.

1.3.3 Final Objective

1. Formulate recommendations for future practice and research.

From this point on research objectives will be referred to as RO1 and RO2. Literature review objectives will be referred to as LRO1, LRO2 and LRO3.

1.4 Research Approach

RO1 involves the collection and analysis of data relating to the timing of feedback with online testing in the classroom. Data is collected using the Haiku Learning Management System (2013). It allows for answer until correct methodology and through password protection it allows for the delaying of feedback by twenty four hours. Data is then exported to excel for analysis and SPSS for t-testing (IBM 2013).

RO2 involves the collection and analysis of survey data, using an online survey service called Survey Monkey (2013). This data from the teachers, parents and students will be exported into excel (Microsoft 2013) and codified along the lines of the key themes to emerge.
LRO1, 2 and 3 are addressed in Chapter Two, in the form of a review of the literature. The primary issues around formative assessment and feedback are identified and outlined with emphasis on the use of the multiple choice question format. This leads to a critical evaluation of the research on the optimal timing of feedback. An investigation of the key forces around conducting assessments online is also reviewed.

The findings of the research objectives combined with the ideas explored in Chapter Two, the literature review, should help contribute to a more complete understanding of online assessment in the classroom. Chapter Three, the methodology, will lay out in more detail how this work is achieved. The final objective will put forward recommendations and will be covered in the conclusion of this study.

1.5 Scope and Limitations

This case study is based on a large mixed primary school in County Tipperary. Specifically it is based around one of the fourth classes. There are twenty eight students with an equal mixture of girls and boys in this class. Stakeholders involved in the study include the students of fourth class and their parents and also the teachers at this school.

The sample size is small and this study does not claim to provide definitive answers to the issue of optimal timing of feedback or claim to be a full understanding of the views and opinions of the stakeholders regarding online testing. Instead this case study is a snap shot or a glimpse at online testing and the issues surrounding it for a particular class in a particular school at this time. It should be seen as a starting point rather than a destination.

While the sample in this study is small there will be issues and findings that other schools can relate to and use in their own investigations. The concept of relatability is employed and expanded on in Chapter Three, the methodology. Bassey (1981) as an example, believed that the relatability of a case study may be more important that its generalisability. This idea is still considered a valid concept after two decades (Dzakiria 2012). As a result of this work primary teachers considering online testing may gain a deeper understanding of the importance of feedback timing and the issues around online testing inside and outside the classroom.
1.6 Ethical Considerations

In order to conduct this work in an ethical manner this case study follows a number of criteria.

- Transparency: Every aspect of the tests, surveys and interviews were explained to participants.
- Confidentiality: No teacher, parent or student can be identified from their responses to the tests or the surveys.
- Voluntary: All participants were volunteers and were informed that they could withdraw at any time.
- Harm: Participants were advised that the risk of harm as a result of the research was negligible.
- This research complied with the school’s data protection policy.

1.7 Case Study Structure

Chapter One: The Introduction provides a general outline of this work. It provides background, looks at the research focus, the objectives, and the research approach. A brief discussion of its scope, limitations and ethics are also provided.

Chapter Two: The Literature Review discusses the existing literature, (LRO1, 2 and 3).

Chapter Three: The Methodology describes the chosen methodologies and provides a rationale and justification for them, (RO1 and 2).

Chapter Four: The Findings present the data gathered from RO1 and 2.

Chapter Five: The Discussion examines the findings and compares and contrasts them to the literature review.

Chapter Six: The Conclusion reviews the study, states the research outcomes and outlines recommendations, covering the final objective.
Chapter Two: Literature Review

2.1 Introduction

Chapter One outlined the primary objectives of this research. This chapter reviews the literature. It examines the primary issues surrounding formative assessment and feedback to students. The focus was on multiple choice format vocabulary tests that use answer until correct and delayed feedback methodologies. An additional focus was on placing this in an online context. In this way LRO1, 2 and 3 were attended to.

A substantial amount of research has been conducted into assessment however it appears that there is an emphasis on third level work in the literature. This is particularly evident with research of online assessment and students (Picciano and Seaman 2009). In as far as possible relevant work specific to K-12 students, as described in the definitions section, was used in this review. When citing research from outside the K-12 level, reference to the actual level was noted.

2.2 Formative Assessment

2.2.1 Definition

Although formative assessment is also known as assessment for learning, for the purposes of this literature review the term formative assessment will be used in order to avoid confusion. As pointed out by Bennett (2011), changing the names given to this type of assessment may only exacerbate rather than throw light on what is meant by formative assessment. According to Leahy et al (2005), formative assessment covers everything a child does from group work to sitting silently looking confused. In fact, he adds, in a classroom that uses formative assessment the gap between assessment and instruction is blurred.

More specifically formative assessment provides information to both the teacher and the student and guides further instruction and learning (Chappuis and Chappuis 2009). It does so both during and after the learning process (Government of Manitoba 2007).
This literature review will focus on one approach to formative assessment, frequent quantitative measures of specific skills (vocabulary testing for this case study) as was narrowly defined by (Dorn 2010).

2.2.2 An Effective Methodology

Agreement on a single definition of formative assessment is difficult and therefore so is assessing its effectiveness (Bennett 2011). This has resulted in research findings for one aspect of formative assessment being used to demonstrate the efficacy of other aspects of formative assessment (Wiliam 2011). What is agreed is that formative assessment in general leads to ‘substantial learning gains’ (Black and Wiliam 1998). However, due to the diverse nature of studies used in their meta-analysis, meaningful effect sizes could not be generated, (Black and Wiliam, cited in Bennett 2011).

These claims of substantial learning gains are backed up in the literature. As an example, an OECD policy brief, Better Policies for Better Lives (2005, p. 2) reported that the claims of substantial learning gains for secondary students align with their own findings. They add that attendance, retention of learning and the quality of work all have been shown to improve. There is some evidence that formative assessment also works for disadvantaged secondary students as reported in OECD CERI (2008). They found that these schools moved from failing to exemplary status over the course of a few years by engaging in formative practices.

However enhanced learning resulting from formative assessment will most likely vary in kind and size from one aspect of formative assessment to the next and from one subpopulation of students to another (Bennett 2011). In support of this, Hattie (2012) states that ‘everything works’ if your only objective is to enhance education. He compiled over 900 meta-analyses and computed effect sizes for different educational interventions and demonstrated that some interventions can have a much greater impact than others.
2.2.3 An Effective Focus

One of the essential elements of formative assessment is the use of varied approaches to assessment (OECD CERI 2008). The use of observation, review of student work, portfolio, interviews, tests and quizzes being cited as examples (Shepard, cited in Looney 2011). This review has focused on the frequent use of tests.

Wilson et al (2011) found that students using computer assisted practice exams earned significantly higher grades in their first year college geography summative assessments. Snooks (2004) encourages third level instructors to use regular practice tests, immediately followed by whole class discussions and instructor feedback.

Smith (2007) felt confident in concluding that frequent, individually completed, online tests that assessed learning and provided feedback at third level correlated with summative exam success. Bangert-Drowns et al 1991b (cited in Black and Wiliam 1998 p. 35) investigated the effects of frequent class testing using a meta-analysis. They found that performance improvements occur when frequent tests are short as opposed to long. In addition they found that the larger the frequency of tests the better the performance so long as that frequency was not greater than one or two tests a week.

2.2.4 Testing Effect

The literature demonstrates that with at least one study opportunity students demonstrate greater retention in final delayed tests when using practice tests than when using repeated study (Roediger and Karpicke 2006). This they state is due to a phenomenon called the testing effect. This effect was well documented for thirteen year olds and undergraduates in separate studies (McDaniel et al 2007; McDaniel et al 2011). Due to this testing effect they promote the idea that frequent classroom testing should be used to promote learning and not just evaluate it. However without feedback to the students the tests cannot be considered formative in nature (Black and Wiliam 1998). OECD CERI (2008) add that feedback is vital to formative assessment but that not all feedback is effective.
2.3 Feedback

2.3.1 Definition

For the purpose of this review, feedback will be defined as ‘information communicated to the learner that is intended to modify his or her thinking or behaviour for the purpose of improving learning’ (Shute 2008). More specifically this case study will focus on feedback at the task level. This level of feedback includes information about how well a task has been accomplished or performed (Hattie and Timperley 2007). Shute et al (2007) say that feedback at this level is specific, in that it actually addresses an answer or response directly and it is timely.

2.3.2 Answer Feedback

Task level feedback comes in two broad varieties according to Shute (2008) in a comprehensive review of formative feedback. These are verification feedback, meaning confirming whether the answer is correct or not and elaboration feedback, where the incorrect answer is explained and the correct answer is addressed. An extension of verification feedback is answer feedback, where the student is shown the correct answer and is not limited to a simple correct or incorrect (Marsh et al 2012, p. 646). In their research answer feedback was better for correcting original errors than verification feedback. They add, though, that both types of feedback were superior to no feedback for general knowledge, multiple choice questions (2012, p. 651).

In general, in order for feedback to be effective, whether verification or elaboration, it needs to contain certain features (Jordan 2012). She says that feedback needs to be relevant to the goals of the task, objective, tailored to the actual mistake and must be understood by the student. Looney (2011) adds that it must be timely. Ineffective feedback can either have a negative or well below average impact on learning (Hattie and Timperley 2007). They add that feedback builds on knowledge and that when a K-12 student simply lacks knowledge re-teaching is more effective than any form of feedback.
2.3.3 Attention Paid to Feedback

The attention students give to feedback may be critical (Butler and Roediger 2008, p. 613). They found, while working with undergraduates, that feedback seems to be an all or nothing proposition. Their work used multiple choice questions and they report that if students do not fully correct the error then feedback will be ineffective.

Kulik and Kulik 1988 (cited in Metcalfe et al 2009) found that delayed feedback often produced better results in the laboratory but that immediate feedback often produced better results in the classroom. Metcalfe et al (2009) hypothesised that this may be attributable to students not paying sufficient attention to feedback when it is delayed.

In their work with grade six and college students they ensured that the students had to type the feedback into the computer for both the immediate and delayed feedback conditions. They used this as a method of ensuring that students all had at least that minimum amount of engagement with the feedback. The resultant research produced better results with delayed feedback in the classroom indicating that their hypothesis was correct. Students across the education spectrum, they say, need to pay attention to feedback.

The amount of information provided in elaborated feedback seems not to be linked to learning outcomes across student ages (Bangert - Drowns et al 1991). They speculated it could have been due to students not paying attention to the feedback or being mindful of it. They speculated that students are really just interested in the correct answer and not the explanation. Morrison (1995) add that the third level students they tested using multiple choice questions may only have been interested in whether they got a question correct or not and lost interest in the tested information once informed.

Motivation of undergraduate students is vitally important and test creators need to be aware of it (Morrison et al 1995). They add that the use of performance incentives could be more important than the exact nature of feedback messages. Butler et al (2007) state, based on their research with third level students using multiple choice questions that it may be beneficial to provide incentives for students to engage with feedback especially when delayed.
2.3.4 Effective Feedback

Hattie (2012) created a list of one hundred and fifty influences on achievement and their effect sizes based on his study of meta-analyses for the general school system. Feedback ranks tenth with an effect size of 0.75. Any result greater than 0.4, he states, is considered to have a better than average influence on achievement. However, there is no one best method of formative assessment (Black and Wiliam 1998). In addition, Shute (2008) concludes that there is no ‘best’ feedback method for all students and learning outcomes.

Gosper (2010) while researching third level quizzes created a table indicating in what ways verification and elaboration feedback may be employed, Appendix C. She proposes that verification feedback, provided immediately is more suitable for ‘factual’ and ‘conceptual’ knowledge domains from the revised Blooms taxonomy. On the opposite side elaboration feedback, provided at a delay, may be best for the upper levels of the revised Blooms taxonomy. However she cautioned that further research is required.

2.3.5 The Link between Feedback and Learning

Butler and Roediger (2008) showed that feedback was better at increasing correct answers in multiple choice tests and reducing the retention of lures. They also showed that providing feedback whether immediate or delayed was always better than the no feedback condition with third level students. Also Metcalfe et al (2009) went further and felt confident enough to declare that the beneficial effects of corrective feedback on learning for students are now beyond doubt. However it needs to be remembered that the specific link between feedback and learning is still murky even after around a century of research (Epstein et al 2003). In addition Shute (2008, p.156) points out that of all the research carried out investigating the links between feedback and learning the conclusions have ranged from inconsistent to contradictory to highly variable.
2.4 The Timing Issue

2.4.1 Definition

Without a strong link between learning and feedback the optimal timing of student feedback is difficult to resolve and in fact remains unresolved in the literature (Butler and Roediger 2008). Clouding the debate over timing is terminology. In the literature immediate can mean anything from seconds to a week and delayed can mean anything from end of a test to a month or more (Brosvic et al 2005). For the purposes of this review immediate will refer to seconds after a response using the answer until correct methodology. Delayed feedback will refer to twenty four hours.

2.4.2 Immediate Feedback, Answer until correct: Research

One particular method of providing feedback for multiple choice questions is called answer until correct and extensive work has been carried out on this methodology in the past ten years by a number of authors, (Brosvic et al 2006; Dihoff et al 2003; Dihoff et al 2004) with third level students and (Epstein et al 2003) with elementary grades.

The benefits of immediate, answer until correct feedback according to these authors are as follows:

1. Immediate feedback combined with answer until correct promotes learning and retention over delayed feedback for students from junior grades right through to college. A delay of up to one day was researched.
2. Immediate feedback is particularly useful when recognition and identification are required by the test.
3. Answer until correct allows students to change their answer until they have the correct response. This iterative responding is believed to help the student to self correct.
4. Proximal knowledge can be rewarded by progressively lower marks for each subsequent response.
5. Progressively lower marks should also help to avoid careless random guessing (DiBattista and Gosse 2006).
2.4.3 Delayed Feedback Research

Feedback may also be delayed. Butler et al (2007) state, that the main point of contention around delayed feedback is how the delay enables students to correct answers. This section outlines the general findings of the delayed feedback researchers.

The literature review findings for delayed feedback are as follows:

1. Butler et al (2007) found that both ten minute and twenty four hour delayed feedback produced superior results to immediate feedback for undergraduate students completing multiple choice tests.
2. Butler and Roediger (2008) found that a ten minute delay of feedback was superior to both immediate and no feedback conditions for undergraduates.
3. Roediger and Butler (2011) point out that for longer delays the research generally supports delayed feedback over immediate.
4. Kulhavy and Anderson (1972) found that with immediate feedback high school students spent less time reviewing their feedback for multiple choice questions. They proposed that students experience fatigue and frustration with their errors when feedback is immediate.
5. Metcalfe et al (2009) highlighted that delayed feedback comes closer to the final test than immediate feedback. They controlled for this lag to test and found delayed feedback (from a day to a week) was still superior, but only for sixth graders and not for college students.

2.4.4 Behaviourism

The approach of the immediate feedback authors has its foundations in the behaviourist inspired teaching machines of Pressey (1926) and Skinner (1958) where it is believed that feedback should be provided as soon as possible in order to eliminate incorrect responses and reinforce correct ones. The opposing school of thought believes that reinforcement and feedback are functionally different (Butler and Roediger 2008).
2.4.5 Delayed Retention Effect

Delayed feedback works, it was proposed, because time is needed to allow errors to dissipate allowing the acquisition of the correct answer to be made easier Kulhavy 1977 (cited in Butler and Roediger 2008). In other words errors made in the initial test will not interfere with correct answers because they will likely have been forgotten (Dihoff et al 2004). This delay is also known as the delayed retention effect or DRE.

2.4.6 Spacing Effect of Delayed Feedback

Smith and Kimball (2010) concluded that delayed feedback is a class of spacing effect and that immediate feedback is a type of massed presentation. There is large body of literature that demonstrates the benefits of spaced practice, as opposed to further study (Metcalf et al 2007). They add that it works for a wide range of material for primary grade students demonstrating that not only are frequent tests a useful tool for evaluating a student’s progress but they are a valuable learning tool also. However caution is urged as the spacing effect benefits are not yet fully understood (Metcalf et al 2009). They hypothesise that the benefits of the spaced effect may be diminished when students make many errors of commission. In this instance they believe that immediate correction may be more beneficial.

2.4.7 Inconclusive Research

Some studies however do not favour one timing method over the other. Bowman and Laurent (2011) demonstrated with their physical education undergraduates that immediate answer until correct feedback did not improve their scores over traditional assessment. They did however report that the students rated the answer until correct system for testing very highly in a satisfaction survey. Also third level students in a separate study perceived the immediate feedback setup as being more useful for their learning (Van der Kleij et al 2012). Gosper (2010) hypothesised that the answer until correct methodology would improve learning but her work did not support this. However she states that the tests contributed only a small percentage to the undergraduates overall score and that they may not have meaningfully engaged with the material as a result.
2.4.8 Subject Specific

The inconsistencies in results between immediate and delayed may be down to what is tested, in other words results for specific studies may be subject domain specific and not be open to generalisations (Brosvic et al 2005). In conclusion Shute (2008) proposes that both immediate and delayed feedback may have both positive and negative attributes and that either may come to the fore depending on the context of the assessment.

2.4.9 Summary (LRO1)

Frequently administered formative assessments have been shown to enhance learning (Black and Wiliam 1998). This is most likely due to what is known as the testing effect (Roediger and Karpicke 2006). In order for these assessments to be considered formative, feedback must be given to the student (Black and Wiliam 1998). When this feedback is best provided is an issue that remains unresolved and poorly understood (Butler and Roediger 2008).

2.5 Multiple Choice Questions

2.5.1 Introduction

Students may benefit more from tests that require generation of answers (for example short answer questions) than from multiple choice tests that simply require recognition of answers (McDaniel et al 2007; McDaniel et al 2011; Roediger and Karpicke 2006). In addition multiple choice questions have received frequent negative commentary and are sometimes perceived by third level lecturers as being only superficially useful (Johannesen and Habib 2010). Also, well constructed multiple choice questions are very time consuming to put together (Clay 2001; Roberts 2006).

However this question format is also known to provide an efficient and effective measure of student learning at all levels of education (Clay 2001; McKeachie 1999 cited in Butler and Roediger 2008). Just as there is no one best way to implement formative assessment (Black and Wiliam 1998), there no one best way of providing feedback (Shute 2008).
Multiple choice questions are not a best question methodology and no one method of assessment will provide a K-12 teacher with all the information they need (NCCA 2007). Frequent practice tests were cited as a useful method to employ formative testing (Smith 2007) and multiple choice questions are a useful tool for this purpose as they are considered to be one of the most versatile of the question types (Clay 2001). However guessing (Clay 2001), recognition testing (Coombe, Folse and Hubley, cited in Coombe 2011) and the adoption of lures (Roediger and Marsh 2005) are key issues.

2.5.2 Guessing

Butler and Roediger (2008), state that guessing is a problem. Students, they say, are often not penalised for guessing on multiple choice tests and as a result may achieve an inflated score relative to their ability, on top of that the instructor will not have any information on whether the student’s answers reflect what they believe to be true. The potential to guess the answer has prompted some to refer to multiple choice testing as ‘multiple guess’ (Clay 2001).

Harper (2003) highlights the possibility that multiple choice questions can be answered by elimination of obviously incorrect lures. However, obvious lures can be reduced by good question design as highlighted by (Clay 2001). He provides general guidelines for making multiple choice answers more difficult for K-12 level students to guess.

They include:

- Keep answers roughly equal in length.
- Disperse correct answers equally among the lures.
- Avoid using always or never in lures.
- Avoid choices that are opposites of each other.
- Add an additional lure.

Waring and Takaki (2003) used a straightforward ‘I don’t know’ option with their nineteen year old subjects, in place of an additional lure in an attempt to curb guessing. They do not record what impact if any this had on scores.
Brown (2001) also says that random guessing can result in an undeserved grade. However he demonstrates that negative marking can cut back the amount of guessing as students in general are afraid of losing marks. He demonstrated this mathematically, stating that provided that three lures and a correct answer per question are used and with at least twenty questions in the test, only 1.39 percent of students could potentially pass by guessing. Negative marking, he has shown, will not eradicate the problem entirely but can cut it down in significance substantially.

As an alternative, Prihoda et al (2006) used a weighting formula to correct for guessing in multiple choice questions. They compared multiple choice question results with equivalent generated answer tests, such as short answer questions. The assumption being that it is very difficult to guess in that format. They state that this correction method increases the validity of multiple choice questions by eliminating the guessing factor.

