

*Remix and Remember*

*An investigation into the enhancement of audio podcasts to facilitate greater retention of information among the listeners*

Brian Kenny BA Media Production (TVU), Grad Dip in Education (Hibernia College)

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## Declaration

I declare that the work described in this document is, except where otherwise stated, is entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

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## **Abstract:**

Podcasts within the educational domain, although not uncommon are largely viewed as supplemental learning tools .Many studies have such as those by Daniel and Woody (2010) validate this perception of podcasts by assessing their worth against other more traditional forms of learning. The vast majority of podcasts remain straight audio recordings of lectures without any editing or enhancement. Those studies that have experimented with enhancing podcasts with music and additional sound effects have had limited success in engaging student more effectively than a traditional podcast (Putman and Kingsley 2010). Engagement however does not automatically lead to learning (Axelson and Flick (2011).

This study attempts to enhance a podcast with additional elements toward the desired effect of increasing the retention of information. In order to do this, existing studies on enhancing podcasts were researched alongside a variety of studies that looked at effective methods of increasing retention of information across the educational divide. This research was adapted to design an enhanced podcast which assimilated effective retention strategies such as testing and reinforcement and situational learning into two audio podcasts. These podcasts contained both enhanced sections and elements that remained unedited from the original recordings of the lecture.

A case study methodology was applied using both qualitative and quantitative data with a cohort of 26 students at the Dundalk Institute of Technology. These students were exposed to the podcasts and a series of pre and post tests to assess the retention of information after listening to the podcasts, and the effect that the individual enhancements had on this retention, A series of semi structured interviews took place with students after each post test to elicit their attitudes, perceptions of the enhanced podcasts and how they felt it affected their retention of the information.

The results from the quantitative data showed that students retained more information from enhanced sections of the podcasts than those that were not enhanced. Certain enhancements proved more successful than others and some retention strategies proved

unsuitable for adaptation into an audio podcast. The Qualitative data suggested that the areas of situational learning, content knowledge and expert interviews were more favourable to students and facilitated better retention of information, whereas audio enhancements such as signalling of words and phrases were not effective.

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# **Chapter 1. Introduction**

## ***1.1 Background and Context***

There is no doubt that the modern lecture theatre is evolving and that technology has had a large part to play in this. Within this environment, podcasts, as educational tools, have met with mixed reactions. Studies like those by Daniel and Woody (2010) while acknowledging their flexibility, ease of use and positive student perceptions of podcasts, have branded their worth largely as supplemental learning tools. Studies like these must be understood in the context of the format of the podcasts scrutinized.

As Eash (2006) demonstrates, podcasts are digital audio files that can be played across a variety of technologies yet they are most likely to be straight forward recordings of a lecture. Few podcasts are digitally enhanced to alter them from the original recording. Studies such as those by Putman and Kingsley (2010) have had limited success in basic enhancement of podcasts with music or sound effects, which can engage the listener and facilitate better learning. However much like the study by Smythe and Neufeld (2010) the enhancements were quite basic and not enough to convince authors like Borgia (2009) that their worth is any more than a supplemental learning tool.

Accordingly therefore, this study aims to address a perceived gap in the literature whereby the limited successes of enhancing podcasts with music and sound effects can be built upon. It was decided that strategies which have been proven effective in increasing retention of information in the wider educational community, may be valid, if transferred to an audio podcast. Ultimately this study will look at the possibilities of enhancement within a podcast and whether these enhancements and editing processes can increase the retention of information for the listener. Enhancement within the context of this research means augmenting or editing the podcast with additional interviews and sound effects or music.

The research question which arises from this investigation is

Can a podcast be enhanced to increase retention of information?

Out of this main research question several sub questions arise.

- To what extent does Reinforcement of information during a podcast, using a variety of speakers alongside testing the listener throughout the podcast, effect retention?
- Can real life situations and experiences be assimilated into an audio podcast?
- Can the principal of signaling words and text using bold and highlighted print be transferred to an audio podcast by using editing and audio enhancements on certain words and phrases?
- Does using multiple sources of information and expert opinions have a positive impact on the listener's ability to remember the information?
- How will an enhanced podcast engage listeners and affect their attention?

In order to accurately deal with this question it is essential to look at different strategies that have proven a success in increasing retention of information over time. These strategies such as testing and reinforcement, or situational learning have been shown to be effective within other areas such as narrative texts or computer simulations yet adapting them to a podcast, in an attempt to facilitate the increase of retention of the information among the listeners is the aim of this study.

## ***1.2 A Roadmap***

The literature review will outline how podcasts are utilised currently within the modern educational sphere and what attempts have been made at editing or altering them. The results of these studies show how the perceptions of podcasts as supplemental learning tools has been justified. The methods of enhancement which these studies deployed will be discussed in order to create an accurate picture of what has already been done within this field of research.

A variety of studies that have analysed effective methods of increasing retention of information will be reviewed such as signaling within texts to experiential learning through the use of computer simulations. The specific elements that have been found to have had an impact on retention of information will be highlighted and an attempt made to integrate these effective strategies into podcasts.

At this, the Design stage, the podcasts will be pieced together, informed by the literature, and utilising complex audio editing and enhancements. Each of the effective strategies was applied to create two digital podcasts using external interviews, the original class lecture and a variety of audio effects and enhancements. The learning experience was set up to facilitate the fairest test, and 26 students studying Early Childhood Studies in the Dundalk Institute of Technology were exposed to the podcasts.

A case study was deemed the most appropriate methodology and both qualitative and quantitative data was used in the form of pre and post-tests for retention after exposure to the podcasts. Alongside these post-tests, which mainly looked at the factual test scores across the various sections of the podcasts, a series of semi structured focus groups aimed at eliciting the student's perceptions of the podcasts were conducted. These were important in terms of assessing how the students felt the enhancements affected their retention during the post tests.

The Findings and Discussion are presented in Chapter 5 under the same headings that were used during the coding processes, namely the specific area of enhancements utilised within the podcasts. These headings also incorporate the five sub questions. The effectiveness of these enhancements in terms of their impact on the student's retention of information is compared by triangulation of the test results and the semi structured interviews.

## **Chapter 2. Literature Review**

### ***2.1 Introduction***

The Literature review will look at how podcasts are used within the modern educational environment and whether or not they are of use as a supplemental learning tool or a primary source of learning. As this study will attempt to enhance a podcast to increase retention, strategies to improve retention will be examined. Finally I will explore the area of measurement of retention and what has been done to measure it across a variety of studies.

### ***2.2 Podcasts***

#### **2.2.1 Podcasts, Setting the Scene**

Eash, (2006) describes a podcast as “a digital audio file that’s created shared and heard” (p 17). There are a variety of uses for podcasts in the modern educational context yet the majority of podcasts are either recordings of lectures for students perusal after class or audio files created by students themselves in a classroom scenario. Durbrige (1984, as cited in Hew, 2008) “stressed the importance of audio for learning as the spoken word can influence a learner’s cognition” (p 334). The preferred length of a podcasts is usually 20 minutes and the majority of students will listen to them on a laptop or personal computer outside of class contact time (Hew 2008).

#### **2.2.2 Podcasts, to Enhance or not to Enhance**

The style of podcasts has proved to be an important factor throughout many studies when looking at their effectiveness and whether they work primarily as a supplemental learning

tool or if they can be a vehicle in delivering primary content for students. One study which focussed on the teaching of vocabulary used podcasts mixed with music and sound effects (Putman & Kingsley, 2009). It was found that this enhancement allowed the student to become more engaged by capturing their attention at the crucial stages and combating the potential boredom of listening to one voice for a prolonged period of time. Daniel and Woody's (2010) research shows the varieties of uses podcasts take within an educational context. The podcast is viewed by the student with enthusiasm and often they are motivated to learn or use a podcast in an educational setting, however this does not automatically lead to learning. In fact Daniel and Woody state that the primary use of a podcast is as a supplemental tool not as a primary source of learning. One of the key areas they look at in terms of the negatives of podcasts as a primary learning tool are individual elements or limitations such as the lack of signalling. For example within a text areas can be highlighted in bold words or italics can highlight an important phrase or sentence whereas an audio podcast does not have this facility. If it were possible to enhance a podcast to achieve signalling these limitations discussed in Daniel and Woody's research would no longer be a problem.

The importance of podcasts as supplemental learning tools has been widely researched and using them as primary learning materials is something that many studies have discounted. The findings of one study that compared the learning and retention of students from listening to a podcast to reading an article with the same material, showed those who listened to the podcasts did not fare any better academically (Borgia, 2009). Once again it must be stressed that in this instance the podcasts were not enhanced rather they were straight audio recordings of a lecture.

The standard format for podcasts is a straight audio recording. It is apparent from looking at the various studies on educational Podcasts within that they can have a positive impact, however the majority of authors are in agreement that their use lies as a supplemental learning tool and they do not seem to have convinced educators that they can compete with traditional lectures. The flaws which have been highlighted across these studies

seem to suggest a problem with podcasts that may be best approached with a technological intervention, such as complex enhancements.

## ***2.3 Factors that Facilitate Retention***

### **2.3.1 Retention and Attention**

“Attention can be described as a cognitive process of selectively concentrating on one aspect of the environment while ignoring other aspects” (Kyndt et al, 2011, p287)

Attention is an essential element when we are looking at academic achievement. The attention of an individual is focussed on one particular element almost like a spotlight which switches from subject to subject depending on the where the spotlight is focussed. The brain is limited to how many items it can focus its attention on at once so ensuring that the focus is on the correct elements and holding that attention is important if one is to ensure information is retained by students. (Kyndt et al 2011)

### **2.3.2 Reinforcement and Testing**

Bell et al (2008) describes how the process of forgetting what has been previously learned is a universal phenomenon which among other things is related to actual memory capacity. In order to achieve longer retention of information a process of reinforcement is necessary. There are various ways to reinforce information in an educational setting, two of the main methods are practicing the recalling of it or restudying it. In this particular study it was found that the flexibility which technology assisted education allowed, enabled the teacher to facilitate a much more personalised learning process, which in turn increased learning and retention of information.

In a study by Shana et al (2009) testing as a method to increase learning and retention of material being studied was looked at in detail. Testing was put forward as a better alternative than a student re-reading or re-visiting lecture material. In this instance it was found that testing, which can take the form of teacher led testing or students self-testing as they engage with the material, encouraged active recall of information, which in turn allowed the learner to put the information that was learned to use. When this happens the brain puts a certain value on what it has recalled and it encourages longer retention of the information.

It is apparent that these strategies are far easier to use in a standard lecture where as they may not be readily blended into a podcast. With careful planning however, strategies such as reinforcement and testing could be added into a carefully constructed podcast by using a narrator or a series of speakers to reinforce material and ask questions as the students listened.

### **2.3.3 Situational Learning**

Botezatu et al (2010) deals with medical education and the area of virtual patients and highlighted this as a key element in the teaching of medical students. Technology can and does play a huge part in this not least due to the fact that it allows for the creation of real life scenarios in which the future students will find themselves at a later date. Knowledge must be learned and applied in order for it to be stored in the long term memory so when material can be taught and applied in the one instance, such as with virtual patient simulations, learning and retention is effective (Botezatu et al 2010). In the study conducted by Botezatu et al (2010) a control group was taught using standard teaching practices and another using virtual patient simulators. Follow up testing showed that the retention of the information was far greater among those that took part in the Virtual patient simulations.

Van Dijk and Kintsch (1983). described 3 models of how learning takes place, surface structure learning which is a mental representation of the wording in a text, text based

learning which primarily focuses on the concepts in the text and the situational model which involves the mental representation of the text in order to create meaning. In this study it was the situational model that led to the greatest retention of information.

“Expert nurses simultaneously devoted attention to the way other nurses practiced in order to guide and direct them” (Bonner, Greenwood, 2005, p 487)

Many students not only learn from a situational environment but they learn highly specific knowledge from others who have experience within the fields that they will find themselves working in at a future date. (Bonner, Greenwood, 2005). In this research which looked at nurses, Bonner and Greenwood (2005) found that nurses will actively seek this information and want to learn from nurses who are more experienced in the situations they are going to ultimately find themselves working in at a future date. Nurses are highly motivated to learn from relevant experts within their field or from situations that will give them this expertise (Morrison and Symes, 2011).

Sieb, English and Barnard (2011) conducted research into student’s motivations and eagerness to learn in particular environments and found that students have a strong idea of the environments that they will be working in at a later date and when their learning environments are designed to reflect this they tend to listen more attentively. The term “content knowledge” is used by Lunney (2008) to describe the kind of specific knowledge that students require in their training and the information that they will seek out more actively. Within the lecture theatre they have a limited opportunity to acquire real life experience so it is within this context that the idea of case studies is highlighted as an important area for medical training.

Although the lecture theatre may allow for limited opportunity to engage with a student’s real future working environment or situational learning, the use of a podcast which has recorded elements of a real life situation may have the desired effect of increasing retention of information. Perhaps this simple technology can bridge the gap between a real life situation and a lecture theatre in a fast and accessible manner.

### **2.3.4 Experiential Learning**

Chow (1990) showed how retention of information can be increased through alternative learning environments or activities. In this study an online game was used to teach mathematical skills or concepts. What was discovered was the importance of the learner working their way through a problem or concept. When they are challenged through a game, exercises or simulation the ability to think their way through a problem becomes important which encourages the processing and in turn the learner will retain what is learned for longer.

Bloomfield et al (2010) looks at the area of nursing and the effective implementation of computer systems in teaching and how they facilitate the retention of the material being taught. In their study about the importance of hand washing and elimination of bacteria, two groups were assessed, one with a traditional teaching method and one using an interactive computer terminal. The long term retention of what was taught proved far better with those that learned in the computer based group. This was mainly attributed to the independent nature of the computer assisted learning method and the fact that the learner had a degree of control over their learning environment against those who were in a face to face lecture where they were limited in this capacity.

Ti et al (2009) studied a group of students learning in an experiential learning situation which involved watching tutorials, and attempting endotracheal intubation without any prompting or step by step guidance. Another group of students were given a lecture and then guided in the steps by a tutor. The results of the experiment showed that those who were allowed to learn by making mistakes and without prompting throughout the steps retained the information better. The reasons given for this were that the students learned better by a real life situation whereby they were allowed to make their own mistakes. Overall experiential learning was superior as it left the students to work out the process themselves which facilitated a greater interest and in turn retention of what they were learning to do.

