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A case study: the effectiveness of social media and online resources in the teaching of junior science

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**A Case Study: The Effectiveness of
Social Media and Online Resources in
the Teaching of Junior Science**

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**Master of Arts
in
Digital Media Development for Education**

University of Limerick

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Submitted to University of Limerick, October, 2013

Declaration

I hereby declare that this work is entirely my own work and has not been previously submitted to any other educational establishment, in whole or in part, for the purpose of attaining any other third level award. I agree that this thesis may be made available by the college to future students.

Michael Doherty
Student ID 0462845
1st October 2013

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Abstract

A Case Study: The Effectiveness of Social Media and Online Resources in the Teaching of Junior Science

Michael Doherty

The purpose of this research, in the form of a case study, is to attempt to utilize both social media and online materials in order to motivate student learning and reduce dependency on the teacher-led model of teaching and learning which is still prevalent in schools.

The setting will be that of a second level rural school in North West Ireland and the context will be that of a junior cycle student cohort being taught sections of the current junior certificate science curriculum through social media and online methods in addition to the traditional teaching methods of 'chalk and blackboard'. By comparing these two modes of course delivery, an insight will be gained into the effectiveness of incorporating social media and online methods into the classroom. Questionnaires were used first of all gain a brief insight into the online activities of teenage students, their parents and the school staff. The subsequent practical element of the study then involved splitting the junior cycle student into two groups, with one group being taught using traditional methods and the other group being guided to learn using social media and external sites containing the relevant course material. Using test results and student feedback, the findings were analyzed and discussed, leading to the conclusion that there is indeed a positive effect on student test performance with the modern online delivery of course content, incorporating social media, as opposed to the traditional mode of delivery. This has implications for the future development of Information and Communications Technologies (ICT) in schools and the re-examination of traditional modes of teaching.

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List of Abbreviations

ICT	Information Communications Technology
NCTE	National Centre for Technology in Education
IT	Information Technology
CD	Compact Disk
CL	Collaborative Learning
COPPA	Children's Online Privacy Protection Act
CSCL	Computer Support for Collaborative Learning
DVD	Digital Versatile Disk
PC	Personal Computer
TV	Television

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Chapter 1 Introduction

1.1 Introduction

The advantages of the Internet over the past 20 years have been immense, and the influence of this technology on the developed world is such that it has transformed the everyday lives of people in a way that has not been paralleled since the era of World War Two. The world of education has had to embrace this new technology with a vigor that enables all its benefits and positives to be utilized to the fullest extent in the education of our upcoming generation. Yet, the speed at which the online world had developed has found many educational establishments lacking in the development of new modern methods of delivering curricula which are relevant to the IT-savvy youth of today. The rapid development of social media has exacerbated this, with students time and energy being increasingly devoted to maintaining an online presence and keeping abreast of their peers social lives, to the detriment of their educational endeavors in many cases.

“A mind without instruction can no more bear fruit than can a field, however fertile, without cultivation.”

- Marcus Tullius Cicero

The school teacher has been the traditional cultivator of young minds, pouring forth knowledge via the medium of textbooks, verbal instruction, chalk and blackboard in addition to occasional forays into alternative mediums such as field studies and class experiments.

In the present day, the educational climate has changed dramatically with the onset of the Digital Age, whereby teachers' and educators' roles are being transformed into that of 'Guide on the Side' as opposed to 'Sage on the Stage'!

On October 4th 2012, the Framework document for the New Junior Cycle Curriculum was announced by the Minister for Education and Skills, which envisaged a more student-led curriculum where ICT will play an important role, as among the twenty four Statements of Learning in the new Junior Cycle Framework document, the final statement refers to the fact that students should use

technology and digital media tools to learn, communicate, work and think collaboratively and creatively in a responsible and ethical manner.

The research in this study will examine the extent to which ICT and the internet, incorporating social media, can be utilized in the new curriculum, both by the teachers and by the students themselves, in order to enhance the learning and teaching experience for all those in the second level arena.

1.2 Research Topic

The purpose of this case study is to examine the effectiveness of social media with online methods in the delivery of curriculum content to a second level junior cycle student cohort, in comparison to traditional teaching methods.

1.3 Research Question

The main areas in which this case study will focus are outlined below:

- Are students using social media sites extensively, and if so, to what purpose?
- Are they willing to utilize social media in the area of education and learning?
- Are parents amenable to the use of social media and internet in their child's education, despite to negative aspects?
- When online content delivery is in parallel with related use of social media, does it provide increased motivation for the student to learn on their own?
- When material is provided to students by both traditional means and online means are subsequent test scores noticeably different?

- Is there a place in the classroom for social media in an educational context, with educational networking replacing social networking?

1.4 Research Setting

The case study setting was that of a second level rural vocational school of 180 pupils in the North West of Ireland. The primary participants were students in the first year junior cycle student cohort, with parents and teachers providing additional sources of qualitative data. The students were of mixed ability and gender, of age thirteen, and were taught sections of the current junior certificate science curriculum through social media and online course materials. Also, students were taught through the traditional teaching methods of ‘chalk and blackboard’.

By comparing these two modes of course delivery, quantitative data was gathered leading to conclusions as to the effectiveness of incorporating social media and online methods into the classroom.

1.5 Context of Research

In relation to the aforementioned framework document for the proposed New Junior Cycle, there are 6 key skills put forward, in addition to Literacy and Numeracy. Several elements to each skill are listed in the document, with ICT being a component of every single one, as seen below:

1. *Managing myself*: Using digital technology to manage myself and my learning
2. *Staying well*: Being responsible, safe and ethical in using digital technology
3. *Communicating*: Using digital technology to communicate
4. *Being creative*: Stimulating creativity using digital technology
5. *Working with others*: Working with others through digital technology

6. *Managing information and thinking*: Using digital technology to access, manage and share content

It is therefore essential to gain an insight into the effectiveness of utilizing ICT methods, in particular social media and online resources, in order to deliver the aforementioned new curriculum, and if a positive conclusion is reached, expand the use of such methods across the complete second-level curriculum.

1.6 Research Methodology

A case study approach was used with qualitative and quantitative data being gathered by means of questionnaires and practical testing which involved two groups of first year junior science classes who underwent pre-testing and post-testing in each of two chosen science topic areas, with the online teaching method and the traditional teaching method being alternated between groups to provide more reliable results which were then compared and contrasted to ascertain the effectiveness of the methods.

Questionnaires were used first of all to gain a brief insight into the online activities of teenage students, their parents and the school staff. The subsequent practical element of the study then involved splitting the junior cycle student into two groups, with one group being taught using traditional methods, devoid of ICT, and the other group being guided to learn using social media and external sites containing the relevant course material.

1.7 Structure of the Research

Chapter 1 provides an overview of the complete study that is undertaken, and the rationale behind it. This is followed by Chapter 2 which examines existing literature in the areas of educational learning theories, leading onto current theories on

teaching techniques which can utilize modern Information and Communications Technologies (ICT) in the classroom. Multimedia learning is looked at in addition to social media and motivational theories, in an attempt to use these in conjunction with multimedia to better effect. Finally, the new junior cycle framework is explored and how student-centered learning using ICT can aid in the delivery of this new curriculum.

The methodologies employed in the study are examined and explained in Chapter 3, with existing research approaches being looked with a view to applying appropriate qualitative and quantitative research methods throughout the study that will result in reliable, valid and useful results and conclusions, while taking into consideration ethical issues and structures throughout.

Chapter 4 proceeds to give the findings of the research, in the form of qualitative tests results from two sets of post and pre-test sessions, in addition to qualitative survey data gathered from the relevant groups which indicated the extent and manner of ICT and online habits among the school community as a whole. Chapter 5 then discusses these findings from the point of view of the Literature review in Chapter 2 and relates them to current research in the area.

Chapter 6 states the overall conclusions reached from the study and gives recommendations and suggestions as to further study in this area.

Chapter 2 Literature Review

2.1 Introduction

In order to give relevant background and context to the main theme of this study, this chapter will at first examine the most prominent learning theories that have developed since the 19th century, then discuss the progression to more modern theories, including a look at human intelligence in relation to learning. Modern ICT developments and multimedia are then looked at from an educational perspective, and how the Internet and social media can be utilized in the learning process. The whole area of human motivation is discussed and then this is expanded to look at how social media can be used as a motivational factor for learning, with the focus on second level science in particular. It concludes with a review of the New Junior Cycle Framework and how this aims to incorporate ICT into the key learning skills which it promotes. This will all be relevant to the research question which examines the effects of utilizing social media in the delivery of science at Junior Cycle.

2.2 Learning and associated theories

Since the latter part of the 18th century, when psychology branched off from philosophy as an independent discipline in its own right, the process behind learning itself began to be looked at. This led to the various learning theories that are in existence today, all of which vary at different levels in their general outlook and approach to the whole human process of learning. However, they can all play a role in trying to gain the ultimate understanding as to when, where, how and why we learn, as the whole process of acquiring, assimilating and then utilizing information is fundamental to our continued existence as humans, and something which education systems throughout the world strive to perfect.

2.2.1 Behaviourism

Behaviourism is a learning theory where learning is measured by observable changes in learner behaviour. It is a theory that advocates the conditioning of a learner by means of various pre-action stimuli or post-action ‘rewards’ which are introduced in order to achieve a successful outcome. The father of Behaviourism, J.B. Watson, defined learning as a sequence of stimulus and response actions in observable cause and effect relationships. (Forrester, Janitzie, 1998) Furthering the work of Watson was another American psychologist E. L. Thorndike.

Thorndike worked at Columbia University in New York for most of his career, where he was devoted to furthering the behaviourist learning theories developed by Watson. His work involved the observation of the behaviour of cats trying to escape from home-made puzzle boxes. As a result of this work he put forward a theory known as the “Law of Effect” which stated that any behaviour that is followed by pleasant consequences will more than likely be repeated, whereas any behaviour followed by unpleasant consequences will eventually cease.

B.F. Skinner conducted further work based on Thorndike’s results and developed what is known as Operant Conditioning. This involves voluntary behaviours being either reinforced or weakened as a result of either a reward or a punishment. This was seen to be a new and more effective theory that could be applied in the area of education.

“The application of operant conditioning to education is simple and direct.” (Skinner, 1968, p.64)

2.2.2 Constructivism

Constructivist theorists such as Vygotsky, Piaget and Papert advocated the view that learning involves the process whereby a person can construct meaning of their own environment based on past experiences and then be in a position to direct their own learning in order to further build upon this knowledge. Vygotsky advocated that our

cognitive development was closely related to our social development and in turn our particular cultural environment, as well as noting and describing a distinct difference in how children view the world as opposed to adults' view of the world around us, labeling the difference in both as the "zone of proximal development".

Educators, according to Vygotsky, needed to be aware of this zone and use it to build upon a child's cognitive level of development in what he called a "Scaffolding" process.

Piaget, a Swiss psychologist, was especially interested in the various stages of our cognitive development from birth right through to adulthood and how we construct meaning to the world around us.

Learning, according to Constructivists is a question of motivating an individual to attach new meaning to past cognitive experience. The constructivist view of learning supports this where students construct learning for themselves in that they are expected to build on what they have previously learned and experienced in order to construct new cognitive models that enable them develop further meaning to the world around them.

2.2.3 Constructionism

Papert expanded further on this idea to create what he termed *Constructionist* theory. Thus, constructionism, my personal reconstruction of constructivism has as its main feature the fact that it looks more closely than other educational-isms at the idea of mental construction. It attaches special importance to the role of constructions in the world as a support for those in the head, thereby becoming less of a purely mentalist doctrine. (Papert, 1993, p.142) Even the statement (endorsed by Piaget) that every act of teaching deprives the child of an opportunity for discovery is not a categorical imperative against teaching, but a paradoxically expressed reminder to keep it in check. The constructionist attitude to teaching is not at all dismissive because it is minimalist - the goal is to teach in such a way as to produce the most learning for the

least teaching. Of course, this cannot be achieved simply by reducing the quantity of teaching while leaving everything unchanged. (Papert, 1993, p.139)

Wilson (1997) informs us that despite all these various learning theories, they all share several commonalities:

- They all endeavour to explain something, or to help us understand the way things are within a certain domain in life
- They include a cluster of various concepts that are then organized together to form a whole
- They usually come with some way of connecting to evidence and observations

Once an individual has learned to verbally interact with others, they can then verbally interact with him or herself. The individual now learns to engage in an internal dialogue. The form that this internal dialogue takes may be called the individual's construction of meaning.

So therefore, according to social constructivism, the individual learns early on, even as language development begins, to construct his or her knowledge and meanings through interaction with others, and in today's social media-saturated world this very interaction takes place on a wider level than ever before, so it is apparent that ICT and computing is well placed to achieve the objectives of the constructivist theories of learning in general, and in particular the theory of Papert, who viewed computer technology as an excellent means to merge learning with meaningful experiences. The objectives of Papert and the other Constructivist theorists are becoming ever more realized as the digital age progresses at lightning pace, and it is this rapid progression that enables more interactive than ever before, so it is essential to incorporate as much learning materials in digital format as possible to enable online access and interactivity which will further the teaching and learning objectives of modern educational curricula.

2.3 The ICT Generation

2.3.1 Digital *Natives* and Digital *Immigrants*

According to Prensky (2001) the current generation of students can be viewed as Digital Natives, as they have been brought up with mobile phones, computer games, music players, video cams. He mentions the fact that today's average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV).

It follows then that such students can be seen to have a reduced attention span during classroom instruction via the traditional methods of "chalk and talk"!

In contrast, the 'older' generation (those born pre-1995) are considered "Digital Immigrants", and as educators of the younger ICT-savvy generation have had to up-skill in order to acquire their ICT skills over time. They believe that their students cannot learn while watching TV or listening to music because it seems like a distraction (in the eyes of their Digital Immigrant teacher), yet modern students are better able to cope with a multitude of multimedia distractions and still perform to the highest of standards.

This provides both opportunities and challenges for educators, where a happy medium must be found in the use of ICTs in the classroom setting which promotes the best possible learning experience for the student.

According to Prensky we must "invent Digital Native methodologies for all subjects, at all levels, using our students to guide us." As students are already engrossed in a haze of social media on a daily basis, it is apparent to those digital 'immigrants' among the educational spheres that it is this methodology that is best placed to advance their teaching and learning aims and objectives among their student learners.

2.3.2 Constructionism and the *Net Generation*

Papert's vision of children becoming constructivist learners is already happening in that there is a major shift to more and more interactive learning as a result of the

proliferation of ICT in the majority of our learning institutions at second level here in Ireland. There will be more and more emphasis on student-based discovery learning and the onus will be placed increasingly on the students themselves to provide evidence of such learning having taken place.

