

# THE SUPPORTING ROLE OF EMERGING MULTIMEDIA TECHNOLOGIES IN HIGHER EDUCATION

Gaye Lightbody  
University of Ulster  
School of Computing and  
Mathematics  
Jordanstown  
BT37 0QB  
g.lightbody@ulster.ac.uk

Paul McCullagh  
University of Ulster  
School of Computing and  
Mathematics  
Jordanstown  
BT37 0QB  
pj.mccullagh@ulster.ac.uk

Chris Weeks  
University of Ulster  
School of Computing and  
Mathematics  
Jordanstown  
BT37 0QB  
weeks-c@ulster.ac.uk

Malcolm Hutchison  
University of Ulster  
School of Computing and  
Mathematics  
Jordanstown  
BT37 0QB  
mj.hutchison@ulster.ac.uk

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## ABSTRACT

*In this paper we give an overview of current investigations into the incorporation of cutting edge technologies within the Higher Education teaching domain. In particular, the role of audio is discussed through a number of case studies. The paper then concludes with a discussion of the authors' plans to incorporate audio and video content as supplementary course material for a technical undergraduate module.*

## Keywords

*Audio, Visual, mp3, iPod, m-learning, podcasting*

## 1. INTRODUCTION

In this paper we shall be providing an overview of the investigations being performed within higher education concerning the use of modern multimedia technologies for providing supporting teaching material, as well as platforms for the concept of "anytime-anywhere learning". Over the last few years there has been an explosive growth in the use of mobile devices, such as laptops, iPods, mp3 players and phones. A culture has evolved around these electronic gadgets and they have become an integral part of our daily lives, yielding the new concept of 'infotainment'. However, their benefit to

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us has not yet reached its full potential, particularly within the area of formal education.

A recent European study [1] looked at the impact of using mobile phones to aid the learning of a group of young adults that had previously encountered poor experiences with education. The study showed a positive outcome when their learning was supported by these devices. One possible reason is that young adults are comfortable with mobile technology and find it an approachable medium. The project was entitled "m-learning" to reflect the analogy to the e-learning culture that has developed widespread enthusiasm and involvement, but with the emphasis on the mobility attribute. Another driving area of m-learning pedagogical research has been in the use of audio devices, such as mp3 players, to support learning in higher education. A number of colleges within the US, such as Stanford University and Duke University, have actively incorporated audio material within their courses with the aim of providing a study of its impact on the entire student experience.

Initially this paper will highlight some the relevant issues concerning the changing needs of the modern student. Then a summary will be given of some of the current analysis surrounding the use of m-learning and the resulting outcomes for several higher education institutions. The paper will conclude with ideas of how the authors intend to adapt the existing methodologies experimented in these colleges to support learning within their own higher education facility.

## 2. CHANGING LEARNING ENVIRONMENT

One of the first questions to ask is what aspects, if any, differ between the modern student and the students from a decade before. Such information has been relevant to the commercial world as well as academia. A white paper from IBM [2] brings to light some interesting viewpoints on the changing needs of today's learners and how training programs should aim to adapt to meet these demands. The paper lists four different generations of the workforce from the 1940's to the present day:

- WWI Generation Before 1940
- Baby Boom Generation 1940-1960
- Generation X 1960-1980
- Millennial (or "Net") Generation 1980-2000

The millennial generation has been brought up within a world of computers, mobile phones and the Internet. They have no fear of present technology and adapt quickly to, and in fact desire, the latest electronic hi-tech advances. They have a natural acceptance of technology and thus have no barriers to impede the use of alternative methods, such as m-learning or e-learning, to supplement their educational experience. Another article, [3], describes this generation of student as smart but impatient, commanding immediate results, with divided attention spans, and an expectation to be given a choice in the education that they buy. The article is positive about the self-motivation of the modern student with their willingness to take control over their education in terms of sharing or seeking out resources to complement their course material.

Another leading question would be, how does the involvement of multimedia content within a course differ from, for example, the Open University, that has been delivering education through the media of audio and video since the 1970's, or even from material stored in a college library archive. The answer to this question comes down to accessibility. With mobile devices, in particular mp3 players, the student can perform other tasks while listening. Or they can fill in their "dead-time" on buses or trains watching video footage on their mobile phones or Personal Digital Assistants (PDAs). Also, there is no need to carry cumbersome tapes or CDs as the data is stored within the tiny gadgets themselves. The mobility and flexibility afforded by such devices are the key factors triggering their increasing potential use in education.

## 3. CURRENT RESEARCH

Duke University [4] hit the headlines in July 2004 by announcing that they were going to give Apple® iPods to each of their 1650 new first year students. Within the year that followed faculty staff from a range of disciplines were encouraged to provide material for play back on the iPod devices and to try to incorporate their use within the courses. A range of activities and focus groups were established to

obtain analysis of the impact of the iPod devices on the performance of the students and their overall university experience.