Experiential learning may possibly be incorporated into a podcast by an audio re-creation of a particular environment like for example a child care facility through which an experience can be created for the listener. Although, given the lack of visual information, it may prove challenging, the addition of an experiential learning element to an audio podcast may have merit.

### **2.3.5 Technology and Retention**

Hartland et al (2008) effectively used short audio visual presentations that attempted to replicate real life situations that were relevant to nurses. It was deemed important given the future working environment of nurses and the interest they showed in learning from actual clinical examples outside of the traditional lecture theatre. The importance of these presentations was deemed to be the stories that were told through them, the nurses were able to empathise with the situations, characters and ultimately learned from watching other nurse both succeed in real life practice and make mistakes. Taking this theory and applying it to work with students in an Early Child Care course would involve an enhanced podcast which used interviews with Creche Owners and other small business in real life situations, and may possibly have a similar effect on the listener.

It is important when looking at this research, in the context of informing the enhancement of a podcast, that these types of content are assessed. For example would a real life recording of a childcare worker in a Creche be a better way to give information about a scenario a student nurse may face in the future than recording an academic lecture delivering the message directly. These considerations are essential when assessing the validity of an enhanced podcast and indeed how to accurately enhance a podcast to facilitate an increase in the retention of the material being taught.

### **2.3.6 Measuring retention**

Across many studies that assess retention of information using various technologies, a pre-test and a post test has been an important element. Yildirim et al (2001) uses a pre-test and post test to compare prior knowledge with retention of information after a learning experience. This study also emphasises the importance of planning the unit objectives of the material to be taught. In order to measure retention these unit objectives must be analysed and compared with the results of a post test

The period of time between the testing is an important element to a study which measures retention and the time for a post test can range from 1 week (Chow et al 2011) to 16 months (Minakova, Falikman 2011). The time and frequency of testing can be adapted to the specific needs of a particular study. In the case of Kroncke (2010) two post tests took place, 2 weeks and again 3 months after the initial learning experience. In this study each participant was given a different sequence of questions

It can be seen from Minakova, Falikman (2011) that the type of questions asked are important in gaining an understanding of what was retained and how effective the learning experience was. In this particular study categories of questions were linked to particular teaching strategies to accurately assess which strategies were more effective in increasing retention.

Starbek et al (2010) also highlights the importance of a pre test to establish prior knowledge and the importance of the questions being planned and linked to the objectives of the learning experience. The post test in this particular study was immediately after the learning experience and again 5 weeks later. Carpenter (2009) tested different groups at different intervals to measure retention over time and compared each group against one another using the pre test and post test information. In this instance one group was assessed at 1 week after the learning experience while another was assessed at 16 weeks after the learning experience.

## **2.4 Conclusion**

Podcasts are now a regular part of the modern educational environment and are generally used as a supplemental learning tool. Few if any Podcasts are enhanced by the addition of music sound effects and when they are they have had positive results in terms of engagement of the listener. Engagement however does not automatically lead to retention of information and the purpose of this study is to look at the elements that have been shown to increase retention of information among students and attempt to incorporate that into a Podcast by enhancing it with these qualities

If we look at retention and the factors that influence it we can get a picture of how a podcast can be enhanced to increase retention, using these qualities. Highlighted words or words in Italics (Signalling) can be replicated by increasing volume in words or putting sound effects on specific sentences.

Reinforcing and testing was also shown to be a positive factor in increasing retention of information and once again this can be co-opted into a podcast by careful editing and the recording of certain situations. Situational learning can be created through an audio podcast, for example, a recording of a bank manager can act as a real life situation which future students may encounter when attempting to set up a business, giving crucial information and both engaging the listener and increasing the retention rate of the material at the same time.

If these strategies can be assimilated into an audio Podcast perhaps it may have a positive effect on the retention of information., The method by which they are effectively assimilated will be a key factor in this process.

## **Chapter 3: Design**

### ***3.1 Introduction-The Problem***

Podcasts are not unusual within a third level setting yet the research outlined in the Literature Review indicates that they are rarely seen as anything but supplemental learning tools. Their value is often seen in their flexibility and ease of accessibility, not in their content. More often than not podcasts are straight audio recordings of a lecture which merely lack the benefits of a lecture theatre, interaction and the ability to ask questions. Podcasts have been shown to increase engagement but not necessarily facilitate retention of information due to their limitations. Through a technological intervention however, this resource was designed to meet this problem by using technology to incorporate the factors that have been shown to increase retention across other learning tools into a podcast. This resource was designed to not only capitalise on the portability of a podcast but to attempt to make a podcast as good as or even better than a standard lecture.

#### **3.1.1 The Solution**

A substantial amount of research was necessary to create a podcast that would both possess all the relevant lecture content alongside engaging students and ensuring that they retained the information contained within the podcast. In concentrating on the needs of the study, namely to facilitate and test for retention of information, a course that was factual in nature was deemed most appropriate. In this instance testing for retention would be straightforward and it would be easy to assess prior knowledge of a topic in order to ensure the research wasn't polluted. Contact was made with a lecturer in the School of Nursing in Dundalk Institute of Technology, to assess an appropriate test group. A series of meetings were arranged with a lecturer, John Mc Donald. After comprehensive meetings it was decided to use a 4<sup>th</sup> year group of students studying Early Childhood Studies. Within this cohort we looked at their curriculum and decided on a

module called Entrepreneurship. According to the lecturer, a great many of these students will strive to set up their own childcare businesses so therefore this Entrepreneurship module is taught at this particular stage in their final year. Although these podcasts focused on the child care area the same principles behind enhancing a podcast for retention could apply across any educational field.

### ***3.2 Principles that informed the design***

Podcasts have been used in educational settings for many years now however they are very often only used as supplemental learning tools. In the design of this technology enhanced experience deciding the best method of enhancing a podcast was essential. In the context of this research achieving a greater level of retention of the information contained within the podcast was the goal. When looking at the research available on podcasts to work towards this goal studies such as Putman and Kingsley (2009) were considered. In this instance podcasts were enhanced effectively by using music and sound effects however the result was an increase in engagement with the listener however as Axelson and Flick (2011) found engaging a listener with material does not mean they will retain the information. It became apparent during this phase that the type of enhancement that the podcast would be exposed to would be a key factor in the success of facilitating retention,

In order to accurately assess the best type of enhancement for retention it became clear that defining retention and indeed looking at what factors have already been shown to increase retention was essential. Once these studies were assessed, as outlined in the literature review, the design phase became important. It was at this stage that the theories within the studies outlined in the literature review would be transferred to the design of an enhanced podcast. Using these principals, the podcast was edited to include situational learning, content knowledge, testing and reinforcement and many other areas which were studied.

The following table outlines the particular design decisions made and the principles that informed them.

**Table 1: Design Principles**

<b>Principle informing Design</b>	<b>Design Decision</b>	<b>Podcast Enhancement</b>
<b>Attention and Retention Kyndt et al (2010)</b>	Constant switching between numerous speakers, use of music to break up sections.	<b>Various pieces of music blended in and fit between relevant sections, multiple sources information used by interviewing several key speakers.</b>
<b>Challenges and Brain based learning Lago, Seepho (2011)</b>	Insert tasks and challenges were possible.	<b>Speakers to ask listener questions and pose problems. Narrator creates scenarios for students to make decisions.</b>
<b>Reinforcement Bell et all (2008)</b>	Reinforce key points.	<b>Use narrator and different speakers to reinforce key points and repeat phrases. Use of audio effects on key words.</b>
<b>Testing Shana (2009)</b>	Test students within the podcast with scenarios and questions.	<b>Use of challenges and direct questions from speakers and narrator to test students within the lecture.</b>
<b>Situational Learning Botezatu et al (2010)</b>	Interview experts and relevant speakers on	<b>Interview and record in a Crèche, Bank, small</b>

	situations that will face students in the future. Create scenarios of future working environments.	<b>businesses and Investors environments.</b>
<b>Experiential Learning Ti et al (2009)</b>	Create real life challenges and experiences for the listener.	<b>Put listener in a scenario where they will face a business choice and have to draw upon what they have just been taught.</b>
<b>Content knowledge Lunney (2008)</b>	Information given by those interviewed must be specific to that required by the students.	<b>Interview Crèche owner, Business Angels and bank manager.</b>
<b>Expert Interviews Bonner, Greenwood (2005)</b>	Expert interviews in this particular field giving specific relevant information.	<b>Interview key finance and business people.</b>
<b>Future working environments Sieb, English, Barnard (2011)</b>	Students must be presented with content that relates to where they will see themselves working in the future.	<b>Interview Crèche owner about setting up Crèche</b>
<b>Prior Knowledge Wolf Woodwick (2010)</b>	Linking information to existing prior knowledge where possible to increase retention.	<b>Recapping on various sections, use of different interviewees to make similar points.</b>
<b>Audio Enhancement Putman, Kingsley (2009)</b>	Adding music and sound effects to Podcasts to increase attention and discourage boredom	<b>Inserting music at regular intervals.</b>

### **3.3 The Enhanced Podcasts**

The enhanced podcasts consist of 2 x 25 minutes of audio recordings segmented and edited rigorously. It was created from a 60 minute audio recording of the class lecturer which was logged and analysed for the information it contained. This information was then processed into categories and relevant sections whereby it was analysed. Where an interviewee was replacing the lecturers original lecture material i.e. a bank manager discussing finance options instead of the lecturer, the information that the interviewee would be giving was based around the original content so as to keep focused on the lecturers learning objectives from the module. The individual enhancements such as signaling or testing were then added to different sections of the lecture. The enhanced podcasts are .wav audio files and are broken down into various different sections. These sections are summarised here and outlined in detail in the appendices (Appendix 1 and 2).

**Table 2: Podcast 1 Sections**

<b>Sections</b>	<b>Time</b>	<b>Voices</b>	<b>Subjects</b>
<b>16</b>	<b>25 mins</b>	<b>Lecturer John Mc Donald, Gary Jones Business Angel, Larry Fitzpatrick Insurance Company, Tom Fingleton Small Business Owner, Peadar Cosgrove HR Company</b>	<b>Equity, Venture Capital, Business Angels, Overdrafts and Term Loans, Asset and Lease Finance, Credit Cards, Hire Purchase</b>

**Table 3: Podcast 2 Sections**

Sections	Time	Voice	Subject
<b>17</b>	<b>25 mins</b>	<b>Lecturer John Mc Donald, Tony Moore Business Man, Anne Johnston Crèche Owner, Trevor Dietz Bank Manager, Sean Mc Ginley Invest N.I.</b>	<b>Loan Applications , Financing a Crèche , Bank Loan Requirements , Bank Services , Grant Thornton and Grant Aid , Invest N.I.,</b>

The following table breaks down the individual enhancements and where they were added to the lecture.

**Table 4: Podcast 1 Outline of Enhancements**

Time	Enhancements	Reference	Purpose
<b>0.00</b>	None-Lecturer John Mc Donald		<b>A familiar voice to introduce the content. Brings consistency for the learner.</b>
<b>2.47 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>3.10 Gary Jones Business Angel</b>	Situational Learning, Content knowledge , Expert Interviews, Audio	Botezatu et al (2010) Lunney (2008) Bonner, Greenwood (2005) Putman, Kingsley	<b>Expert voice, relevant to future working environment, signaling of particular words through audio effects to highlight</b>

	Enhancement	(2009)	<b>relevant phrases.</b>
<b>5.54 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing	Lago, Seepho (2011), Bell et all (2008), Shana (2009)	<b>Experiential and situational learning to increase attention and retention of information.</b>
<b>6.19</b>	None-Lecturer John Mc Donald		<b>Back to familiar voice</b>
<b>9.34 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>9.50 Larry Fitzpatrick Small Business Owner</b>	Situational Learning, Content knowledge, Expert Interviews, Future working environments, Audio Enhancement	Botezatu et al (2010) Lunney (2008) Bonner, Greenwood (2005) Sieb, English, Barnard (2011) Putman, Kingsley (2009)	<b>Relevant to future working environment and situation, highlighting specific relevant information.</b>
<b>14.51 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing	Lago, Seepho (2011), Bell et all (2008), Shana (2009)	<b>Reinforcement and Testing.</b>

<b>15.18</b>	None Lecturer John Mc Donald		<b>Back to familiar voice</b>
<b>18.15 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>18.24 Tom Fingleton Business Owner</b>	Situational Learning, Content knowledge, Expert Interviews, Future working environments	Botezatu et al (2010) Lunney (2008) Bonner, Greenwood (2005) Sieb, English, Barnard (2011)	<b>Expert interviews encouraging attention and retention.</b>
<b>20.26 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing, Experiential Learning	Lago, Seepho (2011), Bell et all (2008), Shana (2009)  Ti et al (2009)	<b>Testing, Experiential learning.</b>
<b>21.05 Peadar Cosgrove Small Businessman</b>	Content knowledge, Expert Interviews, Audio Enhancement	Lunney (2008) Bonner, Greenwood (2005) Putman, Kingsley (2009)	<b>Information relevant to future scenarios, signaling to highlight particular phrases and words.</b>

<b>23.16 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>23.33</b>	None-Lecturer John Mc Donald		<b>Finish with familiar voice of lecturer.</b>
<b>24.17</b>	N/A		N/A

**Table 5: Podcast 2 Outline of Enhancements**

<b>Time</b>	<b>Enhancements</b>	<b>Reference</b>	<b>Purpose</b>
<b>0.00</b>	None-Lecturer John Mc Donald		<b>A familiar voice to introduce the content. Brings consistency for the learner.</b>
<b>1.04 Tony Moore Businessman</b>	Content knowledge Expert Interviews	Lunney (2008) Bonner, Greenwood (2005)	<b>Relevant information for future working environments.</b>
<b>4.03 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing	Lago, Seepho (2011), Bell et all (2008), Shana (2009)	<b>Reinforcement and Testing.</b>
<b>4.17 Anne Johnston Crèche Owner</b>	Situational Learning, Experiential Learning, Expert Interviews, Future	Botezatu et al (2010) Ti et al (2009) Bonner, Greenwood (2005) Sieb, English,	<b>Situational learning, Expert voice, relevant to future working environment, signaling of particular words through</b>

	working environments, Audio Enhancement	Barnard (2011) Putman, Kingsley (2009)	<b>audio effects to highlight relevant phrases.</b>
<b>9.58 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>10.15</b>	None-Lecturer John Mc Donald		<b>Back to familiar voice.</b>
<b>11.34 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>11.50 Trevor Dietz Bank Manager</b>	Experiential Learning, Content knowledge, Expert Interviews, Audio Enhancement	Ti et al (2009) Lunney (2008) Bonner, Greenwood (2005) Putman, Kingsley (2009)	<b>Situational learning, Content knowledge. Specific words highlighted with audio effects.</b>
<b>15.21 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing	Lago, Seepho (2011), Bell et all (2008), Shana (2009)	<b>Reinforcement and testing</b>
<b>15.50</b>	None-Lecturer John Mc Donald		<b>Familiar voice</b>