Learning is going to become more and more student-centred and less teacher-centred, with the role of teachers themselves being relegated somewhat to that of mere "guide on the side" as opposed to the "sage on the stage"! In this respect, ICT is becoming the default means by which curricula are delivered in educational institutions.

Tapscott, (1998) believes that learning is now taking place in a way that has become more and more interactive and self-guided. In his book *Growing Up Digital: The Rise of the Net Generation*, he states that today's learners are no longer passive recipients during the teaching process, but instead are becoming more inquisitive and want to become more involved in the learning.

The net generation children using GlobaLearn [a web site], are beginning to process information and learn differently than the boomers before them. New media tools offer great promise for a new model of learning - one based on discovery and participation.
(Tapscott, 1998, p.127)

Modern computer technology has invaded every aspect of our modern lives, so it is incumbent upon us to absorb this computer technology into education in order to keep in line with the shifts in learning being observed among modern learners.

Tapscott has also observed several shifts in today's learning which are the result of the multiple-media explosion of the past twenty years.

2.3.3 Learning and the *Net Generation*

Modern students are seen to be learning in a way that was inconceivable only 50 years ago. A paradigm shift has occurred in the way that students conduct their learning.

- From linear to hypermedia.
- From instruction to construction and discovery.
- From teacher-centred to learner-centred education.
- From absorbing material to learning how to navigate and how to learn.
- From school to lifelong learning.
- From one-size-fits-all to customised learning.
- From learning as torture to learning as fun.
- From the teacher as transmitter to the teacher as facilitator. (Tapscot, 1998)

It is evident here that the role of the teacher has changed and will change significantly in the modern educational arena as learners themselves take ownership of their learning and will become more active in guiding and directing their own learning experiences.

In relation to second level science teaching and learning in particular, the aforementioned theories provide quite a solid basis from which to construct a social media-led course of instruction from which the curriculum can be delivered effectively. According to Skinner (1957), the construction of scientific knowledge is a case where social constructivist pedagogy is applied in that scientists communicate their findings to their peers who then give feedback, either negative or positive (reinforcement or punishment). This constant dialogue within the scientific community powers forward the progression and advancement of scientific theories and discoveries.

Amongst second level science students this very same dialogue through social media platforms will hopefully be seen to be advantageous from the perspective of the students' learning outcomes.

2.4 Intelligence and Learning types

2.4.1 Multiple Intelligences:

According to the Harvard professor H. Gardner, human intelligence is a broad spectrum of abilities and gives a more holistic view of human intelligence where it is not solely confined to the mathematical and linguistic skills, nor is it uniform amongst the workings of the brain, but takes place in separate distinct areas of the brain, being all brought together when required to enable proper day to day functioning. He defines the following separate intelligences in humans:

- *Linguistic*: the ability to convey meaning through language and speech.
- *Logical*: the ability to manipulate numbers and perform mathematics.
- *Spatial*: the ability to visualize 3-dimensional shapes and spaces.
- *Musical*: the ability to understand and appreciate music and melody.
- *Bodily-kinesthetic*: the ability to perform physical tasks.
- *Interpersonal*: the ability to relate and interact with other people.
- *Intrapersonal*: the ability to be aware of one's inner self and be content.

Gardner's continued work on further intelligences that qualify as cognitive processes will expand upon the traditional concepts of learning as we know them. His intense interest in human intelligence began after studying brain-damaged people where he noticed that some of their abilities, both cognitive and motor-sensory, remained intact after the damage had occurred. This led him to believe that human intelligence was divided into various types, just as the brain itself is divided into various sections that perform the various functions, overlapping them when required.

The theory he proposed was that all humans can learn to develop these various intelligences but that some of them may lend themselves to being more easily developed than others from one person to the next. In other words, everyone cannot

develop their spatial intelligence to the point where they become great architects, or develop their musical intelligence to the point where they conduct symphony orchestras, but each person certainly has the basic intelligences within them to some degree. Now, with the use of computer technology, learners are in better position than ever before to avail of Gardner's view of intelligence and use multimedia technology to develop each facet of their intelligence in a broad, non-linear way.

2.4.2 Self-directed Learning

The *transmittal* model of teaching, where the teacher, lecturer or professor stands at the top of the class and imparts his or her knowledge to the passive audience who memorizes the information and can then reproduce it at examinations, is fast becoming outdated and obsolete in today's multimedia-saturated world.

Professor King (1993) of California University was the first to moot the concept of *Guide on the Side* in relation to the modern educators' role, as opposed to the more traditional one of *Sage on the Stage*, which related to the aforementioned transmittal model of teaching.

She proposed an approach which involved students becoming more active during lessons and less passive. The teacher's role is to become more pro-active in engaging with the students during their class time by guiding them individually or in small groups during tasks, which are set by the teacher and designed to stimulate the student into seeking out their own understanding of the topic.

The inter-connectivity of today's youth via multi-media and Internet necessitates a whole different approach in the provision of education. Young adults now have a whole world of knowledge literally at their fingertips, and educators are seeing their role of "sage on the stage" somewhat relegated to the role of "guide on the side".

This is quite apparent in the New Junior Cycle Framework (2012) which promotes a new, more student-centered approach to teaching upon the introduction of the new cycle in September 2014.

2.4.3 Collaborative Learning

Collaborative learning is where a group of two or more people can learn something together in a way that utilizes each person's particular skills and resources, thus maximizing the learning potential of each individual within the group. The progress of the learning can be monitored by the group and each individual is responsible for providing support and encouragement to the other group members with the common aim of achieving the learning goal that had been set out.

In general, the term *Collaborative Learning* (CL) is used for the description of educational practices based on the simultaneous cognitive and mental effort of multiple students and/or educators. Students share a common goal, depend on each other and are mutually responsible for their success or failure.

It can be related to Vygotsky's views that the learning process is inherently social in nature, as described in his theory of 'zone of proximal development' mentioned previously, and in effect, collaborative learning can be seen as that which is undertaken by students and teachers in a classroom setting where they work together to achieve learning outcomes.

Research has proven the effectiveness of collaborative learning in some cases compared to other educational practices (e.g. competitive or personalized learning). It was concluded by the researchers (Bruckman, 2001, Dillenbourg, 1996) that collaborative activities, centred on a cognitive goal, resulted in more meaningful and more efficient knowledge being acquired. From research like this, several theories have developed such as constructivism and social learning.

Vygotsky, who is the main supporter of social learning theories, states in the basic principles of his theory that "learning and developing is a social, collaborative activity". (1962)

So, it can be seen that modern social networking can be most useful in the application of this theory.

2.5 Multimedia and Learning

Now that it has been reasonably established that current multimedia technology is best placed to advance the aforementioned modern learning theories, the most effective aspects of this technology must be sought out, while at the same time attempting to identify the more negative and distracting elements of current technology and how they can form a barrier to efficient self-directed learning.

2.5.1 Positive aspects of multimedia learning

- Brings the real world to the learner through sound and video
- Allows for self-directed learning.
- Learning pace is controlled by the learner.
- Allows multiple modes of presentation.
- Engages and motivates the learner.

2.5.2 Negative aspects of multimedia learning

- It substitutes actual real world experiences with virtual experience, which lacks stimulation of certain human senses that may aid the learning experience.
- Interactions with other learners do not take place in the same way as in a traditional learning environment. Because it is mainly self-directed, it can provide distractions which may distract the learner and make it difficult to remain 'on-task'.
- An overload of information may be experienced which may make it difficult for the learner to extract the relevant information..
- Due to the possibility of several different modes of multimedia being presented, the learner may find it difficult to concentrate on the information being given.

- Lack of feedback throughout the learning stages may hinder progression.

It is clear that in order to lessen the effect of these negative aspects of technology-based learning the learners themselves must be fully aware of them throughout the process and engage with the technology accordingly by interacting with it and not just being passive receptors of the information, irrespective of how well presented the information may be.

2.5.3 Multimedia Learning and the Internet

The Internet revolution has transformed the whole sphere of multimedia in the world today, in that it is no longer confined by the hardware and how the various applications are utilized to create learning materials which previously had to be distributed via portable storage methods such as floppy disk, CD, DVD, Zip Drives, Rev Drives, or other such portable memory drives.

Since the advancement of the Internet and the invention of the World Wide Web by Berners-Lee in the early 1990's, the distribution of digital material is no longer restricted to memory drives which upload the software onto each device, but instead can now be simply downloaded onto each device from cyberspace via the Internet. Add to this the proliferation of faster cable speeds transporting the digital signals throughout the Internet, from the ISDN networks of over a decade ago through to high-speed fibre optic cables of today, in addition to the advances in non-terrestrial transmission via satellite for example, and there is a veritable explosion of easily accessible and readily available material from which any learner with a slight motivation to learn can glean limitless information.

There has subsequently been tremendous progress made towards advancements in the various modes of presentation of information over the Internet, such as video sharing, podcasting, wikis and blogs amongst a plethora of social media sites which now connect technology users in a way that had been previously unimagined. The immediacy of the available information and the breadth of social interaction which

results has transformed each and every facet of our public and private lives, in parallel with a shift in the way all our public and private institutions now operate.

Education institutions have embraced this shift in social interaction and information availability by allowing various curricula and associated coursework to be readily accessible over the internet where students can have the luxury of accessing the information at the their own discretion.

2.6 Internet and Social Media

2.6.1 What is social media?

The social media phenomenon has resulted in a world where people can now be connected to each other via the internet on such social networking websites as Facebook, Twitter, MySpace, LinkedIn, to name but a few of the many highly interactive platforms now available. Information and interpersonal contact via interactive platforms is readily to hand, literally, with the proliferation of hand-held mobile internet-enabled wireless devices, so now users are constantly ‘connected’ to the web, and each other.

The term *social media* is the collective term for any Internet application that enables users to upload and download information in any multi-media format, such as text, audio, images or video for the main purpose of social interaction and networking.

According to Kaplan and Haenlein (2010), social media can be defined as “a group of Internet-based applications that build on the ideological and technical foundations of Web 2.0, and that allow the creation and exchange of user-generated content.”

The sheer proliferation in recent years of the phenomenon warrants due attention with regard to the possibilities for educators and learners throughout the academic world. According to Nielsen, who conducted a study in 2012, internet users continue to spend more time with social media sites than any other type of site. At the same time, the total time spent on social media in the U.S. across PC and mobile devices

increased by 37 percent to 121 billion minutes in July 2012 compared to 88 billion minutes in July 2011.

2.6.2 Social media and learning

Social media has been seen to be most useful in engaging users and connecting users like never before, and despite the inherent negative aspects that arise with the phenomenon, there should be adequate scope given towards making the case for more and more academic uses of such social media.

This is none more so evident than within the US system where social media has already progressed at a faster pace and is being utilized more and more in the K-12 education system.

“It's commanding the attention of technology-minded educators and school administrators of all stripes as they grapple to take advantage of social media tools and to understand and mitigate the fears and safety issues that may arise when kids and teachers use these tools”. (Hoffman, D. 2011, p6)

Despite all the fears and negativity at first, educators and academic institutions have realized that the power of the social networking phenomenon in the academic sphere would enable any negative aspects to be far outweighed by the positives.

“It might very well be a huge classroom distraction, but why can't social media become a bigger boon for education than we've ever seen? New and emerging technologies have largely sought to bring us greater freedom, and with freedom comes responsibility. Schools that nurture this will do just fine.” (Rivero, V. 2011, p.12)

2.7 Motivation of students

2.7.1 Motivation theories

The new approach to learning as promoted in the New Junior Cycle involves a greater degree of student self-directed learning, and central to this is one simple element; *motivation*.

Human motivation is an area of study under the umbrella of developmental psychology that deals with the factors, both internal and external, that cause humans to pursue particular courses of action in certain situations, or in more long term situations. It has been the focus of study for many psychologists, educators, scientists and others who have strived over many years to narrow down the key elements of the human mind and the thought processes that motivate their actions.

2.7.2 Maslow's theory

Maslow, the American psychologist's 1943 paper "A Theory of Human Motivation" narrows down such elements to what is referred to as the Hierarchy of Human Needs:

1. Physiological needs - these involve food and drink and other physical needs.
2. Safety needs – these involve shelter and avoidance of danger.
3. Love and belonging – the need to be loved and accepted by others.
4. Esteem – involves gaining recognition and approval.
5. Self-actualization –the achievement self-fulfillment and realization of one's potential
6. Self-transcendence -where an individual considers the spiritual aspects of their personal development and may strive to help others to fulfill their potential.

As an individual's basic needs are physiological, such as food and other bodily sustenance, so these are placed low on the hierarchy. When an individual achieves

the point where these needs are met, they are then motivated to achieve needs which exist at the next stage up on the hierarchy, such as safety then attention turns to satisfying needs which exist at higher strands on the hierarchical scale. Any given level in the hierarchy cannot be reached without first attaining the levels below it.

2.7.3 Alderfer's Theory

Alderfer (1972) developed a comparable hierarchy with his ERG (existence, relatedness, and growth) theory. He further modified Maslow's theory to develop his own hierarchy of three core needs that encompass the motivational factors that drive our day to day existence.

Alderfer's Hierarchy of Needs:

- *Existence needs* - These include need for basic material necessities. In short, it includes an individual's physiological and physical safety needs.
- *Relatedness needs* - These include the aspiration that an individual may have for maintaining significant interpersonal relationships and achieving public fame and recognition. Maslow's social needs and external component of esteem needs fall under this class of need.
- *Growth needs* - These include need for self-development and personal growth and advancement.

Ryan and Deci (2000) suggest three motivational needs in humans; autonomy, competence and the need for relatedness. Many others have derived similar theories in this area; McClelland (1987) developed his *Three Needs Theory*, Herzberg's *2-Factor Theory* (1959), Locke's *Goal Theory* (1990), Adam's *Equity Theory* (1965) and McGregor's *X and Y Theory* (1960), to name but a few.

In relation to children, Thompson, Grace and Cohen (2001) regard their dominant needs as connection, recognition and power.

In almost all these motivational theories it can be clearly seen that there is one component that is common to all of them, and that is *bonding* and *relatedness*. This provides clear indication of the potential relevance of social media in motivating students towards educational aims and objectives.