Another alternative approach to guessing was researched by Jennings and Bush (2006). They state that what is considered guessing it is not always a negative reflection on a student’s knowledge, regardless of their age. They argue that a test taker may not be certain of the answer but have it narrowed down. In this case ‘educated guesswork’ reflects partial knowledge of the answer and should be rewarded with partial marks. They showed that free choice tests (where a student is not forced to answer, but may provide more that one answer) generously rewards partial knowledge more than regular tests and that they punish random guessing more harshly than normal tests.

2.5.3 Recognition Testing

It is widely held that multiple choice questions only measure surface knowledge and recall of facts and not understanding (Nickol 2007). Scouller (1998) adds that where undergraduates expect multiple choice summative exams their preparation employs only surface learning approaches.
However Glaser 1984 (cited in Veeravagu et al 2010) stated that knowledge of a domain is the best determinant of expertise. Harper (2003) states it is axiomatic that students need basic knowledge before they can understand more demanding interrelationships and application of knowledge. He adds that multiple choice questions appear to be an ideal vehicle to assess basic knowledge.

Although multiple choice questions are most often used to measure knowledge, well designed questions are capable of measuring higher cognitive processing (Veeravagu et al 2010). At least for third level use multiple choice questions may be an effective alternative to essay style questions for measuring critical thinking skills (Kim et al 2012).

2.5.4 Adoption of Lures

Third level students often take a lure and adopt it into their knowledge and reproduce it on a later test and that by increasing the number of lures the problem can become greater (Butler et al 2006). Although they specify that where a student has scored highly on a multiple choice test additional lures have little impact but the opposite is true when the initial test was found to be difficult.

Dilution of the Testing Effect

Adding to the problem Roediger and Marsh (2005) showed that although practice multiple choice tests with undergraduates demonstrated a positive testing effect the adoption of lures lessened it. In the no study, no feedback, free report condition students adopt lures and they also possess a high confidence in them (Butler and Roediger 2008). However these authors found that additional lures did not significantly impact on the scores in a statistical sense and stated that where research has found additional lures to be progressively harmful, such as (Roediger and Marsh 2005), the effects were statistically small.
Prior Study and Feedback

Important measures that can help counter this negative side of multiple choice testing are prior study and feedback (Butler and Roediger 2008). Fazio et al (2010) found that although lure retention for undergraduates does persist over time (a one week interval) he found that feedback minimizes this negative side of multiple choice testing.

Confidence in Lures

In addition Hattie and Timperley (2007) state that feedback is most effective when the students have a high level of confidence that their selection of a lure was the correct answer. Butterfield and Metcalfe (2001) and (2006) cited in (Metcalfe and Kornell 2007) found that when using a multiple choice, recognition task with undergraduates, lures held in high confidence were most easily corrected. This could possibly be explained by the findings of (Van der Kleij et al 2012). According to their work, third level students spent more time reading feedback when their initial response was a lure than when it was correct.

Importance of Feedback

There is an increasing body of research now pointing to the fact that feedback serves two functions, not just error correction but also the strengthening of initially correct responses, (Smith and Kimball 2010) and supported by their research with third level undergraduates. However Pashler et al (2005) found that feedback for initially correct responses made little difference to performance in later tests in their online study of adult volunteers compared with feedback for incorrect responses. Pashler et al (2005) recommended that no feedback be provided for correct responses. However they stated that the learner could infer that their response was correct when no feedback was supplied and that this is itself a form of feedback so a contradiction is not necessarily present.

2.5.5 Vocabulary and Multiple Choice Questions

Vocabulary testing is a focus of this case study. Waring and Takaki (2003) concluded that multiple choice tests are limited and are not necessarily the best way to assess new word learning from context. Although, these authors added, they do have a role as a pedagogical classroom tool in a formative assessment context.
Multiple choice questions for vocabulary tests though have shown numerous benefits for vocabulary recognition testing (Coombe 2011). She reports that they are reliable because there is only one correct answer if well written, they are practical as they are easy and quick to mark and they are versatile in that they can assess word knowledge in a variety of ways (synonym recognition, definition, meaning in context and odd man out). Finally she adds they are a familiar question type for students globally.

2.5.6 Summary (LRO2)

Multiple choice questions have their downsides. Firstly they are not as effective for learning as tests that require a generation of answers. Secondly when poorly designed they are prone to guessing and the adoption of lures. No one question format is perfect and a variety of formats should be used as part of an overall assessment policy (NCCA 2007).

The generation of answers is known to be better for learning because multiple choice questions only test recognition skills (McDaniel et al 2011). However this is not a completely fair criticism because there are times when this is exactly what is required (Harper 2003).

Guessing in this question format can be combated by various strategies (Clay 2001; Brown 2001; Jennings and Bush 2006; Prihoda et al 2006). Adoption of lures can be lessened as an issue through prior study and feedback (Butler and Roediger 2008).

In addition, Butler and Roediger (2008) say that multiple choice questions are considered very reliable across scorers unlike essay style questions that can be more subjective. Chan et al (2011) adds that they have high validity, reliability and manageability. In addition feedback can be readily given for multiple choice questions whatever the method used (Nickol2007).
2.6 Online Assessment

2.6.1 Introduction

Online assessment can be simply described as computer based assessment (Johannesen and Habib 2010). This definition could include everything from online portfolios to online practice tests (Barbera 2009; Angus and Watson 2009). This literature review will focus on the advantages and disadvantages of online practice tests and the drivers and barriers to their use in mainstream education.

Currently research into online learning and assessment is quite new and much of the literature comes from the third level education system (Means et al 2010; Johannesen 2012). As an example of the lack of emphasis on online learning and assessment for Irish or European primary schools neither the (INTO 2008) or (NCCA 2007) mention online assessment and learning with the exception of e-portfolios. It is likely this is the case because online instruction at K-12 level is still in its infancy (Picciano and Seaman 2009).

2.6.2 Data Protection

With online testing there is an obligation on schools in Ireland to comply with the data protection act 1988 and the amendment act 2003 (Office of Data Protection 2013). There are eight key responsibilities for schools to undertake. They are as follows.

1. Obtain and process information fairly.
2. Keep data only for specific and legal purposes.
3. Use it only for the initial intended purposes.
4. Keep it safe.
5. Keep it accurate.
6. It must not be excessive.
7. Keep it for only as long as is necessary.
8. Provide copies of information stored to relevant persons on request.
2.6.3 General Advantages and Disadvantages

Although there are unprecedented opportunities provided by new technologies to reconsider what is possible in terms of assessment (Challis 2005), technology cannot be considered a panacea as mentioned by Oppenheimer (1997). There are however numerous advantages and disadvantages inherent in online assessment but ultimately it is the pedagogy that matters the most (Chan et al 2011).

Whether a test is completed on paper or computer could be an issue as mentioned by (Clariana and Wallace 2002). However they found that as students become equally familiar with both test modes, they perform equally well providing the two tests are equivalent. In addition to this Kingston (2009) conducted a synthesis of studies of the comparability of pen and paper tests with computer or online based tests over a ten year period, (1997 – 2007). One of their specific findings was that grade level of the learner seems not to have an impact on whether a pen and paper test is superior to a computer or online based test.

Despite the dearth of studies relevant directly to primary school students there are some published studies. Metcalfe et al (2007) worked with sixth and seventh grade students and separately, undergraduates, to generate answers as opposed to multiple choice questions. They report that the testing effect they made use of in their computer programme benefitted learning for elementary grade students more so than did further study.

Metcalfe et al (2009) used a computer programme with grade six students and undergraduates. They found that manipulations that effect memory appear to have a greater impact on primary students than older college students for their answer generation method of testing subjects. The reason for this, they state, could be because college students are better to enact effective study strategies on their own whereas primary grade level students are much more likely to rely on the teacher for help.
2.6.4 Specific Advantages and Disadvantages

It has been demonstrated that first and second level students with little or no knowledge of computer use are at a disadvantage in computer based assessments (Russell et al 2003). However the computer based experience of these students has changed dramatically in recent years (Kingston 2009).

Other potential issues include the potentially disruptive effects of forgotten passwords, students knowing each other’s access information and computer trouble shooting which can divert the teacher’s attention from assisting students and invigilation (Chan et al 2011). These can be mitigated according to Kingston (2009) by giving students opportunities to practice with computer based testing in order to become familiar with the format and the issues.

The general advantages of online assessment have been widely discussed for third level (Hu and Xie 2010; JISC 2004; Miller 2009). Challis (2005) in particular discusses many of the general advantages of online assessment.

They include:

- The creation of a private space where students’ potential inadequacies are not on display.
- Students appreciate being able to work at their own pace.
- Feedback can be embedded in numerous formats in the assessment.
- A large variety of instant question and student statistics are available.

Chan et al (2011) add that there is the potential to set up practice tests for students to attempt out of class in order to check and remedy their misconceptions and that database of questions can be built up saving even more time. Van der Kleij et al (2012) state that there are didactic advantages to computer based assessment over traditional methods in that feedback can be provided at the time of testing making formative assessment more achievable. They add however that there is no unequivocal evidence yet as to how feedback should be provided for best effect in the computer environment.
Presently learning management systems can incorporate these benefits and provide a space for students to embed and showcase their work from online and offline sources (Oxford University Press 2013). Haiku LMS (2013) is an example of a learning management system that incorporates these benefits. It was the system used in this case study and was specifically designed for primary level institutions. It has published its privacy policy for the data saved in its system Haiku Learning (2012).

2.6.5 Drivers and Barriers

Currently in America there is an apparent increasing awareness of the importance of online learning and assessment (Johnson et al 2011). With online instruction comes the need to calibrate online formative assessment techniques to match online instruction (Vonderwell and Boboc 2013). Already the OECD PISA (2013) have given countries, for the first time, the option of computerised tests in maths literacy for the 2012 round of international tests (with reading literacy to follow) in recognition of the common use of computer based mathematical tools in the workplace which they state will be increasingly prevalent as the century progresses.

This increasing awareness may be because there are many drivers for online assessment and learning (Picciano and Seaman 2009). They state that there are a quickly rising number of students at primary and secondary level in America taking online courses as part of their education and that provision in terms of policy and providers are growing at a rapid pace. Their survey includes a cross section of schools and not just virtual school intakes. If online enrolment for K-12 takes the same path as for third level it is likely that it will form a substantial component of all learning at K-12 level, although at secondary level in particular (Picciano et al 2012). There could be as many as three million students now taking online courses at K-12 level in America (Watson et al 2012).

Learning management systems are beginning to integrate self, peer and summative assessment based on automatic analysis of learner data (Redecker and Johannessen 2013). This, they state, will facilitate the way for learning analytics. This is where assessment is embedded into the learning making it truly formative.
Also online assessment has the ability to use animations, simulations and offers the ability to measure a fuller range of cognitive complexity (Pearson Assessments 2013). Other drivers for online assessment include a maturing capability and confidence in the use of technology among users (Craven 2013).

However the challenges may not be easy to overcome according to (Watson and Ryan 2006). They cite the fact that technology and online educational practice are changing so fast that creating an appropriate policy frameworks for online learning will be a challenge. Barriers have also been identified by (Picciano and Seaman 2009). They include on-going funding problems, initial development costs and teacher training.

Other barriers include teacher beliefs, attitudes, confidence and digital resources (Hew and Brush 2007). They add that due to high stakes assessments in America teachers did not have the time or the inclination to try new things. It seems that what will really drive online learning and assessment forward or hinder it is funding and whether it can in the future achieve more with fewer resources (Chingos 2012).

2.6.6 Summary (LRO3)

Online testing has numerous advantages and disadvantages, barriers and drivers. A lot more research is needed into online assessment before it is properly understood at all levels of education (Gaytan and McEwen 2007). They add that whatever online assessment is being attempted, there are a few common features they should contain. They should be varied, contain timely and specific feedback and be conducted on a regular basis. The lack of research is most likely because online instruction at K-12 level is still in its infancy (Picciano and Seaman 2009).
2.7 Conclusion

This review focused on a specific aspect of formative assessment, frequent quantitative online tests. Frequent tests appear to hold much promise due to a phenomenon called the testing effect. However of great importance to frequent testing is feedback, without it they cannot be considered formative (Black and Wiliam1998).

Hattie (2012) found that feedback has a large influence on learning. However if students lack motivation or simply are not mindful of, or attentive to the feedback it loses its value (Butler and Roediger 2008). Incentives to engage with feedback may well be beneficial to learning (Butler et al 2007). A contentious issue and a focus of this case study was the optimum timing of feedback provision. The literature review found that this issue is unresolved.

Multiple choice questions were a focus of this review for the delivery of frequent formative tests. Multiple choice questions for vocabulary assessments have numerous benefits for vocabulary recognition testing (Coombe 2011). She adds they are also a familiar question type for students globally.

Technological developments and tools have improved the flexibility of multiple choice questions (Nickol 2007). Chan et al (2011) states that practice tests are easier to set up online and can be completed in or out of school as appropriate. Students can work independently, (Challis 2005) for example, but time can be lost through forgotten passwords. Experience with online testing though can mitigate many of the disadvantages Kingston (2009).

Although online instruction and assessment face barriers as well as drivers, on balance it seems that education is on the cusp of change (Johnson et al 2011). Funding shortfalls, the inability of policy to keep up with change and teacher training are all hurdles that will need to be cleared (Picciano et al 2012).

This chapter has reviewed the literature relevant to LRO1, 2 and 3 as outlined in Chapter One. The findings of this review were used to inform the details of Chapter Three which follows.
Chapter Three: Methodology

3.1 Introduction

The review of the literature investigated LRO1, 2 and 3. These objectives helped inform the research approach taken in this case study. Specifically, this chapter detailed the methodology adopted to address RO1 and 2. Additionally it described the site and sample selection, the means of collecting data and the analysis approach taken. Finally potential limitations and problems with the chosen research strategy and its implementation were addressed.

3.2 Purpose of the Research

Much of the research into online assessment comes from third level (Johannesen 2012). However, online assessment appears to be gaining traction internationally for K-12 education. OECD PISA (2013) for example, now gives participating countries the option of computerised tests in maths literacy. In addition there is a move towards online module options for K-12 students in America (Johnson et al 2011). With this comes a push to develop online formative assessment that matches the instruction, (Vonderwell and Boboc 2013). There was an opportunity therefore to gain in advance an understanding of the issues involved and to further develop the resources available to the school.

3.3 Research Strategy

Experimental research appeared an ideal approach to this research. It concentrates on causal relationships which involves a separation of phenomena from their social context in order to achieve objectivity (Biggam 2011). However the classroom context was important to this study. Laboratory studies don’t always match the classroom experience (Metcalf et al 2009). As a result controlling all the variables was not a desirable condition and for this reason the experimental approach was rejected.
Action research involves in-depth analysis of a current problem, best solved by close collaboration between the researcher and those involved with the problem. This type of research is iterative in nature (Biggam 2011). Data is collected, analysed and the problem is revisited until an agreed solution is found. However this approach could not be completed in the given timeframe and with the resources available and so was also rejected.

Interpretative researchers believe that understanding the world involves social interactions that are time and place dependent (Mertens 1998). He adds that if this assumption is accepted, research will follow a more qualitative approach in order to understand the constructions held by subjects in that particular context. This approach fits with the requirement of this research to place online testing in the context of a primary school classroom.

As a result an interpretative case study approach was followed. Case study research has been described by Yin (1984) as an empirical enquiry that investigates a contemporary phenomenon within its real life context, in which multiple sources of evidence are used. One of the common criticisms of the case study approach is that its findings cannot be generalised (Borg 1981). However it is not an aim of this research to draw general conclusions instead this research seeks to shed light on what is happening in a particular setting and thereby adding knowledge to existing research.

The findings however may possess a degree of relatability (Taylor et al 2008). While schools have their own particular set of circumstances there will be a significant amount of common ground. Bassey (1981) believes that the relatability of a case study may be more important than its generalisability. In this way subsequent research in other classrooms and indeed other schools may be able to recognise similar issues and problems described in this research and hence learn from its findings.

3.4 Site and Sample Selection

The site was a four hundred and thirty student mixed Primary School in County Tipperary. The students are generally very academic and there are many high achievers as evidenced by the annual Drumcondra standardised tests, Appendix A. This work focused on one of the two mixed ability fourth classes. The class contained fourteen girls and fourteen boys.
Convenience sampling was used because it allowed for swift data collection and time was an important consideration. In addition the researcher had access to research subjects, both students and other stakeholders. Convenience sampling was valid because this case study had a narrow focus. This narrow focus allowed for the study to be completed within the existing time constraints and resources.

All online multiple choice test and survey procedures were explained to participants. Their involvement was voluntary and they could withdraw at any time. Students in particular were required to have their parents’ permission to take part and return a permission slip, Appendix J. All responses were anonymous. Student names used in Chapter Four are fictitious.

3.5 Research Tools

3.5.1 Introduction

RO1 and RO2 were the research objectives for this research. RO1 involved an investigation into online multiple choice vocabulary tests. RO2 required surveys and interviews to put these tests into the context of a primary classroom. The following sections describe the tools used to carry out this work.

3.5.2 Haiku LMS

Haiku LMS (2013) was used as the platform to deliver the tests. This service was named the best e-learning solution for 2012 by EdTech Digest (2013). There were numerous other viable choices for learning management system available to this researcher. Moodle (2013) and Edmodo (2013) were among the most prominent examples of widely used K-12 LMS services. However, Haiku had been the LMS in use with this class level for two years, prior to this research.
Haiku was also a suitable choice because it contained the necessary tools. These included multiple choice tests and the option to vary the number of lures. There was automatic feedback and correction. Feedback could be in answer until correct format or after a specified delay. There was a password protection option for tests which was used to prevent students engaging in further study outside of class. Haiku also had a grade book feature and basic question analysis. Test data could be exported to other software options for further analysis if required.

The students experience with online tests through Haiku marked them as suitable candidates for this study and Haiku as a suitable medium. This was because there were virtually no familiarity issues. Familiarity with the mode of testing is an important consideration as discussed in Chapter Two (Clariana and Wallace 2002). Some issues that were raised in Chapter Two such as test anxiety and forgetting passwords by now only caused the minimum of distractions. Additionally the parents of these students were by now aware of these online tests and had several months to form opinions of their own, pertinent to online testing in the classroom.

Students were also familiar with Quizslides (2012). This service allowed for quizzes to be created in PowerPoint before being converted into online multiple choice quizzes. This service contained all the necessary tools that Haiku had. However its advantage was that it allowed for a wide variety of marking schemes for multiple choice questions including negative marking to discourage guessing and free choice testing which rewards partial knowledge as discussed in Chapter Two. However for each of three trial periods Quizslides provided students with incorrect scores. This was frustrating for students and it was for this reason that Quizslides could not be used.

3.5.3 Survey Monkey

Survey Monkey (2013) was the online survey service used. It is a relatively new survey service among many on the internet but had been gaining mainstream credibility (Schonfeld 2010). It can easily, quickly and cheaply create user friendly surveys. It had a full range of question formats from open-ended to closed-ended and some analysis capability. Data can be exported to other applications for further analysis.
For this research the surveys could be made available to stakeholders instantly and without depending on the student to deliver and collect them. Stakeholders could access surveys through a web address, a link from Haiku or on paper. There were numerous similar services available such as Survey Gizmo (2013) and Zoomerang (2013). However this researcher has experience using Survey Monkey and for this reason it was the logical choice over other similar services.

3.5.4 Digital Voice Recorder

A digital voice recorder, with the permission of the interviewees, was used to record the interviews. It allowed a for free conversation style interview without the need for potentially disruptive note taking. Recordings were downloaded to computer and played back with a free software service called NCH Software (2013). These types of service are numerous, very similar to each other and freely available on the internet. This particular service proved reliable and efficient in the past and for this reason was used.

3.5.5 Excel and SPSS

Excel (Microsoft 2013) was used to collate the data from the multiple choice tests, the survey and interview data. This readily available service contained the necessary tools for the data analysis. In addition a statistical tool called SPSS (IBM 2013) was used to conduct a t-test on the data from the multiple choice tests. This was done in order to determine whether the mean scores for both immediate and delayed feedback test were statistically different. SPSS is a recognised standard tool for this type of task. Excel can conduct this test however it was not specifically designed for this type of work and for this reason SPSS was used.
3.6 Data Collection

3.6.1 Vocabulary Multiple Choice Tests

The online multiple choice vocabulary tests were constructed by this researcher in Haiku, Appendix I shows screen shots. The findings of the Literature Review were used for guidance.