<b>18.20 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>18.45 Sean Mc Ginley</b>	Expert Interviews Future working environments	Bonner, Greenwood (2005) Sieb, English, Barnard (2011)	<b>Future working environment relevance.</b>
<b>20.45 Narrator</b>	Challenges and Brain based learning, Reinforcement, Testing	Lago, Seepho (2011), Bell et all (2008), Shana (2009)	<b>Reinforcement and Testing.</b>
<b>21.24</b>	None-Lecturer John Mc Donald		<b>Conclusion.</b>
<b>21.48 Music</b>	Attention and Retention	Kyndt et al (2010)	<b>To Discourage Boredom and encourage engagement.</b>
<b>22.05</b>	Lecturer John Mc Donald		<b>Conclusion</b>
<b>22.37</b>	N/A		<b>N/A</b>

### ***3.4 Creating the Enhanced Podcast***

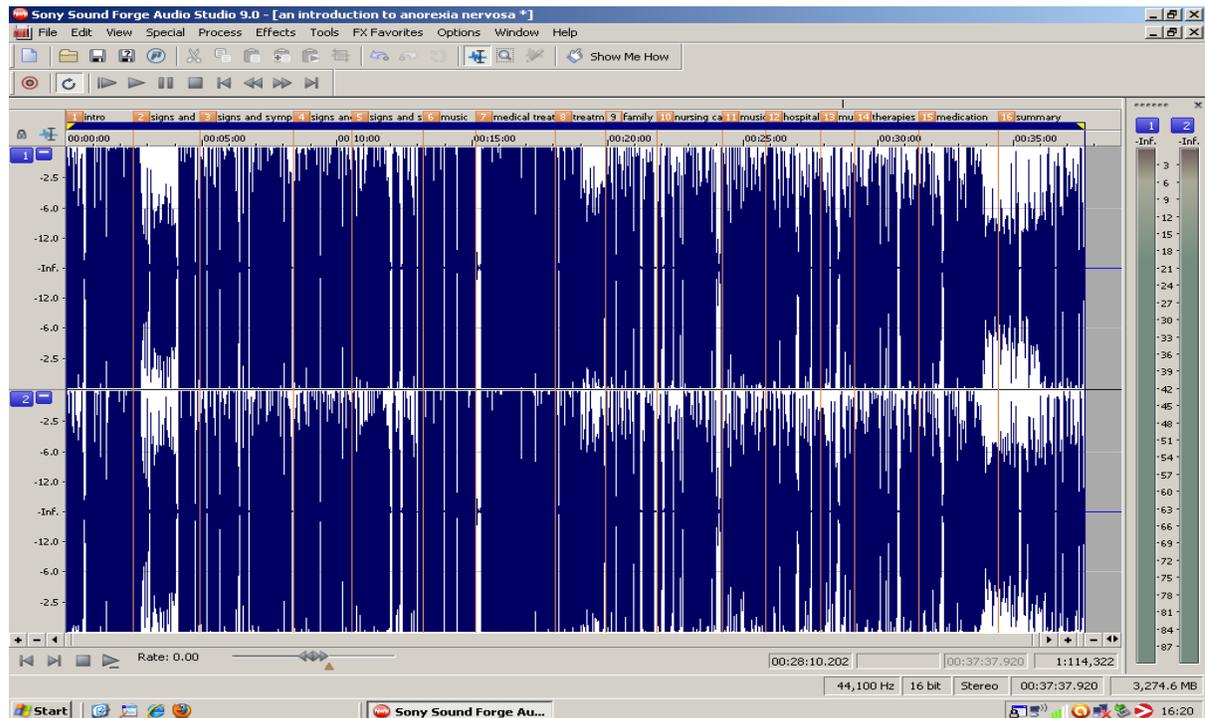
#### **3.4.1 Phase One: Recording the lecture**

The lecturer prepared the lectures as normal and when it was convenient I traveled to Dundalk Institute of Technology to record it. We recorded several takes of the lectures until the lecturer was happy that all of the material was covered and the audio was satisfactory. The device used to record the lecture was a Zoom H4n digital recorder and an AKG D230 Microphone.

#### **3.4.2 Phase Two:-Analysis**

After the recording was completed it was logged and transcribed. At this stage it was segmented into relevant sections based upon the educational material that it contained. The importance of this process was to make sure that when external experts were added to enhance the podcast that they were giving the same information that the original lecture had given and that there was a consistency with educational content in terms of the course and module learning objectives. It also allowed for the analysis of the various sections in order to accurately assess which enhancements i.e. signaling etc. would best fit with the various sections. The audio analysis of the podcast took place within a digital audio editor Sony Soundforge whereby individual markers, which take the form of red lines, were placed throughout in order to divide it into the various sections.

**Figure 1: Individual Editing Screen**



### **3.4.3 Phase 3: Planning**

When the original audio recording was logged with all the educational information it contained, the planning for the enhancement began. Informed by the research in the literature review, professionals within the field were to be included to add an expert opinion to the podcasts. For the purpose of this research it was decided to use actors however it was crucial that the students were not aware that the voices belonged to actors as it was felt this would inhibit the authenticity of the project and pollute the research. Scripts were written, informed by the information contained in the original recording that the experts were replacing. The literature review again informed the planning at this stage by deciding which enhancements to add to the various sections such as testing, creating a choice for the listener to select from and signaling of particular words.

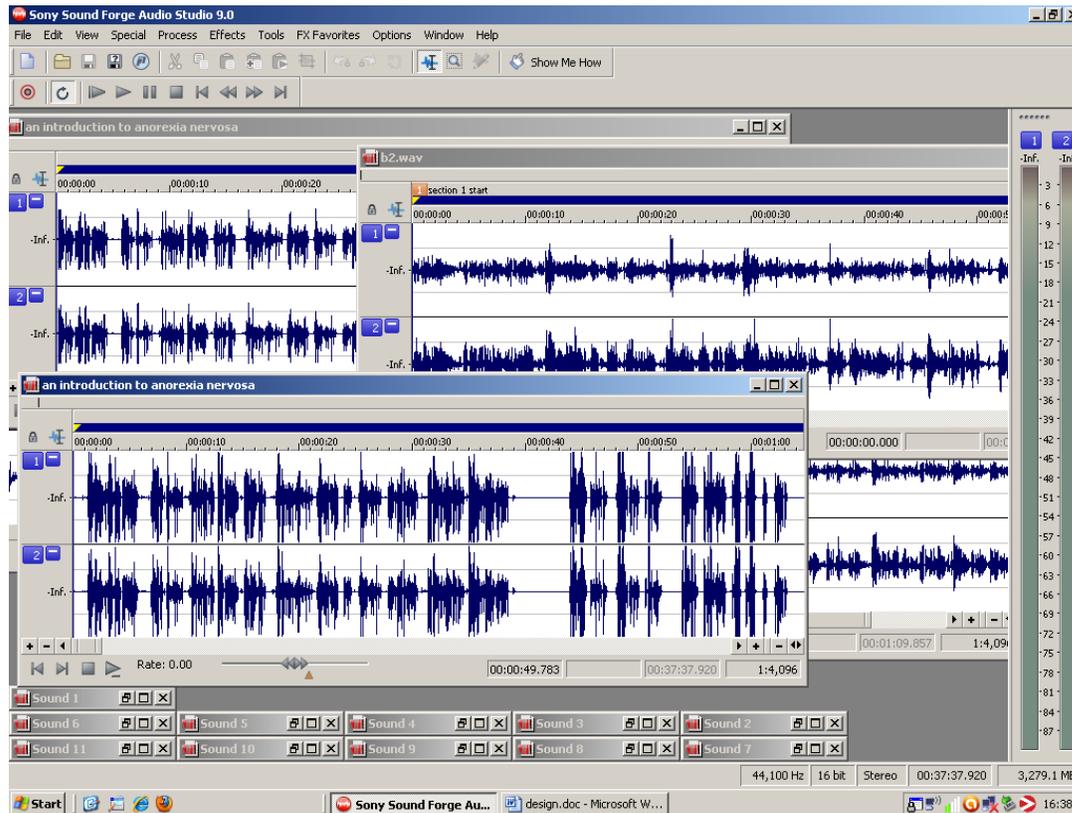
#### **3.4.4 Phase 4: Recording**

The interviews with the external individuals were recorded with as much authenticity as was feasible. For example the actor playing the bank manager was recorded within a busy office in order to accurately recreate the atmosphere. If this wasn't an option the interviews were recorded using quiet rooms with sound effects being added at a later time during post production to ensure authenticity remained constant throughout

#### **3.4.5 Phase 5: Editing**

Initially editing consisted of tidying up interviews by chopping out all the unnecessary pauses, clicks, pops or irrelevant sounds. This was completed when only the relevant information remained. In order to achieve this it was necessary to constantly cross check the transcripts, the original recordings and the interviews to ensure accuracy. This stage of single track editing took place in Sony Sound Forge. When this process was completed satisfactorily the individual interviews, pieces of music and sound effects were ready for sequencing. Once all the individual recordings were edited carefully they were ready for sequencing and post production.

**Figure 2: Multiple Edits Screen**



### **3.4.6 Phase 6: Sequencing and Post Production**

Each individual audio file was taken into the multi track editing software Pro Tools LE so that they could be sequenced and mixed into a straight audio podcast. At this stage the files were mapped out in the correct sequence and mixed for consistency in terms of volume and graphic equalization. The music pieces were added and faded in and out as necessary. The post production took place at this stage which involved any audio effects such as the signaling, correct placement and mixing of relevant sound effects and compression and equalization. Once this was satisfactorily completed the projects went through a final mix down and was rendered as audio files in the .wav format.

**Figure 3: Sequencing and Post Production Screen**



### ***3.5 Technology Used to Enhance the Podcast:***

All of the recordings were completed using an AKG D230 microphone and a Zoom Digital Audio recorder. Initial single track editing and pre production was completed on an audio editor called Sony Soundforge with a Toshiba Satellite L770-149 17" Laptop running windows XP. For post production and sequencing an Apple Mac Book Pro A127 was utilized running Pro Tools LE.

### ***3.6 Design of the learning experience:***

The environment in which the students would engage with the learning experience was an important part of the process. In the normal course of events students would be free to engage with a podcast at home or outside of the lecture hall. In order to ensure that the research wasn't polluted it was decided to play the podcasts to the students whilst they were in the lecture hall. This would ensure that all of the students only listened to the

podcast once and there would be no pollution of the post test results. The justification for this design decision is outlined in the Methodology Chapter.

Ensuring the students listened to the podcasts without any interference or disturbance of the audio quality was important. In order to fully engage with the learning experience and appreciate the enhancements that were made to the podcast, it had to be heard within the lecture theatre clearly. For this process to be completed the students were moved to a smaller lecture hall which was equipped with an adequate amplification and speaker system from which the podcasts could be played and heard clearly.

## **Chapter 4: Methodology**

### ***4.1 Research Question***

The research question for this study came about after substantial research into the use of podcasts within the modern educational sphere and their effectiveness as learning tools. It became apparent that podcasts were viewed by students positively however a lot of the research that this study conducted showed that they were for the large part deemed as a good supplemental learning tool. Podcasts in this instance were simply recordings of lecturers or educational content their use being that they were portable and allowed students to listen to them with flexibility and ease. Any podcasts that were enhanced or altered were merely edited slightly with music or sounds effects that proved to engage students but not necessarily allow them to retain the information any more than they would by attending a normal lecture. This study attempted therefore to address a perceived gap in the literature where podcasts could be enhanced informed by strategies proven to increase retention of information. Research was conducted on studies that tested for retention of information and the strategies employed in these studies were adapted to enhance a podcast, with the aim of increasing retention of the information it contained, among the listeners. The research question that arose from this study was therefore,

Can a podcast be enhanced to increase retention of information?

The five research sub questions are:

- To what extent does Reinforcement of information during a podcast, using a variety of speakers alongside testing the listener throughout the podcast, effect retention?
- Can real life situations and experiences be assimilated into an audio podcast?

- Can the principal of signaling words and text using bold and highlighted print be transferred to an audio podcast by using editing and audio enhancements on certain words and phrases?
- Does using multiple sources of information and expert opinions have a positive impact on the listener's ability to remember the information?
- How will an enhanced podcast engage listeners and effect their attention?

## ***4.2 Case Study***

A case study was deemed the most suitable method of research methodology for this study as it allows for the collection of both qualitative and quantitative data and is not rigidly tied to either source (Kitchin and Tate, 1999). A Case study has the advantage of allowing flexibility in terms of its use of this data and allows for pragmatic decisions around the appropriate methods needed at any particular stage of the study as it moves forward (Denzin & Lincoln, 2005). This flexibility was deemed necessary in this particular study as it would be recording and understanding the perceptions of students to the learning experience as the study evolved. Using both qualitative and quantitative data in this instance allows for factual post tests and semi structured interviews to gain an understanding of students perceptions of the learning experience and how their retention of information was effected by the enhancements made to the podcasts. Using this data, along with the results of the tests allows for certain conclusions to be drawn.

According to Yin (2004) one of the strengths of case studies are that they allow the researcher to carry the study out in a real life context, in this instance within a university, among a cohort of students studying a particular module for which the podcasts would become a part of. In this instance the case study methodology allowed an investigation into the relationship between the students, the podcasts and the enhancements to the podcasts. Studying this evidence gives the researcher the knowledge which allows for a description of the possible reasons for the outcomes.

This study focused on retention and the factors that facilitate it. Enhancing certain areas of the podcasts with these elements, whilst leaving other areas un-enhanced allowed for comparison at the findings stage. The design of a questionnaire which covered both sections of the podcast allowed for an assessment of the effects of the enhancements on retention. The unedited sections of the podcast represent a normal podcast and therefore questions from this area aim to show the retention of information from a normal podcast with the questions from the enhanced area representing the retention of information from an enhanced podcast.