2.7.4 Motivation and social media

All individuals strive for a sense of belonging and connection to their fellow humans, a sense of being related and being part of the broader human spectrum of existence. It is important to realize this within the context of the younger generation and how we provide for their education in such a way as to maximize their learning potential in order for each person to fulfill their innate desire to be relevant. This previously noted, Thompson, Grace and Cohen (2001), state that the most important needs for children are *connection*, *recognition* and *power*, so it is relevant to assume that the modern trend of interpersonal networking via social media empowers our youth to a degree which was unattainable among the young students of previous generations. A certain sense of control and ownership of their interpersonal relationships, albeit cyber-relationships, can be seen as generally positive. They are now connected in a way like never before to their peers, and it is the lure of social connectivity which can be a strong motivational factor in their continued use of social media. So, it is reasonable to assume that if such social media is incorporated into the educational spectrum, that learning and the transmission of educational material can be greatly enhanced, if utilized correctly. If more and more emphasis was placed on the educational potential of social networking, then maybe some of the negative aspects felt by parents and others would be greatly alleviated.

2.8 ICT in Science Education

2.8.1 ICT and student motivation

The University of York Science Education Group published a report in 2002 which focused on ICT use in science education and found that learners are more highly motivated when their learning is supported by ICT, in particular;

- Students are more engaged in activities and they show an increased interest and demonstrate a longer attention span.
- ICT can provide access to a huge range of resources that are of high quality and relevant to scientific learning.
- The multi-media resources available enable visualisation and movement to enhance understanding of scientific ideas.
- ICT widens the range of material that can be used in teaching and learning to include text, still and moving images and sound, and increases the variety of ways that the material can be used for whole class and individual learning.
- ICT also allows teachers with different teaching styles to modify materials and the way they are used in different and effective ways as they see fit.
- ICT improves the quality of data available to students, through Internet availability.
- Many ICT tasks do not require the use of a specific classroom or laboratory. An activity, started in one classroom, can be continued in a different room later in the day or at home in the evening.
- ICT provides opportunities for teachers to be creative in their teaching and in student learning. (University of York Science Education Group (2002))

The above points illustrate the fact that the introduction of ICT into science teaching in particular further introduces a strong motivation to learn among students. It is envisaged that the introduction of social networking-based learning avenues will only further enhance their learning in this area at Junior Cycle level.

2.9 The New Junior Cycle Framework

On October 4th 2012, the Framework document for the New Junior Cycle Curriculum was announced by the Minister for Education and Skills. It sets out the details and timeline for the implementation of the new curriculum beginning in September 2014 and phased in over several years until its full implementation in 2020. The main focus will now be on student-led learning and teachers will have an increased role in relation to assessment of student learning on an on-going basis over the duration of the new two-year Junior Cycle.

2.9.1 ICT and the New Junior Cycle

ICT has featured in this new framework and it is imperative that it used as an integral tool to provide the best standards of teaching and learning as envisaged by the Minister and his team.

The major change to the new curriculum is the introduction of school-based assessment which will comprise of 60% examination and 40% school work over the two years of the cycle. This schoolwork will involve elements such as assignments, written reports, oral activities, case studies, projects and various other written exercises and assessments. In relation to ICT, the Minister was quite clear;

Schools may use developments such as e-portfolios to enhance the changes that this school-work component can provide.

To support this, I have already convened an education and industry group to advise on how ICT can be used to enhance the junior cycle experience at school level.

(Quinn,R, TD, Minister for Education and Skills, 4th Oct 2012)

2.9.2 Collaborative learning and the New Junior Cycle

It is obvious to all that ICT must play an important part in the new curriculum, so among the 24 Statements of Learning in the Framework document, the final statement refers to the fact that students should use

technology and digital media tools to learn, communicate, work and think collaboratively and creatively in a responsible and ethical manner.

As discussed earlier, collaborative learning is an important component of the broad learning experience, and the aim here of getting students to learn and think collaboratively will be best served by utilizing social networking.

2.9.3 Key Skills and the New Junior Cycle

Relating once again to the Framework document, there are 6 key skills put forward, in addition to Literacy and Numeracy. Several elements to each skill are listed in the document, with ICT being a component of every single one, as seen below:

1. Managing myself -Using digital technology to manage myself and my learning
2. Staying well -Being responsible, safe and ethical in using digital technology
3. Communicating -Using digital technology to communicate
4. Being creative -Stimulating creativity using digital technology
5. Working with others -Working with others through digital technology
6. Managing information and thinking -Using digital technology to access, manage and share content

(Department of Education and Skills; A Framework for Junior Cycle, 2012)

The inclusion of social networking as part of these technological tools is implied, and the more it is developed then the classrooms of the near future will benefit like never before from the learning and collaborative opportunities provided for by such technology.

2.10 Conclusion

This chapter examined the various backgrounds and theories involved in effecting learning and teaching methodologies that are student-led and self-directed in nature, from behaviourism to constructivism and constructionism through to modern collaborative learning and ICT-led learning environments, with the application of social networking as a means of motivating and directing such learning, particularly in the context of the New Junior Cycle.

Chapter 3 Methodology

3.1 Introduction

This chapter will outline the main methodologies employed during the course of this case study and explain the reasoning behind those methodologies in the context of this area of research. The related areas of research validity, reliability and ethics are also examined and applied throughout the course of the study.

3.2 Research Background

3.2.1 Context

The context of this research is within the Irish second-level junior cycle curriculum and involves qualitative and quantitative research being undertaken among students, teachers and parents. In particular, the quantitative aspect of the research takes place among a first year Junior Certificate science group, of age group 13-14.

The New Junior Cycle curriculum is to be introduced on a phased basis from 2014 onwards, with science being introduced in 2016. This study is therefore undertaken to learn the effects, if any, of introducing social media into the classroom as a means of delivering the curriculum effectively to students who are already proficient in the use of multimedia and social networking sites such as Facebook on a regular basis. Attitudes and pre-conceptions among teachers and parents are also looked at to provide a general context to the study, and to gain data regarding the potential for expansion of the use of social media within the classrooms in the future at second level.

3.2.2 Research questions

To provide a narrower context to the research undertaken in the area described previously, several questions can be looked at and subsequently analyzed during the later stages of the research;

- Can social media be utilized as a learning tool?
- Can students learn more effectively through the use of social media?
- Can self-directed learning take place as a result of using social media?
- Can students be motivated more easily to learn, if material is provided via social media?
- Are teachers willing and able to provide such social media outlets to students as part of their classroom curriculum delivery in the future?
- Are parents open to the positive aspects of social media within an educational context, and supportive of the future potential it can have in the education of their children?

3.3 Research Approach

3.3.1 Qualitative

Qualitative research involves gathering information from individual interviews, group interviews, focus groups, and participant observation. It can provide researchers with a more clear view of their research and gain insights into the thought processes of participants which may otherwise not be gained through mere quantitative collection of facts and figures. It also relies on the researcher being aware of the social context in which the qualitative analysis is conducted and as a result will infer or extrapolate their own conclusions from the data obtained.

3.3.2 Quantitative

This type of research data is obtained from questionnaires, tests, experiments, practical work and can be either a) Descriptive analysis, or b) Inferential analysis

where the former relates to gathering, aggregating and compiling data and raw figures into a descriptive format in charts and graphs, whereas the latter involves testing a particular hypothesis and drawing inferences from the resulting data. Quantitative types of analysis is reliant on facts and figures to give actual raw data from which the researcher can display and graph accordingly to show results in a clear and understandable manner, free from any inferences or suppositions on their part.

3.3.3 Case study

A case study of a situation familiar to this researcher has been chosen as the preferred method of research in this instance, as it lends itself more closely to the type of problem under investigation regarding the limited time frame available to conduct the study, and also in relation to the qualitative aspects involved in the study.

3.4 Data Collection Tools

This research will utilize a mixed methodology approach with the use of case study research involving pre-testing, post-testing and various questionnaires aimed at the various groups of participants and peripheral participants in the study.

Two or more methods of data collection are required to constitute what is referred to as *triangulation*. This is a means of ensuring some degree of reliability, consistency and credibility in relation to the study and any significant findings or results that may result from the research undertaken.

3.4.1 Testing

3.4.1.1 Two Group Comparison Testing

There are several types from which to choose;

- **Norm-referenced test** compares students' achievement with another group's achievement.
- **Criteria-referenced test** provides data on the level of achievement of each student and does not make comparisons with others. The test measures what a student knows or has learned, as opposed to merely comparing what they know in comparison to another student.
- **Domain-referenced test** measures students' achievement in particular area or domain, paying attention to the content in that domain, for example *Gravity* or *Magnetism* in science. (Huitt, W. (1996))

3.4.1.2 Pre-testing and post-testing

Two junior science physics topics will be chosen and pre-testing will take place among the complete group of relevant student participants to ascertain their existing level of knowledge of the chosen topics.

The participant group will then be divided at random into two groups A and B.

Post-testing will then be administered to both groups after they have both been instructed alternately in each of the two topics via traditional methods of *chalk and talk* and then via multimedia methods.

Comparisons in both methods of instruction and the resulting affect in learner test performance will be studied as part of this research.

3.4.1.3 Testing: Topic 1

Pre-testing of both groups simultaneously will occur prior to any instruction in the topic.

Group A will be taught the relevant theory associated with Topic 1 via traditional methods of chalk and blackboard, with no use whatsoever of multiple-media during the class. This session of instruction will be confined to one 40 minute class period.

Group B will then be instructed to study the relevant theory on Topic 1 via the medium of social media, where they will find the same material available, but with additional links made available to animated clips and video clips demonstrating the topic at hand.

This will complete the instruction sessions for Topic 1 for both groups.

Post-testing will then take place across both groups simultaneously, with the test material being identical to that in the pre-test.

3.4.1.4 Testing: Topic 2

Pre-testing of both groups simultaneously will take place once again, prior to receiving any instruction in the topic, this time topic 2.

Group B will now be taught the relevant theory associated with Topic 2 via traditional methods of *chalk and blackboard* with no use whatsoever of multiple-media during the class. This session of instruction will also be confined to one 40 minute class period.

Group A will then be instructed to study the relevant theory on Topic 2 via the medium of *social media*, where they will find the same topic 2 material available, but with additional links made available to animated clips and video clips demonstrating the topic at hand.

This will complete the instruction sessions for Topic 1 for both groups.

Post-testing will once again take place across both groups simultaneously, with the test material being identical to that in the pre-test.

This phase of the research methodology is designed to provide quantitative data relative to the levels of learning taking place so that comparisons can more easily be studied between traditional teaching methods and the more modern multimedia methods involving self-directed learning through social media interaction.

3.4.2 Questionnaire

This researcher decided to use questionnaires as one method of gathering qualitative data related to the research. Several different questionnaires have been created to gather information from each of the sample groups involved in the study, involving teachers, parents and students.

There are several types of question that can be used in a questionnaire, depending on the type of data required, and these fall into two general categories of question, namely *open-ended* and *closed* questions.

Open-ended questions can be used where the researcher requires information that may not be specific in nature or in cases where the possible answers to a question are unknown or if the questionnaire is exploratory in nature (Bailey, 1994). They can be employed where there may be too many possible answers to the questions so as to make closed questioning unfeasible and tedious. Instead, respondents can answer as much as they wish, and in particular in cases where issues may be complex and where simple answers are simply not possible.

Open questioning can also lead to information from respondents which may be well-suited to closed question questionnaires in the future, or in subsequent sections of the research (Bailey, 1994).

Closed questions, on the other hand, provide respondents with several possible answers from which they must choose. This is useful if the literacy level of the respondents is unknown, and it enables results to be analyzed more easily. When highly structured, they are useful in that they generate frequencies of response that can be treated statistically and analyzed in a more mathematical way, in addition to enabling comparisons to be made across sample groups (Wilson & McLean, 1994). . They can contain fixed alternative questions such as true or false, multiple-choice or rating scale. A common rating scale to use is the Likert Scale, which provides five possible responses for each question in the survey; *strongly agree, agree, don't know, disagree* and *strongly disagree*.(Likert 1932). Other levels of rating options can be used other than these five response options, such as three, seven, etc., yet in the case

A balanced rating-scale consisting of three response options can enable simplicity and understanding on the part of the respondent, while enabling the researcher to avoid ambiguity when collating results of research, hence this is the main type of questioning employed by this researcher in the questionnaires.

Closed questions can prescribe a range of responses from which the respondent may choose, but however, closed questions have a disadvantage in that they do not allow for respondents to add remarks in explanation or to expand on their answers. Also, the range of possible responses may not be exhaustive and there could be instances of bias in the options being provided, which is always a risk in the case of closed questioning. (Oppenheim 1992)

This researcher has opted to avail of a two-pronged approach to the design of the questions to be distributed to the groups in question, which range widely in age and literacy levels, in that a combination of closed and open questioning is employed glean a more expansive range of information in the study. The closed question

approach involves a three item scale for responding to each question, with scope for additional information by the respondents in the form of open answering

Several issues need to be considered before designing and distributing any questionnaire, in order to gain the most reliable and accurate information being retrieved by the researcher. Researchers in this area in the past identified several areas to be considered prior to developing the questions. These relate to content, wording, answering and sequencing.

In relation to content;

- a) Is the question necessary and how will it be useful?
- b) Are several questions needed instead of just one?
- c) Do those being questioned have the information necessary to give an answer?
- d) Does the question relate closely to the personal experience of the respondent?
- e) Is the question content sufficiently general and free from overlying specificity?
- f) Is the content balanced and free from bias or leaning towards one direction?

In relation to the question wording, the following must be taken into consideration;

- a) Is the wording difficult to understand or could it be misunderstood?
- b) Is the wording biased, loaded or emotionally slanted in any way?

When considering the answering of the questions, it is important to consider;

- a) Does the answer call for a checked answer, a one or two word answer or a number?
- b) In the case of a check answer being used, does it require a dichotomous answer, multiple choice or scale? If so, then
- c) In the case of a check-list being used, does it cover all relevant alternatives?
- d) Is the form simple and uncluttered and easy to answer?

Finally, in relation to the positioning of the questions within the questionnaire, care must be taken to ensure several items of good practice;

- a) Does the answer of a particular question become influenced by the answer to the preceding question?
- b) Is there a psychological order to the question sequence?
- c) Is the question too early or late in the sequence in order to facilitate enough interest to elicit a reliable answer? (Sellitz et al. 1976)

3.4.2.1 Student Questionnaire

This questionnaire is intended to gather qualitative information in the form of feedback from students regarding the pre-testing and post-testing phase of the research in which they took part, and whether or not they themselves felt any benefits or inspirations towards the learning process as a result.

3.4.2.2 Parent Questionnaire

The views and attitudes of parents are viewed as increasingly important in that they are now seen as integral to their children's education and somewhat parallel to teachers at second level in promoting learning and encouraging the children to learn in a more self-guided manner. It is in this regard that their opinions and views on their children's use of multimedia tools in their education, in particular their use of online social media such as Facebook, form such a crucial prerequisite to the introduction of such inside the classroom.