Vocabulary learning and testing was the focus of the tests. Anderson and Freebody 1985 (cited in Dougherty Stahl and Bravo 2010) state that vocabulary knowledge is inextricably linked to reading comprehension and conceptual knowledge at K-12 level. Bloom 1976 (cited in Biemiller and Boote 2006) showed that a student’s vocabulary is very closely correlated with their reading comprehension. Vocabulary is essential to the language learning process (Coombe 2011). It is an essential building block of language and hence requires assessment (Schmitt et al 2001).

However Dougherty Stahl and Bravo (2010) caution that vocabulary and comprehension are multidimensional, incremental, context dependent and develop across a lifetime and as a result don’t lend themselves to simplistic assessment measures. Coombe, Folse and Hubley 2007 (cited in Coombe 2011) added that multiple choice tests are not adequate at the testing of productive language skills or language as communication for K-12 level students. This, they say, restricts the multiple choice format because it only measures a student’s ability to recognise and discriminate between facts.

In order to have valid multiple choice questions for these tests, vocabulary was presented as discrete elements from a selected list and without context. This was assessment of word recognition and not production. Due to this approach taken, multiple choice format tests were a suitable question format.

Vocabulary instruction here refers to the explicit instruction of the selected words in context with repeated reading. This approach has shown large increases in the acquisition and retention of vocabulary by primary grade students up to grade 2 (Biemiller and Boote, 2006) and for grade four McKeown et al 1985 (cited in the National Institute of Child Health and Human Development 2000).
3.6.2 Timing of Feedback (RO1)

Immediate feedback for multiple choice questions in this study means directly after a student submits an answer. In addition students re-answered until correct, when necessary. Delayed feedback means twenty four ours after the test. In both cases the student received the correct answer as opposed to a verification of being right or wrong, table 3.1. This is known as answer feedback. Chapter Two outlined a number of advantages to answer feedback. It has been shown to help students with error correction more so than verification feedback (Marsh, et al 2012, p. 651). This feedback method is thought to be most effective for factual knowledge (Gosper, 2010) and correcting initial mistakes (Marsh et al 2012).

<table>
<thead>
<tr>
<th>Table 3.1 Timing of Feedback – Definitions</th>
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<tr>
<td><strong>Immediate (Answer until correct)</strong></td>
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<tr>
<td>Student may re-answer a question and do so until they choose the correct option.</td>
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It was possible to award progressively lower marks for subsequent answers, in the immediate, answer until correct case. However for the purposes of this test, marks were only awarded on the first answer. This allowed for a direct comparison with the delayed test.

The attention students pay to the feedback provided emerged as a significant issue in Chapter Two (Butler and Roediger 2008). As a result students were required to make a list of the correct answers on paper to be handed up for the delayed case. This forced the student to make a conscious effort to review their answers. For the immediate feedback case pupils reviewed their answer feedback after each click on an answer.
3.6.3 Guessing

Guessing was raised as a serious issue in Chapter Two for the multiple choice question format. Negative marking is an effective counter strategy (Brown, 2001). However, negative marking was an unfamiliar mode of testing for the students and for this reason was not considered.

The free choice methodology espoused by Jennings and Bush (2006) also seemed to be an ideal option. However this service was only freely available in Quizslides which proved to be unreliable as it was still in beta.

Therefore, in order to combat guessing an additional lure was added. This was also considered an effective strategy (Clay 2001). This brought the number of lures to four taking the total number of options for each question to five. Although the possible adoption of lures could be a problem with this approach it was not expected to be a significant factor (Butler and Roediger 2008). One lure per question contained a nonsense word, but with a plausible structure. This was included to help expose potential wild guessing.

3.6.4 Pre tests

A pre test was conducted to exclude words that may have been familiar to the students. The words selected were from a 7th grade word list, downloaded from a vocabulary learning website called Flocabulary (2013), Appendix B. They analysed basal readers appropriate to seventh grade American students. Their list provided a convenient bank of vocabulary suitable for the equivalent of sixth class in Ireland.

This level of difficulty was required in order to ensure that students were being instructed and assessed on words they did not previously know or had little knowledge of. Assessing students on words they already knew would not produce useful data for this study. Words were checked to ensure they conformed to their normal spelling in the United Kingdom and Ireland. Words were also screened to ensure they were not specific to any particular cultural setting. This was done in order to minimise cultural bias.
Haiku was used to pre-test the raw vocabulary list. Appendix I provides screenshots of the pre test, the instruction stage and the tests. For the pre test the words appeared on screen with true and false options. True indicated a student knew the word, false indicated they did not. If eighty percent or more of the students claimed not to know a word then it was included in the research on the grounds that it was an unfamiliar word to most students.

3.6.5 Pilot Tests

Words selected from this process were randomly divided into four lists. Each list was assigned to a separate multiple choice test. There were two immediate feedback tests and two delayed feedback tests. The first immediate feedback test with the first delayed feedback test formed the pilot tests. Pilot tests were conducted in order to fine tune the testing procedure prior to research. The remaining two tests formed the immediate and delayed feedback tests used in the research.

3.6.6 Instruction Stage

Just prior to the immediate and delayed feedback tests the fifteen words to be tested were presented to the students, using Haiku, Appendix I. This stage was called the instruction stage, table 3.2. Each word was presented on screen with its definition and a meaningful sentence. Students had the option of listening with head phones to the audio of the word, the definition and the word in a sentence. This was an aid to understanding the text in front of the student and also to help create a sense of private space. Students were required to enter the word into a blank space to ensure that attention was being paid to the work. Making sure the student understood the question, had a sense of a private space and engaged with the work all emerged as important issues in Chapter Two.
3.6.7 Immediate, Delayed and Final Tests

Each test contained the same fifteen words presented to the students during their respective instruction stages. The delayed feedback tests were conducted on a Thursday morning. On the following Friday morning feedback was provided for the delayed test and the immediate feedback test was conducted, table 3.2. This was so that the delay from receiving feedback for both sets of tests to the final test was the same, seven days. This was found to be an important variable in Chapter Two (Metcalfe et al 2009). Close monitoring of students by the researcher and another teacher was conducted in order to ensure that students completed and reviewed their tests as appropriate. One week later the final tests were conducted. Answer until correct was not used and students received their results at the end of these final tests.

Table 3.2 Online Tests Timetable

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<tr>
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3.6.8 Data Collection: Surveys

Surveys employing both quantitative and qualitative questions were used to gather data on the views of the teachers, parents and students, Appendix E. Surveys provide convenience as it was impractical logistically and from a time perspective to interview stakeholders in small groups or individually. In addition the use of surveys was appropriate because data can be gathered on specific issues determined by the researcher but also allow for the stakeholders to express their views with open questions.

All surveys were pretested. Students from the opposite fourth class completed the student survey, members of staff who were also parents reviewed the parent surveys and two colleagues reviewed the teacher surveys. Pretesting was conducted to assess the wording, presentation and logic of the surveys and changes were made as appropriate.

In order to provide structure to the surveys and allow for the collection of quantitative and qualitative data, a combination of open and closed questions were used (Robson 1993). Each stakeholder survey contained similar questions to allow for comparison. From these common focus areas emerged various themes. Appendix F contains the participant responses colour coded by theme.

The Common Focus Areas were as follows:

- Time spent online and enthusiasm for online testing
- Advantages and Disadvantages of online tests
- Advantages and Disadvantages of online practice tests
- Speed of feedback
- Barriers and Drivers to online testing

The advantages and disadvantages were divided into online tests and online practice tests. Online practice tests refer to formative assessments that can be completed either in the classroom or at home whereas online tests refer to the weekly tests the students were used to. The difference is that online tests have been conducted on a regular basis outside of this research. Two categories were used to allow parents and students differentiate between the normal class practice and this research.
Reminders to parents to complete surveys were judiciously sent via homework journals. Students were surveyed in class in an attempt to avoid possible collaboration with parents on answers. Teachers completed surveys at their own time in school or at home. A due date was set for the completion of surveys to provide stakeholders with a soft deadline.

3.6.9 Data Collection: Interviews

Two interviews were conducted, separately, with the principal and computer teacher of the school to provide added depth to the study. They were thought likely to possess additional views in relation to the drivers and barriers to online tests that other stakeholders may not have possessed. The interview questions followed a similar pattern to the survey questions in order for comparison purposes. There was considerable scope for interviewees to express themselves as they saw appropriate beyond the scope of the questions in front of them, Appendix E.

3.7 Analysis

3.7.1 Test Analysis

Tests conducted on Haiku were automatically corrected. Score data was exported to Microsoft Excel for analysis. Students’ final recall test and their initial test were subtracted and bar charts were produced to help determine, visually, differences between immediate and delayed feedback tests. Box plots were then used to further summarise the data and more clearly highlight the difference between the tests in terms of maximum and minimum scores and importantly in terms of their mean scores. Finally a p-test was administered using SPSS. A p-test provides a probability value. It is a measure of the strength of evidence against the null hypothesis. It was used to statistically verify whether a difference between the means for the two tests was significant. This approach was followed so as to present the data visually for quick inspection and then to analyse its significance.
3.7.2 Survey Analysis

Descriptive analysis was used to organise the data gathered. It was suitable because this study does not attempt to describe the student population in general, simply this group under investigation. Common themes were identified. These themes were assigned a code in order to better track them across the data, Appendix F.

3.7.3 Triangulation

By collecting data from a variety of stakeholders, and selecting a class that has extensive experience with online testing it was expected that an enriched understanding of online testing would emerge. This allowed for triangulation to be used. In this research triangulation was used to help explain ‘in more detail the complexity of human behaviour by studying it from more than one standpoint’ (Cohen and Manion 1995).

3.7.4 Data Protection

Permission was previously sought and received from parents to permit the school to use Haiku with the understanding that there would be some data relating to their child stored there. The school complies with the data protection act 1988 and its amendment act 2003 (Office of Data Protection 2013). In addition written permission was sought for the voluntary participation of parents and students in this study, Appendix J.
3.8 Limitations and Potential Problems

3.8.1 Limitations of Tests

The sample size used in this case study was small, just one class in one primary school. A larger sample may provide different results. In addition the words used came from analysis of readers for American students and may have had some cultural bias. Also a delay of one day was the only delay tested for and delays of different durations could produce different results. Finally testing of material different vocabulary could produce different results as suggested in the literature review.

3.8.2 Instruction Stage

Student motivation may have been an important variable. It was not controlled for in this research. If these tests were to be conducted on a frequent basis this could be a significant variable as discussed in Chapter Two (Metcalf et al. 2009). An investigation into suitable motivational incentives could prove a useful exercise to combat this issue (Butler et al. 2007).

3.8.3 Immediate Tests

Students were instructed to answer until they had the correct answer in the immediate feedback tests. However students were aware that they would not be rewarded with partial marks for second and subsequent attempts. It was possible that they could move on to the next question without making further attempts and hence receive no feedback. Although possible it is not thought to be a major issue as students were very cooperative throughout the lead up to the research and for the pilot tests. In addition this researcher and a colleague patrolled the classroom ensuring students were complying with the instructions.
3.8.4 Interviews

Interviewing colleagues brings objectivity problems into focus. Transcript interpretations could be influenced by familiarity. To minimise this there was no discussion of online test issues with these colleagues prior to the interviews. However a more difficult limitation may have been the recording of the interviews. Interviewees, knowing they are being recorded may not provide answers that truly reflect their views.

3.8.5 Anonymity

Full anonymity was given to students, parents and teachers in the surveys. They were encouraged to speak freely because trust was of vital importance. All procedures must be transparent (Yin 2003). The limitation with anonymity was that it did not allow links between answers and participants. Links could have created a further line of investigation if needed. However it was felt that on balance stakeholders were more likely to cooperate and be honest with the survey if it was anonymous.

3.8.6 Reliability

The issue of reliability was a limiting factor. The comparison of feedback timings was being conducted over a short period of time and with a small sample of children. Differences in results could potentially arise if the study were conducted on a larger and longer scale with the same population or even a more representative population. However this work should be considered the first step into the investigation of online testing within the school.

Reliability is also an issue with the surveys and interviews. The survey data is opinion based which is significant because online testing at the primary level is still in its infancy and the views of many parents and relevant staff members may not be well developed. In addition not all stakeholders will have been exposed equally to online tests in the past year.
Yin (2003) suggests that the way to deal with case study reliability issues is to ‘make as many steps as operational as possible and to conduct the research as if someone were looking over your shoulder’. This case study meets this test of reliability as details of procedures and methods used were described in this chapter. All results, including interview findings are made available in the appendices. In addition, reliability comes from a highly structured and transparent approach, using research methods and data collection techniques that have credibility in the research community.

3.9 Conclusion

Chapter Two provided a review of the literature, guided by LRO1, 2 and 3. These objectives helped inform the research approach taken to fulfil RO1 and 2 and this chapter described the methodology used. It provided justification for the selection of these methodologies and showed how the research was carried out. It provided assurance that appropriate procedures were followed and outlined the limitations. Chapter Four presents the data collected from testing, surveying and interviewing.
Chapter Four: Case Study Findings

4.1 Introduction

Chapter Three, described the methodology used to investigate RO1 and 2. This chapter presents the data that was collected. Firstly the findings of the multiple choice vocabulary tests are presented and then the findings of the surveys and interviews together. They are presented in this order to reflect the order of the case study objectives they represent.

The research focuses on three groups of stakeholder at a large primary school in county Tipperary. They include the teachers at the school, the students of fourth class and their parents. The fourth class completed the online multiple choice vocabulary tests. The teachers working at the school, the same fourth class students and their parents took part in separate online surveys. Finally the principal and computer teacher were interviewed.

4.2 Multiple Choice Vocabulary Tests

4.2.1 Introduction

In the following presentation reference is made to the following tests.

- Pre-test (test used to select words for research)
- Pilot Tests (one delayed and one immediate)
- Research Tests (referred to as the Delayed Test and the Immediate Test)

Two separate sets of tests were carried out, pilot tests and the research tests. The delayed and immediate pilot tests are collectively referred to as the pilot tests. The research tests are referred to individually. Delayed refers to feedback being delayed by one day. Immediate refers to feedback being provided immediately using the answer until correct method.
4.2.2 Pilot Tests

The pilot tests were deemed too easy for the students. Nine students achieved 100% in the delayed feedback pilot test and seven students achieved 100% in the immediate feedback pilot test. As a result, for the research tests, thirty words were presented to the students at the instruction stage instead of the fifteen for the pilot tests. Students were still tested on just fifteen words randomly selected from the instruction stage. In addition the nonsense words used as a lure for each question in the pilot tests were replaced with real words, from the same word list. These replacement words were selected as 70% or more of students indicated they did not know what they meant in the pre-test. The pilot study showed that nonsense words were not being selected by students in the pilot tests and were therefore not useful as lures.

4.2.3 Test Results

The initial test results, whether delayed or immediate, were subtracted from their respective final recall test score. These values, which can be found in Appendix D, were used to construct bar charts, figures 4.1 and 4.2. These subtracted values are also used in constructing the box-plots, figure 4.3 and for calculating the subsequent t-test scores, table 4.3. Names used in the charts are fictional although girls’ names are used for girls and boys’ names are used for boys.

The majority of students did less well in the final test than the initial delayed feedback test, figure 4.1. The same outcome occurred for the immediate test condition, figure 4.2. This reduction in test scores is discussed in the Chapter Five, (section 5.3). While ten students did less well on the delayed test, figure 4.1, seventeen students did less well for the immediate test, figure 4.2. In addition the students in the immediate condition that performed less well on the final test did so by a larger margin than those in the delayed condition, figures 4.1 and 4.2. In the delayed condition the reduction in score was an average of 14%, in the immediate condition the average reduction was 18%.
There are twentyeight students in this fourth class. In cases where a student completed the entire delayed test but missed the immediate test (or vice versa) their results were omitted. Twenty six students completed both delayed and immediate tests and their corresponding final tests.

4.2.4 Box Plot

To further summarise the data a box-plot chart was used to clearly represent the distribution of results and their means, figure 4.3. The median score and the maximum score was lower for the immediate condition, figure 4.3. The only similarity relates to the minimum score which was the same for both conditions. This result was almost exactly replicated by the pilot tests.
4.2.5 T-Test

A paired-samples t-test was conducted using SPSS to compare the mean scores of the delayed feedback and the immediate feedback conditions. There was no significant difference in mean scores for the delayed feedback test ($M = -1.50$, $SD = 12.61$) and the immediate feedback test ($M = -8.69$, $SD = 15.28$); $t (25) = 1.897$, $p = .069$, table 4.1. These results show that although there is mean variation between the two test types, the difference is not significant. A $p$ score of <0.5 was required to establish a significant difference at the 95% confidence level.

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<thead>
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<th>N</th>
<th>SD</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
<th>M Diff</th>
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<td>26</td>
<td>15.283</td>
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Figure 4.3 Box Plot Comparing Test Results
4.3 Survey Findings

4.3.1 Introduction

Teachers, parents and students were surveyed using Survey Monkey. Each stakeholder group were given a different version of the same basic survey as discussed in Chapter Three. The survey questions for each group can be seen in Appendix E. The principal and IT teacher were interviewed using similar questions to match the themes used in the surveys. The full transcripts can be viewed in Appendix G.

4.3.2 Response Rate

The following represents the response rate:

- Teachers 12 out of 19 teachers (16 classroom and 3 learning support and resource teachers)
- Parents 24 out of a possible 28
- Students 25 out of 28 (three were absent on the day of the survey)

According to Survey Monkey, a twenty to thirty percent response rate is considered an acceptable response rate for an online survey. The teacher responses to follow may not fully represent the views of the entire staff. Further work is required to validate the views and opinions given here.

4.3.3 Structure

The structure of the survey findings section follows the focus areas common to each stakeholder survey. From each of these areas of focus emerge the themes, Appendix H. These emergent themes are discussed in relation to the findings of the literature review in Chapter Five. Appendix F contains the participant responses coded by emergent themes.
4.3.4 Time Spent online

All survey participants were asked about how much time they typically spend online to use as a potential measure of their confidence with using the internet (Eastin and LaRose 2000; Joyce 2011). However the primary function of the opening question was to offer a non-threatening and easy way into the survey.

Ten of the teachers surveyed reported that they spent between one hour and more a day online, figure 4.4. Just over twenty three students reported spending an hour or more on the internet each day, figure 4.5. With parents the numbers were more spread out. Just half of parents indicated they spent an hour or more online each day and the other half varied from a few minutes to it varies a lot, figure 4.6. One parent indicated they are never online. Generally participants appear to be familiar with using the internet.

![Figure 4.4 Teachers Daily Internet Usage](image)

**Figure 4.4 Teachers Daily Internet Usage**

![Figure 4.5 Students Daily Internet Usage](image)

**Figure 4.5 Students Daily Internet Usage**
4.3.5 Enthusiasm for online testing: Teachers, Students, Parents, Interviewees

The measurement of enthusiasm is not an exact science. This case study has tried the direct approach and simply asked. The weakness with this however is that people may be affected by social desirability (McLeod 2009). They may not give their true opinions but ones that they, subconsciously, deem to be socially acceptable. This was the reason for using anonymous surveys however it is not possible to measure the extent to which this phenomenon was present.

Teachers

Teachers were divided between neutral and very enthusiastic about the idea of using online testing in their classroom, figure 4.7. Overall teachers appear marginally positive about online testing with just two out of twelve teachers indicating that they were very unenthusiastic. Just one of those teachers left a comment. It said that ‘I am not very confident with technology ...’. This respondent rated online tests as unimportant and of limited use respectively. The other comment said that ‘I am not confident that the technology would be 100% reliable’. However this teacher rated themselves neutral regarding online tests.

Figure 4.7 Teacher Enthusiasm for Online Testing
Students

All twenty five students were between don’t mind and really like it, figure 4.8. Four of the eight comments indicated they found online testing made it easier or was ‘fun and cool’. Others liked the fact that they were allowed go on an approved website after they were finished but waiting for others. No child expressed dissatisfaction with online testing.