### ***4.3 Data Collection***

The design of the test questionnaire (one for each separate podcast) was an important part of the process. Each test involved ten questions with two points allocated for each question (see appendix 3 and 4). The questions were carefully chosen in consultation with the student's lecturer and cross checked with the podcasts to ensure a fair mix of questions across each area of enhancement. For example the parts of the podcasts that were just straight recordings of the lecturer had particular questions as did the parts of the podcast enhanced with signaling, external interviews etc. This allowed for an in depth analysis of what areas of information were retained and how this related to the particular enhancements of the podcasts.

The focus of the data collection was on the test results of the questionnaires and the student perceptions of the podcasts. Quantitative data was given in the form of student scores on the series of tests immediately after listening to the podcast, one week later and again one week later. This data allowed for an assessment of how students fared across the enhanced sections of the podcast and those that were not enhanced or edited.

Semi-structured focus group interviews took place directly after students engaged with the material and again after each post test. Yin (2003) states the importance of open ended questioning to facilitate emerging themes, in this instance to gain an understanding of the student's point of view on the effect enhanced elements of the podcast had on their

retention of the information contained within it, and how this was utilised during the post tests. Creswell (2008) states that this is a valuable process if the students being interviewed interact positively with one another. In the context of this study the students had been studying together for four years and there seemed to be a good atmosphere within the student cohort so it was felt the focus groups would elicit useful responses and allow for collection of important data.

## ***4.4 Analysis***

### **4.4.1 Quantitative Data**

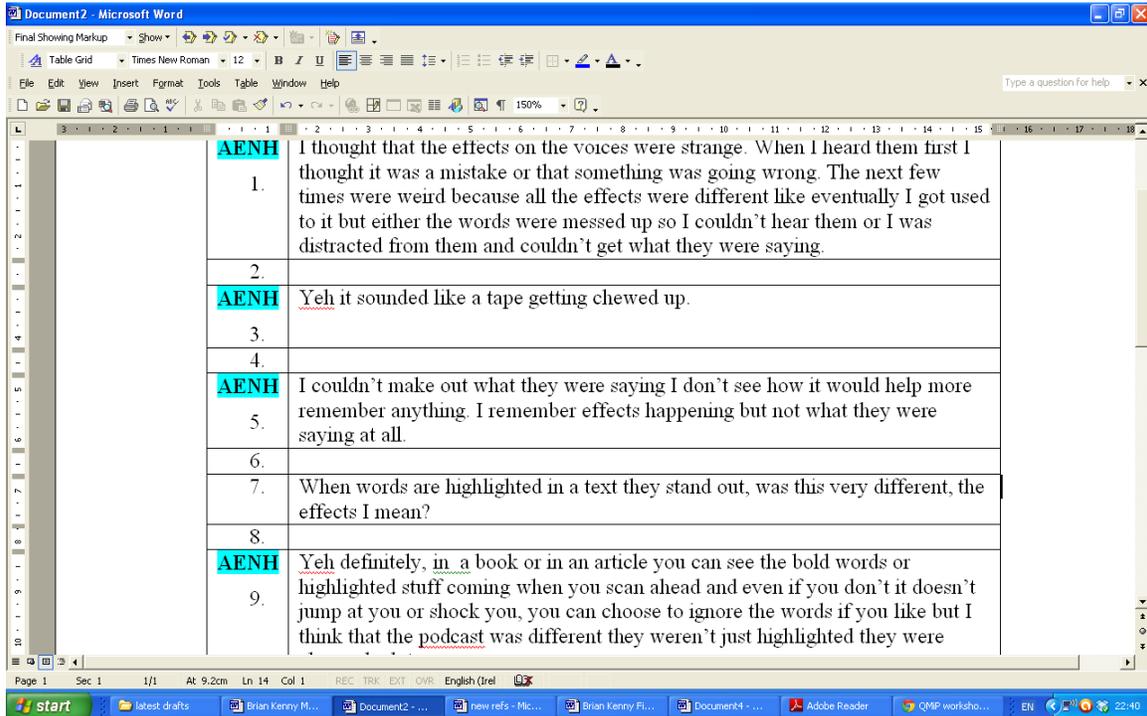
The test scores for each of the podcasts and post tests were analysed and computed. Both individual and average scores across all of the tests as well as a breakdown of scores in each particular questions of the podcasts were attained. This allowed for careful analysis of the retention of information over time and the effect each particular enhancement had on this retention.

### **4.4.2 Qualitative Data**

Semi-structured focus group interviews formed the basis of the qualitative data and data collection process. Student's general attitudes and opinions on the learning experience were also gauged as part this process. All the interviews were audio recorded and semi-structured. The questions asked within the interviews were as open ended as possible in order to encourage genuine perceptions and responses. All interviews were transcribed to text using Microsoft word. Hahn (2008) stressed the validity of Microsoft word for coding in a scenario whereby the researcher is more familiar with this program than other software packages and outlines a useful coding process which facilitates segmenting large pieces of text into emerging themes using codes. The transcribed text was imported into a new document and the convert text to table function was utilised. Columns were used to

number each section of text with a separate column for each series of comments (see figure 4).

**Figure 4: Coding in Microsoft Word**



All of the interviews were coded in this manner with a colour code used for each theme that emerged. The codes and themes used were as follows.

**Reinforcement and Testing:**

**RTST**

**Situational Learning and Experiential Learning:**

**SLENG**

**Audio Enhancements:**

**AENH**

**Expert Interviews and Content Knowledge:**

**EXIVS**

**Attention and Engagement:**

**ATENG**

#### ***4.5 Participants***

The participants in this project were fourth year Early Child Care students in the Dundalk Institute of Technology. There were 26 in total involved in this study. The title of the module was Entrepreneurship.

#### ***4.6 Procedure***

Before commencing this research the students were given a talk to explain the whole process informing them of the purpose of the research, the chosen methodologies and the expected outcomes. At this stage students were actively encouraged to ask any questions or raise any concerns that they might have. The students were reassured that the test for retention was purely for research purposes and would be totally anonymous. After this discussion the students were handed a copy of the Information Sheet for Participants. Once the students decided they were happy to progress they continued to read and sign the consent form (see Appendix 7 and 8).

#### ***4.7 Ethics***

There were no ethical concerns raised during this research and all participants were over 18 years of age. Ethical approval was sought from both Trinity College Dublin and The Dundalk Institute of Technology, following their application process in full. Approval was granted by both boards (see Appendix 9 and 10).

#### ***4.8 Implementation***

The research was implemented in the Dundalk Institute of Technology over a series of sessions. The first sessions took part over two consecutive days (March 6<sup>th</sup> and 7<sup>th</sup>) whereby the students took a test on their prior knowledge of the material before the two podcasts were played to the students (one on each day). The students then took a test

immediately after engaging with the resource and semi structured interviews were conducted. . All of these interviews and discussions were audio recorded for later reference. The second sessions took place one week later over two consecutive days when the students took the same post test and again had a semi structured interview. Finally, for the last sessions this process was repeated one week later.

Students were instructed to engage with the podcasts as they would normal lecture material however the students were not given copies of the lecture material until the post testing was complete.

In this case the learning experience was somewhat artificial, however careful consideration was given to the process and it was felt necessary. The lecturer advised that in his experience of the group certain individuals would utilise resources given for use outside of class contact time and others would not use these resources. In order to conduct a fair test across a class group on retention of information from the podcast, it was important to ensure all students engaged with the podcast an equal number of times. The only guarantee of this was in controlling access to the podcast until the study was complete.

The logic behind this approach was that the advantages of podcasts in terms of their flexibility and ease of access outside lectures has already been highlighted in many studies. This research aimed to focus on enhancing podcasts to increase retention. Once this was completed the possibilities of some students listening to the podcast more times than others would be understood not to have taken away from any possible benefits of enhancement but rather add to it. In essence the results from this controlled test would be the very minimum benefits possible with students having engaged with the material on only one occasion.

## **Chapter 5: Findings and Discussion of Findings**

### ***5.1 Introduction***

The purpose of this study was to test the effect enhancing a podcast had on retention of information. In order to do this a mixed method of research was employed using a case study with both qualitative and quantitative research methods. The quantitative data was a detailed questionnaire on specific information contained within the lecture.

This was to test for retention of information. The following chapter will outline the findings of the Qualitative data through the overall average results of each retention test (the individual students results are located in Appendix 5 and 6). Following that the results across each question will be shown, giving a comparison of the questions from both the enhanced areas of the podcast and those that were left unedited. The Qualitative data will be presented under the various headings which arose during the coding of the data from the semi structured interviews. The discussion of the findings are also outlined under these headings which are directly linked to the sub questions.

### ***5.2 Quantitative Data Results***

#### **5.2.1 Results of Retention tests**

Each test involved 10 specific questions with two marks allocated for each question. The test was given prior to listening to the podcast, immediately after engaging with the podcast, one week later and again one week later. The overall average results were as follows: (The figures in red indicate the drop in marks and percentages between the post tests).

**Table 6: Overall Average Results of Tests**

Podcast	Pre Test Marks	Pre Test %	Post Test 1 Marks	Post Test 1 %	Post Test 2 Marks	Post Test 2 %	Post Test 3 Marks	Post Test 3 %
<b>Podcast 1</b>	2	10%	17	85%	15 (-2)	75% (-10%)	11 (-4)	55% (-20%)
<b>Podcast 2</b>	2	10%	18	90%	14 (-4)	70% (-20%)	11 (-3)	55% (-15%)

The individual student’s results are outlined in Appendix 5 and 6..

The results of individual questions with specific enhancements were broken down to analyse the retention against specific elements of the podcast that were enhanced. The following table outlines the questions and the enhancements linked to each particular area the questions were linked to.

**Table 7: Podcast 1 Questions and Enhancements**

Questions	Voice	Enhancements
<b>1</b>	John Mc Donald Lecturer	none
<b>2</b>	Gary Jones, Business Angel	Content knowledge , Expert Interviews,
<b>3</b>	Gary Jones, Business Angel	Content knowledge , Expert Interviews, Testing reinforcement Situational Learning,
<b>4</b>	Gary Jones, Business Angel	Audio Enhancement, Signalling.
<b>5</b>	John Mc Donald	None
<b>6</b>	Larry Fitzpatrick,	Content knowledge, Expert Interviews,

	Business Owner	Audio Enhancement (Signalling) Testing reinforcement
7	John Mc Donald Lecturer	None
8	Tom Fingleton, Business Owner	Situational Learning, Content knowledge, Expert Interviews,
9-	Peadar Cosgrove, Business Owner	Content knowledge, Expert Interviews,
10	Peadar Cosgrove, Business Owner	Content knowledge, Expert Interviews, Audio Enhancement (Signalling)

**Table 8: Podcast 2 Questions and Enhancements**

Question	Voice	Enhancements
1	John Mc Donald Lecturer	None
2	Tony Moore, Business Owner	Content knowledge Expert Interviews
3	Tony Moore, Business Owner	Content knowledge Expert Interviews Testing reinforcement
4	Anne Johnston, Business Owner	Content knowledge Expert Interviews, Situational Learning
5	Anne Johnston,	Content knowledge

	Business Owner	Expert Interviews, Audio Enhancement (Signalling)
<b>6</b>	John Mc Donald Lecturer	None
<b>7</b>	Trevor Dietz, Bank Manager	Content knowledge, Expert Interviews, Audio Enhancement (Signaling) Experiential Learning, Testing reinforcement Situational Learning
<b>8</b>	Trevor Dietz, Bank Manager	Content knowledge, Expert Interviews
<b>9</b>	John Mc Donald Lecturer	None
<b>10</b>	Sean Mc Ginley, Invest NI	Expert Interviews Content Knowledge

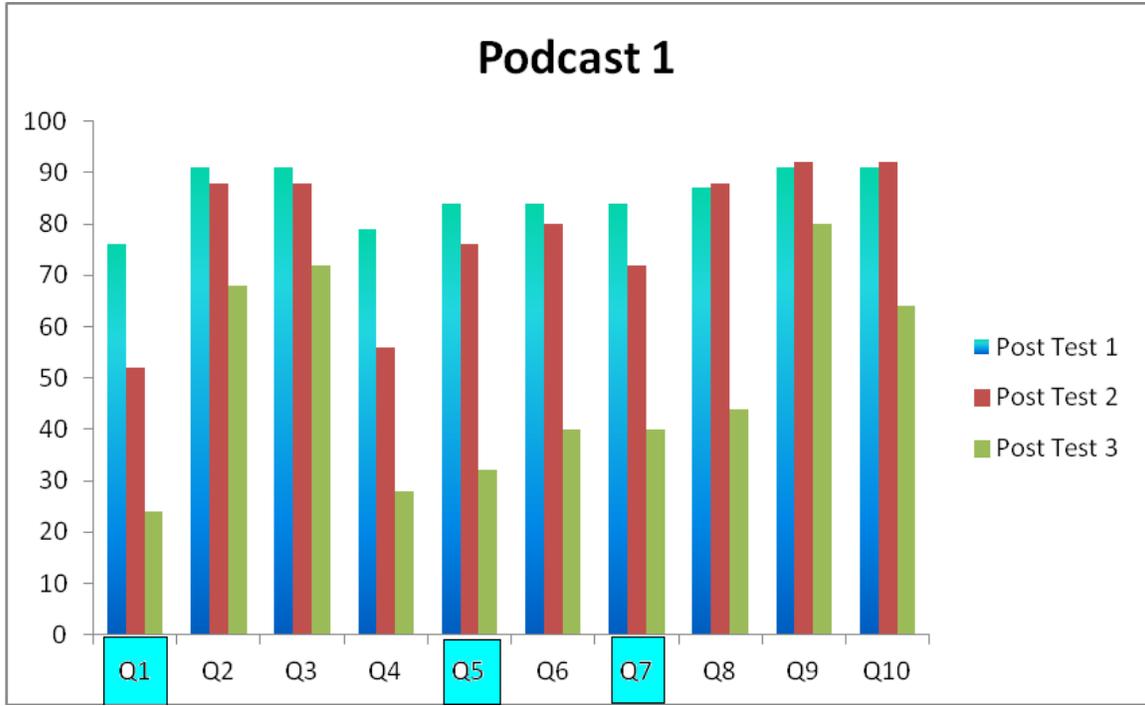
The following tables and charts outline the average students results across the various questions.