This questionnaire will gather qualitative information and data in the form of written feedback, whether negative and positive, on the increased use of social media in their children's education, and whether or not they see it as relevant for the future, in particular in view of the changes in teaching approach mooted by the Department of Education and Skills upon the publication of the new Junior Cycle Framework in October 2012.

3.4.2.3 Teacher Questionnaire

In this questionnaire, the all-important views of the teachers themselves are requested in relation to the proposed use of social media within the classroom to both deliver course material and retrieve submissions of work from students, as well as using it to provide a forum for student discussion and self-guided learning of the section of the curriculum relevant to each teacher.

Any noticeable differences in attitudes among the various age groups within the teaching body will be observed, and conclusions then drawn as to the level of difficulty that will exist in the introduction of such new ideas within the teaching cohort, as the support of this cohort is compulsory if it is to be successfully introduced across the board, provided of course that such introduction is deemed beneficial and positive to begin with.

3.5 Validity

Research validity issues can be many and varied, especially dependent on the context and general environment in which the researcher chooses to conduct the data gathering exercises. Attention must be paid at all times to the possible areas where conflict may arise, where contradictions may occur or where data may be wholly unreliable and not considered valid for inclusion in the analysis of the information during the final stages of the research.

Researcher bias is an issue, especially in open ended qualitative research whereby researcher can often find only what they *want* to find and proceed to write up results accordingly!!

It can result from selective observation by the researcher, selective recording of information or even the personal views of the researcher in question. All of these factors can greatly contribute to an issue of validity which can greatly alter the true nature of the qualitative data being gathered and analyzed by the researcher.

According to Johnson (1997), a strategy called *reflexivity* can reduce this whereby a researcher engages in critical self-reflection regarding his or her own biases and predispositions. Through this approach, they become more self-aware and make a conscious effort to control and curtail their own biases.

This researcher's bias towards results which would show conclusive positive reaction and predisposition towards online educational techniques via social media was not allowed to curtail the analysis of questionnaire results and observations made during the research.

In relation to qualitative research techniques, there are three types of validity according to Maxwell (1996);

- descriptive validity
- interpretive validity
- theoretical validity

Descriptive validity refers to the actual setting and situation in which the data was obtained, and the level of truth as to what transpired during the data gathering session is assumed to be accurate.

Interpretive validity aims to consider the mindset of those being interviewed for example, and drawing inferences as a result. It is important that the researcher allow for the apparent psychological and emotional states of the participants and provide a valid account of these during the process of analyzing the data gathered from such participants.

Theoretical validity, the third type of validity, uses a theoretical explanation to explain the results obtained and shows how the result may fit into pre-existing theoretical norms and processes. It serves to justify further the results obtained and further validates them to a degree which is less likely to be questioned or doubted.

In relation to quantitative research techniques there can be considered the following types of validity;

1. Face Validity – where the testing appears distinctly to be assessing the construct under study. It is obvious to those involved that the appropriate test is being done, which aids in the confidence of the participants towards continued testing.

2. Construct validity- where the test measures the construct it is intended to measure and no other variable. Those involved in the area of expertise being tested can decide what each item is intended to measure.

3. Criterion-related validity – This is used to predict performance in the future by correlating test results with no other criterion of interest.

4. Formative validity

This is when a measure is applied in order to assess the ability of a a measure to improve the outcome of a particular study in the future.

5. Sampling Validity

This involves ensuring that all areas which make up the concept being studied are adequately covered by the measure being undertaken. A sample from each domain is taken to represent the whole (Maxwell, 1996).

3.6 Reliability

This is an indicator of how well measurements tools and assessment procedures produce steady and consistent results each time they are conducted. Over a period of time or over several tests there should be little or no major variation in the results achieved. The importance of this in research cannot be overstated, especially in areas of medical research where consistency of results is paramount in order to arrive at the most logical conclusions.

There are several types of reliability, according to Denzin and Lincoln (1994);

1. Test-Retest reliability

This is obtained by conducting the same test twice over a period of time to a particular group. The scores from each test can then be correlated to evaluate the stability of the test, hence its reliability.

2. Parallel forms reliability

This is a measure of reliability obtained by conducting two different assessment tools to the same group of individuals, but with each version containing items that test for the same skill or knowledge base, but in a different way. Both sets of results are then compared to test for reliability and consistency.

3 Inter-rater reliability

This is used to assess the degree to which different assessors or judges agree in their particular assessments of a particular subject. It stems from the fact that humans can have different perceptions and outlooks on things which may result in a widely-varied set of results when performing assessments. It is mainly used in areas where subjective judgments can be made, such as assessing an art portfolio for example.

4. Internal consistency reliability

This is used to evaluate the degree to which different test items that probe the same construct produce the same result, and involves calculating correlations between items on the same test, or the correlation between test scores from each of two sets of items that probe the same knowledge area on a particular test, known as ‘Split-half’ technique (Cozby, P.C., 2001)

3.7 Triangulation

This is achieved by use of more than one method of collecting data relevant to the study in question in order to further validate the research data. According to Cohen, Manion and Morrison (2007), triangulation involves using more than one method of

gathering data in the course of a research study involving social research. In other words, it is a multi-method approach where an attempt is made to fully explain complex human behaviors by studying it from more than one viewpoint using both qualitative and quantitative data.

This researcher had utilized this approach in that both qualitative and quantitative methods are used to generate sufficient validity and reliability to enable a realistic conclusion to be drawn from the data and information collated throughout the study. Questionnaires were employed among all groups within the study, and both pre-testing and post-testing carried out to obtain concrete data for analysis.

3.8 Limitations

The limitations of the research stem from the fact that there are some variables outside the control of the researcher, or variables that cannot be solely attributed to the nature of the study being undertaken, such as student socio-economic background where availability of high speed broadband may be an issue, pre-exposure of students to ICT prior to second level and pre-conceptions in relation to ICT use in general.

3.9 Ethics

In relation to ethics in educational research, and especially considering that minors are involved in this particular research, there are several principles to which one must adhere;

1. Minimizing Harm. Is there any aspect of the research that may cause harm to the participants, the researchers themselves or any individual or group associated with the research participants?
2. Respecting Autonomy. Is due respect shown to those taking part in the research and is there a willingness to allow them participate in a voluntary way, free from coercion or deception?

3. Protecting Privacy. Will the content be made public and if so, what portions of the research should remain confidential?

4. Offering Reciprocity. Should participants be offered rewards for taking part due to the fact that it may be time-consuming for them to volunteer to do so?

5. Treating People Equitably. All participants should be equally treated and no preferences or bias shown in gathering the data from the various participant groupings (Hammersley & Traianou, 2012).

3.9.1 Social media ethics

Facebook' current policy regarding user age is 13 years. The participants of this study were 13 years at the stage of the study where they were required to create and use a Facebook page as part of the study being undertaken.

Attention is drawn to the Facebook Statement of Rights and Responsibilities, section 4.5, which states that "You will not use Facebook if you are under 13".

This restriction comes under the requirements of U.S. legislation which states that

operators of commercial web sites and online services directed to children under 13 that collect personal information from children, and operators of general audience sites with actual knowledge that they are collecting information from children under 13.(COPPA 1998)

In May 2011, a survey indicated that 7.5 million Facebook users are below the minimum age, with more than 5 million were 10-years-old or younger.

3.10 Timeline

The timeline for the research case study was ten months. The case study proposal was submitted in November 2012. After consultation with the supervisor this proposal was amended in scope and re-submitted in a reduced form the following month, with initial research and literature review being conducted over the course of the next 2 months, January and February 2013.

In March the methodology stage of the research was conducted, with preparations for distribution of questionnaires to the relevant groups being undertaken during this period. Parents were posted out a questionnaire in addition to an accompanying letter explaining the case study and requesting a signed permission slip to be returned prior to commencement of the student participation in the practical element of the research.

The experimental stage also began towards the end of March, with the two methods of teaching the pre-chosen coursework being conducted among the sample groups of junior cycle students within the school. The pre-testing and subsequent teaching was conducted over a period of two weeks in total, with post-testing occurring after a period of two days from the students' initial exposure to the course material.

April 2013 saw the completion of the methodology and the practical element of the research study and the start of the next stage. Results were gathered and collated over the course of the next two months, with findings being written up and the subsequent discussion of these findings taking the most part of the next two months.

All aspects of the study were gathered, collated and combined into a complete work over the course of the final two months of July and August 2013, with any necessary alterations or amendments being done throughout this period.

Chapter 4 Findings

4.1 Introduction

4.1.1 Overview

The findings of this study incorporate several aspects in relation to the effectiveness of topic delivery through ICT methods which incorporate online social media versus traditional modes of delivery in the classroom.

The use of the 'chalk and talk' method of delivery was compared with the online method of delivery, with topics alternated between each method and between each of the two chosen groups in order to provide reliability and validity of results.

A science website created by the researcher and hosted by *Wordpress*, provided the online reference material for each group, while the social media element to the study was provided by *Facebook*, which provided participants with links and information on the material that they were required to study and learn prior to each post-test.

The participants were of mixed ability throughout, so the testing was designed to cater for all the levels of cognitive ability. Questions were designed to allow for the fact that not all students were at the same level of numeracy and literacy due to various factors prior to their entry into the second level system.

Questionnaire use was important and all relevant groups returned data which was relevant and important to the study being undertaken.

4.1.2 The Participants

The participants in this study were from a rural second level co-educational vocational school in the North West of Ireland.

The students were chosen from year one of the Junior Cycle science curriculum. There were 20 students in total of mixed ability and gender.

The age of all the students was 13 years.

The group was divided into two groups for the study, Group A and Group B, with ten members in each group.

Both groups would be alternated between ICT with social media and traditional learning methods during the course of the study to ensure balance and validity and reliability within the study.

A post-test was designed for Group A and Group B which was similar in content but varied in question structure and layout. This was in accordance with good practice in the implementation of pre-testing and post-testing.

4.2 The two methods of teaching

4.2.1. Traditional

This occurred throughout the study among both groups of participants in an alternate fashion. It involved a maximum of two class periods where the teacher availed of the blackboard and chalk, aided by oral instruction and explanation where required. The depth of treatment and explanation was kept to a level which could be easily replicated across both groups in the study, to aid in reliability and fairness.

At no stage was ICT or computing resources availed of, with students instructed to avoid online referencing of the topic prior to the post-testing the following day. The time periods of one day between instruction and post-testing was deliberate in order to avoid having the students avail of online opportunities to reference the topics outside of school time.

Hardcopy notes were provided for students to study outside of school hours prior to post-testing.

4.2.2 ICT and online social networking

Students were first surveyed to ascertain their level of ICT and online activity prior to the testing. Those students who did not already have a Facebook account were

asked to create an account for the purposes of the study, from which they would be provided with the relevant materials on each topic.

Students who had not yet reached the age of 13 were exempted from using the online portion of the research. This also applied to students whose parents expressed reservations about the social media aspect of the study and refused permission for their child to sign up to the Facebook site.

Delivery of the ICT portion was achieved by directing the participants to a newly created Facebook page dedicated to science in the school, which then, through the use of hyperlinks, directed the students to a Wordpress site created by this researcher which contained all the information required for study prior to the post-testing session. A page was created on the site which specifically contained the information required by students. It contained images, text and several video clips illustrating the concepts required. Several additional pages contained a variety of other science topics, yet students were instructed to remain on task and consult only the relevant page with the relevant topic material.

4.2.2.1 Upload of topics online

This was done by the researcher in the form of text, images and video files which adhered closely to Meyers Principles of Multi-Media design;

1. *Multimedia*: People learn better from words and pictures than from words alone
2. *Spatial Contiguity*: The word should appear near the corresponding pictures.
3. *Temporal Contiguity*: The words and pictures should appear simultaneously.
4. *Coherence*: People learn better when extraneous words, pictures, and sounds are excluded rather than included
5. *Modality*: People learn better from animation and narration than from animation and on-screen text.

6. *Redundancy*: Individuals can learn better from animation and narration only, rather than from animation, narration, and on-screen text.
7. *Individual Differences Principle*: Design effects are stronger for low-knowledge learners than for high-knowledge learners. Design effects are stronger for high-spatial learners than for low-spatial learners. (Mayer, R. E., 2005).

During the second testing session involving topic 2, *Sound*, students from Group A were taught using method 2, traditional methods. As they had already utilized the online Wordpress site for the previous topic, there would have been a temptation to consult it once again in this case, so to prevent this, the page was hidden from view with no labeling as to its contents. Only those in Group B were to be given direct access to the page via a hyperlink on the Facebook page to which they were initially directed. This greatly aided the validity and reliability of any results during the subsequent pre-testing periods.

4.3 Survey findings

4.3.1 Academic staff

There were a total of 14 respondents to the academic staff member survey, which was carried out before the student practical testing element of the case study commenced.

The main finding from the teacher survey was that most if not all staff considered themselves ICT-literate, and willing to use the internet in the classroom in the course of delivering the curriculum. 72% of teachers admitted to using social networking at some point, to varying degrees of frequency.

Some other main results from the teacher survey questions are displayed below (see Appendices for complete results tables).

Would you be willing to introduce the use of social media (e.g. Facebook) for educational purposes? (i.e. in the classroom?)

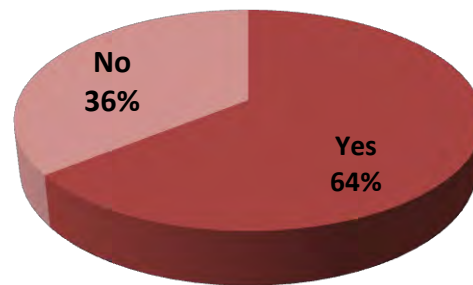


Figure 4.1 – Question 9

Would you prefer if social networking sites changed their emphasis to educational networking?

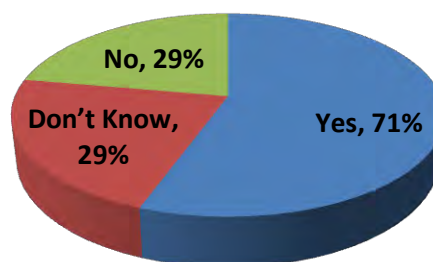


Figure 4.2 – Question 11

4.3.2 Parents

The parent questionnaire results showed that most parents used the internet and the majority has used social networking, but only 69% of those surveyed were aware of the sites used by their children. Overall, 38% of parents were aware that their children used Facebook, 37% admitted not knowing, and 25% saying their children did not use Facebook or other social networking, with almost all parents expressing awareness of the negative aspects of social media sites.