The iPods were envisaged to be employed in several ways. Firstly, they were to be used to provide a portable access of material to support the course content. This was accessible via the Duke iPod content server, iTunes Music Store, Blackboard course management tool, and podcasts. The latter has become a powerful tool for material distribution as it allows the users to subscribe to be automatically updated over the internet with new recordings as they are uploaded to the university's database.

Secondly, microphones had been supplied with the iPods to enable students to record lectures. This provided some success and resulted in a repository, referred to as iLectures, whereby students uploaded their recorded lectures to share with their colleagues. However, there were some issues regarding the quality of the recordings.

In addition, the iPods were to be used to record informal group discussions and interviews. They were also considered as a tool for supporting their personal learning by recording their own notes for repeated listening. Lastly, the extensive memory capacity of the iPods (20GB) provided an ample storage medium for all their study data.

After the year trial Duke University published a report of their findings [5]. The iPods had been used for a range of modules from traditionally audio intense courses, such as music and languages, to more technical courses, such as engineering and science. They established focus groups from within the faculty and the students, and performed a number of questionnaires to obtain student feedback. They found that the students were open to engage with the devices and that 75% of them used the iPods for a minimum of one course for academic purposes. In particular, 60% of the students used their iPods for recording lectures, interviews, or even to keep details of group meetings, discussions and revision sessions.

They found that the use of iPods did provide instructional merit but this was not widespread in all courses. There were also limitations in the applications that they were able to support. Some felt that the iPods were not sufficient to link up the visual with the audio and were more suited to courses with less technical content. As a result, in the following year, distribution of iPods was limited to courses where they had created a significant learning advantage. There was also a concern that the provision of lecture audio transcripts might impact attendance, however, there was little information to draw a conclusion as it was hard to track the use of the recorded lectures by the students. Overall there was an opinion that their use did however positively impact exam performance.

At an institutional level the iPod experiment led to greater discussion concerning the role of technology within the educational environment. This resulted in the formation of the Duke Digital Initiative [6], whereby the experiences of the iPod project are being used to expand the application of audio and video material, extending their use on a range of platforms such as laptops and PDAs.

Shortly after the Duke iPod experiment started, several other colleges began their own investigations. Drexel University's School of Education [7], in the US, initiated a study of the impact of iPods in their college during the autumn semester of 2005. It was at a much smaller scale than that of Duke University with only 30 students being supplied the iPods. Students were invited to submit a proposal to the university stating original ideas for how to incorporate the iPods as a learning tool. Successful candidates received a free iPod and accessories. The intention of the faculty staff was to supply recorded lectures online and to encourage the students to record study-group sessions and interviews. Drexel has incorporated podcasting as part of their investigation, with both students and faculty staff being involved in setting up their own podcasts, made accessible through a dedicated university web site called PodPage [8]. If proven successful then they may continue the distribution of iPods in the following year.

Within the academic circle the term "coursecasting" has been used to reflect the use of podcasting to deliver updated lecture recordings to student subscribers. One example is Purdue University, in the US. They have set up a coursecasting environment called "BoilerCast" [9] distributing audio material for 70 of their courses. It is a well-established service formed within the college whereby dedicated staff, and not the lecturers themselves, provide all the technical support. The college recognises that the coursecasts are not a replacement for attending lectures, but feel that the availability of material assists non-native speakers and supports repeated listening for revision. There are a mixture of opinions [10] regarding the availability of full lecture audio transcripts with the main fear being that it may impact classroom attendance. However, there is also the view that using such modern technology enables the colleges to keep up to date with student culture and might even act to encourage participation.

Charles Sturt University in Australia have taken a slightly different perspective on the role of audio material in teaching. Chan and Lee [11] discuss how the anxiety and preconceptions that a student may have about a course, even before they enter the lecture hall, can have a detrimental effect on their capacity to learn. They suggest techniques in which podcasting could be used to alleviate the concerns of the student. A pilot study to investigate their initiative was set up for first year information

technology undergraduates. They suggested the use of informal audio clips delivered "just in time" before a lecture using podcasting. The aim would be that the student would review the material prior to the lecture so to settle their anxieties and remove their preconceptions about the difficulty of the course content.

The reasoning of their research came from a teaching evaluation called the Harvard Minute Paper whereby students are asked to respond to two questions. Firstly, what was the most important thing they learned in class, and secondly what important questions remained unanswered. By applying their own questionnaires at the start and end of the lectures Chan and Lee were able to obtain feedback from the students about their concerns. Results showed that over a quarter of the students felt they found the course too difficult even before the class began. From their study they highlight the importance of the choice of material, as ill-suited audio clips could provide a negative effect rather than a positive one. They also point out that students not completing their assigned pre-class listening could feel ill prepared leading to increased apprehension. To counteract these issues the authors recommend that students should only be supplied with small bite sized portions of audio to increase their motivation to learn.