**Table 9: Podcast 1 average results for each Question**

Question	Post Test 1 Result	Post Test 2 Result	Post Test 3 Result	Overall Average	Enhanced
<b>1</b>	76%	52%	24%	51%	No Enhancements
<b>2</b>	91%	88%	68%	82%	Enhanced
<b>3</b>	91%	88%	72%	84%	Enhanced
<b>4</b>	79%	56%	28%	54%	Enhanced
<b>5</b>	84%	76%	32%	64%	No Enhancements
<b>6</b>	84%	80%	40%	68%	Enhanced
<b>7</b>	84%	72%	40%	65%	No Enhancements
<b>8</b>	87%	88%	44%	73%	Enhanced
<b>9</b>	91%	92%	80%	82%	Enhanced
<b>10</b>	91%	92%	64%	82%	Enhanced

**Figure 5: Podcast 1 average results for each Question**

Questions highlighted in blue contained no enhancements.

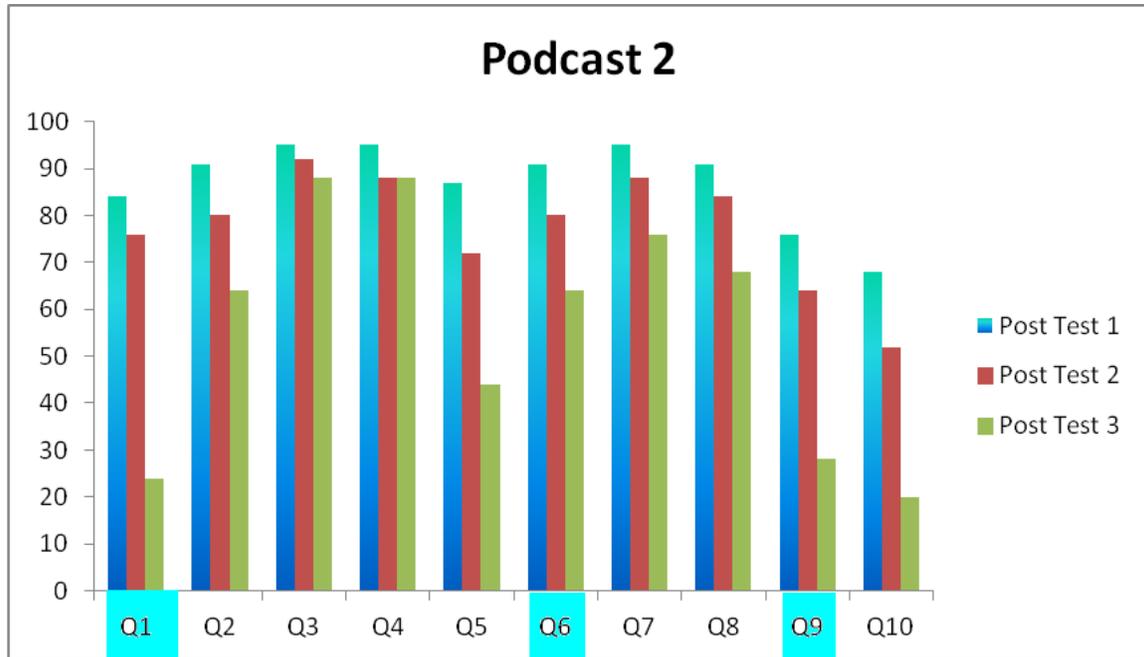


**Table 10: Podcast 2 average results for each Question**

<b>Question</b>	<b>Post Test 1 Result</b>	<b>Post Test 2 Result</b>	<b>Post Test 3 Result</b>	<b>Overall Average</b>	<b>Enhancements</b>
<b>1</b>	84%	76%	24%	61%	No Enhancements
<b>2</b>	91%	80%	64%	78%	Enhanced
<b>3</b>	95%	92%	88%	92%	Enhanced
<b>4</b>	95%	88%	88%	90%	Enhanced
<b>5</b>	87%	72%	44%	68%	Enhanced
<b>6</b>	91%	80%	64%	78%	No Enhancements
<b>7</b>	95%	88%	76%	86%	Enhanced
<b>8</b>	91%	84%	68%	81%	Enhanced
<b>9</b>	76%	64%	28%	56%	No Enhancements
<b>10</b>	68%	52%	20%	47%	Enhanced

**Figure 6: Podcast 2 average results for each Question**

Questions highlighted in blue contained no enhancements.



The following charts outline the questions in which the students performed highest overall across the three post tests with the questions that contained no enhancements in red (average score).

Figure 7: Podcast 1 Highest performing Questions

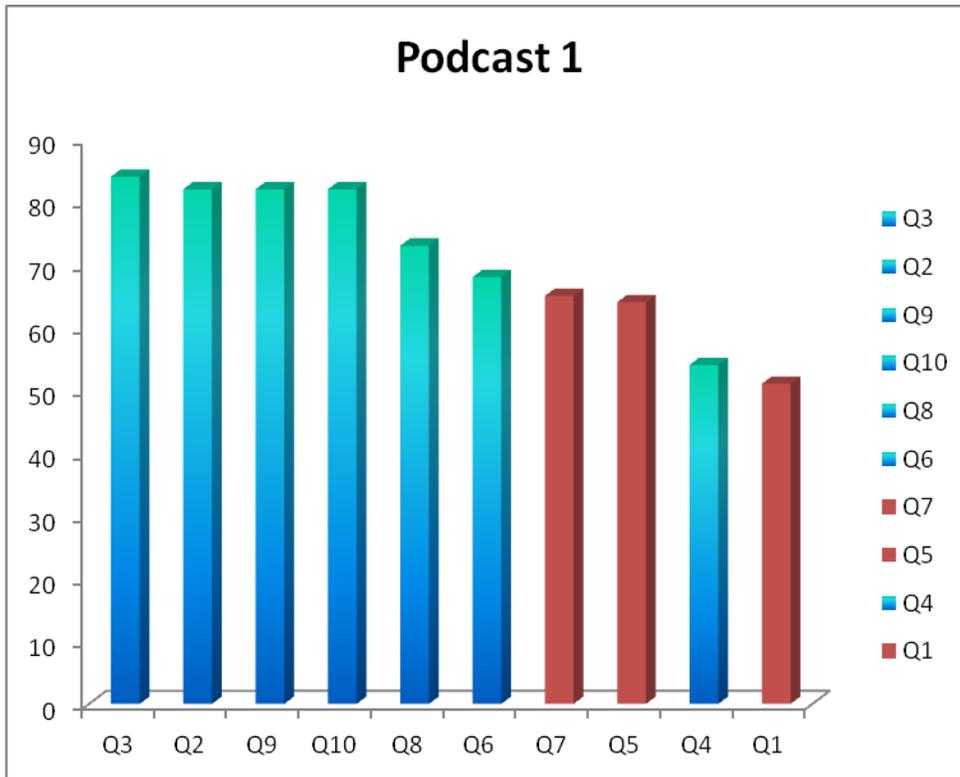
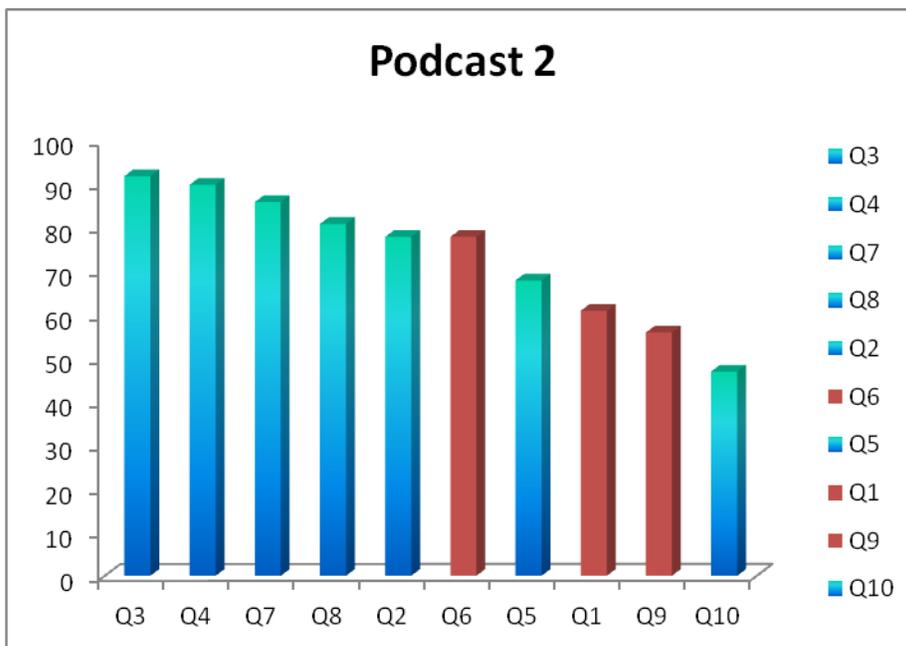


Figure 8: Podcast 2 Highest performing Questions



## **5.3 Qualitative Data Results**

The interviews were analysed and information was coded using Microsoft Word. During coding information around attitudes, the perceived effectiveness of individual enhancements, and their impact was being sought. Therefore the headings for coding reflect the themes which emerged around the various enhancements made to the podcast, and the student's perceptions of them.

### **5.3.1 Reinforcement and Testing: RTST**

As regards the sections with testing and reinforcement most students seemed initially (post test 1 focus group) to have little to say about whether testing was effective in helping them learn or remember information. The overall opinion expressed seemed to be that the questions helped them think about the information they had just heard, however questions might be more effective at a later date in helping them to recall information, or challenge them to think about it, against immediately after they had heard the information. Comments ranged from *“The questions came straight after you just heard the information so I cant see how that would help, maybe if it was at the end of the podcast like the way you get questions at then end of a piece of text”* to *“when you have questions in a text you have time to think about them but in the podcast you were only just thinking about them when the next part came in”*. Some students were more positive with comments like *“ I liked it because it was like highlighting something for me, the questions focused on a particular part of the conversation you just heard so it highlighted that part of it which was obviously important”*. Another student stated that *“it was a good way of picking out an important part of the podcast in the same way you'd test yourself to learn something off by heart, it tested right away and there were only one or two questions in the podcast so it wasn't overkill”*. Overall the students agreed that it was positive not to have too many questions but there were disagreements on whether the questions were better at the end or after each particular section.

The opinions changed however with the more time that elapsed. For example after post test 2 students were beginning to lose track of which sections had the questions originally in the podcast. Some were saying that they think they were recalling information because they were asked questions about it in the podcasts and as it had been reinforced and others were stating that they couldn't be sure. By the final post test the general consensus was they could remember particular answers to questions but weren't sure if that was because they were tested on it. Comments ranged from *"I think it would have been better if the questions were asked by the people that were interviewed like the bank manager or crèche owner instead of a narrator"* to *"Id have to see my results of the test but I reckon that the testing highlighted parts of the podcast that there were obviously going to be questions on after and that made me remember them because I knew there were going to be questions on it"*

### **5.3.2 Situational Learning and Experiential Learning: SLEXG**

The attitudes toward situational learning were quite positive overall. Students generally felt that if the situation was one that they were interested in then they would listen more intently. One student mentioned that she had no interest in setting up a business but that she would like to manage a Crèche so she didn't pay much attention to the bank manager but did listen to the Crèche owner as she thought it would give her an insight into the attitudes of her future employers. This prompted a discussion on how they would have liked more interactive scenarios and if this was possible within a podcast with comments like *"I don't think you can really have interactive experiences with podcasts, the narrator asking us to pitch a business idea or choose a bank loan was the best you could do and it did make you think quickly about it but its not as interactive as a role play in class or as a computer game"*. There was general agreement that the recordings of the situations were positive and interesting and most students felt that listening to people in situations helped them learn better as it was a real life scenario and *"put the theory into practice"*. In particular the Crèche scenario was mentioned several times as was the bank manager with students sating *"I know I'm going to be in front of a guy like that so I was listening to his voice and thinking is he just giving the speech for the P.R. or is he really interested"*

*in financing businesses*". Other interesting comments were *"Some of the situations were really relevant like the Crèche owner but I didn't think listening to a guy who ran an insurance business, we're all going to be setting up childcare businesses so that's totally different.*

The attitudes didn't change much as time went on and the posts test 2 and 3 took place. Overall the opinions remained the same that situational learning was very positive provided the situation was relevant to them, the only drawbacks expressed were the limitations to experiential learning due to the lack of control of the podcast. This cropped up several times as students mentioned that if they had the podcasts at home or were allowed stop and start them then they would have been able to interact with the situations or experiences, like pitching a business idea, much better..

### **5.3.3 Audio Enhancements: AENH**

Throughout the focus groups the audio enhancements (i.e. signaling through the use of various effects on individual words or phrases) were highlighted in a negative manner. Although it was clear that the audio enhancements highlighted phrases and grabbed people's attention at particular moments students felt that it was distracting rather than assisting them in remembering information. There was a distinction between the various type of enhancements with those that were *"not too bad like just a change of the voice or something"* to those that *"made the words inaudible and totally distracted me"* During the immediate focus group post test 1 students expressed opinions around the audio enhancements such as *"I thought it was a mistake in the recording, it sounded like the tape getting chewed up"* or *"it made me listen more to see what was going on rather than to listen to what they were saying and it actually took my attention off the next bit of the podcast, I thought it was kind of funny"*. After post test 2 little had changed with students generally agreeing that the sections with audio enhancements stood out more clearly but were often difficult to hear and distracted them more than focusing their attention on a particular topics. It was felt that it was out of context and often unnecessary. When they were asked about whether it had a similar effect to highlighting or bold words in a text

they disagreed with individual comments such as “ *No in a book or piece of paper its more subtle and you can see it coming when you look over the page first, but it was just strange in the podcast like it was underwater or something*” A discussion took place around how effective highlighted or bold phrases in texts were in the first place and how students often preferred to highlight particular words themselves or areas that they individually felt might cause them difficulty. The general opinion was that bold words in a text could be ignored and students could focus on other areas where as with the audio enhancements on specific words it was apparent that students felt they were distracting and intrusive and the sudden manner in which they were presented with them would have the opposite of the desired effect.