The results of some of the more relevant survey questions are shown below;

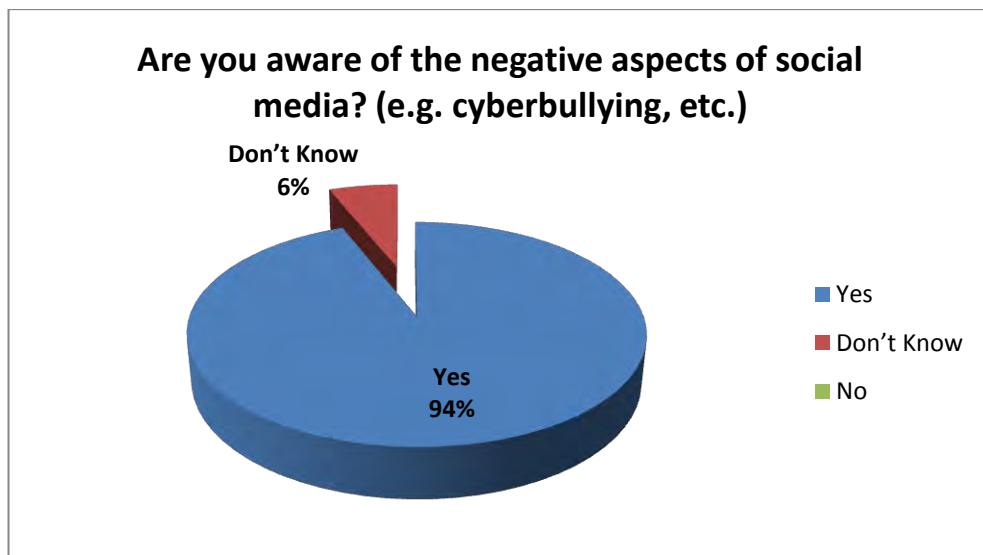


Figure 4.3 – Question 11

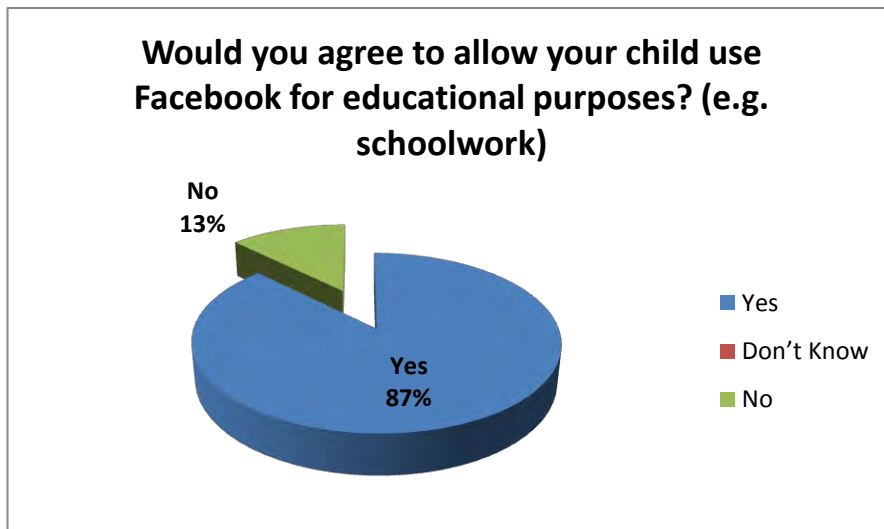


Figure 4.4 – Question 15

4.3.3 Students (pre-testing)

The students were given a questionnaire prior to taking the tests in each topic, primarily to ascertain the existing level of their social media and general internet use, so that allowance could be made, if necessary, in the case of students less familiar with ICT than some of their counterparts. Socio-economic factors can contribute to an imbalance in the levels of ICT exposure among the student population in this age group upon entering second level education, so this may cause a slight effect in the results in the study.

Some results are displayed below in relation to online usage among the students;

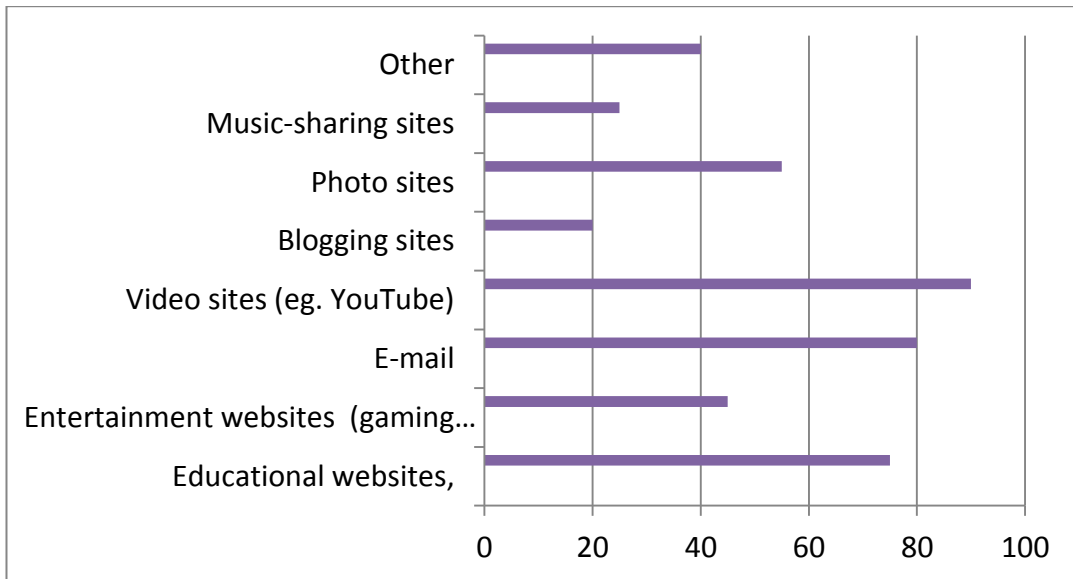


Figure 4.5 Question 2: What resources do you use?

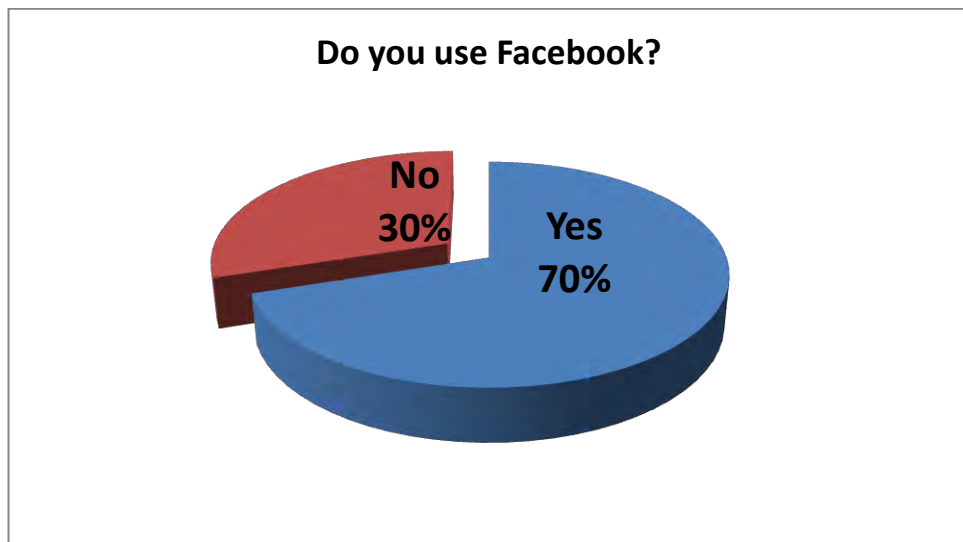


Figure 4.6 – Question 3

4.3.4 Students (post-testing)

Results from the post-testing Questionnaire gathered information on student perceptions of the testing process, and tried to gain an insight as to the student preferences for each teaching and learning method employed during the research. The results show that there was a general positive reaction to the online aspect of the learning, and a willingness to continue with further use of ICT and internet in the classroom. Some relevant individual question results are shown below;

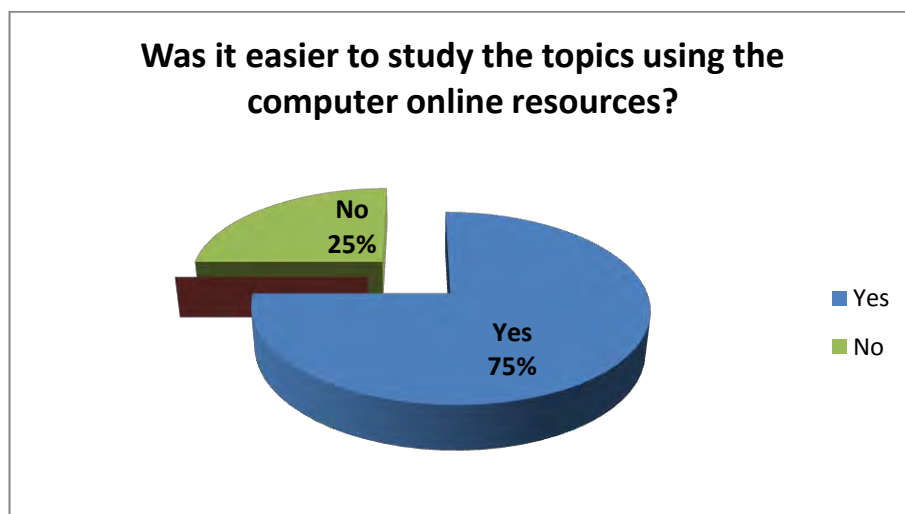


Figure 4.7 – Question 2

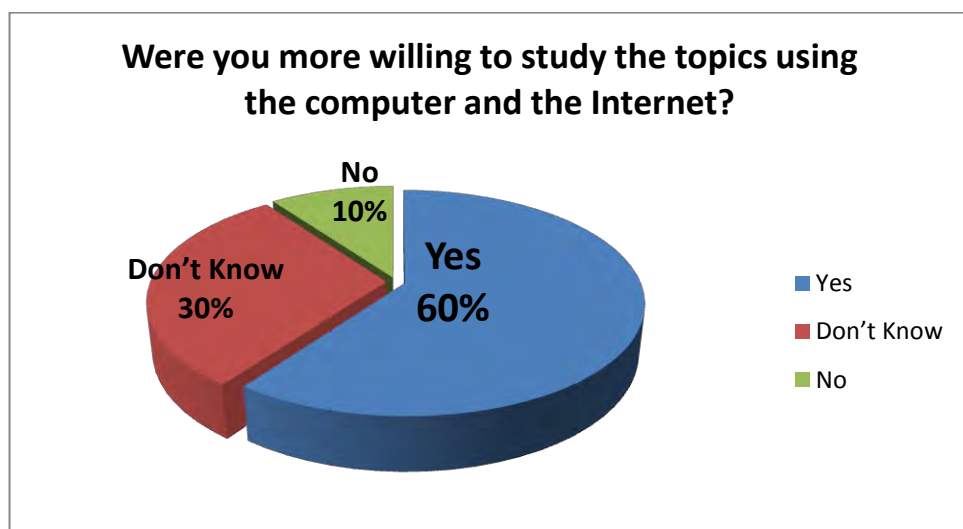


Figure 4.8 – Question 4

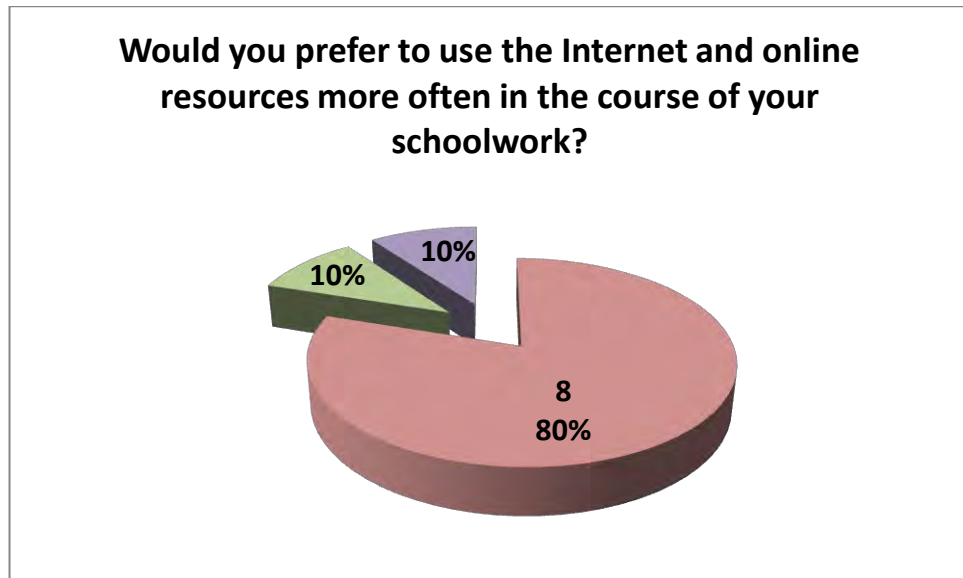


Figure 4.9 – Question 6

4.4 Testing

4.4.1 Topic 1 – Moments and Levers

4.4.1.1 Pre-test

The pre-test was first conducted with test group A and test group B simultaneously, prior to any delivery of course material and with no direction by the teacher as to the topic area to be tested. This was intended to yield a baseline from which subsequent testing and student performance could be measured. All students in both groups were pre-tested simultaneously under strict supervised conditions.

Sub-topic areas covered in the pre-test were;

- Moment of a force - definition
- Moment calculations
- Fulcrum
- Effort
- Load
- Law of the Lever
- Centre of Gravity
- Calculations
- Stability - definitions

A time period of several days was allowed to elapse prior to conducting the post-test with each group, with the teacher starting the delivery of the course material to each group one day prior to post-testing, using the two different methods of teaching as stated below;

- Group A was taught using method 1; traditional teaching methods
- Group B was taught using method 2; ICT and social media

4.4.1.2 Group A - Teaching Method 1

Group A was taught over one class period using blackboard and hardcopy notes were provided for home study prior to the pre-test the following day. Students were not allowed access to the dedicated social media page to help ensure that no relevant ICT or online resources were made available to them. The extent of teacher explanations of topic areas in the classroom was kept to a minimum, so that a standard level of instruction could be adhered to across both test Groups. This was to ensure a more valid interpretation of subsequent test results.

4.4.1.3 Group A - Post-test

The results obtained from Group A after both tests are displayed in Figure 4.10 and show the increase in each student's percentage grade from pre-test to post-test. An overall average increase was calculated to provide a figure from which subsequent tests could be compared and contrasted.