Figure 4.8 Student Enthusiasm for Online Testing

Parents

Parents were asked firstly for their opinion of their child’s enthusiasm and secondly for their own enthusiasm. A large majority reported their children as being between a little enthusiastic and very enthusiastic. However in contrast three parents indicated that their child was between unhappy and very unenthusiastic, figure 4.10. This is despite no student reporting a lack of enthusiasm, figure 4.8.

One parent commented that their child ‘appears unsure of himself and apprehensive’. However this parent added that while they are never online themselves they can see that computers are ‘the way of now and the future’. The remaining comments indicated enthusiasm for online testing with comments like ‘no time constraint so therefore gives him an opportunity to answer the questions’.

Three parents reported being between a little and very unenthusiastic themselves about online testing, figure 4.9. One of these respondents commented that ‘the use of IT ... has made my son much more interested in learning’. This comment appears to be at odds with the indicated level of enthusiasm. None of the other parents who indicated a lack of enthusiasm left a comment.
Interviewees

The Principal expressed conditional enthusiasm about online testing. She added that online testing is an example of the way things are going and that if online testing came on-stream that parents would probably go along with changes in school policy as they are very supportive. This partial enthusiasm appears to be in line with the general views of those teachers and parents that responded. In contrast, students were very positive about it, figure 4.8. However the Principal stated that that there is no ‘push’ from the Department of Education and the computer teacher added that as a result the enthusiasm of teachers would be a function of their level of interest in IT.
The computer teacher said she would be ‘fairly enthusiastic’ about online testing. She could see advantages such as receiving instant feedback but also acknowledged that there are ‘pitfalls’. Along with one of the parent comments she feels that getting into the routine of checking results online at home by parents could be an issue. The principal also felt that there would need to be a way to ensure that parents were accessing the tests and that they were being looked at. One parent, on this particular issue stated that ‘it would be a good idea if parents had to tick a box online to confirm that they had seen the results’. This suggestion has been passed onto Haiku.

Finally, the computer teacher, along with one teacher felt that technical issues would lessen enthusiasm for online testing. Technical issues did emerge as a big issue for all survey participants when asked about the possible disadvantages. This is further developed in the disadvantages to online Testing section.

4.3.6 Advantages of Online Testing: Emergent Themes

The findings on advantages and disadvantages are divided into online tests and online practice tests. Online practice tests refer to formative assessments that can be completed either in the classroom or at home, whereas online tests refer to the weekly tests the students are used to as discussed in Chapter Three. The most frequently reported emergent themes are presented in the following sections and summarised in Appendix H.

Experience

Three teachers and fifteen parents mentioned that it was an advantage that students are being prepared for and given practice with IT, figure 4.11. One teacher said that it ‘helps students become computer literate’ and another said that ‘children gain experience in using IT’. One parent said ‘yes it’s good that they have the discipline of using technology in different settings’. Another parent said online tests had the advantage of ‘preparing for future advances in educational use of computers’. Although this was the most frequently cited advantage of online testing, no student expressed the gaining of computer experience as an advantage.
Generally like

Just over one third of students made comments expressing that they liked online assessment, with one child saying, ‘I just like doing the test online’ and another saying, ‘it is cool’, figure 4.11. One teacher comment summed up the other adult responses by saying, ‘Children like IT’. Five survey respondents referred to a novelty factor at play with one parent saying, ‘Online tests are more of a novelty and therefore easy for children to sit’. In addition one teacher said that students ‘don’t view it as a test’ when they do it online, a sentiment shared by the computer teacher.

An alternative reason for students being very positive about online testing could be due to an issue not directly related to testing. Students found it an advantage that they could go on an approved website when they were done and waiting for the rest, such as Scratch (2013) and MangaHigh (2013). They made comments such as ‘I like it when we get to go on Scratch after we finish our test’.

Immediate Results

Instant feedback and correction emerged as one of the main advantages of online testing, figure 4.11. Almost every teacher and just over one third of parents reported that the instant correction of the tests was an advantage. Teachers made comments such as ‘immediate results and possibly analysis’ and ‘less time marking’. While parents said things like ‘immediate results for student and parent’ and ‘be able to ... compare to other weeks’. One student added that there was ‘no need for correcting’.

Independence

Only one teacher commented on the advantage to the child of having freedom during the test to work at their own pace, figure 4.11. No parent mentioned this as an advantage. Seven students commented that it was an advantage that they ‘don’t have to wait for anyone’ and that nobody has to ‘ask the teacher to repeat questions’. The advantage to students of being able to work independently was raised in the literature review (Challis 2005).
**Miscellaneous**

One third of the teachers, no parent and roughly one third of the students left comments that did not clearly fit into any emergent theme, figure 4.11. The most common response referred directly or indirectly to paper tests. One teacher said, ‘no paper, pens, pencils needed’, while another said, ‘another interesting approach to the usual written tests’. One student said that, ‘I like it because your hand does not get sore from writing’.

Five parents stated that having a record of the tests and results was an advantage. They said that, ‘We can look at the tests online’. Just one survey respondent, a parent, stated that, ‘I don’t think the online test has an advantage over the regular test’, but did not elaborate.

![Advantages: Online Testing](image)

**Figure 4.11 Advantages of Online Testing in General**

**Interviews**

The principal and the computer teacher reiterated some of the views expressed in the surveys. For example they both, independently, felt that instant feedback and having ‘a library of results’ would be a big advantage of online testing in general. The principal said the ease of recording test results for a student across their school career would be an advantage. She added that these records would be convenient for teachers, parents and even inspections.
The computer teacher added that tests can be accessed from mobile devices and that you don’t have to be at home to check the test scores. Some students have already availed of this facility with one saying, ‘tests can be done at home’. A final advantage mentioned by the computer teacher was that as a teacher you can instantly see how effective your teaching was and as a result modify your instruction. One teacher repeated this when they said it would be easy to, ‘allow for differentiation’.

**Importance to various Stakeholders**

Teachers were also asked how important online testing was for the three different stakeholder groups. The vast majority felt that online testing was between neutral and important for students and parents while eleven of the twelve surveyed said that it was between neutral and important for teachers, figure 4.12. No teacher reported that it would be essential and just one reported it had no importance for parents. That particular teacher left no comment.

Only two comments were left for this question. The first stated that it is the ‘way forward’; the second said that ‘I haven’t yet seen evidence that online testing is better than conventional testing’. This second teacher was neutral on the importance of online testing in general and expressed concerns around reliability of computers and the internet and the time required to set-up tests. However they also responded that online practice tests taken at home could be quite important to each of the stakeholder groups and that if there was to be an online testing initiative they would favour online practice tests in particular.

![Figure 4.12 Value of Classroom Online Testing – Teacher View](image-url)
4.3.7 Disadvantages of Online Testing: Emergent Themes

*No Issues*

One teacher and one student reported that there are no disadvantages. In contrast over half of the parent respondents reported that there are no disadvantages, figure 4.13. The actual responses were mostly a straightforward ‘no’. Some others were less clear cut. For example the teacher said, ‘I can’t see any disadvantages at the moment’ and a parent said, ‘No disadvantages that I can see’. Both sets of respondents qualified their comments, saying simply that there are no obvious disadvantages.

*Internet Issues*

Internet connectivity came up as a disadvantage especially with teachers and students, figure 4.13. One teacher said that there is a, ‘dependence on connectivity’. A student said ‘Sometimes the computer’s internet connection doesn’t work’, while another student left no doubt about how this made them feel, ‘I don’t like it when the internet doesn’t work’. Anecdotally it seems that the vast majority of internet connection problems are quite minor and temporary.

*Technical Issues*

Six teachers, one parent and four students mentioned technical issues in their comments, figure 4.13. Teachers appeared relatively more concerned with technical issues with one saying that, ‘Computers not always reliable’ and ‘laptop batteries can be low or empty.

*Unfairness*

Two parents and three students reported a degree of unfairness with computer marking, figure 4.13. One parent said that the ‘student complains that ... correct answers don’t get logged’. Also a teacher reported that valid answers can be missed where a ‘human corrector would give’ a score.

*Presentation Skills*

One teacher and four parents considered online testing to be potentially damaging to ‘presentation, grammar and spelling’ as mentioned by the teacher, figure 4.13. A parent felt that ‘handwriting and ability to organise themselves could be compromised doing tests online’.

56
**Miscellaneous**

Six teachers, three parents and six students made additional comments about the disadvantages, figure 4.13. For teachers they included, preparation time, a diversity of computer skills required by the student and finding and assessing suitable tests. However tests are made suitable by the teacher when creating them.

One parent pointed out that because tests are not being done across the school that students ‘will have to revert to timed tests next year’. One student said that ‘sometimes it is hard to do fadas’. The multiple choice question format was an issue for two teachers and four parents. For these respondents it was important to have a variety of question formats available for online testing. For one parent it is very important that students, ‘put answers into their own words’.

![Disadvantages: Online Testing](image)

**Figure 4.13 Disadvantages of Online Testing in General**

**Interview: Disadvantages of Online Testing**

The computer teacher cited similar disadvantages as other teachers. She mentioned time required to setup or prepare online tests and ‘computer glitches’. She added that it might be difficult to ensure parents were accessing the tests online. In fact one parent stated that ‘they never get to see them (results)’.
The computer teacher added that if online testing were to be adopted by the school everyone would need to operate from the same software. Every teacher would require training and that the ‘whole school would need to be onboard’. If online testing was to be adopted by the school the principal’s primary concern would be confidentiality. She queried the likelihood of achieving one hundred percent security in terms of hacking. This was a major concern for her, she said, because the security of students’ data is her responsibility in the school.

4.3.8 Advantages of Online Practice Tests: Emergent Themes

**Preparation**

Similar proportions of survey respondents cited preparation for the test as an advantage of online practice tests. Three quarters of teachers, two thirds of parents and just over eight tenths of students made similar comments, figure 4.14. One teacher said that students are ‘more confident in themselves’. A parent said that they would be ‘fully aware of what is expected of the child and be more involved’. One of the students said that they ‘have more time to learn what they got wrong in the practice’. Preparation was the single most important advantage of online practice tests, figure 4.14. Comments relate to online practice tests in class and at home.

Figure 4.14 Advantages of Online Practice Tests
Interview: Advantages of Online Practice Tests

The computer teacher said that a teacher gets to see where the students are in relation to where you want them to be and any deficiencies can be addressed. The Principal expressed the view that just like any area in life, practice helps. The Principal added that practice tests were like ‘guidance to learning’ and would possibly be very advantageous to a weaker student that needs more support.

Importance to Various Stakeholders

Teachers were asked how important online practice testing was for the three different stakeholders. This testing can take place in the classroom or at home. Most believed that they could be quite important for teachers, parents and students, figure 4.15. Teachers felt broadly similar about online tests in the classroom, figure 4.12. These tests take place on a regular basis, at the end of each week. There were no comments left to expand on why these tests could be important.

Figure 4.15 Value of Online Practice Tests – Teacher View
4.3.9 Disadvantages of Online Practice Testing: Emergent Themes

**No Issues**

The no issues category was by far the largest excluding the amorphous miscellaneous category, figure 4.16. Almost all comments, from each stakeholder group, stated either that there were no disadvantages or that they could not think of any.

**Internet Issues**

Five parents and one student (but no teacher) commented on possible internet and computer access issues for some families, figure 4.16. One parent said ‘not everyone may have access to an online facility’ and a student added that ‘some people don’t have a laptop’. On a technical note one parent added that ‘technology can be prone to failure’.

**Time Required**

For one third of teachers, preparation time figured as a disadvantage, figure 4.16. They were concerned that online practice tests could be ‘time consuming’ to set up and might be considered ‘doubling the same task’. Preparation time also was a factor for some teachers regarding online testing in the classroom. A Junior Infant teacher stated that these tests would be ‘difficult to organise / carry out and assess’ for her classroom. Online testing at this age level might well be significantly different to older age groups where students are more independent and computer literate generally. Just one parent felt that time could be an issue for their family, especially ‘when they get home late’. No student mentioned time required to complete online practice tests as being a disadvantage.

**Cheating and Over Confidence**

Four students felt that cheating could be an issue, figure 4.16. They said things like ‘people could write down the answers’ and ‘you know what is coming up and might cheat’. No teacher or parent commented on this as being a possible disadvantage. Interestingly one teacher and one student independently cited over confidence, figure 4.16. The teacher said that ‘if the child does well in the practice test he/she may not do any more work for the rest of the test’ and the student said ‘you might study really hard on Monday and then not bother to study on Friday’.
Miscellaneous

General comments again formed a large proportion of responses, figure 4.16. One parent said that the other kids at home would be ‘left out’. However one teacher was concerned with whether a student that needed extra practice would actually ‘heed it before the main test’. Supporting this concern, a student believed that ‘some people might not do it’.

![Disadvantages: Online Practice Tests](image)

**Figure 4.16 Disadvantages of Online Practice Tests**

Interviews

In regard to online practice tests at home the principal was concerned. She felt it is unlikely all parents have regular access to the internet and that as principal she needed to consider the ‘base line’. She stated that it would not be permissible to leave people behind due to a lack of resources. This was a concern shared with four parents and one student.

4.3.10 Speed of Feedback: Teachers, Parents, Students, Interviewees

Although end of test feedback was not a part of this case study research, teachers, parents and students are very familiar with it. This is because it is normal practice in this school for students to have their results to take home the day of the test. For this reason end of test feedback was included as an option in the surveys.
**Teachers**

Nine teachers and twenty parents indicated that they would prefer feedback for the student to be at the end of the test, figure 4.17. Only one teacher left a comment and said that immediate answer feedback ‘may discourage the student if the answer is incorrect’.

![Figure 4.17 Optimum Timing of Feedback – Teacher View](image)

**Parents**

Parents had a preference for end of test feedback, figure 4.18. Parents commented that immediate feedback ‘may lead to time wasting ... and the child may not then have time to finish the test’. Another parent felt that ‘the child needs time to assess the test for themselves before they get feedback so that they can become critical thinkers’. This is quite close to the idea of delayed retention effect discussed in the literature review.

![Figure 4.18 Optimum Timing of Feedback – Parent View](image)
Students

In contrast students clearly prefer immediate answers, figure 4.19. Students were asked which test they preferred as opposed to being directly asked if they preferred immediate or delayed feedback. Of importance is that they were not given the option of end of test in order to avoid confusion. Their comments were quite clear, ‘...you don’t have to wait to see your answers ...’, ‘you learn by your mistakes straight away’ and ‘it would encourage you to look over the words and think again’. This preference for immediate feedback was also found with third level students in the literature review, Bowman and Laurent (2011).

![Figure 4.19 Optimum Timing of Feedback – Student View](image)

Interviewees

The computer teacher added that end of test was best because if it was left to the following day students ‘may have lost interest’. The Principal also made this same point which was succinctly summed up by one student that said ‘I hate waiting’. In conclusion the principal expressed the view that results should be made available by the end of the day and certainly not instantly after each response.
4.3.11 Barriers: Emergent Themes

Teachers were asked what they thought may be the barriers to introducing online testing. Parents and students were asked how important they thought computers will be to their education in secondary school.

**Resources**

Ten teachers reported that the physical infrastructure could be a barrier, figure 4.20. Comments included ‘availability of technology’, ‘lack of laptops’ and ‘a computer per child might be difficult to achieve’. Currently this school has twenty eight laptops stored in two mobile trolleys which roughly equates to the number of students in each class.

**Internet Issues**

In addition to a ‘lack of laptops’ four teachers also commented that ‘internet quality’ would be a barrier, figure 4.20. These teachers said that an ‘unreliable internet’ and ‘connectivity’ issues cause problems. Unreliable internet access has been reported for other questions also by parents and students alike in the context of home and school.

**Preparation and Technical Issues**

Two teachers felt that the ‘time it takes teachers to set up tests’ and ‘the preparation time for all tests’ were barriers to online testing. Just one teacher considered that technical issues could be a barrier due to ‘unreliable ‘laptops / iPads’, figure 4.20.

**Miscellaneous**

Just three teachers fit into this category, figure 4.20. Two teachers wondered about ‘finding and accessing tests’ and ‘who creates the test for the children?’ These comments may indicate a misunderstanding. Tests are constructed by the teacher and should closely reflect what they want to be assessed. One teacher mentioned ‘teachers’ lack of knowledge’ as being a barrier. It is possible that teachers would welcome training if they were to be asked to undertake online testing. This possibility was alluded to in the drivers section.
4.3.12 Drivers: Emergent Themes

Training

Just two comments were left regarding training for teachers, figure 4.21. One teacher said that ‘training for teachers’ would be a driver and in support the other said that ‘teachers are open to new methodologies of learning’. This contrasts with one of the barriers listed which mentioned a lack of knowledge as being a potential problem.

Generally Like

Two teachers felt that the students’ attitude toward the tests could be a driver if they were positive toward them, figure 4.21. One said that ‘if children are ... enthusiastic about them that would help promote this system’ and the other said that the ‘children’s own comfort using computers’ is already a solid foundation to online testing in the future.

Internet Issues

One teacher felt that if we had ‘more reliable internet’ that could help drive online testing, figure 4.21.

Immediate Feedback

Another teacher felt that ‘instant and accurate feedback’ would help drive online testing in the future, figure 4.21.
**Miscellaneous**

Some teachers had a different angle on what could be a driver. One suggested that ‘if tests were practical and user friendly’ it would help and another said that ‘prepping the student for secondary school that uses the same system’ would help, figure 4.21.

![Drivers to Online Testing: Teachers](image)

Figure 4.21 Drivers to Online Testing – Teacher View

### 4.3.13 Interviews

Both interviewees expressed different ideas about the barriers and drivers to online testing. The computer teacher mentioned that in her opinion teachers and people in general are ‘resistant to change’. Teachers may be ‘fearful’ or even ‘terrified’ of having to do online testing especially if it was imposed. However she went on to say that ‘in this school you have people working together...’ and ‘if you have a summer course in the school where you are focused on online testing’ then ‘you’d have a whole school operating together to run it’.

The Principal stated that students are coming in at junior infant level and are already confident with using technology and that this is just the way the world is going. This means, she said, that we have no option but go along with it. However she cautioned that if any initiative is to succeed it needs the support of the staff and parents. She added that when things are forced from the top they are likely to fail.
4.3.14 Parent and Student View on the Future

Parents and students were asked ‘Do you think computers will have an important role ... in secondary school / in the future?’ No less than twenty three out of twenty four parents said that computers would be between important and very important to their child’s education in secondary school. Just one teacher commented on this. Parent comments reported that computers will be important for ‘jobs, interviews, tests ... will all use computers and be online’ and ‘absolutely, the way forward’. One parent said that computers would be very unimportant but no comment was left by this respondent.

Six students ticked ‘not sure’ if computers would be important in secondary school. One student left a comment saying ‘no’. Nineteen students indicated that they considered that computers would be between important and very important for secondary. No single reason emerged in comments to explain their belief. Comments included opinions such as ‘yes, because we will need to do lots of research’, ‘laptops might be cheaper than books’ and ‘yes for computer science’.

4.4 Conclusion

4.4.1 Tests

Although there is a trend toward feedback delayed by twenty four hours the difference in means was found to be not significant. The p-value obtained was 0.069. Whereas a value less than 0.05 was required, at the 95% confidence level, in order to be able to say that the difference was significant.

4.4.2 Surveys and Interviews

Themes to emerge from the survey data are listed in order of importance in Appendix H. This chapter described in detail the findings from the research carried out. In Chapter Five these findings are analysed and synthesised. To achieve this, the findings from this chapter are compared to the findings of the literature review. In this way all objectives are brought together and the research is prepared for a conclusion.
Chapter Five: Discussion

5.1 Introduction

Chapter Four described in detail the findings of the research stage of this case study. This chapter brings these findings together with issues from the literature review. In this way all objectives stated in the introduction to this work are brought together. They are analysed and synthesised and this case study is readied for a conclusion.

5.2 Structure

This case study asked one question. Is there a significant difference between multiple choice vocabulary test scores when feedback is provided to every response (answer until correct) as opposed to delayed feedback (one day) in the context of a primary school classroom? The first section of this chapter relates to RO1, the timing of feedback. The second part considers the context of a primary classroom relating to RO2. Both sections will draw from Chapter Two and objectives LRO1, 2 and 3.