#### **5.3.4 Expert Interviews and Content Knowledge: EXIVS**

In the initial focus groups the expert interviews were a key discussion point. The students expressed positive opinions around hearing information from “*people on the ground*”. The opinion that hearing information from a series of individuals who are “*in the know*” or who “*work in that area every day*” was positive, was widely expressed. During focus groups 2 and 3 students were asked if they felt hearing opinions from these experts had helped them retain the information longer. One student stated “*I think so, for me anyway I heard the voice of the bank manager and crèche owner coming back, not so much the insurance person, I thought that was boring but I definitely remembered their voices and what they said*”. This led on to a discussion about whether the expert’s voices were a novelty and it was just because they were used to the lecturer. Students opinions varied on this from those who drew comparisons with “*interesting documentaries with lots of interview and boring news reports with one interview*” and those who felt that “*at the end of the day your going to learn it anyway if you want to pass your exams, its not entertainment like a documentary its learning information to get through college*”

The link between personally relevant information and their future working environments was a key area of discussion within all of the post test focus groups. There was significant difference of the perceived relevance of information from the various

individuals. For example the interviews with the bank manager and the Crèche owner were mentioned over and over in terms of the importance from the student's points of view. Comments like *"I perked up when the Crèche owner was talking because I really want my own business and her experience was important to me"* and *"I'm worried about finance so the bank manager was important to me"*. Asked if they felt their interest was linked to recalling the information in the later post test the group's felt there was a link to it. Students perceptions were that if they had a stronger interest in it they were going to remember it, one student drew comparisons with preparing for her driving test *"I'm learning to drive and know the route my test will take so every time I'm down there in a car I'm looking at traffic or when its busiest on the road because but I don't do that if I'm in a car somewhere else"*

The negative perceptions of individual sections were also interesting in the context of this area. The interview with the Insurance company owner came up several times and was described as *"boring"* or *"irrelevant"*. Across the post test focus groups it was felt that minute details of setting up a business were not relevant at this stage of their careers. Students generally felt that if they were going to go into business for themselves then the priorities at this stage were finding funding and making it work. Other minor details like insurance were not seen as relevant at this particular time.

### **5.3.5 Attention and Engagement: ATENG**

Music was cited by students throughout the focus groups as having a positive effect in breaking up the sections and allowing them to re-focus and prepare for another interview. It was felt that the format of the podcasts became apparent early on and that music was seen as a divider between sections and was welcomed in this regard. Students commented that the pieces of music *"came in at the right times"* and *"if I was getting bored I refocused again after the piece of music"* or *"it was like a start again from the previous talker"*. Students who had stated they had little or no experience of podcasts expressed opinions that they found it more engaging as it was *"a new experience for me"* or it was a

*“novelty because it was just a little bit different than the usual lectures”* although it was recognised amongst this cohort that *“I’m sure the novelty would wear off”*.

Audio quality was mentioned by several students in a positive manner compared to their normal experiences of podcasts and in this regard those who had previous experiences of podcasts felt that the use of several different voices and the mixing of music and narration allowed them to remain reasonably attentive throughout.

In terms of engagement the main points of discussion that arose regularly was the fact that they were unable to control the podcast in the format that it was given to them. When they were asked about their engagement within this format they responded generally positively *“yeh the different speakers and questions kept you on your toes but I kept wishing I could rewind it or pause it, that’s the point of a podcast isn’t it”* Despite the fact that the different style of the podcast and the variety of speakers and scenarios were highlighted as encouraging engagement, the focus groups continued to come back to the limitations of the podcast within this setting, namely the lack of control. By post test 2 and 3 focus groups the students opinions hadn’t altered and it seemed that they appreciated the positives of the podcasts in terms of engagement and attention yet felt the context in which it was used i.e. a controlled artificial environment was a negative.

## ***5.4 Discussion of Findings***

In looking more closely at the questions in which students retained the most information and triangulating that data with the results of the coding and focus groups some patterns seem to appear. These are discussed using the same headings under which the Qualitative data results were laid out, which are directly linked to the five research sub questions.

### **5.4.1 Reinforcement and Testing**

*To what extent does Reinforcement of information during a podcast, using a variety of speakers alongside testing the listener throughout the podcast, effect retention?*

Testing and reinforcement featured within questions 3 and 6 of podcast 1 and scores on both these questions were high. Shana et al (2009) highlights testing as putting value on a piece of material and therefore reinforcing it. In the context of an audio podcast it seems that Reinforcement and Testing seems to have been successfully assimilated into an audio podcast. Question 6 is one which merits further investigation. It contained both audio enhancements through signaling, which was deemed distracting by the majority of students, and also testing and reinforcement which it seems may have had a positive impact on retention. This question was on an area that was flagged within the focus groups by students as boring, namely insurance and overdrafts. This may explain mid table results, perhaps without the testing and reinforcement the question would have yielded less favourable results. One can only surmise that the testing and reinforcement somewhat compensated for what may have been lost in retention by the audio enhancement and perceived irrelevant subject matter.

Looking at Podcast 2, testing and reinforcement featured in the questions which performed 3<sup>rd</sup> and 1<sup>st</sup> best overall, which is concurrent with the results of the first podcast. What is interesting to note is that within the second podcast there were two questions based on the section by Businessman Tony Moore. Both contained his content knowledge

and expert interviews however there was a significant difference on the retention around both of these questions. In Question three testing and reinforcement was present and the retention of information from this question was at the top of the results however the second question, without testing and reinforcement fared mid table, suggesting that testing and reinforcement may have played a significant part in this result. Overall questions which featured Testing and Reinforcement fared quite well and students perceptions around testing and reinforcement also seems to suggest that it was a valid addition to the podcast. Most students were in agreement that the testing and reinforcement was a positive, what they disagreed on was where the testing would be best placed and by whom the testing would be best carried out.

#### **5.4.2 Situational Learning and Experiential Learning**

*Can real life situations and experiences be assimilated into an audio podcast?*

The questions around the bank manager which several students had mentioned as relevant to their future working environments, in line with the research of Lunney (2008), scored 3<sup>rd</sup> and 4<sup>th</sup> overall which the data from the focus groups also indicated as likely. The acquisition of finance and the difficulties in obtaining it from a bank were key concerns raised in the focus groups. It seems the manner in which the information was presented to the listeners by the bank manager was effective. In particular the bank managers section was far more in the area of situational learning than others in that it opened with him on a telephone call giving listeners the impression of a real life situation. In fact this was also the case with the Crèche section whereby the owner opened the door and greeted the listener with the children heard playing in the background. Students had expressed favourable attitudes towards the section with the bank manager with many stating that this would be an area that would have a crucial effect on their ability to set up a business in the future.

Although positive attitudes were expressed towards experiential learning and situational learning, the experiential learning capability of a podcast seems to have limited impact due to the nature of an audio podcast and the lack of opportunities for interactivity. Situations such as those posed by the narrator, whereby students are asked to pitch a business idea or choose a type of loan are difficult to incorporate into a podcast (in the controlled environment of this study) as students would have to stop and pause the recording, otherwise they would quickly be moved to the next section. This may be a possibility in a less controlled atmosphere. Strong elements of content knowledge and expert interviews were featured in the sections which contained situational learning and these elements often overlap so it is difficult to isolate situational learning from these other enhancements in order to analyse its effectiveness. Where situational learning was to occur it would be very difficult to do so without content knowledge and expert interviews. It seems, from looking at the results and feedback from the interviews, that situational learning in the form of recreating a situation within an audio podcast (i.e. a phone call in a bank or a busy Crèche) compliments content knowledge and expert interviews and when these elements are featured together they work well.

### **5.4.3 Audio Enhancements**

*Can the principal of signaling words and text using bold and highlighted print be transferred to an audio podcast by using editing and audio enhancements on certain words and phrases?*

The positives of signaling in terms of Daniel and Woody's research (2010) highlights that signaling is generally a process whereby text can be highlighted in bold. Transferring this principal to an audio podcast seems not to have worked as the retention of information across the sections that received audio enhancement was low and the feedback from the focus groups show that students were in fact more distracted than engaged by these audio enhancements. Perhaps in the context of this research the principal of signaling words in a visual learning capacity cannot simply be transferred to audio podcasts without further

research in to the complexities of the process, and without looking at why it has proved successful in helping students retain information.

In Podcast one questions 6 and 4 contained signaling. Question 6 ranked 6<sup>th</sup> overall with question 4 ranking second from the bottom which seems to be in line with the negative opinions expressed about signaling within the focus groups.. What did contradict the trend here was that question 10 contained an audio enhancement yet students retained the information well. Perhaps the interest in the content knowledge compensated for this or the fact that the particular audio enhancement in this instance was not as severe as others (i.e. a simple changing of the voice rather than pitch or echo) which allowed the students to hear the words more clearly than in other instances of audio enhancement whereby they complained of being distracted or being unable to comprehend what was being said to them.

A good comparison of audio enhancements against other enhancements within the Podcasts is to look at the sections of Podcast 2 that featured the Creche. This was an area that was given favourable comments by the students within the focus groups. Two questions on this area were featured. One of them Q4 came second highest on average whereas the second question Q5 scored 7<sup>th</sup> highest and contained an audio enhancement which may have inhibited the retention of the information in this question, given the attitude expressed by those in the focus groups around the importance of information within the Creche section and the distractive nature of the audio enhancements. In this particular context the audio enhancement was an effect which altered the sound of the voice. Students mentioned during the focus groups that some of the audio enhancements took their attention off what was being said in order to figure out why the voice was changing. Finally questions 7 and 8 of Podcast 2 were both in the section from the bank manager, again highlighted as positive by the students. Question 7 contained an audio enhancement and scored 3<sup>rd</sup> in the overall table whereas question 8 came 4<sup>th</sup>. It must be noted however that as well as containing an audio enhancement question 7 also contained testing and reinforcement which most likely contributed to its high result. Overall judging

from the feedback and test results it seems that signaling and audio enhancements were not successfully assimilated into the audio podcast.

#### **5.4.4 Expert Interviews and Content Knowledge**

*Does using multiple sources of information and expert opinions have a positive impact on the listener's ability to remember the information?*

Within the first podcast the questions in which students performed best all had some form of enhancement, in particular it was the content knowledge and expert interviews that seemed to encourage the best performance in the tests. Looking at the feedback from the interviews it seems that students showed an interest and retained more information in the areas that they felt had relevance to their future working environments, in this particular context setting up a business and receiving funding. The focus groups showed that the areas in which students decided content knowledge and expert interviews were important depended upon different factors. In the design of the podcast, it was decided that a series of business owners should feature to give a broad perspective of the problems and issues that would face them in their future endeavours. It seems however that some of these experts were not deemed as relevant as others. Some questions for example, had an insurance businessman who talked about getting overdrafts from a bank. Feedback from the focus groups generally suggested this was boring and not of interest to the students as would be an interview with childcare business owner or a bank manager. This seems to be in line with the findings of Sieb, English and Barnard (2011) outlined within the literature review of this paper whereby students focus more on information relevant to their future working environments. It seems in the context of Bonner and Greenwood (2005) it is easier to focus on a students future working environment when in a specific context like nursing however in an a module such as was utilised for this study

(entrepreneurship in early childcare studies) assessing students motivations in this regard seems more challenging.

The scores and retention from the questions on this area however came in about average (6<sup>th</sup> out of ten overall). This may be explained by the fact that as well as the enhancements with content knowledge and expert interviews this particular question and area was reinforced by the narrator with testing and reinforcement. Two of the highest performing questions were questions 3 and 2 which were both within the area of business angel Gary Jones. This was in line with the attitudes expressed in the focus groups that they were interested in this area as it was highly relevant to the potential success of their future business, in short receiving funding to get it up and running. Interestingly enough the third question within this area performed second worst overall in terms of retention, this may be due to the fact that it contained audio enhancement and signalling on a particular word (the website address) which was what the question asked about it was. Finally with regard to the first podcast Questions 9 and 10 fared very well in terms of students retaining the information contained within them. The subject matter was hire purchase for a business, favourable to many as it doesn't involve a large amount of capital.

In terms of the second podcast the best performing questions were again those that had enhancements and in particular those that were in areas that student expressed the most interest in. In this instance it seems that the students discounted some of the interviews and focussed on others. This was particularly apparent in podcast 2 whereby the students mentioned the bank manager and Crèche owner as being the most interesting across all of the post test focus groups. It was generally felt that acquiring direct finance and hearing about the experiences of other individuals who had set up businesses in their areas was of the most interest to them and this is in line with the studies of Morrison and Symes (2011). The questions around the Crèche owner, which were all mentioned as very interesting to the students during post test focus groups, scored second highest and 7<sup>th</sup> highest overall.

What was very interesting is that students decided which parts were relevant to them. In the research of Bonner and Greenwood (2005) the study was within a medical area i.e. on nurses. Students in this context had a clear idea of their future working environment and therefore the individual element that they deemed important were quite generic across a variety of nursing students, however in the area chosen for this study, entrepreneurship within early childhood care, it is not so easy to pick generic areas. Some students are interested in setting up their own businesses so for them funding from banks, easy access to funding from Hire Purchase etc is relevant. Within this process some will be more advanced in their knowledge of setting up a business so elements like insurance etc may have limited interest to them, however listening to a Crèche owner would be relevant to the majority of them as those who are not interested in setting up a Crèche most likely would like to work there. If content knowledge as outlined by Lunney (2008) is to be incorporated into podcasts effectively, choosing the correct material specific to students seems necessary for maximum effectiveness.

#### **5.4.5 Attention and Engagement**

*How will an enhanced podcast engage listeners and affect their attention?*

The areas of the first podcast which had no enhancements i.e. were just the straight recordings of the lecturer, scored in the lower half of the results and essentially the students retained less information in these areas. These questions were 1, 5 and 7. Within the second podcast the unenhanced questions i.e. those that were asked around the elements of the podcast merely containing the lecturer's voice came within the bottom half of the table (5<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup>). It seems obvious therefore to conclude that the enhanced elements helped the students retain information better however there are significant factors to consider before making this conclusion. The novelty factor which students brought up many times may have contributed to this, the students know the lecturers voice and were aware that they would be hearing his voice again. It is feasible that this may have encouraged them to concentrate more on the new elements being introduced to

them such as interviews with bank managers and Crèche owners which they all described as very interesting to them.

The limited artificial learning experience was without a doubt an important factor to take into account with regards to the exercise. Many students mentioned that they felt they would have had more control or learned more if they were listening to the podcast in a less controlled environment, for example if they were able to stop and start it, listen to it at will, rewind it, or skip to preferred parts. It is possible that being aware that they were not permitted to take the podcast home after listening to it encouraged them to focus more on those elements that were new to them once again discounting the lecturer's parts. Overall however it seems that the style of the Podcast and the addition of music and additional interviews and sound effects engaged the students and managed to hold their attention.