Pre-test 1	Post-test 1	increase
24%	48%	24%
52%	72%	20%
56%	76%	20%
48%	68%	20%
56%	68%	12%
24%	72%	48%
32%	52%	20%
56%	68%	12%
20%	32%	12%
16%	44%	28%
	Avg. Increase:	22%

Figure 4.10: Table of test results comparison for Group A
Topic 1 - Moments and Levers

A visual representation of the above results below shows that there is indeed an improvement in test results after the traditional instruction, with the majority of students achieving an increase in marks of over 20 percentage points.

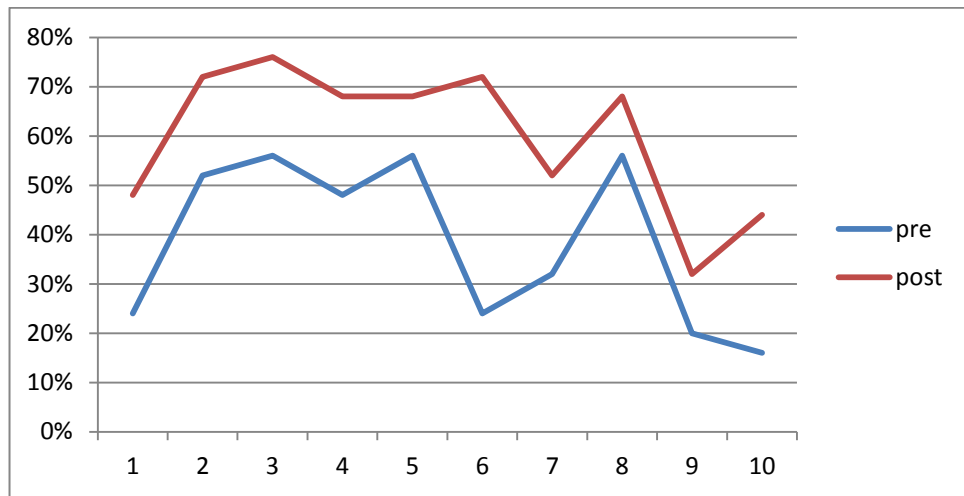


Figure 4.11: Trend graph showing test results comparison for Group A

The general shape of the graph is accounted for by the fact that there were students of mixed ability in the classroom and hence, the erratic slope of the graph which these tests were carried out.

4.4.1.4 Group B - Teaching Method 2

Group B was directed to utilize the dedicated school science Facebook Page where they were directed via hyperlinks to the location of the online material to be studied, which was located on the Wordpress science site developed by this researcher, where the same topic material was available in the form of interactive clips and video demonstrations. Students were encouraged to access this material and study it thoroughly prior to the post-test which would occur in the next day. A motivational factor for the students was the fact that they could utilize social networking to aid and direct them in accessing the relevant online topic material.

4.4.1.5 Group B - Post-test

The results obtained from Group B after both tests are displayed in Figure 4.12 and show the increase in each student's percentage grade from pre-test to post-test. An

overall average increase was calculated and showed a higher value than was obtained by Group A in the same test.

Pre-test 1	Post-test 1	Increase
68%	100%	32%
44%	88%	44%
48%	76%	28%
28%	48%	20%
32%	64%	32%
52%	68%	16%
20%	32%	12%
32%	52%	20%
24%	72%	48%
60%	96%	36%
	Average Increase:	29%

Figure 4.12: Table of test results for Group B
Topic 1 - Moments and Levers

The graph below shows the trend of results on both tests, showing yet again the variable abilities within the class, yet the extent of the improvement in results can be more readily seen from the calculations on the table 4.3 above, which shows an average increase in grades of 29 per cent for Group B.

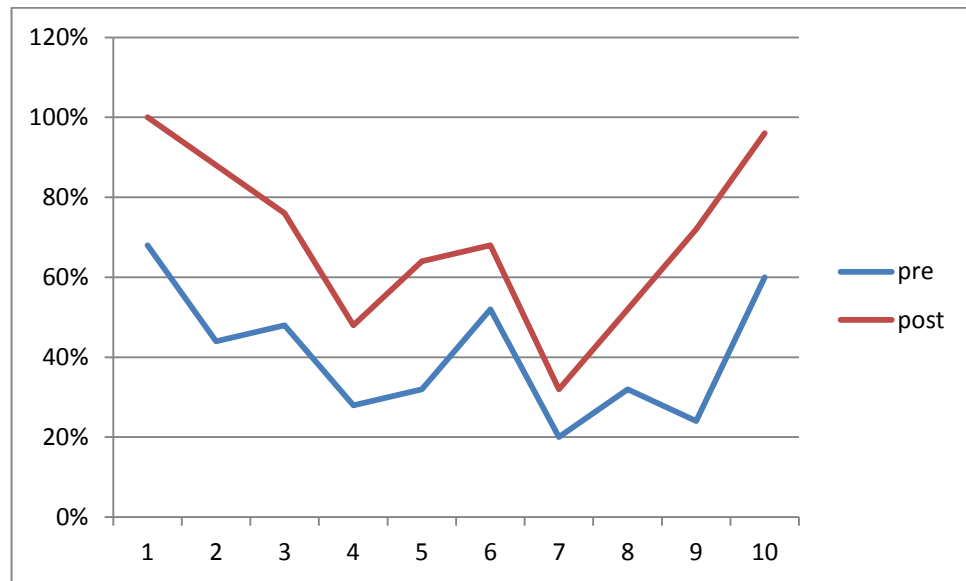


Figure 4.13: Trend graph showing results comparison for Group B

This is in comparison with an average increase of 22% among the Group A participants who were taught using the traditional methods, with no use or reference to ICT resources in any way.

4.4.2 Topic 2 – Sound

4.4.2.1 Pre-test

This pre-test was conducted after a time period of one week had elapsed from the post-testing of the previous topics. Once again, it was conducted with test group A and test group B simultaneously. There was no prior direction from the teacher as to the area of the curriculum to be tested.

The results obtained from this test would once again yield a baseline from which the subsequent post-test results could be compared.

Sub-topic areas covered in the pre-test were:

- Nature of sound
- Causes of sound
- Effects of sound

- Hearing and the ear
- Uses of sound
 - echoes
 - ultrasound
 - sonar
 - Thunder and lightning
- Measurement of sound

Once again, after pre-testing both groups in topic 2, a time period of several days was allowed to elapse prior to conducting the post-test with each group, with the teacher waiting to begin delivery of the topic 2 course material until one day prior to post-testing.

This time the same two methods of teaching were utilized, but they were applied to the opposite groupings. This was to ensure increased reliability and fairness in applying each method, as stated below:

- Group A was then taught using method 2; ICT and social media
- Group B was taught using method 1; traditional teaching methods

4.4.2.2 Group A - Teaching Method 2

Group A was directed to the dedicated school science Facebook page where they were directed via various new hyperlinks to the new location of the online material to be studied, which this time was located on a new page on the Wordpress science site developed by this researcher. The page was unnamed to prevent Group B students from accidentally or deliberately finding the *Sound* topic listed on the page tabs. The topic material was available in the form of interactive clips and relevant video demonstrations. Students were encouraged to access this material and study it thoroughly prior to the post-test which would occur in the next day. Once again, the motivational factor for the students was the fact that they were being instructed to

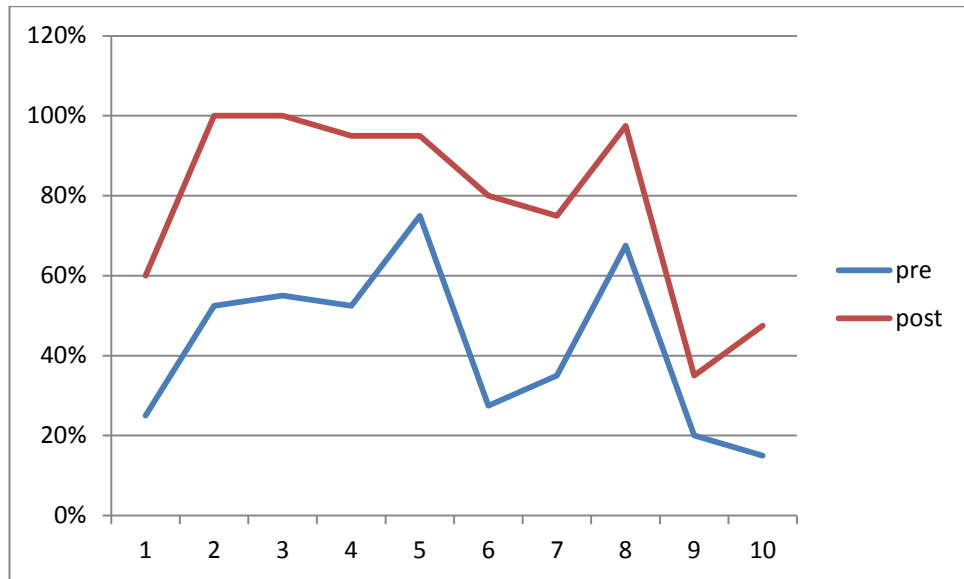
access their social networking pages in order to gain the appropriate link to the relevant page on the Wordpress site.

4.4.2.3 Group A - Post-test

The results obtained from Group A after both tests are displayed in Figure 4.5 and show the increase in each student's percentage grade from pre-test to post-test. The overall average increase was shown to provide a figure from which the other tests could be compared and contrasted.

Pre-test 2	Post-test 2	Increase
25%	60%	35%
53%	100%	48%
55%	100%	45%
53%	95%	43%
75%	95%	20%
28%	80%	53%
35%	75%	40%
68%	98%	30%
20%	35%	15%
15%	48%	33%
	Average Increase:	36%

Figure 4.14: Table of test results for Group A
Topic 2 - Sound



**Figure 4.15: Trend graph showing results comparison for Group A
Topic 2-Sound**

4.4.2.4 Group B - Teaching Method 1

For the delivery of the second topic, *Sound*, it was now Group B who were taught using the traditional method over one class period using blackboard, with supplemental hardcopy notes provided for home study prior to the pre-test the following day. Students were not allowed any access to the dedicated social media page, and were asked not to consult any online material in any form that may affect the integrity of the post-testing.

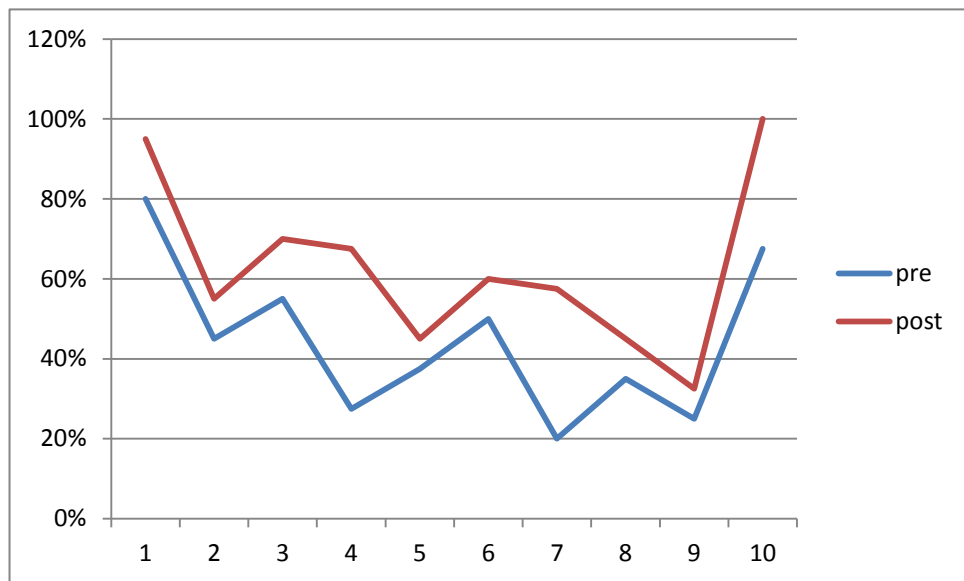
4.4.2.5 Group B - Post-test

The results obtained from Group B after both tests are displayed in Figure 4.7 and show the increase in each student's percentage grade from pre-test to post-test. The overall average increase was once again calculated.

Pre-test 2	Post-test 2	Increase
80%	95%	15%
45%	55%	10%
55%	70%	15%
28%	68%	40%
38%	45%	8%
50%	60%	10%
20%	58%	38%
35%	45%	10%
25%	33%	8%
68%	100%	33%
	Average Increase:	19%

Figure 4.16: Table of test results for Group B

Topic 2 - Sound



**Figure 4.17: Trend graph showing results comparison for Group B
Topic 2 - *Sound***

4.5 Integrity of testing

In order to maintain the integrity of the results obtained no member of Group A was allowed to use this site prior to post-testing, as they were earmarked to receive their instruction in the topic through traditional methods of teaching and learning. To further reinforce this, the Facebook page was edited in order to block or ‘un-friend’ students from Group A. This ensured they had no access to the online material as opposed to the traditional hard-copy handouts that were distributed previously to Group A.

The second group, group B, were given hardcopy notes on the topic in addition to teacher instruction on the topic using class materials not related to ICT. This was the

traditional method of delivery referred to previously, from which comparisons would be drawn subsequently.

Group A and Group B were both given a pre-test on the first topic, which was *Sound*. This was a standard test over a forty minute period given to all students simultaneously and students were duly informed that it was a pre-test designed to assess their *existing* level of knowledge in the given topic area.

Subsequently, both groups were given post-tests over a similar forty minute period which was closely supervised to prevent copying and to ensure all students remained on task for the duration.

The tests were marked in accordance with standard marking techniques, with one mark assigned to each correct element in the test.

The total marks in each case were recorded to establish a baseline from which subsequent tests could be compared, providing the researcher with data in which to gauge the learning value of each teaching and learning method being evaluated in this study.