5.3 Part 1: Testing

5.3.1 Introduction

RO1 sought to compare immediate (answer until correct) feedback timing with delayed (twenty four hours) feedback using multiple choice vocabulary questions. These tests were recognition and not production of answer tests. The comparison was made in order to help determine which feedback timing might make a superior frequent formative assessment methodology.
Initially it appeared that delayed feedback tests produced better results than immediate feedback tests did. A box plot showed that the mean scores for the class were higher for the delayed test than for the immediate test, figure 4.3. However a t-test was carried out and produced a p-value of 0.069, table 4.3. A value of 0.05 or less was required in order to be able to say the difference in means was significant at the 95% confidence level. As a result, it can be stated that this study did not find a significant difference between feedback provided immediately and delayed.

5.3.2 Optimum Timing

The literature review revealed that the optimum timing of feedback is an unresolved issue. Some research finds that immediate feedback leads to superior performance on a later test (Dihoff et al 2003; Epstein et al 2003). Other research finds that delayed feedback, from end of test to a week or more later, leads to superior performance on a summative test (Butler and Roediger 2008; Metcalfe et al 2009). Finally there are some inconclusive case studies and research (Bowman and Laurent 2011; Gosper 2010; Van der Kleij et al 2012). This case study is in line with the findings of these latter researchers.

However, this research found that students performed less well on the final recall test than on the initial tests. This is despite research showing that the approach taken should lead to effective vocabulary learning (Biemiller and Boote, 2006; McKeown et al, cited in National Institute of Child Health and Human Development 2000). This was true for the immediate, answer until correct, feedback, figure 4.1. It was also true for the delayed tests although to a lesser extent, figure 4.2. This finding is not in line with what was found in the literature. Researchers typically found that students performed better on the final recall tests. Butler and Roediger (2008) for example found that both immediate and delayed feedback increased the number of correct responses in the final recall test.

The structure of the testing may assist in explaining this finding. The literature review discussed the effectiveness of a phenomenon known as the spacing effect (Metcalf et al 2007). These authors proposed that delayed feedback was a better method of learning than immediate feedback. This, they report, is because the delayed feedback acted like an additional study, whereas the immediate feedback is an all in one massed session of testing and feedback.
The vocabulary instruction stage and the subsequent test in this research may well have acted as the equivalent of a single massed practice session. This would suggest that students had the equivalent of just one instruction stage, or massed practice and no practice test before the final recall test.

However this research indicated a trend toward delayed feedback. Fewer pupils had a reduced score in the final delayed feedback test than the final immediate feedback test, figure 4.1, 4.2 and 4.3. The space from the initial instruction and test to the feedback the following day may have allowed the delayed feedback to act as an additional study and therefore students may have benefited somewhat from the spacing effect. This slight trend could also be explained by the delayed retention effect (Dihoff et al 2004). These authors explain that a delay to feedback may allow errors to dissipate and be forgotten allowing the correct responses to be more easily assimilated. Further research would be required to verify this.

5.3.3 Summary (RO1)

A significant difference between immediate, answer until correct and delayed (twenty four hours) was not found. Pupils performed slightly better with delayed feedback. However in both timings students performed less well on the final recall test. The implications of the spacing effect and the delayed retention effect may help explain the observed trend. However, the specific reasons for the effectiveness of the spacing effect and the delayed retention effect are not well understood (Metcalfe et al 2009; Dihoff et al 2004). Further research with a modified testing timetable could help further understand these results.
5.4 Part 2: Primary Classroom Context

5.4.1 Introduction

This case study also sought to gain a deeper understanding of online testing within the context of a primary school classroom. To achieve this, the views of teachers, parents and students were explored using online surveys, RO2. In addition a review of the literature was undertaken and structured along the lines of LRO1, 2 and 3. In order to achieve this deeper understanding the findings of the survey and literature review were compared. It should be understood that all survey related comments and references relate to RO2.

5.4.2 Formative Assessment

LRO1 sought to identify and outline the issues surrounding formative assessment and feedback to students. Formative assessment will be discussed first and feedback will be discussed in the next section.

In this research stakeholders referred to numerous formative advantages of online practice tests. The computer teacher stated that online practice tests provide instant feedback on how well a teacher has taught a topic and can give them guidance on how to proceed. Changing the focus from the teacher to the student, she said that students quickly forget much of what they have learned after a test. However frequent practice tests, she says, should help them retain more material. A parent reported that they could review the tests online and easily compare them from week to week. Adding to this point a student felt that they would have time to go over what they got wrong. Frequent online testing has formative advantages that appear clear to stakeholders.

Another formative advantage to emerge from teachers, parents and students was preparation for summative assessments. It was reported more often than all the other themes combined. Teachers left comments such as ‘... children will be more confident in themselves’. One parent felt that ‘the more they practice the more they will learn’. Finally one student said that ‘you understand it more’. The principal added that frequent tests were ‘guidance to learning’.
These views have support in the literature. Formative assessment guides further instruction and learning (Chappuis and Chappuis 2009). Frequent practice tests are considered to be one of the effective approaches to formative assessment (Smith 2007). McDaniel et al (2011) recommended that frequent tests be used to promote learning and not just test it because of the impact of the testing effect. This effect has shown that practice testing is better than restudying (Roediger and Karpicke 2006). However the frequency of tests should not exceed one or two times a week and should be short as opposed long (Bangert-Drowns et al, cited in Black and Wiliam 1998 p. 35).

A concern cited by students and some teachers was that with practice tests at home students could become overconfident. It is possible that students could use the test just once and not bother look over the material again. This is a possibility but should be reflected in a student’s performance and remedied. This would be a way of using these tests in a formative manner.

5.4.3 Feedback

Feedback is a highly effective educational intervention (Hattie 2012). Gosper (2010) proposed that verification feedback, of which answer feedback is a variety, is most effective for factual assessments. This case study has focused on answer level feedback. This is when feedback provides the answer to the question and not just verification of whether the response was correct or not. However just like formative assessment, there is no one optimal method of how or when to provide feedback (Shute, 2008).

The issue of feedback emerged from the surveys in numerous areas. Teachers expressed feedback from their own perspective. They felt that from online testing it would be an advantage to have ‘immediate results’, ‘possible analysis’ and ‘easy graphing’. A parent felt the same but from their own perspective, ‘immediate results for child and parent’ and for a student they liked that ‘it is quicker’. The potential immediacy of feedback from tests was clearly considered as a big advantage of online testing for all stakeholders.

Stakeholders have expressed positive views on frequent online tests and on the potential immediacy of feedback of test results and analysis. However by immediacy, stakeholders appear to be referring to computers doing the work of correcting and analysing and doing it at moment’s notice. Not to how fast feedback can be provided after each response. This conveniently generated feedback helps to make these frequent tests formative in nature.
5.4.4 Optimum Timing of Feedback

LRO1 also sought to identify and outline the issues around the optimum timing of feedback. The optimum timing issue is unresolved in the literature. However, one area where the students’ views align with some research is in regard to what the optimum timing of feedback is. A clear preference for immediate feedback came to light with students. Their comments were quite clear, ‘...you don’t have to wait to see your answers ...’, ‘you learn by your mistakes straight away’ and ‘it would encourage you to look over the words and think again’. This same preference is also what other researchers have found with third level students (Bowman and Laurent 2011; Van der Kleij et al 2012).

Parents and teachers on the other hand felt that end of test would be best. A delay of a day was not considered ideal because according to the principal and the computer teacher the students ‘may lose interest’. A parent felt that immediate feedback ‘may lead to time wasting ... and the child may not then have time to finish the test’. A teacher worried that it ‘may discourage the student if the answer is incorrect’. These views were supported by Kulhavy and Anderson (1972). They reported that students found it frustrating and tiring to receive feedback immediately. This seems to contradict the students reported preference for immediate feedback.

What can be said for certain is that stakeholders generally would prefer feedback to be provided quickly and not to be delayed by up to a day. However, stakeholders have been used to feedback being provided within the day at this school. It seems that clear significant advantages would need to be demonstrated by delayed or immediate over end of test feedback before a change of opinion might occur.

The literature does not provide clear guidance. It showed that immediate feedback should be better for recognition testing, as used in this research; but this was not demonstrated here. It was also suggested in the literature that when students make many errors of commission then immediate correction would be better than delayed feedback (Metcalf et al 2009), but otherwise they found that delayed was better.
5.4.5 Summary (LRO1)

Frequent practice tests can provide information on how well a topic was taught and what needs to be done. They also help students retain more of what they have learned. Stakeholders have positive attitudes about the benefits of frequent tests and the convenience of quick and efficient feedback. Parents and teachers have a strong preference for end of test delay for feedback. However a large majority of students would prefer immediate feedback.

5.4.6 Multiple Choice Question Format

LRO2 sought to evaluate critically the issues around the use of multiple choice questions. The primary focus of this case study was to compare feedback timings and attempt to understand online testing in the context of a primary classroom. It was not intended to present multiple choice questions as a best or only option.

In this case study the issue of question format came up a few times from parents and teachers, figure 4.13. They felt that it would be more useful to have students producing answers than simply recognising them from a list of options as in the multiple choice format. Comments left said things like, ‘or will there be a reliance on multiple choice’ and ‘but it is good for children to have to write out the answers as well as select them from multiple choice answers’.

The literature review acknowledges that generation of answers leads to increased learning over multiple choice tests (Roediger and Karpicke 2006). However multiple choice tests are in fact well suited to vocabulary recognition testing (Coombe 2011). In this case study they were an efficient means of conducting the research into frequent online practice tests and required no explanation to the students.

Multiple choice questions have their downside, for example when poorly designed guessing and the adoption of lures become problems. One parent clearly felt that ‘...they can guess a lot’. The literature review provided some solutions to these issues. For guessing Brown (2001) showed that negative marking is effective. Butler and Roediger (2008) showed that an additional lure would help. They added that prior study and feedback lessen the amount of lures students retained.
This was the approach adopted in this case study. Finally, Jennings and Bush (2006) showed that free choice tests reward partial knowledge and punish random guessing more than other methods.

5.4.7 Summary (LRO2)

Multiple choice questions proved a suitable question format in this research as they were familiar to the students. In addition they are known to be a suitable means of assessing vocabulary through recognition testing. They are an efficient means of conducting frequent online tests and have their place but are not the most effective question format for measuring learning accurately. Although the problems of guessing and the adoption of lures can be minimised, effective multiple choice questions are time consuming to construct.

5.4.8 Assessments Online

5.4.9 Introduction

LRO3 sought to investigate the forces influencing the use of online assessment in the classroom. The surveys revealed that students generally are very positive toward online tests. They are allowed to go on an approved website after they are finished and are waiting for others. This may go some way toward explaining their positive attitudes. In addition some survey participants said that students don’t see these as tests at all and that there may be a novelty factor at play. Parents in particular though, liked that their child was getting experience with technology. Teachers on the other hand were only slightly positive.

However of note, three parents indicated their lack of enthusiasm toward online assessment. One of these parents left a comment saying that online testing made their son more interested in learning. This comment seems at odds with the reported enthusiasm level. Three parents also indicated that their child was not enthusiastic about online testing. This is despite not a single student reporting a lack of enthusiasm of any kind.
It is possible different answers were intended in the Likert scales, although this cannot be confirmed due to the anonymity of the surveys. Anecdotally it can be said that these students have never made negative comments about having to do their tests online.

Finally it emerged from the findings that teachers and parents would like to have a way for online tests to be marked as signed. This is not available with Haiku although it is possible to see who has accessed the LMS. A request was sent to Haiku to include this and the reply was that it would be submitted for consideration.

5.4.10 Positive Forces

Numerous positive forces influencing online assessment emerged from the surveys. Most prominent were, independence for the student, immediacy of correcting and of feedback and finally preparation for summative tests.

Challis (2005) cited the creation of a private space for students and that many students appreciate being able to work at their own pace. These points surfaced in the survey data particularly from students. While two teachers mentioned these advantages, seven students did. They said things like ‘...you don’t have to wait for others...’ and ‘there are hardly any interruptions’. These students evidently regard independence and the chance to work at their own pace as an advantage.

Challis (2005) adds that feedback can be embedded in the assessment and that automatic marking and statistics are instantly available. These advantages were cited by all groups of stakeholder. The immediate nature of feedback, results and statistics was mostly an advantage for teachers. However they were also cited by parents and students.

It emerged quite strongly from the survey data that all stakeholders considered preparation for summative assessments as an advantage to online practice tests carried out at home. As one student put it, ‘you can study the things you need to do for Friday’. However preparation time to construct tests emerged as an issue for some teachers.
The principal said that online testing is ‘the way things are going’. A large majority of parents felt that computers would be important to their child’s education in secondary school. The literature review revealed that if online enrolment for K-12 takes the same path as for third level it will form a substantial component of all learning at K-12 level, secondary level in particular (Picciano et al 2012). There could be as many as three million students now taking online courses at K-12 level in America (Watson et al 2012). There seems to be an air of inevitability about computers in general in education.

5.4.11 Negative Forces

In terms of negative forces impacting on online assessment, the findings produced a number of issues. Firstly though the category of ‘no issues’ with online testing was the most frequent response among stakeholders. Technical, internet and resource issues did arise however and to a lesser extend issues of unfair marking and time required to prepare tests.

Technical issues were equally an issue for teachers, parents and students. They left comments like, ‘computers not always reliable’. The internet was an issue. Comments included ‘...internet doesn’t work and it can be annoying’. Home access was the primary concern of the principal who stated that it would not be permissible to leave people behind due to a lack of resources and she had to consider the ‘base line’. These issues were concerns for all groups of stakeholder. They will be difficult to deal with initially but with experience most issues can be sorted out by teachers and increasingly the students.

In addition a concern expressed by two parents and three students was a perceived unfairness with how tests are marked. A parent said that ‘...correct answers don’t get logged’ and a child said that it ‘marks my question wrong but it is right’.

Teachers need to be careful in creating tests as the software judges an answer correct or incorrect depending on what answer the teacher entered. This does not seem to be a major concern judging by the small numbers reporting it, figure 4.13. Kingston (2009) stated that issues relating to a lack of familiarity should be mitigated over time as participants become practiced in using the technology.
Anecdotally it appears that creating tests online is a relatively time consuming process. Adding this extra work load would most likely require clear learning advantages before this work could be justified by teachers.

All of these issues would make initial attempts by a school to introduce online assessment difficult. However, with practice and experience these issues can be mitigated (Kingston, 2009), although it would take perseverance and funding. It would also require training as mentioned by a few teachers. This was also a recommendation of the Better Schools = Better Economy report (ICT in Schools Advisory Group 2009). Initiatives requiring funding, though, are unlikely to happen in the current economic climate.

Finally the principal considered that the security of data would to be a huge concern. Schools are required to comply with the Data Protection Act 1988 and its amendment in 2003 (Office of Data Protection, 2013). A school’s data protection policy would need to be kept up to date and reviewed periodically.

5.4.12 Summary (LRO3)

Online assessments have advantages. They provide a private space for the student where they can work at their own pace. Feedback and analysis can be provided automatically to students, parents and teachers. These practice assessments provide the student with the opportunity to prepare for the summative assessment. They may do this by helping students retain more knowledge than they would otherwise.

Online assessments also have disadvantages. Technical issues both in school and at home were concerns as was pupil access to the internet outside of school. In addition the unfamiliar nature of online testing may cause some initial problems like forgetting passwords and batteries running out before a student realises they require a charger. However experience with this mode of testing should mitigate these issues over time.
5.4.13 The Future

The importance of technology to education is officially recognised (ICT in Schools Advisory Group 2009). However, the principal stated that online testing would require money and that is not available in the current economic climate. She also added that there is no ‘push’ from the Department of Education and that something like this would really depend on teachers having an interest and driving it on. A different economic climate should ease funding needs. In addition the principal said that she needed to consider the base line and that it would not be permissible to leave students behind due to a lack of resources at home.

However in principle there is a great deal of positivity toward online practice tests from stakeholders. Fifteen parents were encouraged as it provided a mechanism by which their children can ‘improve their efficiency on the computer’. Nine students reported that they liked online testing because of ‘the way it makes the test fun’ and this was backed up by similar comments from some teachers.

Although a clear majority of parents and students were enthusiastic about online testing, teachers were divided between enthusiastic and neutral. This may be indicating that they are not yet convinced about the merits of online testing. Perhaps teachers will reserve judgement until more research is completed and the issues better understood. Training and collegiality emerged from the interviews as having the potential to mitigate teacher concerns.

Even though online tests were described as ‘a novelty’ by a small number of teachers, parents and students and also by the computer teacher, an air of inevitability has emerged from the findings and the literature review. The principal said ‘...I think that is the way the world is going’. A parent said ‘it is the way forward’. If online enrolment for K-12 takes the same path in American as it did for third level it is likely that it will form a substantial component of all learning at K-12 level there according to (Picciano et al 2012).

5.5 Conclusion

This chapter has discussed the findings of the research in light of the literature reviewed in Chapter Two. The conclusions drawn from these discussions will be presented in Chapter Six.
Chapter Six: Conclusion

6.1 Introduction

This case study has compared immediate feedback, answer until correct, with twenty four hour delayed feedback in the context of a primary school classroom. There were three primary components to this study. Firstly there was a review of the available literature and second there was the comparison of the feedback timings. Finally there was an exploration of the views and beliefs of teachers, parents and students in order to give these tests a context. The objectives used to achieve these case study components were as follows;

6.1.1 Research Objectives

1. Compare the immediate feedback timing method (answer until correct) with delayed feedback (twenty four hours) for online multiple choice vocabulary questions.
2. Explore key stakeholder views related to online testing both in and outside the classroom.

6.1.2 Literature Review Objectives

1. Identify and outline the issues surrounding formative assessment and feedback to students with emphasis on the optimum timing of feedback.
2. Evaluate critically the issues around multiple choice format questions.
3. Examine the forces influencing the use of online assessment in the classroom.

6.1.3 Final Objective

1. Formulate recommendations for future practice and research.

This chapter will revisit the research objectives above. It will do so by summarising the findings of this case study and it will offer conclusions. Chapter Five, was large and requires a summary. In addition the outcomes of this research and its limitations will be discussed. Finally recommendations for future research and a conclusion will be outlined. By adopting this structure it is intended that the research work will be concluded and that the objectives met.
6.2 Objectives: Outcomes

6.2.1 RO1: Optimal Timing of Feedback

The case study set out to determine if there was a significant difference between immediate, answer until correct feedback and twenty four hour delayed feedback. Online vocabulary based multiple choice questions were used as the medium of research.

This research found that there was a slight trend toward delayed feedback. However a t-test concluded that the difference in means between the two tests was not significant. This research also found that in relation to their initial immediate feedback and initial delayed feedback tests, students mostly performed less well on their respective final recall tests. This was not found to be the case in the literature review. Researchers typically found that students performed better on the final recall tests regardless of the timing. Disagreement arises only over which delay is better.

The structure of the testing may assist in explaining the slight trend toward delayed feedback. The vocabulary instruction stage and the subsequent test in this research may well have acted as the equivalent of a single massed practice session. This would suggest that students had the equivalent of just one instruction stage, or massed practice and not the intended vocabulary instruction stage followed by a practice test before the final recall test.

There was a twenty four hour gap between the initial instruction for the delayed feedback test and its subsequent feedback. This gap may have allowed the subsequent delayed feedback session to act as an additional study. Therefore students may have benefited from the spacing effect which is a well documented phenomenon in the literature, Chapter Two. This slight trend could also be explained by the delayed retention effect also discussed in the literature review. This may allow errors to dissipate and be forgotten allowing the correct responses to be more easily assimilated.

6.2.2 RO2: Classroom Context

LRO1, 2 and 3 were investigated and compared with RO2 in order to gain a deeper understanding of online testing in the context of a primary school classroom. In the following sections it should be understood that all survey related comments and references relate to RO2.
6.2.3 LRO1 Formative Assessment

The literature review showed that frequent practice testing is a suitable means of implementing formative assessment. However it was also recommended that tests should be short and no more frequent than one or two a week. In this research, teachers, parents and students reported generally positive attitudes toward frequent online practice tests.

Numerous stakeholders reported advantages of frequent online practice tests that compare exactly with what formative assessment is all about. The computer teacher believed that frequent tests would inform the teacher about how well the learning has gone and they could then amend as necessary. She also believed that pupils would retain more if they had to take practice tests. A parent felt that it would be great to be able to compare results from week to week. Finally a student realised that practice tests would give them time to go over things they got wrong.