## Chapter 6: Conclusion

The benefits of podcasts have been shown across many studies with flexibility and positive student attitudes towards them as key factors (Daniel Woody 2009). The fact that students can listen to podcast in a portable fashion on an mp3 player has also proved to have its advantages (Adams Palmer 2006). It is interesting to note that students, although recognising the usefulness of enhanced podcasts in the focus groups, and scoring well in many sections, often commented on how they would have benefited more if they had more control over the podcasts. It was necessary that this study took place within a controlled environment in order to ensure a fair test of retention however ultimately it aimed to test if particular enhancements could impact positively on students retention of the information. Once this was completed the already proven benefits of podcasts i.e. flexibility, ease of access, student control, could be added to the list of positives of enhanced podcasts outside of the controlled learning experience. Ultimately in this scenario the podcast would be a positive learning tool with the added advantages of flexibility and positive student perceptions.

This paper aimed to look at whether a podcast could be enhanced to increase retention of information. In order to do this literature on proven strategies used to increase retention across many educational fields was researched, and informed by this research, an enhanced podcast was created. This podcast used a wide range of tools from situational learning to signaling of individual words and phrases. The post-test assessed students performance across each area of enhancement while the semi structured interviews allowed for an insight into the students perceptions of their retention based upon their experiences of engaging with the learning experience.

The results showed that enhancing a podcast with certain elements can have an impact on retention of information. Certain elements were more effective than others in particular content knowledge and expert interviews were perceived as students as being important and this in turn seemed to affect their retention of information. The issue arises however

as to what content is suitable to individual's perceived future working environments. In the cohort of students utilised for this research almost all of them were interested in working within a childcare institute so therefore the content given by the Crèche owner was retained more effectively than that of the small businessman dealing with Insurance for example.

Students retained less information across the sections that were not enhanced, i.e. those that were excerpts from the original audio lecture. Looking at these test results against the outcomes of the interviews it is apparent that enhancements can be effective if incorporated correctly and used with the right students group. Some enhancements proved ineffective and in many cases inhibited learning by distracting students. In this instance audio enhancements or audio signaling aimed at replicating the highlighting of words in a text, merely confused students who found them not only distracting but hard to understand.

Many of the strategies for increasing retention as outlined in the literature review proved capable of being utilised within an audio podcast. An example of this was testing and reinforcement which according to an analysis of the post test results and interviews allowed students to highlight an important part of the podcast and through testing flagged elements of perceived importance for them. Other areas like experiential learning, although in theory worked well, were limited by the learning experience set up in that the environment was controlled.

### ***6.1 Limitations of the study***

The main limitation of the study was the controlled nature of the learning experience. It was important to ensure that each student listened to the podcast an equal number of times, therefore the podcasts were not given to the students until the study was completed. This meant that when analysing the scores of the post-test there would be certainty that some individuals had not retained more information as they had listened to

the podcasts more times. Unfortunately this controlling of the environment may have limited the effectiveness of certain enhancements like experiential learning. In the normal course of events experimental learning may take place for example, with a computer simulation. In this instance students can control the experience. Limiting this control by not giving students copies of the podcasts to stop and pause as they deemed necessary meant the effectiveness of situations, like the section within the podcast where they were asked to pitch an idea, was limited. Another limitation was the small sample size and the time constraints of the study. Ideally a larger sample size and a longer time frame would elicit more accurate results, however within the time limitations of this study a satisfactory sample size and time frame were achieved.

## ***6.2 Areas of Future Research***

An area that may warrant further research or investigation is conducting this research with a larger sample size over an extended period of time. If a class could be split into two large groups and utilised for research over an entire semester, one group receiving academic standard lectures whilst the other receive the same material in the form of enhanced podcasts, a very accurate comparison could be drawn. In this instance the long term use of podcasts would give the researcher the opportunity to assess how the flexible listening and user control of the material interacted with the enhanced podcast and what effect this had on retention. Developing a strategy that would ensure a fair test whilst not limiting the student's use of the podcasts would be a useful exercise.

In conclusion, the editing and enhancing of podcasts in order to increase retention of information was successful, with limitations to the success. The individual restrictions of this study as already mentioned alongside the areas which were not effectively assimilated into podcasts must all be taken into account if a podcast is to be successfully enhanced in this manner. However enhancing podcasts raises the possibility that they may be capable of becoming more than just supplemental learning tools.

## References:

- Adams Palmer (2006). Reading Writing and Podcasting. *District Administration*, (42), 22-24.
- Axelson, R. D., & Flick, A. (2010). Defining student engagement. *Change: The Magazine of Higher Learning*, 43(1), 38–43.
- Bell, D. S., Harless, C. E., Higa, J. K., Bjork, E. L., Bjork, R. A., Bazargan, M., & Mangione, C. M. (2008). Knowledge Retention after an Online Tutorial: A Randomized Educational Experiment among Resident Physicians. *Journal of General Internal Medicine*, 23(8), 1164–1171. doi:10.1007/s11606-008-0604-2
- Bloomfield, J., Roberts, J., & While, A. (2010). The effect of computer-assisted learning versus conventional teaching methods on the acquisition and retention of handwashing theory and skills in pre-qualification nursing students: A randomised controlled trial. *International Journal of Nursing Studies*, 47(3), 287–294. doi:10.1016/j.ijnurstu.2009.08.003
- Bonner, A., & Greenwood, J. (2006). The acquisition and exercise of nephrology nursing expertise: a grounded theory study. *Journal of clinical nursing*, 15(4), 480–489.
- Borgia, L. (2009). Enhanced vocabulary podcasts implementation in fifth grade classrooms. *The Free Library*.
- Botezatu, M., Hult, H., Tessma, M. K., & Fors, U. (2010). Virtual patient simulation: Knowledge gain or knowledge loss? *Medical Teacher*, 32(7), 562–568. doi:10.3109/01421590903514630
- Carpenter, S. K., Pashler, H., & Cepeda, N. J. (2009). Using tests to enhance 8th grade

- students' retention of U.S. history facts. *Applied Cognitive Psychology*, 23(6), 760–771. doi:10.1002/acp.1507
- Chow, A. F., Woodford, K. C., & Maes, J. (2011). Deal or No Deal: using games to improve student learning, retention and decision-making. *International Journal of Mathematical Education in Science and Technology*, 42(2), 259–264. doi:10.1080/0020739X.2010.519796
- Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. *Educational psychology review*, 3(3), 149–210.
- Cohen, G, Stanhope, N, (1992), Very long term memory for knowledge acquired at School and University, *Applied Cognitive Psychology*, 6, 467-482.
- Creswell, J. W. (2008). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (3rd ed.). Upper Saddle Creek, NJ: Pearson Education
- Daniel, D. B., & Woody, W. D. (2010). They Hear, But Do Not Listen: Retention for Podcasted Material in a Classroom Context. *Teaching of Psychology*, 37(3), 199–203. doi:10.1080/00986283.2010.488542
- Denzin, N. K., Lincoln, Y. S. (2005) Eds. *the Sage handbook of Qualitative Research*. London: Sage
- Eash, E. K. (2006). Podcasting 101 for K-12 librarians. *COMPUTERS IN LIBRARIES-WESTPORT-*, 26(4), 16.
- Fernández Alemán, J. L., Carrillo de Gea, J. M., & Rodríguez Mondéjar, J. J. (2011). Effects of competitive computer-assisted learning versus conventional teaching methods on the acquisition and retention of knowledge in medical

- surgical nursing students. *Nurse Education Today*, 31(8), 866–871.  
doi:10.1016/j.nedt.2010.12.02
- Hahn, C, (2008), *Doing Practical Research Using Your Computer, A Practical Guide*,  
London Sage
- Hartland, W, Biddle, C, Fallacaro, M, (2008), Audiovisual Facilitation of Clinical  
Knowledge: A Paradigm for Dispersed Student Education Based on Paivio's Dual  
Coding Theory. *AANA Journal*, 76 (3), 194-198
- Hew, K. F. (2008). Use of audio podcast in K-12 and higher education: a review of  
research topics and methodologies. *Educational Technology Research and  
Development*, 57(3), 333-357. doi:10.1007/s11423-008-9108-3
- Holbrook, J., & Dupont, C. (2010). Making the Decision to Provide Enhanced Podcasts to  
Post-Secondary Science Students. *Journal of Science Education and Technology*,  
20(3), 233–245. doi:10.1007/s10956-010-9248-1
- Kitchin, R. and Tate, N. (1999) *Conducting Research in Human Geography: Theory,  
Methodology and Practice*. Pearson: Harlow
- Kröncke, K.-D. (2010). Computer-based learning versus practical course in pre-clinical  
education: Acceptance and knowledge retention. *Medical Teacher*, 32(5), 408–  
413. doi:10.3109/01421590903394611
- Kyndt, E., Cascallar, E., & Dochy, F. (2011). Individual differences in working memory  
capacity and attention, and their relationship with students' approaches to  
learning. *Higher Education*, 64(3), 285–297. doi:10.1007/s10734-011-9493-0
- La Pelle, N, (2004), *Simplifying Qualitative Data Analysis Using General Purpose*

- Software Tools, *Field Methods*, 16, p 85-108
- Lago, L., & Seepho, S. (2012). Brain-Compatible Activities for EFL Vocabulary Learning and Retention. *International Journal of Scientific and Research Publications*, 35.
- Lunney, M. (2008) Current Knowledge Related to Intelligence and Thinking with Implications for the Development and Use of Case Studies. *International Journal of Nursing Terminologies and Classifications*, 19(4), 158–162, doi:10.1111/j.1744-618X.2008.00104.
- Mann, S., & Robinson, A. (2009). Boredom in the lecture theatre: an investigation into the contributors, moderators and outcomes of boredom amongst university students. *British Educational Research Journal*, 35(2), 243–258. doi:10.1080/01411920802042911
- Marjan, B. (2011). The Role of Multimedia Software on Learning and Retention Basic Foundation in Science Lessons. *Australian Journal of Basic and Applied Sciences*, 5(12), 1280–1282.
- Minakova, M. A., & Falikman, M. V. (2011). Knowledge Retrieval Strategies. *Journal of Russian and East European Psychology*, 49(3), 55–67. doi:10.2753/RPO1061-0405490304
- Morrison, S. M., & Symes, L. (2011). An Integrative Review of Expert Nursing Practice. *Journal of Nursing Scholarship*, 43(2), 163–170. doi:10.1111/j.1547-5069.2011.01398.x
- Muthukumar, S. L. (2005). Creating interactive multimedia-based educational courseware: cognition in learning. *Cognition, Technology & Work*, 7(1), 46–50.
- Pashler, H., Rohrer, D., Cepeda, N. J., & Carpenter, S. K. (2007). Enhancing learning and

- retarding forgetting: Choices and consequences. *Psychonomic Bulletin & Review*, 14(2), 187–193.
- Putman, S. M., & Kingsley, T. (2009). The atoms family: Using podcasts to enhance the development of science vocabulary. *The Reading Teacher*, 63(2), 100–108.
- Seib C., & English, R., & Barnard, A. (2011). Teaching Undergraduate Students Community Nursing. *Journal of Nursing Education*, 50(9), 536–539.
- Smythe, S., & Neufeld, P. (2010). Podcast time”: Negotiating digital literacies and communities of learning in a middle years ELL classroom. *Journal of Adolescent & Adult Literacy*, 53(6), 488–496.
- Starbek, P., StarčičErjavec, M., & Peklaj, C. (2010). Teaching genetics with multimedia results in better acquisition of knowledge and improvement in comprehension. *Journal of Computer Assisted Learning*, 26(3), 214–224.  
doi:10.1111/j.1365-2729.2009.00344.x
- Ti, L. K., Chen, F.-G., Tan, G.-M., Tan, W.-T., Tan, J. M. J., Shen, L., & Goy, R. W. L. (2009). Experiential learning improves the learning and retention of endotracheal intubation. *Medical Education*, 43(7), 654–660. doi:10.1111/j.1365-2923.2009.03399.x
- Van Dijk.A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York Academic Press, doi: 10.1037/0278-7393.31.2.359
- Vasinda, McLeod (2011). Extending Readers Theatre: A Powerful and Purposeful Match With Podcasting. *The Reading Teacher*, 64(7), 486–497.
- Wilson, K., & Korn, J. H. (2007). Attention during lectures: Beyond ten minutes. *Teaching of Psychology*, 34(2), 85–89.

- Wolfe, M. B. W., & Mienko, J. A. (2007). Learning and memory of factual content from narrative and expository text. *British Journal of Educational Psychology*, 77(3), 541–564. doi:10.1348/000709906X143902
- Wolfe, M. B. W., & Woodwyk, J. M. (2010). Processing and memory of information presented in narrative or expository texts. *British Journal of Educational Psychology*, 80(3), 341–362. doi:10.1348/000709910X485700
- Yildirim, Z., Ozden, M. Y., & Aksu, M. (2001). Comparison of hypermedia learning and traditional instruction on knowledge acquisition and retention. *The Journal of Educational Research*, 94(4), 207–214.
- Yin, R. K. (2003). *Case Study Research: Design and Methods* (Third Edition.). Sage Publications, Inc
- Yin, R. (2004). *Case Study Methods*. Retrieved 22nd May, 2009, from <http://029c7c0.netsolhost.com/Docs/AERAdraft.pdf>

## Appendix 1: Detailed Content of Podcast 1

Section	Time	Voice	Subject	Background
<b>1</b>	0.00	Lecturer John Mc Donald	Equity, Venture Capital	<b>Quiet</b>
<b>2</b>	2.47	N/A	N/A	<b>Music</b>
<b>3</b>	3.10	Gary Jones Business Angel	Business Angels	<b>Busy Office</b>
<b>4</b>	5.54	Narrator	Pitching Business Idea	<b>Music</b>
<b>5</b>	6.19	Lecturer John Mc Donald	Tax based equity	<b>Quiet</b>
<b>6</b>	9.34	N/A	N/A	<b>Music</b>
<b>7</b>	9.50	Larry Fitzpatrick Small Business Owner	Overdrafts and Term Loans	<b>Insurance Company</b>
<b>8</b>	14.51	Narrator	Questions on Overdrafts	<b>Music</b>
<b>9</b>	15.18	Lecturer John Mc Donald	Asset and Lease Finance	<b>Music</b>
<b>10</b>	18.15	N/A	N/A	<b>Music</b>
<b>11</b>	18.24	Tom Fingleton Small Business Owner	Credit Cards	<b>Busy Office</b>
<b>12</b>	20.26	Narrator	Questions on Credit Cards	<b>Music</b>
<b>13</b>	21.05	Peadar Cosgrove HP Company	Hire Purchase	<b>Busy Office</b>
<b>14</b>	23.16	N/A	N/A	<b>Music</b>
<b>15</b>	23.33	Lecturer John	Conclusion and	<b>None</b>

		Mc Donald	Summary	
<b>16</b>	<b>24.17</b>	<b>N/A</b>	<b>N/A</b>	<b>Music</b>

## Appendix 2: Detailed Content of Podcast 2

Section	Time	Voice	Subject	Background
<b>1</b>	0.00	Lecturer John Mc Donald	Introduction	<b>Quiet</b>
<b>2</b>	1.04	Tony Moore Business Man	Loan Applications	<b>Bank</b>
<b>3</b>	4.03	Narrator	Questions on Loans	<b>Music</b>
<b>4</b>	4.17	Anne Johnston Crèche Owner	Financing a Crèche	<b>Crèche</b>
<b>5</b>	9.58	N/A	N/A	<b>Music</b>
<b>6</b>	10.15	Lecturer John Mc Donald	Bank Loan Requirements	<b>None</b>
<b>7</b>	11.34	N/A	N/A	<b>Music</b>
<b>8</b>	11.50	Trevor Dietz Bank Manager	Bank Services	<b>Bus bank</b>
<b>9</b>	15.21	Narrator	Questions on Loans	<b>Music</b>
<b>10</b>	15.50	Lecturer John Mc Donald	Grant Thornton and Grant Aid	<b>None</b>
<b>11</b>	18.20	N/A	N/A	<b>Music</b>
<b>12</b>	18.45	Sean Fingleton Invest N.I.	Invest N.I.	<b>Office</b>
<b>13</b>	20.45	Narrator	Questions on Invest N.I.	<b>Music</b>
<b>14</b>	21.24	Lecturer John Mc Donald	Invest N.I.	<b>None</b>
<b>15</b>	21.48	N/A	N/A	<b>Music</b>

<b>16</b>	22.05	Lecturer John Mc Donald	Conclusion	<b>None</b>
<b>17</b>	<b>22.37</b>	<b>N/A</b>	<b>N/A</b>	<b>Music</b>

## **Appendix 3: Post Test Questions for Podcast 1**

### ***Questions***

1: Name a type of equity mentioned at the start of the lecture?