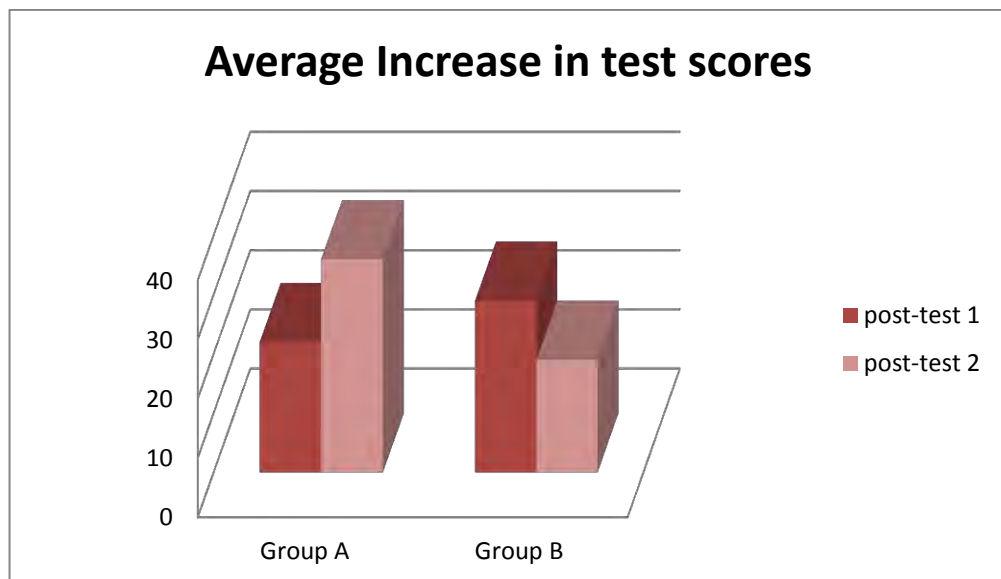


Figure 4.18 Summary of average test score increases

As evident from Figure 4.9, Group A performed better in post-test 2, whereas Group B performed better in post-test 1. In each of these cases the course material was delivered via ICT and online methods, incorporating social media, whereas the lower performance in each Group took place after receiving traditional teaching methods, without utilizing ICT or internet.

4.5.1 Time spent on task

The time spent by participants on each test varied, yet the maximum time allowed to complete each test was 40 minutes. Approximately half the participants were completed at least ten minutes before the allotted time had expired. This indicated that the time allowed was more than sufficient for the material to be examined and for students to understand and apply their answers without the added pressure of inappropriate time being allowed.

4.6 Evidence of Learning

4.6.1 Test Group A

The teacher designed post-test conducted with test group A showed increases in the test results across the group. This indicated that the material presented to the group in each case across both topic areas had been studied and hence an improved performance resulted as evident in both subsequent pre-tests.

The increase in performance in post-test 1 varied among the group members from 12% to 48%, with an overall average increase of 22%. This was after method 1 (with no ICT use) had been employed in teaching the prescribed topic.

In post-test 2, the increase in student marks ranged from 15% to 53%, with an overall average of 36%. This was achieved after the students were delivered the prescribed topic using social media and online methods, and indicated that the online learning with social media yielded the larger increase in student performance in pre-testing.

4.6.2 Test Group B

The Group B post-test conducted after topic 1, *Moments and Levers*, showed increases in the test results across the group. This indicated that the material presented to the group had been adequately studied and therefore resulted in an improved performance.

The increase in performance varied from 12% to 48%, as in group A's results, with an overall average increase of 29%. This was after method 2 was used in the content delivery phase of the study, which involved ICT and social media use throughout.

In post-test 2, the increase in student marks ranged from 8% to 40%, with an overall average of 19%. This was achieved after the students were delivered the prescribed topic using method 1, traditional methods of teacher instruction with hardcopy notes distributed throughout.

4.7 Conclusion

In conclusion, it is important to note that the results and information obtained during the course of the research have been obtained in an environment where certain other variables may have played a part in the results achieved in most cases, in that socio-economic backgrounds of the students may have played a part in whether or not their computer and online access was of the same quality throughout the complete spectrum of participants.

Also, effort was made throughout to maintain validity and reliability during the teaching and testing process. The fact that, inherent in the facet of research being studied, the self-motivation and self-guided learning aspect of the students, and the freedom therein, meant that sources of information other than those indicated by the researcher could have been consulted by some students during their study of each topic. In particular, students who participated in the groups being taught traditionally, without the aid of online or ICT resources could not always be guaranteed to maintain their studies at home without being tempted to revert to online help and consultation. This would have affected the impact of the resulting test data of traditional versus ICT.

The timeframe allowed for study of each topic prior to post-testing was deliberately chosen to be a short time period for this very reason, to reduce the time available for the groups to avail of sources of information, whether it is traditional text books or online sources, in order to maintain the integrity of the comparison groups.

Chapter 5 Discussion

5.1 Introduction

This chapter will examine and analyze the results which were presented in the preceding chapter, and the factors arising from the results will be examined in relation to current research and thinking in the areas concerned. This will aid in reaching conclusions to be discussed further in Chapter 6, and prove informative and worthwhile in justifying the area of research undertaken.

5.2 Overview of the case study

The case study set out to examine the prevalence of ICT and social media use among the school community with a view to incorporating ICT and social networking into the classroom as a teaching method in the delivery of certain topic areas of the current Junior Cycle science curriculum. This would provide indicators as to the relevance of continuing to utilize ICT and the internet in the classroom and aid in the decision making process in regard to new teaching approaches that are being mooted with the advent of the New Junior Cycle curriculum which was announced in October 2012.

The case study was conducted over a three month period among a junior cycle student cohort of mixed gender and ability in a rural second level vocational school in the North West of Ireland.

5.3 Findings

5.3.1 Testing

- The use of traditional teaching methods in the classroom increased the students' knowledge base in the particular area being studied.

- Traditional methods of ‘chalk and talk’ without ICT were effective in emphasizing to students the specifics of what must be learned in any given topic, but not as effective at motivating students to learn off-site on their own time i.e. reading hardcopy notes and diagrams.
- The introduction of social media links and online course material further increased the students’ test performance, with higher individual increases in test scores recorded.
- With online activities being enabled, the students’ were more motivated to learn in a self-guided manner.
- Students were more inclined to study topics repeatedly, due to the ability to repeat interactive demonstrations and instructional video clips online, thus aiding retention of the material prior to examination.
- Inter-student interaction via social media enabled mutual discussion and guidance regarding the topic material to be learned prior to testing.
- Attitudes towards online instruction as opposed to the traditional classroom methodologies were positive in general.

5.3.2 Surveying

In relation to the qualitative aspect of the case study, the survey method of data collection gathered the views of the various groups through postal questionnaires and provided feedback in relation to general attitudes and pre-conceptions that existed regarding online social media and its impact on the student cohort both inside and outside of school time.

General findings from the questionnaires from the various groups were as follows:

5.3.2.1 Parents Questionnaire

- Parents showed some reluctance to allow social media become prevalent in their children's day to day lives.
- Awareness was evident of the dangers of social media in the form of cyber bullying, among other aspects.
- Positive views were expressed in relation to the use of social media exclusively in an educational context in future.

5.3.2.2 Teacher Questionnaire

- Among the academic staff members who consider themselves ICT-literate, there was a willingness to utilize social media if it proved advantageous and motivating to students in the future.
- All staff members agreed with the use of internet resources in the classroom.
- The majority of staff supported the introduction of social media into the classroom
- Most staff agreed that an emphasis on educational networking as opposed to social networking
- All agreed that social media will become an essential part of education in the future.

Almost two thirds of teaching staff indicated a willingness to introduce social media into the classroom. This could be attributed to possible reservations on students being able to remain on task were they required to interact in the social networking arena, and also due to the awareness of the negative aspects of social media which are evident in cases of cyber-bullying and in extreme cases, suicide.

5.3.2.3 Student Questionnaire

Students were given a questionnaire prior to and after testing, to assess their level of ICT use and the prevalence of online activity and social networking in their lives in general.

5.4 Social media in the classroom

There is a need for educators to consider the positive applications of social media in the classroom and to embrace the positive aspects and potential which can be inherent in social networking as a whole. The founder of Facebook has always promoted the educational potential of his social media site, yet one aspect which hinders this, he feels, is the current age restriction on use;

My philosophy is that for education you need to start at a really, really young age. Because of the restrictions we haven't even begun this learning process. If they're lifted then we'd start to learn what works. We'd take a lot of precautions to make sure that they [younger kids] are safe. (Zuckerberg, 2011)

5.4.1 Issues

Online safety is an issue that parents are particularly concerned about in the current climate of cyber-bullying and online intimidation by users of social media forums. Anonymity is sometimes an added factor in the case of some social media sites with poor regulation and controls. In this study all participants were surveyed as to their use of and attitude to social media, and in the case of parents there was a significant number who expressed concerns regarding social media and its distractive influence on the lives of their children. But, when queried on its possible benefits from an educational point of view, the respondents seemed more amenable to change and accepting of the inevitability of social media and online networking in the future.

The use of Facebook in this study necessitated the permission of parents due to the fact that, regardless of parental views on social networking, there is an expressed age limit of 13 years applicable to all users. Facebook's Statement of Rights and Responsibilities contains the following in relation to this:

Registration and Account Security

Facebook users provide their real names and information, and we need your help to keep it that way. Here are some commitments you make to us relating to registering and maintaining the security of your account:

- 1. You will not provide any false personal information on Facebook, or create an account for anyone other than yourself without permission.*
- 2. You will not create more than one personal account.*
- 3. If we disable your account, you will not create another one without our permission.*
- 4. You will not use your personal timeline primarily for your own commercial gain, and will use a Facebook Page for such purposes.*
- 5. **You will not use Facebook if you are under 13.***
- 6. You will not use Facebook if you are a convicted sex offender.*
- 7. You will keep your contact information accurate and up-to-date.*
- 8. You will not share your password (or in the case of developers, your secret key), let anyone else access your account, or do anything else that might jeopardize the security of your account.*
- 9. You will not transfer your account (including any Page or application you administer) to anyone without first getting our written permission.*

(Facebook: Statement of Rights and Responsibilities, [accessed 10 May 2013])

This age limit is not absolute in that it can easily be circumvented by users who wish to simply register with false dates of birth, which can be difficult to authenticate. The founder has expressed his intention to lower, if not eliminate this age restriction altogether in the near future. This may meet with opposition from parents and other groups who fear that social media is still somewhat unregulated and that minors are

as yet ill-equipped emotionally to handle forms of cyber-bullying that have occurred through the medium of social media, but the reasoning behind it is one of education.

In relation to data use policy, the participants of the case study adhered to all times to the School ICT Acceptable Use Policy, and in relation to the social networking aspect, Facebook's Data Use Policy states the following in relation to minors and safety;

We take safety issues very seriously, especially with children, and we encourage parents to teach their children about safe internet practices. To learn more, visit our Safety Center.

To protect minors, we may put special safeguards in place (such as placing restrictions on the ability of adults to share and connect with them), recognizing this may provide minors a more limited experience on Facebook.

(Facebook; Data Use Policy – Minors and Safety [accessed May 11 2013])

5.5 Online course delivery

This was achieved by directing the participants through Facebook to the Wordpress science site where there was a dedicated page containing the required material for the topic in question. The content adhered to Meyer's Principles of multimedia design to maximize student comprehension over the short time period of study made available prior to pre-testing. (see Chapter 3, section 3.4)

5.5.1 Pupil Motivation

Participants were motivated by several factors in the case of both sections of the study, but the factors differed in each case. The initial motivations were student curiosity with the process, searching out social media and connecting up with others in the social media environment.

Students were given the opportunity to avail of the *Wordpress* site containing the science topic material developed by this researcher. The material was constructed with a balance of text, diagrams, animations and video presentations in accordance with Meyer's Seven Principles of Multi-media design (see Section 4.2.2.1)

An element of academic competition existed between both groups after the initial test results were obtained and relayed to the class, which may have increased individual motivation towards more robust learning prior to subsequent post-testing.

Another important motivating factor in the case of method two is the fact that students can experience independence of learning as they are learning in an environment without the teacher being physically present as an influencing factor. For many students, it is the lack of formality and structured learning within the classroom that appealed to them, as they were enabled to experience the topic material on their own time and in their own personal domestic environment in most cases, which they found greatly influenced their ability to absorb the information more readily and at their own personal learning pace.

During the testing session the pupils were closely supervised throughout and the majority of students were seen to remain on task for the duration of the allotted test period.

5.6 Conclusion

Subsequently, the findings and discussion here shows that there is a place in the educational process for the continued use of multi-media and online resources throughout the educational curriculum at second level, with an emphasis on student self-directed learning and internal motivation being major influences on the success of these practices in the delivery of course content at junior cycle and beyond

6. Conclusion

6.1 Introduction

This final chapter will discuss the preceding chapters and formulate conclusions based on the information acquired throughout the research and case study. The findings in chapter four led to a broad discussion in chapter 5 which sought to analyze further the implications of the data and information acquired during the course of the practical elements of the study, in addition to analysis of the views and practices of the participants gleaned from the supporting questionnaires that were distributed to the relevant research groupings. Recommendations will be also be made regarding further use of social media and the internet within secondary education and the ways in which it could be improved.

6.2 Review of case study

The case study set out to investigate the effects of traditional teaching methods on student performance versus teaching methods involving online material and the use of social media. The main objectives were as follows:

- Are students using social media sites extensively, and if so, to what purpose?
- Are they willing to utilize social media in the area of education and learning?
- Are parents amenable to the use of social media and internet in their child's education, despite to negative aspects?

- When online content delivery is in parallel with related use of social media, does it provide increased motivation for the student to learn on their own?
- When material is provided to students by both traditional means and online means are subsequent test scores in each noticeably different?
- Is there a place in the classroom for social media in an educational context, with educational networking replacing social networking?

6.3 Outcomes and Recommendations

The outcomes of the study are given in Chapter 4, with discussion and analysis taking place in Chapter 5 where the results are put in context..

In view of the findings of the study it is recommended that further study be done in the whole area of online delivery of course content in parallel with social media. Both methods of delivery should co-exist in the classroom and form an organic development of new learning modes with the student at the center of the learning process and the primary driver of the learning process, with the teacher facilitating and guiding the students towards a level of self-management whereby they are much less dependent on the teacher-driven traditional modes of classroom learning and in a position to facilitate their own learning strategies using modern ICT and online methods.

School ICT Acceptable Usage Policies can be amended to cater for the use of social networking by students in the process of their learning in future, with initial closely monitored usage by school management and staff to ascertain the level of misuse and non-educational use the online activity is put to by the users within the school.

6.4 Teacher Views

Teaching staff showed an interest in the development of online and social media-related course-work delivery in the future, especially from the point of view of making the teachers' jobs less difficult in that students are provided with an outlet to progress their own learning at their own pace without constant pressure from teachers within the classroom. Teachers acknowledge that the fact that students are chiefly responsible for their own learning through ICT methods and are enabled to utilize online resources increasingly within the school and home increases their internal motivational factors greatly, especially in the case of the more able students.

6.5 Conclusion

This study has researched the effectiveness of using ICT and social media to deliver topics in the junior cycle science curriculum, in comparison to the more traditional methods of delivery which existed prior to the ICT revolution and continue to exist in education. The scope and breadth of the case study was limited, yet it yielded results, both qualitative and quantitative, which were quite positive and bode well for further research in this area in the future which could further consolidate the integration of ICT, internet and social media into the classrooms throughout the complete educational spectrum.