The theme of preparation for summative assessments emerged as the single most cited advantage of online practice tests. The principal added that any practice would be of help and the computer teacher felt that they would help students retain more knowledge. Frequent testing as a result is thought by stakeholders to be a tool that has value.

When using online tests at home a teacher should be aware that pupils may become overconfident and just do tests once and not restudy material they find difficult. The literature review found that pupil motivation and the attention they pay to feedback is also very important. If these tests are to be formative in nature student performance and motivation need to be monitored to ensure the tests are an effective learning tool. An investigation into the use of incentives could prove beneficial to motivation and attention to feedback.

6.2.4 LRO1 Feedback

The issue of feedback emerged from the surveys from a few different angles. Teachers felt that immediate results combined with graphing and analysis would be advantages of online assessment. Some parents felt that immediate results would benefit themselves and their child. Students just like the way the testing procedure is faster for them. The literature revealed that without feedback these frequent tests are not formative in nature and that feedback is a highly effective educational intervention.
6.2.5 LRO1 Optimal Timing

This research found that the difference between immediate and delayed feedback was not significant. In the surveys a large majority of teachers and parents selected end of test feedback as the most beneficial timing method for learning. This is the current default methodology at this school. However students were quite different. A large majority felt that immediate feedback would be better for learning.

Some teachers and parents worried that students may have lost interest if they had to wait a day. For immediate feedback they were concerned that it could become frustrating and time consuming for students to have to address the feedback. This problem with the immediate feedback was also commented upon in the literature review.

6.2.6 LRO2 Multiple Choice Question Format

A small number of parents and teachers raised the issue of question format. Issues they cited include;

- A variety of question formats would allow for more in depth assessment.
- Guessing answers would be a problem with multiple choice questions.
- Generation of answers would be better than selecting answers as is the case with the multiple choice format.
- Automatic analysis of results is only possible with question formats like multiple choice questions.

The literature review addressed these issues. A variety of question formats is considered necessary for a complete assessment policy. However this research was concerned with just one aspect of assessment, frequent vocabulary recognition tests. The literature review showed that multiple choice questions are effective for this. Guessing can be mitigated with negative marking or the rewarding of proximal knowledge. It can also be minimised by adding an additional lure. Requiring students to generate answers is a test format that will lead to greater learning. Multiple choice questions, though, are still considered an efficient frequent assessment method, for vocabulary recognition tests in particular. In addition feedback can easily be embedded in multiple choice tests.
6.2.7 LRO3 Testing Online

There was a degree of variability among teachers and parents regarding their enthusiasm for online testing. Overall there was a slight majority of teachers that expressed general enthusiasm. However the interviews revealed that training and collegiality could help with concerns some teachers may have. A few parents indicated that they were very unenthusiastic about online testing. However from the few positive comments left by those participants it is quite possible a different response was intended.

The students on the other hand were enthusiastic by a large majority. A few parents and teachers reported a novelty factor attached to online testing and this could help explain the students’ enthusiasm. In addition students revealed that they are allowed access recommended websites when they are finished and waiting for others. This incentive could also help explain their relative high levels of enthusiasm.

Although advantages and disadvantages emerged from the data there does appear to be a sense of inevitability about the increasing influence of computers in education. Comments from the interviews, the surveys and the literature review, indicate that online instruction and assessment are going to become more important in the future. For the immediate future though a lack of funding, resource issues and an inability to guarantee student access at home will act to at least slow the wide spread use of online assessment in Irish primary classrooms.

Numerous advantages and disadvantages to online testing were reported by survey participants. The most frequently reported advantages were as follows;

- Students are gaining experience with computers.
- A variety of question and student statistics become instantly available.
- A private space for students is created.
- Students appreciate being able to work independently.
- Students are thoroughly prepared for the summative test.
- A library or results builds up over time.
The most frequent response to the disadvantages was that there were none. Of the disadvantages reported the most frequently cited were as follows:

- Internet reliability.
- Technical issues.
- Unfair marking.
- Time required setting up and completing tests.
- Not all students have access to the internet for practice tests at home.
- Lack of resources and funding.

### 6.4 Limitations

A number of factors may set this case study apart from other attempts to repeat this research.

Firstly, the annual Drumcondra standardised results are noticeably above the national average possibly marking this school as somewhat outside normal standards.

Secondly, this school is well equipped with technology. It has twenty eight laptop computers and 32 iPads for students to use. They can be moved easily from class to class as needed and link to the internet wirelessly. Also every class is equipped with an interactive white board. Although this is now standard in schools across the country, the whole package of technology resources may not be.

Thirdly, the students had half an academic year of experience with online testing prior to this research. This made them very familiar with the issues involved.

Finally, the answer until correct format was used for immediate feedback in this research. A gap of twenty four hours was used for the delayed feedback. These exact methods and timings are not the only options available to teachers. Different methods and timings may produce different results for researchers.
6.5 Recommendations

The following recommendations fulfil the final objective of this work. Further research could be carried out on the following themes:

- Create a space of time between instruction stage and the practice test.
- Conduct online practice testing over a term or school year for a particular class.
- Set the tests for students of different classes.
- Use different subject material for testing.

The first recommendation would help keep the instruction stage and test as separate entities. They may have performed as one massed practice in this research. This recommendation could possibly help students improve their scores from the first to the final test. The next three recommendations should help broaden this research.

6.6 Conclusion

This case study has compared two timing options for feedback with online multiple choice vocabulary tests. It also looked at the classroom context of these tests by surveying and interviewing stakeholders.

This work did not find a significant difference between immediate and delayed feedback. However, this work does suggest that having a space of about a day between instruction and the practice or a similar gap between online practice tests means that the exact timing of feedback may not be a significant consideration.

Teachers and parents expressed a preference for end of test feedback, although students would prefer immediate feedback. These preferences can be catered for without fear of impacting significantly on learning provided a retest and or a restudy are provided. It should be noted that in the literature review testing was shown to be better than restudying due to the testing effect.
This work also found that parents and students are largely positive about the use of online testing. Teachers, though, may need more time to investigate the issues, training and perhaps a greater depth of research relevant to K-12 level to draw from before taking a strong position either way.

Conducting frequent tests online holds numerous clear advantages. This research found that there are issues though. However it appears that the advantages outweigh the negative forces with ‘no issues’ emerging as the largest category for disadvantages of online testing. For the moment though, practice tests will be useful mostly in class as opposed to home because it cannot be guaranteed that all students will have access to the internet. Even within school resources could be a significant issue if all class were to adopt online testing.

Initially schools will require perseverance if online testing is to become a useful methodology. Over time though, teachers and students should become more able to deal with the minor technical issues that arise. In the future training for teachers and funding for resources should provide drivers to the more widespread implementation of online assessment. There is an air of inevitability about online testing, but significantly more K-12 relevant research is required if it is to be implemented to best effect.
Bibliography


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Appendices

Appendix A: Drumcondra Reading versus National Average

<table>
<thead>
<tr>
<th>Number of Pupils by Sten Score</th>
<th>1-3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8-10</th>
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<tbody>
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<td>Number</td>
<td>4</td>
<td>11</td>
<td>31</td>
<td>55</td>
<td>58</td>
<td>147</td>
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<tr>
<td>School %</td>
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<td>4</td>
<td>10</td>
<td>18</td>
<td>19</td>
<td>48</td>
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<tr>
<td>National %</td>
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<td>15</td>
<td>19</td>
<td>19</td>
<td>15</td>
<td>16</td>
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For the School Year 2011 / 2012
Appendix B: Words used in Testing

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<thead>
<tr>
<th>Delayed</th>
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<td>abate</td>
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<tr>
<td>astute</td>
<td>abode</td>
</tr>
<tr>
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<td>antagonize</td>
</tr>
<tr>
<td>cater</td>
<td>apathy</td>
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<tr>
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<td>congested</td>
</tr>
<tr>
<td>endure</td>
<td>flabbergast</td>
</tr>
<tr>
<td>firebrand</td>
<td>flagrant</td>
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<tr>
<td>homage</td>
<td>Haggle</td>
</tr>
<tr>
<td>impede</td>
<td>insinuate</td>
</tr>
<tr>
<td>loath</td>
<td>inundate</td>
</tr>
<tr>
<td>negligent</td>
<td>mirth</td>
</tr>
<tr>
<td>nimble</td>
<td>poised</td>
</tr>
<tr>
<td>rupture</td>
<td>Rant</td>
</tr>
<tr>
<td>shirk</td>
<td>reprimand</td>
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<tr>
<td>utmost</td>
<td>sullen</td>
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Complete Word List

<table>
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<th>Emblem</th>
<th>Obnoxious</th>
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<td>peevish</td>
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</tr>
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<td>firebrand</td>
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astute
authentic
avert
Bellow
beseech
bestow
bewilder
bigot
blatant
bleak
bystander
brawl
browse
Candid
canine
canny
capricious
capsize
casual
casualty
catastrophe
cater
chorus
citrus
clamber
climax
compromise
concur
confront
congested
conjure
consult
corrupt
counterfeit
covet
custumbary
Debut
deceased

gruelling
gruesome
Haggle
headlong
hilarious
homage
homicide
hospitable
hurtle
hybrid
Illiterate
impede
implore
incident
incredulous
infamous
infuriate
insinuate
intensified
inundate
irate
Lavish
legacy
legitimate
lethal
loath
lurk
Magnetic
mirth
quench
magnitude
maternal
maul
melancholy
mellow
momentum
mortify
mull
prior
prowess
Radiant
random
rant
recede
reprimand
resume
revert
robust
rupture
Saga
sequel
sham
shirk
simultaneously
snare
species
status
stodgy
substantial
subtle
sullen
supervise
Tamper
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trickle
trivial
Uncertainty
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urgent
utmost
Vengeance
vicious
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<td></td>
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<td>dumbfound</td>
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Narrative

Wary

nimble

nomadic

noteworthy

notify

notorious

nurture

Year
Appendix C: Feedback and Teaching Methodology

<table>
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<th>Knowledge dimension</th>
<th>The cognitive process dimension</th>
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<td>Immediate feedback</td>
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<tr>
<td>Understand</td>
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</tr>
<tr>
<td>Apply</td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
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</tr>
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<td>Factual</td>
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<td>Conceptual</td>
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<tr>
<td>Metacognitive</td>
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Source: Gosper, M., (2010)
Appendix D: Student Test Data

Delayed feedback scores are the difference between the initial and final test.

Immediate feedback scores are the difference between the initial and final test.

This data set was used to perform the t-test. The data was entered in this order.

Student names are fictitious.

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Delayed Feedback</th>
<th>Immediate Feedback</th>
</tr>
</thead>
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<tr>
<td>Adrian</td>
<td>0</td>
<td>Adrian -7</td>
</tr>
<tr>
<td>Alex</td>
<td>-7</td>
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</tr>
<tr>
<td>Alice</td>
<td>0</td>
<td>Alice -20</td>
</tr>
<tr>
<td>Andy</td>
<td>0</td>
<td>Andy 7</td>
</tr>
<tr>
<td>Angela</td>
<td>26</td>
<td>Angela 14</td>
</tr>
<tr>
<td>Ann</td>
<td>13</td>
<td>Ann -6</td>
</tr>
<tr>
<td>Clara</td>
<td>-6</td>
<td>Clara 0</td>
</tr>
<tr>
<td>Eddie</td>
<td>-13</td>
<td>Eddie 0</td>
</tr>
<tr>
<td>George</td>
<td>-33</td>
<td>George 7</td>
</tr>
<tr>
<td>Grace</td>
<td>13</td>
<td>Grace 0</td>
</tr>
<tr>
<td>Harry</td>
<td>7</td>
<td>Harry -13</td>
</tr>
<tr>
<td>John</td>
<td>13</td>
<td>John -7</td>
</tr>
<tr>
<td>Justin</td>
<td>-20</td>
<td>Justin -27</td>
</tr>
<tr>
<td>Kaylee</td>
<td>7</td>
<td>Kaylee 14</td>
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<tr>
<td>Kyle</td>
<td>-13</td>
<td>Kyle 20</td>
</tr>
<tr>
<td>Lauren</td>
<td>7</td>
<td>Lauren -27</td>
</tr>
<tr>
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</tr>
<tr>
<td>Marcus</td>
<td>0</td>
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<tr>
<td>Maria</td>
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</tr>
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<td>Sam</td>
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<td>Sam -33</td>
</tr>
<tr>
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<td>Sean</td>
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<td>Sean -20</td>
</tr>
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<td>Stella</td>
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<td>Stella 13</td>
</tr>
<tr>
<td>Trevor</td>
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<td>Trevor -27</td>
</tr>
</tbody>
</table>
Appendix E: Survey Questions

Online Practice Tests - <b><u>Teacher Survey<u></b></u>

Survey Introduction

Hi,
Thank you for taking the time to complete this survey.

There are 12 questions. Some require you to tick an option. Others require a brief sentence or two regarding your opinion on some aspect of online testing. All questions require a response. However in the event that you have nothing to contribute to the questions requiring a sentence or two simply add n/a in order to proceed.

Your answers will contribute in a meaningful way to my project and help deepen my understanding of the issues surrounding online testing in the classroom.

Muinteoir David

*1. Typically how much time do you spend online in twenty four hours? Include time spent for school and non school browsing.

<table>
<thead>
<tr>
<th>Never online</th>
<th>A few minutes</th>
<th>About an hour</th>
<th>Two hours or more</th>
<th>It varies a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any other comments?

*2. How would you rate your enthusiasm for using online tests in your classroom?

<table>
<thead>
<tr>
<th>Very enthusiastic</th>
<th>Happy</th>
<th>Neutral</th>
<th>Unhappy</th>
<th>Very unenthusiastic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any other comments?

*3. What, in your opinion, are the advantages of doing tests online in the classroom?


*4. What, in your opinion, are the disadvantages of doing tests online in the classroom?

*5. Do you think online practice tests conducted in school a week prior to the main test would be helpful to the children's learning?

<table>
<thead>
<tr>
<th>Very unhelpful</th>
<th>Unhelpful</th>
<th>I don't know</th>
<th>Helpful</th>
<th>Very helpful</th>
</tr>
</thead>
</table>

Any other comments?

*6. What do you think are the advantages of doing practices tests online for you and your class?
(In the classroom)

*7. What do you think are the disadvantages of doing online practice tests for you and your class?
(In the classroom)

*8. Please rate online testing in the classroom for the following groups.

<table>
<thead>
<tr>
<th></th>
<th>Essential</th>
<th>Important</th>
<th>Neutral</th>
<th>Unimportant</th>
<th>No advantages at all</th>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any other comments?
9. Online practice tests can be made available to pupils for use at home. Please rate the value of online practice tests completed at home for the following groups.

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<th>Of limited use</th>
<th>Neutral</th>
<th>Quite important</th>
<th>Essential</th>
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</thead>
<tbody>
<tr>
<td>For Pupils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. How quickly do you think a child should receive feedback on their tests?

- [ ] Immediately, after each answer
- [ ] At the end of the test
- [ ] A delay of one day
- [ ] A delay of more than one day
- [ ] It is not important

Any other comments?

11. What barriers, if any exist, may make online testing impractical in the school?

12. What drivers, if any exist, may help to promote online testing in the school?

Online Practice Tests - Teacher Survey

This Survey is now complete.

Thank you again for your time and cooperation. It is greatly appreciated.

Maínteoir David
Hi,
Thank you for taking the time to answer the questions in this survey. Your answers will help with my understanding of online testing inside and outside the classroom.

There are eleven questions. Some questions require you to click your chosen answer and include the option of leaving an additional comment. Other questions require you to write a line or two outlining your opinion. If you choose to skip these comment questions simply insert n/a in order to proceed.

Thank you again for taking the time out to help me with this work.
Muintear David

*1. Typically how much time do you (parent) spend online in twenty four hours?
Include time spent at work and at home.

<table>
<thead>
<tr>
<th>Never online</th>
<th>A few minutes</th>
<th>About an hour</th>
<th>Two hours or more</th>
<th>It varies a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other (please specify)

*2. How would you rate your child’s enthusiasm for doing their tests online?

<table>
<thead>
<tr>
<th>Very enthusiastic</th>
<th>Happy</th>
<th>Neutral</th>
<th>Unhappy</th>
<th>Very unenthusiastic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any other comments?

*3. How would you rate your enthusiasm for your child doing their tests online?

<table>
<thead>
<tr>
<th>Very unenthusiastic</th>
<th>A little unenthusiastic</th>
<th>Do not mind</th>
<th>A little enthusiastic</th>
<th>Very enthusiastic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any other comments?
4. Are there advantages for your child in doing end of week tests online while at school?
   Please comment

5. Are there disadvantages for your child in doing end of week tests online while at school?
   Please comment

6. What is your opinion on the use of online practice tests in the classroom a week before the main test?
   
<table>
<thead>
<tr>
<th>Very unhelpful</th>
<th>Unhelpful</th>
<th>I don't know</th>
<th>Helpful</th>
<th>Very helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>
   
   Other (please specify)

7. If online practice tests were made part of your child's homework on school nights, how often would your child be able to complete it?
   
<table>
<thead>
<tr>
<th>4 nights per week</th>
<th>2 or 3 nights a week</th>
<th>1 night per week</th>
<th>I don't know</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>
   
   Any other comments?

8. Are there advantages for parents and children in completing practice tests on the computer at home?
   (In preparation for the end of week test)
   Please comment
9. Are there disadvantages for parents and children in doing practice tests on the computer at home?  
(In preparation for the end of week test)  
Please comment

10. How quickly do you think a child should receive feedback on their tests?  
- Immediately after each answer is submitted  
- At the end of the test  
- A delay of one day  
- It is not important  
- I do not know  
Any other comments?

11. Do you think that computers will have an important role in your child's education in the future?  
- Very unimportant  
- A little bit important  
- I don't know  
- Important  
- Very important  
Any other comments?

Online Practice Tests - Parent Survey

This Survey is now complete.

Thank you again for your time, it is greatly appreciated.
Múinteoir David
Hi,
Thank you for taking the time to answer my questions about online testing.

There are eleven questions. For some you only have to tick a circle for others you need to put in some comments.

Type n/a in the comment box if you have no comment.

Be honest, take your time and remember this is not a test of you. Your answers will help me to better understand online testing in the classroom.

Thank you again,
Muinteoir David

**1. On a normal school day how much time do you spend online?**
(Include all time at school and at home)

<table>
<thead>
<tr>
<th>Never online</th>
<th>A few minutes</th>
<th>About an hour</th>
<th>Two hours or more</th>
<th>It varies a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have you anything else to say?

**2. How do you feel about doing your tests online?**

<table>
<thead>
<tr>
<th>Really like it</th>
<th>Like it</th>
<th>Do not mind</th>
<th>Do not like it</th>
<th>Really do not like it</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have you anything else to say?

**3. What do you like about doing your tests online?**

**4. What do you not like about doing your tests online?**
5. How helpful do you think practice tests are?
(A practice test is where you get to do a practice version of the test before the real test)

<table>
<thead>
<tr>
<th>Really unhelpful</th>
<th>Unhelpful</th>
<th>I have no opinion</th>
<th>Helpful</th>
<th>Really helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have you anything else to say?

6. If practice tests were made part of your homework would you be able to do them at home?

<table>
<thead>
<tr>
<th>Yes, every school night</th>
<th>Yes, sometimes</th>
<th>I don't know</th>
<th>No, rarely</th>
<th>No, never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have you anything else to say?

7. What are the advantages of doing online practice tests in class a week before the main test?

8. What are the disadvantages of doing online practice tests in class a week before the main test?

9. You did two different types of practice test. Which one did you think was more useful?

- The Thursday test where I had to wait until Friday to go over the answers.
- The Friday test where I got my answers straight away.
- Both tests were equally useful.