2: Which big business is mentioned by the business angel?

3: Name one of the types of business angels?

4: What is the business angel website address?

5: What scheme is run by the Dundalk Credit union?

6: How many days must your overdraft be in credit for each year to avoid penalties?

7: What is invoice finance?

8: Two kinds of credit card charges are mentioned, name one?

9: Is VAT payable on hire purchase agreements?

10: What kind of interest rate is mentioned with regards to Hire Purchase?

## **Appendix 4: Post Test Questions for Podcast 2**

### ***Questions***

1: At the start of the lecture what factor is cited as a major help in looking for funding for your business?

2: Name one area the bank will look at when assessing your application for funding?

3: Which factor did the bank focus on for Tony Moore's loan application?

4: Which kind of loan was secured for funding the Crèche?

5: What area was the bank most concerned about while looking at funding the Creche?

6: John Mac Donald mentions several principles that a bank will look at in assessing your funding application, name one of them?

7: Name one type of loans available at Bank Of Ireland?

8: Name one of the types of tools the Bank Of Ireland website has available for businesses?

9: In relation to the section on Grant Thornton an agency that gives non repayable grants is mentioned, what is it?

10: Sean Mc Ginley from Invest NI mentions something that looks favourable when looking for funding from them what is it?

## Appendix 5: Individual Student Results Podcast 1

Student	Pre Test Result		Post Test 1 Result		Post Test 2 Result		Post Test 3 Result	
	Marks	%	Marks	%	Marks	%	Marks	%
1	4	20	20	100	18	90	16	80
2	2	10	20	100	14	70	8	40
3	2	10	20	100	16	80	12	60
4	4	20	18	90	18	90	16	80
5	2	10	20	100	20	100	12	60
6	0	0	14	70	10	50	6	30
7	6	30	18	90	18	90	16	80
8	4	20	18	90	16	80	8	40
9	2	10	20	100	20	100	18	90
10	2	10	18	90	16	80	10	50
11	4	20	18	90	12	60	8	40
12	2	10	16	80	14	70	8	40
13	2	10	16	80	14	70	10	50
14	4	20	20	100	20	100	14	70
15	2	10	16	80	16	80	10	50
16	2	10	16	80	14	70	12	60
17	6	30	20	100	18	90	14	70
18	4	20	18	90	16	80	12	60
19	2	10	18	90	16	80	10	50
20	0	0	16	80	14	70	8	40
21	0	0	14	70	N/A	N/A	6	30
22	2	10	18	90	16	80	10	50
23	2	10	18	90	18	90	16	80

<b>24</b>	2	10	16	80	16	80	12	60
<b>25</b>	2	10	16	80	12	60	N/A	N/A
<b>26</b>	0	0	12	60	10	50	6	30

## Appendix 6: Individual Student Results Podcast 2

Student	Pre Test Result		Post Test 1 Result		Post Test 2 Result		Post Test 3 Result	
	Marks	%	Marks	%	Marks	%	Marks	%
1	2	10	18	90	18	90	18	90
2	2	10	20	100	14	70	4	20
3	6	30	20	100	8	40	14	70
4	2	10	16	80	6	30	10	50
5	4	20	18	90	8	40	6	30
6	0	0	14	70	14	70	4	20
7	2	10	18	90	14	70	10	50
8	2	10	18	90	14	70	6	30
9	2	10	20	100	20	100	12	60
10	2	10	20	100	20	100	14	70
11	4	20	20	100	18	90	14	70
12	2	10	18	90	18	90	14	70
13	0	0	16	80	10	50	8	40
14	2	10	18	90	18	90	14	70
15	0	0	16	80	14	70	12	60
16	2	10	18	90	10	50	16	80
17	2	10	18	90	16	80	10	50
18	2	10	18	90	N/A	N/A	8	40
19	4	20	20	100	16	80	12	60
20	2	10	16	80	14	70	14	70
21	2	10	16	80	8	40	12	60
22	4	20	16	80	16	80	10	50
23	2	10	18	90	18	90	N/A	N/A

<b>24</b>	4	20	20	100	20	100	18	90
<b>25</b>	6	30	18	90	14	70	14	70
<b>26</b>	2	10	14	70	10	50	8	40

## **Appendix 7: Informed Consent Form**

### **TRINITY COLLEGE DUBLIN INFORMED CONSENT FORM**

#### **LEAD RESEARCHER:**

Brian Kenny

#### **BACKGROUND OF RESEARCH:**

Podcasts have become increasingly available as alternatives to traditional lectures within recent years. The majority of these podcasts are recorded verbatim, a straight lecture and are rarely edited or enhanced. This research will attempt to investigate the effectiveness of enhancing a podcast to increase retention of information..

#### **PROCEDURES OF THIS STUDY:**

During this study you will be asked to listen to a podcast of a lecture. Following on from the lecture you will be asked to complete a standard test based on the information within the lecture. This same test will be repeated one weeks late and again two weeks later. The tests will allow me to measure the retention of information over the assigned period of time.

Following the initial test the participants will be asked to take part in a short group interview with the researcher. The interview will be audio recorded and all audio recordings will be anonymised when transcribed

Your participation is completely voluntary and you can withdraw from the activity at anytime without penalties imposed. If you decide to withdraw, all collected information from your participation will be removed and not included in the research documentation. In addition each participant needs to provide their consent in written form by signing this document and return it to the researcher.

All information that is collected by the researchers will be anonymised and stored in accordance with the Data Protection Act at Trinity College, Dublin. In the unlikely event

that information about illegal activities should emerge during the study, the researchers will follow the school's data protection policy and inform the relevant authorities.

**PUBLICATION:**

The results of this research will be published in a dissertation as part of a Masters degree in Technology and Learning at the Department of Computer Science and Statistics at Trinity College Dublin in Dublin. Individual results will be aggregated anonymously and research reported on aggregate results.

**DECLARATION:**

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- *<If the research involves viewing materials via a computer monitor>* I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

**PARTICIPANT'S NAME:**

**PARTICIPANT'S SIGNATURE:**

**Date:**

**Statement of investigator's responsibility:** I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

**RESEARCHERS CONTACT DETAILS:**

**INVESTIGATOR'S SIGNATURE:**

**Date**

# **Appendix 8: Informed Consent Form**

**TRINITY COLLEGE DUBLIN**

**INFORMATION SHEET FOR PARTICIPANTS**

**Project Title**

**Can a Podcast be enhanced to increase retention of information?**

## **Introduction**

Podcasts are increasingly used within an educational context both as an additional teaching aid and in some instances as an alternative to traditional lectures. This research will investigate the levels of student retention of information after listening to podcast that has been enhanced and edited in an attempt to highlight certain areas and important information. The research aims to measure whether this is effective in terms of student retention of information and whether enhancing a podcast with additional editing and insertion of music and sound fx increases the retention levels of students.

## **Research activities**

During this research you will be asked to listen to a podcast of a lecture. After this you will be asked to conduct a short test on what you have learned from the lecture. Following from the lecture you will be asked to take part in a group interview of which an audio recording will be made for later analysis. The lecture will take approximately 30 minutes, the test approximately 20 minutes and the group interviews approximately 30 minutes. You will be asked to complete the same test again one week later and again one week later.

## **Your Participation**

Participation in the research part of the project is voluntary and you may leave the project at any time, for any reason, without penalty and any information already recorded about you will not be used. There are no anticipated risks to your involvement in this study. In addition each participant needs to provide their consent in written form by signing a consent form provided by the researcher.

## **Information Collection**

All information that is collected by the researchers will be anonymised and stored in accordance with the Data Protection Act at Trinity College, Dublin. In the unlikely event

that information about illegal activities should emerge during the study, the researchers will follow the school's data protection policy and inform the relevant authorities. No audio or video recordings will be made available to anyone other than the research/research team, nor will any such recordings be replayed in any public forum or presentation of the research.

**Conflict of Interest**

Although the researcher is conducting the learning activity himself he is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way. If you require further information or have questions during or after the research project, please do not hesitate to contact the researcher at [kennyb1@tcd.ie](mailto:kennyb1@tcd.ie)

***Project***

**Can a Podcast be enhanced to increase retention of information?**

Adult Participant Consent Sheet

I .....agree to take part in this research project.

I have read, or had read to me, information about the project and know how information will be collected and stored. I understand that I can choose not to take part in the research at any time.

Data Protection: I agree to Trinity College, University of Dublin storing and using my information from this project.

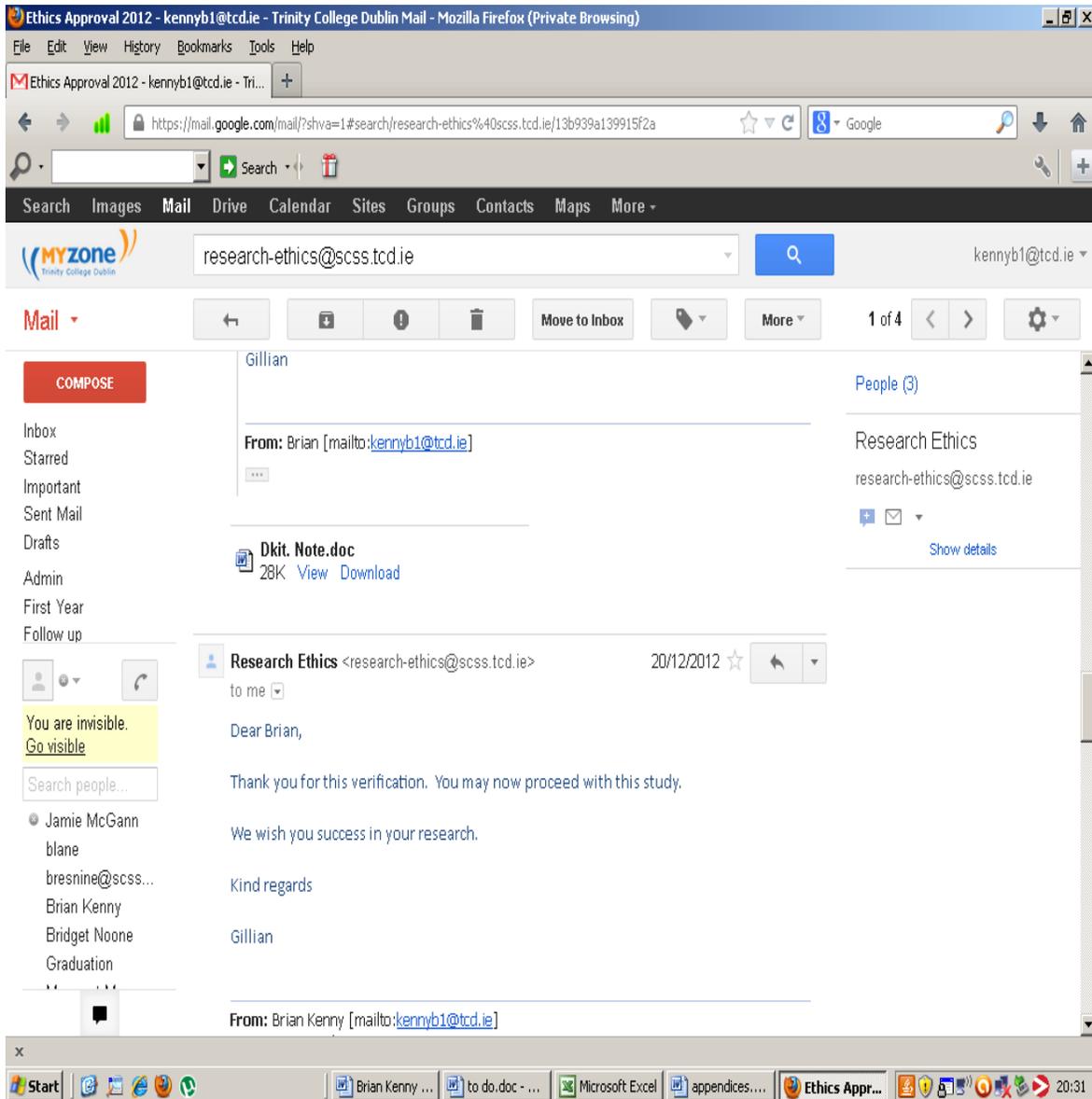
Date:.....

Signature of Project Leader (TCD):.....

Date:.....

**Please note:** For any further questions please contact [kennyb1@tcd.ie](mailto:kennyb1@tcd.ie) 086-8409592

## Appendix 9: Email of Ethical Approval from TCD



# Appendix 10: Email of Ethical Approval from TCD