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Appendices

Appendix A: Letter to Principal

Dear Principal,

I am currently undertaking a post graduate course in Digital Media Development for Education at University of Limerick which involves undertaking research among the school community.

With your permission, I would like to undertake this research among both the staff and the junior science classes over the course of the coming months. Any data gathered during the research will be treated with confidentiality throughout.

My intention is to survey the staff, students and parents in relation to their use of ICT and online resources, with particular emphasis on social media. First year science classes taking part will be taught science topics using social media and online methods as well as traditional non ICT-related methods. Parental permission will be sought prior to students' use of online resources, with all data obtained from the participants remaining confidential throughout.

This information will form the basis of the study, which is intended to benefit the students and teachers in the future in relation to delivery of the forthcoming New Junior Cycle curriculum.

Yours sincerely

.....
M. Doherty

Appendix B: Letter to Parents

Dear Parent/Guardian

As part of a post graduate study I am currently undertaking in the school, first year science students will soon take part in a case study involving the delivery of portions of their Junior Cycle science course with the aid of computers and online resources, including social media sites.

In the event that your son/daughter does not already avail of social media sites on the Internet, then they will be asked to do so during the course of this case study. If, however, you do not wish your son/daughter to avail of the social media aspects of the study then please indicate this on the permission slip below and return it to the school with the completed questionnaire.

The information acquired from this study will aid in the formation of improvements which will benefit the students and teachers alike in relation to delivery of the forthcoming New Junior Cycle curriculum.

Yours faithfully

M. Doherty

.....

Permission Slip:

Do you wish to allow your son/daughter (name) to take part in the case study?

Yes

No

Signed

Parent / Guardian

Appendix C: Parent Questionnaire

		Yes	Don't Know	No	Give details here: (if you wish)
1	Do you use the Internet?				
	Home Work Other				
2	Do you use Facebook?				
3	If not, do you use a different social network site?				
4	Do you use it regularly?				
	If so, then: Several times a day?				
	Once a day?				
	Once a week				
	Once a month				
5	What are the main reasons for use?				
	Watching friends' activities				
	Contact with friends				
	Sharing photos				
	Sharing videos				
	Other				
6	Does your child access Internet via computer often?				
7	Does your child often access Internet via other devices? (e.g. smartphones, tablets etc.)				
8	Are you aware of the sites that they use?				
9	Does your child use Internet social networking sites?				
10	Do they use Facebook?				
11	Are you aware of the negative aspects of social media? (e.g. Facebook)				
12	Do you inform your child about the dangers of social media sites?				
13	Do you wish there was more external regulation of such sites?				
14	Do you agree with increased use of Internet in your child's education?				
15	Would you agree with allowing your child use Facebook for educational purposes? (e.g. schoolwork)				
16	Would you prefer if most social networking sites changed their emphasis to educational netw				
17	Do you see the Internet and social media as being essential to your child's education in the future?				
18	Do you consider yourself ICT literate?				

Appendix D: Parent Questionnaire – Results

16 Respondents		Yes	%	Don't Know		No	
1	Do you use the Internet?	14	88		0	2	13
	Home	10	63		0		0
	Work	2	13		0		0
	Other	2	13		0		0
2	Do you use Facebook?	11	69		0	3	19
3	If not, do you use a different social network site?		0		0	3	19
4	Do you use it regularly?		0		0		0
	Several times a day		0		0		0
	Once a day	4	25		0		0
	Once a week	2	13		0		0
	Several times a week	4	25		0		0
	Once a month	1	6		0		0
5	What are the main reasons for use?		0		0		0
	Family contact	6	38		0		0
	Contact with friends	3	19		0		0
	Sharing photos	1	6		0		0
	Sharing videos		0		0		0
	Other	1	6		0		0
6	Does your child access Internet via computer?	16	100		0		0
7	Does your child often access Internet via other devices? (e.g. smartphones, tablets etc.)	6	38	8	50	5	31
8	Are you aware of the sites that they use?	11	69	2	13	3	19
9	Does your child use Internet social networking sites?	8	50	4	25	4	25
10	Do they use Facebook?	6	38	6	38	4	25
11	Are you aware of the negative aspects of social media? (e.g. cyberbullying, etc.)	15	94	1	6		0
12	Do you inform your child about these negative aspects to social media sites?	14	88		0	2	13
13	Do you wish there was more external regulation of such sites?	16	100		0		0
14	Do you agree with increased use of Internet in your child's education?	16	100		0		0
15	Would you agree to allow your child use Facebook for educational purposes? (e.g. schoolwork)	14	88		0	2	13
16	Would you prefer if most social networking sites changed their emphasis to educational networking?	16	100		0		0
17	Do you see the Internet and social media as being essential to your child's education in the future?	13	81	3	19		0
18	Do you consider yourself computer-literate?	10	63	4	25	2	13

Appendix E: Teacher Questionnaire

		Yes	Don't Know	No	Give details here: (if you wish)
1	Do you consider yourself ICT-literate?				
2	What Internet resources do you use? <i>(Please tick your choices below):</i>				
	Online search engines (e.g. Google, Yahoo)				
	E-mail				
	Video sites (eg. YouTube)				
	Virtual Learning Environments (e.g. Moodle)				
	Blogging sites (e.g. Wordpress)				
	Photo sites (e.g. Flickr, Photobucket)				
	Other				
3	Do you use the Internet in the course of your teaching? <i>(If YES, please tick each area below appropriately):</i>				
	Class preparation				
	Class teaching				
	Administration				
	Professional development				
	Other				
4	Do you use Facebook?				
5	Do you use other social networking site(s)? <i>(please state on right):</i>				Other site(s):
6	Do you use it regularly? <i>(If YES, please tick appropriate box on the right)</i>				Several times a day <input type="checkbox"/> Once a day <input type="checkbox"/> Once a week <input type="checkbox"/> Several times a week <input type="checkbox"/> Once a month <input type="checkbox"/>

7	What are the main reasons for use? <i>(Please choose options below):</i>				
	Maintaining contact with friends				
	Sharing photos / videos				
	Contacting businesses etc.				
	Work-related activities				
	Other				
8	Do you agree with use of Internet resources in the classroom?				
9	Would you be willing to introduce the use of social media (e.g. Facebook) for educational purposes? (i.e. in the classroom?)				
10	Are you aware of the negative aspects of social media? (e.g. cyberbullying, etc.)				
11	Would you prefer if social networking sites changed their emphasis to educational networking?				
12	Do you see the Internet and social media as being essential to the classroom in the future?				

Appendix F: Teacher Questionnaire – Results

		Yes	%		%	No	%
1	Do you consider yourself ICT-literate?	14	100			0	0
2	What Internet resources do you use?		0			14	100
	Online search engines (e.g. Google, Yahoo)	14	100			0	0
	E-mail	14	100			0	0
	Video sites (eg. YouTube)	9	64			5	36
	Virtual Learning Environments (e.g. Moodle)	4	29			10	71
	Blogging sites (e.g. Wordpress)	3	21			11	79
	Photo sites (e.g. Flickr, Photobucket)	4	29			10	71
	Other	8	57			6	43
3	Do you use the Internet in the course of your teaching?	14	100			0	0
	Class preparation	9	64			5	36
	Class teaching	13	93			1	7
	Administration	6	43			8	57
	Professional development	5	36			9	64
	Other	10	71			4	29
4	Do you use Facebook?	8	57			6	43
5	Do you use other social networking site(s)?	0	0			2	14
6	Do you use it regularly?	4	29			6	43
	If YES, please tick appropriate box on the right		0			10	71
	Several times a day	1	7			9	64
	Once a day	3	21			7	50
	Several times a week	3	21			7	50
	Once a week	3	21			7	50
	Once a month	3	21			7	50
7	What are the main reasons for use?						0
	Contact with friends	9	64				0
	Sharing photos / videos	5	36				0
	Contacting businesses etc.	2	14				0
	Work-related activities	3	21				0
	Other	6	43				0
8	Do you agree with use of Internet resources in the classroom?	14	100			0	0
9	Would you be willing to introduce the use of social media (e.g. Facebook) for educational purposes? (i.e. in the classroom?)	9	64			5	36
10	Are you aware of the negative aspects of social media? (e.g. cyberbullying, etc.)	14	100			0	0
11	Would you prefer if social networking sites changed their emphasis to educational networking?	10	71	4	29	4	29
12	Do you see the Internet and social media as being essential to the classroom in the future?	9	64			5	36

Appendix G: Student Questionnaire (Pre-test)

Please answer each question below by ticking one of the three options in each case and give further details in the final column if you wish to do so:

		Y	Don't Know	N	Give details here: (if you wish)
1	Do you use the Internet?				
2	What Internet resources do you use? (Please tick your choices below): <div style="text-align: center;"> Online searches E-mail Video sites (eg. YouTube) Blogging sites Photo sites Music-sharing sites Other </div>				
3	Do you use Facebook?				
4	If not, do you use a different social network site?				
5	Do you use it regularly? If YES, please tick appropriate box on the right				Several times a day <input type="checkbox"/> Once a day <input type="checkbox"/> Once a week <input type="checkbox"/> Several times a week <input type="checkbox"/> Once a month <input type="checkbox"/>
6	What are the main reasons for use?				
	Watching friends' activities				
	Contact with friends				
	Sharing photos				
	Sharing videos				
	Other				
7	Are you aware of the negative aspects of social media sites? (e.g. cyberbullying, etc.)				
8	Are you aware of online safety?				

Appendix H: Student Questionnaire (Pre-test) - Results

		Yes	%	Don't Know	%	No	%
1	<i>Do you use the Internet?</i>	20	100		0		0
2	What Internet resources do you use?		0		0		0
	Educational websites,	15	75		0	5	25
	Entertainment websites (gaming sites etc.)	9	45		0	11	55
	E-mail	16	80		0	4	20
	Video sites (eg. YouTube)	18	90		0	2	10
	Blogging sites	4	20		0	16	80
	Photo sites	11	55		0	9	45
	Music-sharing sites	5	25		0	15	75
	Other	8	40		0	12	60
3	Do you use Facebook?	14	70		0	6	30
4	If not, do you use a different social network site?	0	0		0	6	30
5	Do you use it regularly?	12	60		0	2	10
	Several times a day	1	5		0	19	95
	Once a day	6	30		0	14	70
	Several times a week	3	15		0	17	85
	Once a week	3	15		0	17	85
	Once a month	2	10		0	18	90
6	What are the main reasons for use?		0		0		0
	Watching friends' activities	12	60		0	8	40
	Contact with friends	14	70		0	6	30
	Sharing photos	12	60		0	8	40
	Sharing videos	10	50		0	10	50
	Other	6	30		0	14	70
7	Are you aware of the negative aspects of social media sites? (e.g. cyberbullying, etc.)	11	55	5	25	4	20
8	Are you aware of online safety?	10	50	7	35	3	15

Appendix I: Student Questionnaire (Post-test)

Please answer each question below by ticking one of the three options in each case and give further details in the final column if you wish to do so

		Yes	Don't Know	No	Give details here: (if you wish)
1	Did you find any test difficult? <i>(If so, please tick options on right)</i>				Test 1 <input type="checkbox"/> (Sound) Test 2 <input type="checkbox"/> (Moments/Levers)
	If <i>YES</i> , please give a reason:				<i>Reason:</i>
2	Was it easier to study the topics using the <i>computer online resources</i> ?				
3	Was it easier to study the topics by the <i>traditional method using teacher notes and the blackboard</i> ? (<u>without</u> using computers and the Internet)				
4	Did you prefer to study the topics using the computer and the Internet?				
5	Did you find any problems with learning using online methods?				<i>Give details:</i>
6	Would you prefer to use the Internet and online resources <u>more often</u> in the course of your schoolwork?				

Appendix J: Student Questionnaire (Post-test) - Results

20 respondents		Yes	%	Don't Know	%	No	%
1	Did you find any test difficult?	9	45		0	11	55
	Test 1 (Sound)	3	15		0	17	85
	Test 2 (Moments/Levers)	6	30		0	13	65
2	Was it easier to study the topics using the computer online resources?	15	75		0	5	25
3	Was it easier to study the topics by the traditional method using teacher notes and the blackboard? (without using computers and the Internet)	5	25		0	15	75
4	Were you more willing to study the topics using the computer and the Internet?	12	60	6	30	2	10
5	Did you find any problems with learning using the Internet?	5	25	4	20	11	55
6	Would you prefer to use the Internet and online resources more often in the course of your schoolwork?	16	80	2	10	2	10

Appendix K: Screen Shot – “Science for Juniors” website (hosted by Wordpress)

The screenshot shows a web browser window displaying the "Science for Juniors" website. The page has a dark theme and features a navigation menu with links for Home, Forces, Gravity, Heat, Light, Posts and Comments Page, Pressure, Sound, and Test your knowledge. The main content area is titled "Sound" and includes the following text:

Sound is a form of energy caused by vibrations.

These sound vibrations (or waves) travel through the air at a speed of 340 metres per second. (This is much slower than LIGHT waves, which travel at 300 million metres per second - which is why lightning is always seen before the thunder)

Sound waves must have a medium to travel through, which means that they cannot travel through a vacuum.

The following video clip show the Bell Jar Experiment to show that sound needs a medium to travel through.

Sound - Bell in Vacuum

The video shows a bell inside a glass jar with a vacuum pump. A "WARNING" sign is visible. The video player shows a progress bar at 0:00 / 1:19.

Humans hear sounds when something vibrates, then the vibrations travel through the air into our ears, which then cause our ear-drums to vibrate, sending a signal to our brains that interprets it as a sound.

When sound gets reflected off hard surfaces, it causes an ECHO to be heard. High frequency sounds cannot be heard by humans, and are called ULTRASOUND.

Watch this video clip:

Sound echoes and dolphins

The video shows sound waves reflecting off a surface. The video player shows a progress bar at 0:00 / 2:12.

Sound waves can get reflected off surfaces at the same angle at which they hit the surface. The following video clip demonstrates this.

Laws of Reflection of Sound - OLabs - Amrit

The video shows a sound wave reflecting off a surface. The video player shows a progress bar at 0:00 / 3:21.

The loudness of sound is measured in units called decibels, with a piece of equipment called a Sound Meter. If a person is regularly exposed to sounds more than 85 decibels, then it may cause deafness unless hearing protection is worn.

The bottom of the screen shows a Windows taskbar with the date 04/09/2013 and time 20:06.