Have you anything else to say?
Screen Shots of Surveys (Survey Monkey)
Appendix F: Survey Answers

**Codes**

Green = Teachers  Orange = Parents  Yellow = Students

Assess = Assessment

Cheat = Cheating

Ex = Experience

Imm = Speed of feedback / Results

Ind = Independence

LC = Low Confidence

Like = Generally Like

Neat = Neatness issues

Net = Internet

No = No advantages

None = No disadvantages

Nov = Novelty

OC = Over confidence

Prep = Preparation

QFormat = Question Format

Rec = Record of results

Res = Resources

TI = Technical Issues

Time = Time

TR = Training

Unfair = Unfairness of computer marking

Yes = No specific reasons just positive
**Online Tests: Advantages**

- **Ex** Children gain experience in using IT.
- **Ex** children develop greater efficiency using laptops. IT is so much part of their lives now so it's essential they know how to use it for learning at home and in school
- **Ex** It helps the students become more computer literate
- **Ex** Yes, as she has experience performing the test online,
- **Ex** Also prepares for the future and college as most aptitude tests/college applications/exams/submission will be online also
- **Ex** Use of computers is important for development of IT skills.
- **Ex** Online efficiency is important It's the way of now and the future.
- **Ex** Yes, It prepare him for work life which will involve alot of computer time
- **Ex** yes improves IT proficiency
- **Ex** it helps IT skills
- **Ex** Future tests will likely be multiple choice and online, so it is good for them to get used to this
- **Ex** Yes preparing for future advances in educational use of computers.
- **Ex** Yes, it's good that they have the discipline of using technology in different settings ...
- **Ex** Including the classroom
- **Ex** Yes, as she's improving her computer skills, unlike her Mum!
- **Ex** yes it helps them to become familiar with computers.
- **Ex** The advantages are my child is using technology
- **Ex** To improve there efficiency on the computer.
- **Ex** he will become more comfortable and familiar with online tests which are going to be a part of his education in the future

- **Imm** For the Teacher results can be calculated quickly
- **Imm** Instant Feedback
- **Imm** Immediate results and possible analysis
- **Imm** instant results cut down on time spent marking
- **Imm** clear results/scores.
- **Imm** When it works, a testing program could save me time.
- **Imm** instant correction easy graphing of results
- **Imm** Instant feedback
- **Imm** The fact that results are instant is great
- **Imm** Immediate results for child and parent.
- **Imm** I like that there is no need for correcting
- **Imm** it's quicker

- **Ind** develop independency
- **Ind** It encourages own focus/concentration
- **Ind** what i like do test online because you don't have to wait for others and wait for the teacher to call out the spellings theirs no time limit
- **Ind** I like it online because you don't have to wait for anyone
- **Ind** we get to go on scratch after and its easier because the teacher doesn't have to call out spellings because they are on the laptops
- **Ind** it is easy because we don't have to ask for the question again
- **Ind** you can do it at home
you can move straight on to the next question
it is quick and and there are hardly any interruptions
I like the way that you sometimes dont have to wait for the other people
Children like IT
Children enjoy it
She enjoys them
They look forward to it
He also feels it is cool and so is quite enthusiastic and happy to show us his results at home.
I like when we get to go on scratch after we finish our test.
i just like doing test online
i like doing it on the computer
it is cool and fun and all ways is easy
the way that it makes your test fun
It is fun because you use a computer
Then we can do scratch after
sometimes we are aloud on friv
The way it makes the test fun
No Paper/pens/pencils needed.
Saves on paper
another interesting approach to the usual written tests.
easy graphing of results allow for differentiation
because i understand it more
I think it is easier than having to it on paper
i like it because it is way easier than doing it on paper and its quicker
it does not hurt your hand as much as it does when you are writing
you don't have to write the questions down
No Books
i like it because your hand does not get sore from writing
I dont think the online test is an advantage over a regular test
children view it less as a test
Online tests are more of a novelty therefore are easier for children to sit
It is a lot easier
I think its easier to do them online apart from a page
it is easier to do
and we the parents can view the actual test after completion
we can look at the tests online, and compare to other weeks
review the tests easily over a period of weeks to see any pattern that is forming.
It is nice to be able to see how they did that week after helping them practice.
Easy record of tests etc

**Online Practice Tests: Advantages**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess</td>
<td>Benchmarking where each child is relative to where they want to be. It gives the teacher an idea of the standard in the class and identify those who may not fully understand the topic.</td>
</tr>
<tr>
<td>Ex</td>
<td>Experience gained.</td>
</tr>
<tr>
<td>Misc</td>
<td>Infant classroom- new interesting way of assessing. give teacher good insight into the children's knowledge.</td>
</tr>
<tr>
<td>Misc</td>
<td>builds relationship</td>
</tr>
<tr>
<td>Net</td>
<td>No computer.</td>
</tr>
<tr>
<td>Net</td>
<td>not for us mum who are not as computer literate as we should be! Mind you , by the time</td>
</tr>
<tr>
<td>No</td>
<td>Once the child practice their tests I don't think it matters whether they practice them on manually or on the computer.</td>
</tr>
<tr>
<td>Prep</td>
<td>Practice tests prepare the children. It helps the children to do a test and then maybe have another attempt.</td>
</tr>
<tr>
<td>Prep</td>
<td>Questions can be approached and answered before the test. Helps familiarise the children with test. can help to allay fears they may have about the test and help build their confidence thus enabling them to complete test accurately.</td>
</tr>
<tr>
<td>Prep</td>
<td>Also children become familiar with the tests and are more confident in themselves.</td>
</tr>
<tr>
<td>Prep</td>
<td>Children will be used to the set up when they do testing.</td>
</tr>
<tr>
<td>Prep</td>
<td>The children would have prior training in how to enter information etc.</td>
</tr>
<tr>
<td>Prep</td>
<td>Kids are more relaxed when doing the real test.</td>
</tr>
<tr>
<td>Prep</td>
<td>I imagine it would focus the pupils for the real test the following week. They prepare for the set up and layout of test. Allows the children to complete the test with confidence.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes so both Parent and child understand what is needed to.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes as parent and child can interact and learn from eachother, repetition helps to drill them in consistent correct answers.</td>
</tr>
<tr>
<td>Prep</td>
<td>Parents can see work that is being covered. Yes, parent will be fully aware of what is expected of the child and be more involved.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes, you get prepared for the lay out of the test and Parents get to understand what the children are doing.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes helps prepare.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes, it gets them into the right frame of mind to answer online tests.</td>
</tr>
<tr>
<td>Prep</td>
<td>Parents also become more familiar with format of tests.</td>
</tr>
<tr>
<td>Prep</td>
<td>Yes practice all good.</td>
</tr>
<tr>
<td>Prep</td>
<td>yes, they will have an idea of what will be expected.</td>
</tr>
</tbody>
</table>
| Prep     | Yes, it helps with a bit of interaction in what the kids are working on. Parents lose
this as kids move up the years!

I feel that the more they practice the more they will learn so

yes, definitely, all practice and repetition is a good thing.

Also sometimes he rushes and it would be good for him to learn to read the questions and to choose his option carefully

It helps them focus on what they need to know and lets us know what they are learning :) 

so you will get to know what the words mean

you understand it more

because you know what is coming up and you can study for it.

They have more time to learn what they got wrong in the practice

really good because if you don't practice you won't get high scores but if you do you will get a high score

It might give other people a chance of getting a better score

We know what is coming on Fridays.

that you are prepared for your test

i think the good thing about doing a test a week before so you can see how long you can remember thing without even really learning the words

it makes the main test a bit easier

it gives you an idia about the test

you could learn all the stuff that we have to do for our test

you could ask a quitsion

i dont know... i dont maybe good some times for better score

it helps you to remember the answers

u no wats cuming up

if u come across one of the words before the main test it will be stuck in your head

you know everything

You can study the things you need to do for Friday.

you get to all do it so every one will do it

you can get to know the system and how it works

because you would know what the test would be like

Again it depends on how much time is available, this would put our family under additional pressure when we get home late.
Online Tests: Disadvantages

Cheat people could write down the answers when they are finished the practice they could write down the correct answers and then on their Friday test they could type down all the right answers it might be cheating if u had it at the side of the screen when you to every thing right in the practice u wud no wats cumingnup and might cheat
Cheat

Misc will the ones who need a warning heed it before the main test
Misc Infant Classroom- difficult to organise/ carry out and assess.
Misc The parent or carer may not be computer literate
Misc You are tied to home to complete homework.
Misc Other kids left out
Misc If the child requires help with the computer this may not be available every night
Misc The parent might step in and give too much assistance to
Misc that some people will forget a lot of the words
Misc you may not know what they mean and get them all wrong and people might tease you i think the disadvantages is that you want to get a good score so it is better that you learn them off by heart
Misc You might forget sometimes you can forget and you might get confused you could see what the questions are and practice those only
Misc Some people might not do it
Misc Yes, in that it might get to only think in that frame of mind as opposed to written tests
Net If compulsory not everyone may have access to an online facility
Net No computer
Net yes- maybe if not all children have access to internet at home or internet down or slow perhaps occasional access problems and same as concern above about limiting online homework
Net Only if there are some parents that don't have a computer in the house ...
Net Some people don't have a laptop
None none
None None
None I can't think of any
None None
None No
None No, none I believe
None Not aware of any
None Can't think of any
None No obvious disadvantages
None I doubt it
None I don't think so
None None
None nothing
None I don't know
None

OC

It may become too easy and not necessarily require much
that you might study really hard on Monday and then not bother to study on Thursday
That we could forget what we practiced.
if a child does well in the practice test he/she may not do any more work for the next test

TI

Technology can be prone to failure (problems)

Time

Time Consuming, doubling the same task
It would be time consuming preparing the tests, setting up the room, checking the results
Possibly the time setting up the technology in the classroom
take time
Maybe time consuming.

Online Practice Tests: Disadvantages

Cheat

children have access to possibly googling the answer!
personal preference - some teachers would favour having a test in front of them to persue / mark etc in the same way some would prefer a book to a kindle

Misc

Could be difficult to set up with a big class
Looses the personal interaction
The children need to be used to the set up.
diversity of computer skills
finding and accessing these tests
The change of format took a little while to adjust to but then became easier
yes I never get to see them only a verbal report.
will have to revert back to timed tests later.
time and i dont like waiting
Irish
there was a lot of them and it was a bit anoying
i do not like that when you do something wrong i do not feel right
sometimes its hard to do fadas
if you not have a laptop they can't see their work.

Neat

Are the children too reliant on technology to the detriment of presentation/
handwriting/ spelling/ grammar
Some. Maybe inhibits writing skills under pressure
also possibly less writing practice
The disadvantage would be that my child is not practicing their handwriting
I would think that their ability to write, or organise themselves, and time themselves
would be compromised when doing tests online

Net

Dependence on connectivity
Internet not always reliable
poor internet connection!!!
Broadband connects can be very unpredictable
sometimes the internet does not work and i have to wait a long
if there is no internet connection
sometimes the internet doesn't work and it can be annoying

sometimes you have internet connections

Sometimes the computer's internet connection doesn't work.
sometime's the computer doesn't connect
I don't like when the internet doesn't work

Sometimes access problems

I don't like when the internet doesn't work

Sometimes access problems

I can't see any disadvantages at the moment

I don't think there are any disadvantages

Not really

no not aware of any

No real disadvantage to the online aspect

No disadvantages that I can see

no

None

Nothing

No

Scope of questions - can you be as in depth in question types or will there be a reliance on multi choice etc.

Analysis is probably only possible on yes/no or multi choice answers

I would prefer for spellings to be hand written for a better understanding

... and how to put answers into the students own words.

but it is good for children to have to write out the answers as well as select them from multiple choice answers

Written tests would be more accurate, as they can guess a lot

Computers fail at the time of testing.

Computers not always reliable

Technical problems

The programs/technology in use can sometimes be unreliable

Laptop batteries can be low or empty

Time take to prepare and a reliance on technology that isn't always reliable.

Only one I can think of is if the computers malfunction, can be disruptive...

when there is problems on the computer

Sometimes the computer has an upload so you have to do your

that sometimes your laptop does not work and at home if you do

sometimes it glitches and it might skip a question

the program may only very specific answers and therefore discount answers which a human corrector would have allowed for whatever reason

Child reports difficulties with inputting answers as system marks answers wrong depending on whether capital letters used etc.

None, other than student complaints when for some reason or other correct
answers don't get logged or properly recorded ... Though this is a lesson in itself

Unfair if it marks my question wrong but its right
Unfair I dont like the way that the computer sometimes gives you unfair score
Unfair Maybe some Irish questions might stand wrong because it wouldn't let me do fadas

Enthusiasm for Online Testing

Ind My child finds it easier, it is not time constraint so therefore gives him an opportunity to answer the questions.
Ind I like it because we don't have to ask for the question again.
Ind tests online are acessable anywhere
Ind cus u cud go on different webs after ur done the tests
Ind i like it better because u do not have to use a pencil and after u can play a game
LC I'm not confident that the internet and the testing program would be 100% reliable
LC I am not very comfortable with technology and would have concerns about
Like Has helped to create an interest in IT.
Like i hink the use of technology in my son's classroom has made him much more intrested in learning
Like i do not mind because if i think muinteoir david thinks it is ok then i am all right
Like i like it because it is fun and cool
Like its way better
Like because they are fun
Misc He appears unsure of himself and apprehensive.
Misc I Like the idea of her having the experience of doing tests online and also the option for me to view the test when complete, however I would also like tests to be written.
Misc The only question it poses for me is that later a child has to revert back to the traditional test and therefore is constraint by time and also how fast they can write.
Misc We must get into habit of viewing weekly test results online. When tests came home in test copy at weekend, parents had to sign that they had viewed results. It might be a good idea if parents had to tick a box online to confirm that they had seen results. This would be a valuable asset for the teacher too.
Misc alright .
Misc i think its easier than doing it on paper
Misc I think it is easier
Qformat I would feel that with the multiply choice questions that it makes it easier for the child to pick the right answer, but maybe i am old fashioned, i understand that this is the way forward as long as they can work out the sums or spellings themselves.
TI technical problems arising in a whole class situation.
## Barriers and Drivers

### Barriers

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misc</td>
<td>Who creates the test for the children?</td>
</tr>
<tr>
<td>Misc</td>
<td>use of computers. organisation finding/ accessing tests. prior knowledge/experience of testing online. teachers lack of knowledge.</td>
</tr>
<tr>
<td>Net</td>
<td>connectivity</td>
</tr>
<tr>
<td>Net</td>
<td>Internet Quality difficulty with internet access. not all children have internet access or else it's limited</td>
</tr>
<tr>
<td>Net</td>
<td>Unreliable internet</td>
</tr>
<tr>
<td>Prep</td>
<td>Preparation time for all tests</td>
</tr>
<tr>
<td>Prep</td>
<td>Time it takes for teachers to set up tests</td>
</tr>
<tr>
<td>Res</td>
<td>large class numbers</td>
</tr>
<tr>
<td>Res</td>
<td>Computer resources. Childs confidence in using a computer.</td>
</tr>
<tr>
<td>Res</td>
<td>Availability of the technology</td>
</tr>
<tr>
<td>Res</td>
<td>Lack of laptops</td>
</tr>
<tr>
<td>Res</td>
<td>large classes ..sufficient computers in working order</td>
</tr>
<tr>
<td>Res</td>
<td>(2) Insufficient number of laptops/iPads for all classes resources available (computers, internet etc.)</td>
</tr>
<tr>
<td>Res</td>
<td>Barriers may include access to computers and internet</td>
</tr>
<tr>
<td>Res</td>
<td>It is necessary to have a computer for every child.</td>
</tr>
<tr>
<td>Res</td>
<td>Large Classes</td>
</tr>
<tr>
<td>TI</td>
<td>Unreliable laptops/iPads</td>
</tr>
</tbody>
</table>

### Drivers

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imm</td>
<td>Instant and accurate feedback</td>
</tr>
<tr>
<td>Imm</td>
<td>if the children enjoy these tests more than traditional tests and are enthusiastic about them that would help promote this system</td>
</tr>
<tr>
<td>Like</td>
<td>Muinteoir David! Inspections. childrens own comfort using computers</td>
</tr>
<tr>
<td>Like</td>
<td>Experience. Practical experience in using IT</td>
</tr>
<tr>
<td>Misc</td>
<td>if tests are user friendly for teacher and results are easy to interpret Evidence that shows online testing can: (1) reduce a teacher's work load and not increase it (2) improve the learning of pupils (not just their test scores) Possibly prepping the pupil for a secondary school which uses the same method of testing</td>
</tr>
<tr>
<td>Misc</td>
<td>more reliable internet</td>
</tr>
<tr>
<td>TR</td>
<td>Training for Teachers</td>
</tr>
<tr>
<td>TR</td>
<td>teachers are open to new methodologies of learning.</td>
</tr>
</tbody>
</table>
Importance in the Future

**Yes**
Yes definitely! Jobs, interviews, tests, applications, education, online learning, Revision, access to lectures notes, submissions etc, will all use computers and be online

**Yes**
Absolutely, the way forward.

**Yes**
It's great to combine the old and new approaches to education.
I feel that computers will be widely used in their education in the future especially for resourcing work

**Wrong**
No

**Yes**
it might be cheaper to buy a laptop instead of buying all the books and things

**Yes**
we might need them for science or projects

**Yes**
I think that they will be important because we will have to know how to use them

**Yes**
Computers will be important because we will have to do lots of research

**Yes**
i do think that the computers or laptops will be easier

**Yes**
Because of junior cert and leaving cert

**Yes**
for your junior cert and for your leaving cert

**Yes**
science servay alot of other things

**Yes**
cus if u want to be a computer engineer u wud have nothing to practice on

**Yes**
they will be important for study

**Yes**
because computer science

**Yes**
for projects
Appendix G: Interview Transcripts

Computer Teacher

Question 1:

Ah, how would you rate your enthusiasm for doing online tests in your classroom?

Ah, I’d be fairly enthusiastic, ah I could see some pitfalls of it but generally am I think it is well worth while doing and you get instant feedback on what, how they are getting on with the tests and every thing else.

Instant feedback okay. What are the reasons that you think, what difficulties might you come across do you think?

Well I think the problem is just the IT problem more than anything else, you know that computers are not working or there’s batteries running out, things like that or even that children won’t access the information when they go home or their parents won’t access the information when they go home. That if it’s in a test copy that they could put down in front of them they look at it but if it’s online they mightn’t check it up.

Okay, so at the moment we have a routine where the child takes the test book home and the parent corrects it and that is a well worn routine, do you think that could happen for online testing or?

It could but I think, I think it’s the same pitfalls as there is with taking the copies home is that there are children who will always get it done and there are children who will never get it done no matter how many times you ask them to do it, ah they, they still won’t do it where as with the online thing there is even less chance they will do it where as if they have the copy they will definitely, eventually even if you get on to kids, I don’t know if there is a way to check to see. Is there a way to check...to see if the parents have looked at it?

It would, it would depend on the software that you are using. But in Haiku it is possible to see who has logged in and what they have viewed.

Right!

And for how long they have been on it, but not, there isn’t any other w...

But is it a teacher or is it a parent login or is it a ...

There are separate parent logins and pupils logins...

Oh alright so it’s not the child, you couldn’t know whether it was the c... You’d know if it was the child or the parent looking at it.

You would.

Right.
Question 2:
What do you think might be people’s opinion of (online) testing in the school environment, do you think other teachers would use it or would not use it?

I think they wouldn’t. I think it depends on how much you like IT and I also think it depends on how confident you are and also how much time you spend on it outside school, not within the school, you know from nine ‘till three. If you do a lot of stuff on IT outside school when you go home in the evening then you’d use it. But if you don’t you’d never use it.

And can you see anything coming down the line where IT will be encouraged more in schools not necessarily for online testing but to do more online material?

I think they are even now (about?) the Department of Education you know. If .... the money that’s available is available for IT training and for online training, am, and if you want to do history or geography or whatever else you have to pay for that first of all (.....?) teacher, whereas all IT training is free and also the courses, the summer courses that are available, the ones that they run this year and in Clare Education Centre are mostly IT ..... That’s all encouraging teachers to become, to embrace IT than what they were before ......

Question 3:
What in your opinion are the advantages of doing tests online?

Am, I think you get instant feedback as to how the children are doing. You can compare and contrast you know if you are doing it over a couple of years how they are going you know from year to year to year. Am, parents can have a look and see how their child is doing, can look at the test and how the results are and all the rest and I think the child themselves doesn’t see it as a test if they are doing it on a computer than it they actually have the test book out, even though they are doing exactly the same thing and but because they are doing it on a computer and because they are doing it online they think it is more fun or that it is a nicer activity so they don’t view it as much as a test.

Okay, and any disadvantages?

Ah, disadvantages, it takes a long time to prepare the thing before hand and you have to have the correct software and you have to be trained in how to use it and if you were using it in a school it would probably have to be uniform throughout the school so therefore you’d have to train all the teachers in how to use it throughout the school and you know and... I think that would be the main one and then after that the IT glitches that there would be and then parents you can’t always be certain that they are going to check it online or as I said before they’d be looking at the test copy whereas I don’t know that they would be as... I think they just ... it’s all about education, that they need to see it as a test because I think even with parents they think if because the child sees it as not as much a test the parents see it as on a computer it’s not as much a test as in the test copy, I think it’s all about perception.

Okay
Question 4:

Do you think online practice tests conducted a week prior to the main test would be helpful to children’s’ learning?

I do, because sometimes I think with testing the children learn things and they retain it just for that test ... immediate test and if you ask them the same questions a week later they wouldn’t know the answers to half the questions because it is only for that moment whereas if they have a practice test they go through it all they retain a certain amount and then if you did another test on it ... I think they would retain a lot more whereas with sometimes I just find with the weekly test just I you know the copy or whatever without a practice test before hand online that they don’t have as much retention of it.

If a teacher was to do practice tests online like that do you think online testing would have an advantage over testing in their normal test book?

Definitely because you would get a better idea of where the children were at, what is their retention, how much have they actually learned than just a quick snip of what they know right now.

Question 5:

Do you think there are any specific disadvantages to doing tests, practice tests online?

Ah, not really I think it is advantageous always except sometimes that the children might think that it’s not a real test (when?) they do it twice do you know sometimes children just have that perception of it.

Question 6:

How quickly do you think a child should receive feedback after their tests?

I think it should be almost immediately, not after each question but at the end of the test so that they should know immediately because I think if it is any longer than that the child loses interest first of all in how they got on, it doesn’t really matter when there is an immediate feedback that they appreciate how they did also that is the good thing about online testing is that if it is in a copy book or whatever you have to bring it home and you have to correct it at home and there is a big long delay whereas with online testing it is immediate so it is a big advantage really.

Ah, so at the end of the test you think is the best.

At the end of the test yeah.

Ah so are there any specific disadvantages then to giving them the answers immediately after each question, after each attempt at a question?

I think there is (thinking), I think if you are giving them the answer after each question, I think the delay is the mo... it kind of, preceding with the test I always think it is best to get to
the end of the test and then go back and see how they got on in each question at the end of the test rather than going through each question individually and given an answer at the end and then going on to the next question, just personally myself.

Okay, and again just going back to the end of the test you think that is the best one. Is there any specific reason apart from, you mentioned that am, it’s just to give them a break to get to the end of the test (and?) review it and that they might not have the interest the following day. Are there any other reasons why it might be (even?) better at the end of the test?

I don’t think so really. That’s the main, like, the main reason, I can’t think of another reason why...

So, I mean, children they do the test, get their answers and ah, if you are leaving it until the following day their heads are somewhere else.

Yeah, they have lost interest.

Okay.

Question 7:

What are the advantages or disadvantages for pupils .... for online testing.

I think the first one is that, for online testing that they first of all don’t see it as a test they see it as a challenge rather than a test because it’s on the computer and I think that they get instant feedback s well so therefore they find that kind of, they don’t have the long delay and therefore they get instant enough feedback on what they have done. Ah disadvantages, I don’t know that there is any particular disadvantages really, am.

And for parents?

For parents they can go online and they can check the answers straight away and see how they are getting on and compare it to the week before and ah as opposed to having to bring the test copy home and then they don’t know, they have forgotten the copy, or they are not there or they can check it anywhere they like too, they can have it on their IPhone or they can go online and check it on their IPhone and they don’t even have to be at home on the computer, it’s very useful like that.

And the disadvantages for parents?

Ah well I suppose there are still parents that still don’t have that facility to go online or don’t have computers or don’t have it on their phones so you will always face that challenge there are people that don’t have it and generally it is to do with their socioeconomic setting, if they are not so well off they miughtn’t have the same facilities you know.
And for teachers?

For teachers the advantages obviously is with correcting things like that you can set up the questions so that it is easy enough to correct and it is not as labour intensive to do as far as the correcting part now maybe setting it up is but correcting it isn’t as labour intensive. You get a constant, not only do you get a picture of the child but you get a picture of the whole class in a feedback straight away you know how things are going or if you are teaching something and you want to know how well you thought it you kind of get an answer straight away .... the children’s results as to how well it’s bee understood, am, as regards disadvantage I think the time involved in setting it up is probably the main disadvantage of it.

Question 8:

What barriers or drivers do you think exist for online testing in schools?

I think the main barrier that you face is that a lot of the teachers, people in general are resistant to change in what they are doing you know. If you say, go into every class and say now we are going to do online testing from next year you would immediately get fear in people’s eyes as.. they’d be terrified that they wouldn’t be able to do it, how will they set it up and what would they do. I think that would be the main barriers is more fear and resistance you know. Am, ..., what was the other one?

Ah drivers, what might help them to ... 

Am, I think if you have particularly in this school you have people working together you know and two fourths, two fifths, two sixths if one teacher is doing it you could work together you know to create the thing and it would encourage more teachers to do it you know and summer courses where, if you have a summer course in the school where you are focused on online testing and setting up online testing in the school if all the teachers went to it then you’d have a whole school operating together to run it.
**Principal**

**Question 1:**

How would you rate your enthusiasm for online tests in school in general?

I would probably saw just about average because I don’t know enough about them and I wouldn’t be very, very familiar with them myself ...

Okay

So, but I can see the benefit of them because I think that is the way the world is going in technology is going that way so it is a learning process but probably not very comfortable at the moment because of not knowing enough.

**Can you see any particular difficulties with online testing, if you were to say next September we are going to do online testing what would you see are the biggest issues that might get it the way of it?**

First of all from a schools point of view I would say that not everybody would know enough that would be the first thing and secondly then I suppose security and that would be a huge issue and confidentiality all of that area I think, anything that is testing because mistakes, particularly when you get people that are not very, very sure, if mistakes are made how do you rectify it and I think it gets more difficult when it goes online it is not easy like if you make a mistake, manually or writing you can erase it, it is not as difficult, it is not as easy to go online to change mistakes. So that would be confidentially that would be a huge issue I had, I would have.

Okay and the site that was used in this test it’s am, it’s a cloud service called Haiku, so ah, you would have to use the pupils names, that you need to identify them in that way. Now you don’t have to give email addresses of kids or anything like that but all their data would be stored, you don’t have complete control over it it’s stored with an online company, would you have any trust problems with that?

Again I suppose you just wonder, because this is all going so fast is there, is there total 100% security or is, can people just hack into those and then something happens. I suppose because things are so new and as principal I would have, I would have, I wouldn’t say I’d be 100% because I still would have those reservations because that would be my responsibility to make sure it is safe and can we say at the moment because things are going so fast, while everybody is trying their best to make sure it is 100% and because I suppose it is so new.
**Question 2:**

What do you think might be teachers’ opinion of doing online testing in their own classrooms?

Those who I think are ... like technology and that might have no problem but I think those who don’t know as much might find it difficult ... and I think then trying to again in a school you are trying to find a balance and when they might not know enough about it, it might put some people under pressure and particularly when the department are not giving us any in training for this that could be an issue.

**I was going to ask that next, is there any push coming from above to implement things like this in schools?**

No there isn’t, anything that any, as you know, any that is ... the school is done by teachers themselves who are interested ... getting from anything to do with IT, there is very, very little being given, being given to us. I think a lot, a lot has been on teacher input really. There has been a certain amount of funding as you know from the department but that wouldn’t cover what I think people are doing at all.

Okay.

**Question 3:**

What in your opinion are the advantages of doing tests online?

Well then they are very easy to record and then you have a record of them and you can see from year to year, very, very clearly so you can keep a record of each child and it is there for parents or for inspectors of for school so from that point I think for record it is, it is very (?).

And are there any particular disadvantages?

Apart from the confidentiality again which I have mentioned and again the knowledge of each staff wouldn’t you know that would be the disadvantage I think and also for recording, where do you keep them you know how are they, there is so much about data protection how are they kept, again the whole thing about record keeping because we have such, in schools because of such strict things on data protection, so that would be a responsibility there.

So there might be a difficulty of using the services of Haiku it’s not, it is a private company in the States would you think, would you prefer that or having a complete in school solution where there is no access to the outside?

I think it would be easier if you had something in school.

Okay.
**Question 4:**

Do you think online practice tests conducted a week prior to the main test would be helpful to children’s learning?

Yes they are getting into a format, it’s like, you know if they practice their spellings, if they practice their writing, if they practice writing a story, they will you know, any practice helps a child learning because they will have, something new we all find it difficult, but if you do anything a few times it will you know, driving a car, cycling a bicycle, if they practice, so yes I would think in general that would be true.

Okay.

**Question 5:**

Do you think there are any specific advantages to doing practice tests online?

The advantages I would see is that it would focus a child’s attention on what they are learning so it is easier so that rather than studying in a vacuum they are much more focused on what they are learning so I think they will then retain more that would be the huge ... and it also gives a child confidence especially the weaker child you know they kind of know what is coming up so they are not, they have steps again it’s guidance to learning and they have good confidence and that will help them and they are not afraid of tests which they shouldn’t be you know what I mean, so I think from that point of view it is good.

Now it is possible, there are services out there like Kubbu where you can put the tests online and the child can do them at home, do you think, has that any advantages or disadvantages?

I suppose it depends on what you want to get out of a test you know we have to ask ourselves why are we testing, that I suppose has to be, because each child will learn at a different pace and each child will learn or retain stuff and so why, what are we trying to teach and what are we trying to learn so I think we have to decide there, what is the purpose of doing these test.

One particular test you could do, in Kubbu you could have crosswords and am multiple choice questions and it can be used for vocabulary testing or spelling tests things like that, ah ...

Yeah I think like that vocabulary and say spellings yes they are all teaching different skills and the more practice they do the better. Crosswords again is teaching another skill, some children are better at them than others again some people will learn them, practice makes perfect. Again it is just doing a skill and doing it a different ways and I suppose it all depends on what kind of learner children are, some children are visual learners so if they see it they will learn quicker. Some people are auditory so if they hear it, it might be better so, and then some people like technology so it’s novel they might be more inclined to do it than doing it in paper which they might find boring so I think it all depends on generating an interest in the child in learning first of all and then each child will learn differently so there are always
going to be, you know children are going to learn differently so all those things will apply differently to each child then.

Okay.

**In tests how quickly do you think a child should receive their feedback after a test?**

I think really that would be up to the teacher, I think there is advantages and disadvantages. I think we are in a world where everything should be, it is not instant but then again you don’t go too long either, you don’t leave something too long because then they lose interest. So I suppose for class ... give time for the teacher to look at them as well maybe the next day would be a compromise I don’t think you should give it to them too quickly nor too long ... say the end of the day, yeah I think would be better.

Okay.

**Question 6:**

**Now what are the advantages or disadvantages for pupils of doing online testing?**

For pupils doing ... the advantages would be that they have, they can go in and check their work themselves, teachers can check it, parents can check it and there is no, they know whether it is right or wrong, you can’t change it so, you can’t dispute it, that would be an advantage and a disadvantage I suppose is am ... again I suppose the confidentiality that somebody else could get somebody else’s children’s work or teachers are comparing and contrasting am that would be a disadvantage the whole confidentiality thing.

**And are there any advantages or disadvantages for parents?**

Well parents can check on their children’s work so they know what they are doing and they know how their children are getting on and they can keep or see where they are going wrong you know and check each questions and so, for parents it is very, very good.

Okay, now the routine in this school is that you have your test book, it goes home and gets signed and comes back in again and that is a well worn routine at this stage, do you think it would be difficult to get parents to go from that checking online.

Again I suppose it would depend on the parents’ interest and how if it’s become school policy then I wouldn’t, I think parents do engage very well with the school and if there is a change they would do that. I think parents are younger, they are at that age too where they would engage with technology and I think they would possibly like it, and but I think too it is good to get feedback from them that they would sign the test, I think that system is good because then you can be sure that they have seen it, that’s why, if they haven’t you can only take the child’s word for it, so I do think parents do need to look at tests be they online or not they need to check them.
Are there particular disadvantages for parents?

I suppose I would always be worried in case some parents wouldn’t have, have the technology, maybe that’s very, very few but as principal I have to be worried about the base line, I would not be excluding anybody and so for that reason and maybe they wouldn’t have ... you know the education to be informed so for that reason I suppose that’s where I would worry about, everybody’s treated the same.

Okay, ah and advantages or disadvantages for teachers?

Again for teachers I think it is just for keeping the record ah and it is something new and ah I suppose the record would be the most important.

Okay.

Question 7:

What barriers or drivers do you think exist for online testing in schools?

Well the barriers first of all I think is we are ... so inundated with so many new initiatives and while they are all brilliant they all need time so you have to pick and choose, that’s one and with that then you need money and with the economy the way it is we are really depending on teachers having an interest and schools having an interest and how much we drive it ourselves. So that would be one, ah, sorry the second part of that question then?

Ah, drivers, what might actually be pushing it?

Pushing it, I think just the way the world is going at the moment, you know, we are in a world where things are happening so fast, even in the last ten years, I don’t think we have an option of not going with that. So that I think is driving us. Children are coming in knowing it from infants, particularly so I think we just have to go with that I don’t think we have an option and how we do it best for the school collectively because I don’t think we can impose anything on, in a school, it has to be from the staff and from the parents and then I think it works. If you impose something from the top down I don’t think it works, so people have to be really interested in it, people are interested in it collectively I then think it works but if something is imposed and you have lukewarm enthusiasm therefore you are going to have failure. So it is trying to get all those bodies and again I suppose ... people are comfortable and confident in using it. Because that is huge barrier if people don’t know how to do something, it turns people off and you are trying to get a consensus within all those and bringing people along with you and you are really in the school hoping people will drive it in the sense of lead it because it has to be lead and people have to be interested in it and that means giving extra time and that.

Okay.
## Appendix H: Themes to Emerge from the Surveys

<table>
<thead>
<tr>
<th>Area of Focus</th>
<th>Emerging themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time spent online</td>
<td>Ranges from a lot to it varies from day to day</td>
</tr>
<tr>
<td>Enthusiasm</td>
<td>Generally enthusiastic except for teachers. They were divided between the categories enthusiastic and neutral</td>
</tr>
<tr>
<td>Advantages Online Tests</td>
<td>Experience of computers, Generally liked, Immediate nature, Miscellaneous advantages, Novelty factor, No advantages</td>
</tr>
<tr>
<td>Disadvantages Online Tests</td>
<td>No disadvantages, Miscellaneous disadvantages, Internet Issues, Technical Issues, Question Format, Unfairness of computer marking, No requirement to be neat and lose presentation skills, Cheating</td>
</tr>
<tr>
<td>Advantages Online Practice Tests</td>
<td>Preparation for summative test, Access to tests anywhere, Miscellaneous advantages, Internet, Experience using computers, No advantages, Time saving advantages</td>
</tr>
<tr>
<td>Disadvantages Online Practice Tests</td>
<td>No disadvantages, Miscellaneous disadvantages, Internet issues, Time to complete tests, Cheating, Over confidence, Technical issues</td>
</tr>
<tr>
<td>Speed of Feedback</td>
<td>Teachers, End of test; Parents, End of test; Students, Immediate feedback</td>
</tr>
<tr>
<td>Barriers</td>
<td>Resources, Internet Issues, Miscellaneous Barriers, Preparation time, Technical issues</td>
</tr>
<tr>
<td>Drivers</td>
<td>Miscellaneous drivers, Online tests are generally liked, If training were provided, Immediate feedback to everyone, Internet</td>
</tr>
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Appendix I: Haiku Assessment Screen Shots

Sample Pre-test Screen Shot
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Conjure: to call up into existence as if by magic. A magician loves to conjure up all kinds of magic tricks.</td>
</tr>
<tr>
<td>2</td>
<td>Aspire: to long for something of great value. Some pupils love attention and aspire to be famous.</td>
</tr>
<tr>
<td>3</td>
<td>Acclaim: to welcome something with approval and joy, to applaud it. The movie Lincoln received acclaim from all over the world.</td>
</tr>
<tr>
<td>4</td>
<td>Candid: to tell the clear truth without trying to make it sound better or worse than it was. When asking someone for their honest opinion you want them to be candid.</td>
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</tbody>
</table>
# Test 3 MCQ Delayed

## Section 1

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>to warn, caution or advise against something</td>
</tr>
<tr>
<td></td>
<td>- abode</td>
</tr>
<tr>
<td></td>
<td>- applaud</td>
</tr>
<tr>
<td></td>
<td>- admonish</td>
</tr>
<tr>
<td></td>
<td>- blatant</td>
</tr>
<tr>
<td></td>
<td>- indiscretion</td>
</tr>
<tr>
<td>2</td>
<td>very smart, clever, cunning</td>
</tr>
<tr>
<td>3</td>
<td>guilty of neglect, not doing a job properly</td>
</tr>
<tr>
<td>4</td>
<td>to put up with or tolerate for a long time</td>
</tr>
<tr>
<td>5</td>
<td>to burst, break or tear</td>
</tr>
<tr>
<td>6</td>
<td>show of respect or honour, in public, to a person or thing</td>
</tr>
<tr>
<td>7</td>
<td>not wanting to do something, to be reluctant or unwilling</td>
</tr>
<tr>
<td>8</td>
<td>of the greatest amount</td>
</tr>
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</table>

Sample Delayed Assessment Screen Shot
### Test 4 MCQ Immediate

#### Section 1

<table>
<thead>
<tr>
<th></th>
<th>to cover over in water like in a flood, to overwhelm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

|   | being in a state of balance                       |
| 2 |                                                     |

|   | giving out in a serious manner for some wrong doing |
| 3 |                                                     |

|   | To really bargain over the price of something, to look for the best price possible |
| 4 |                                                     |

|   | for long periods of time being quietly bad tempered or ill-humoured |
| 5 |                                                     |

|   | suggesting something that twists the truth, to hint at something in a sly way |
| 6 |                                                     |

|   | to decrease in amount or intensity |
| 7 |                                                     |

|   | Lacking interest when others are excited and interested |
| 8 |                                                     |

Sample Immediate Assessment Screen Shot
Appendix J: Student and Parent Permission Slip

Research and Survey Notification: Permission Slip and Withdrawal Form

Dear Parent of Guardian,

I am currently doing a project as part of a course in UL. The course is centred on learning the skills necessary in order to make best use of the technology in the classroom.

- Your child is being asked to participate in the research element of this project and also in a survey regarding the same work. The research involves practice tests using Haiku LMS and the survey will be administered using SurveyMonkey.com.
- Additionally I would be grateful if you could also complete a survey regarding your views of online assessment again using SurveyMonkey.com. Details of how to take part will follow.

The aim of the surveys is to help evaluate pupils and parents views and opinions of online assessment. Participation is voluntary. Please fill in the permission / withdrawal slip at the end of this page and return to the class teacher as soon as possible.

**Topic of Research.** Practice tests will involve multiple choice questions on vocabulary. Two types of practice test are being evaluated. The first has delayed feedback (24 hours) and the other is an answer until correct format test (immediate feedback). I would like to find out if one method is superior to the other for our particular circumstances in Ballina Primary School. The entire procedure will take three weeks in total.

**It is Voluntary.** Participants can opt out at any time.

It is Anonymous. Although pupils’ names will be associated with the test results during the research stage, they will not be used in the thesis write-up. Surveys are totally anonymous.

**Potential Risks.** There are no known risks of physical or psychological harm to you or your child.

**Direct Benefit.** The results of the survey will help the school develop programs that meet the educational needs of students such as your child.

**For Further Information.** The research and survey was developed by Múinteoir David. If you have any questions about the survey, call the school or call in and I will answer them for you.

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**Permission Slip.**

I am the parent or guardian of ____________ (child’s name), and I give

Permission for:

(a tick indicates permission)

1: My child
2: Myself

To take part in this research project.

Signature: __________________________ Date: ____________

PTO – If you wish to withdraw permission
Withdrawal Slip.

I am the parent or guardian of _____________________ (child’s name), and I wish to withdraw permission for:

(a tick indicates withdrawal)

1: My child
2: Myself

To take part in this research project.

Signature: __________________________ Date: _____________