From an initial survey they found that all but 1 from a class of 26 students would be willing to engage with the project and listen to material between 3 and 10 minutes long. However, the duration of the audio was reduced to between 3 to 5 minutes to correspond with the estimated amount of "dead-time" that students had while entering and leaving the campus. This duration concurred with Clark and Walsh [12] who in their discussion suggest that snippets of audio should be confined to the length of a music track (3-5 minutes) so to hold the user's attention and to enhance the ease in navigating between clips of interest. Chan and Lee commenced their study in autumn 2005 aiming to show a "proof of concept", the results from which have not yet been published. The following academic year they plan to use the research to enhance the effectiveness of their podcasts.

Stanford University in California has also been a key contributor in researching the role of audio material in higher education. They have a website devoted to the distribution of mp3 clips [13] of faculty lectures, campus events, book readings, and music recorded by Stanford students. The software driving the repository is the customised Apple® "iTunes U" package which has been licensed free of charge to a number of colleges for this purpose [14]. It will allow colleges to create collections of academic recordings with the capability of controlling access to the material.

## 4. CHOICE OF MEDIA

Much of the current research into the role of new technologies in higher education has been with the incorporation of audio material to supplement the courses. Clark and Walsh [12] discuss the benefits of audio as learning medium, with focus on mp3 players. In summary they make these key points:

- Listening is instinctual, reading is not
- Listening gets round illiteracy
- Listening gets round dyslexia
- Listening frees eyes and hands
- Listening is a mobile medium
- Listening and learning go hand in hand

They highlight the fact that children as young as three will have learnt to speak and listen instinctively, whereas, they will need to have been taught how to read and write.

The advantage to those suffering from dyslexia or visual impairment is obvious. However, even students with mild hearing impairments could find benefits in being able to listen to the lectures on their own terms with increased volume and the ability to repeat sections when required. The same is true for those learning in a language that is not their native tongue.

Audio is a very powerful medium for conveying general concepts and feelings but there is concern over its limitations when used to teach highly complex and technical material. A solution could be to accompany the audio with animated visual clips; a good example of this is found on the MathTutor [15] website. Here, there are a number of iPod downloads for the description of a range of different mathematical operations. The downloaded files are in a MPEG4 (.m4v) format and can be played on a range of free downloadable software for viewing on PCs, laptops, and PDAs etc. They can also be viewed on video enabled mobile phones and iPods. The MathTutor web site gives a perfect example of how the visual and the audio could be combined. The individual commentaries are short, focusing in on a key issue. The accompanying visual animation is in synch with the audio giving a graphical clarification of the explanation, with little or no text.

Microsoft have developed a software package, called MS Producer that allows the combination of the audio with the associated MS PowerPoint slides. Östlund and Svensson [16] present the design processes involved in developing web based courses incorporating audio and video content using MS Producer as their chosen tool. They demonstrate how it can be used to display the slides and the video of a lecturer with the audio in synch. This medium shows great potential for developing supporting lecture material.

## 5. FUTURE RESEARCH

The authors propose to incorporate the use of multimedia material targeted to PCs and mobile devices within an existing Advanced Computer Networks undergraduate module, and to present a study of the benefits provided to the students. It is envisaged that this will be an ongoing project, with a progressive increase in content made available to the students throughout the academic year. The project commenced in June 2006, thanks to funding from Microsoft through the Higher Education Academy. This funding will have been sufficient to “prototype” the material development and deployment for a significant portion of the course.

Prior to the course commencement the aim will be to develop a series of frequently asked questions (FAQs) to target the areas that tend to be of most confusion, and to provide a glossary of common terms for quick reference. In both cases relevant slides will be accompanied by authored audio using MS Producer to synchronise the delivery. The FAQs will contain a greater level of detail but will last no longer than 5 minutes in duration, as suggested by Clark and Walsh [12]. To increase mobility the audio will be available on its own for use on iPods, MP3 players and mobile phones. The development of the series of FAQs will be ongoing with current students being asked to provide anonymous feedback from which the questions for the following year will be formed.

Once the course has begun the objective will be to video a number of lectures and tutorials and combine the footage in sequence with the accompanying slides using MS Producer. To increase the overall access to the lectures, the material will also be available in audio alone, with the aim for students to be able to listen to the lessons while on the move using iPods, MP3 players and mobile phones. Some iPods and mobile phones do support video footage so this may be another possibility for future investigation.

An important aspect of the project will be the deployment of material to the students, requiring the development of a website from which they can access the content. Some of the material, such as current lectures, may also be distributed using podcasting. This is a relatively new and innovative social media tool that differs from downloads in that users do not need to manually select and download the material that they are interested in. If subscribed to a podcasting site they are automatically updated with new material. The technology supporting this is known as Really Simple Syndication (RSS), and is used to syndicate and distribute files over the internet. In basic terms, an RSS reader on the user's PC will check the feed for changes and react by automatically retrieving the new data from the specified URL.

The main benefit of RSS is that individuals can specify the content of interest and thus have total control over the flow of information that they receive. If no longer required they can simply remove the feed from their RSS reader and the updates are no longer retrieved. This has proven to be a very effective method for delivery of supplementary information. The feed is compiled in compliance to the user's choices so that they receive the information pertinent to them. This further instils a sense of learning responsibility and removes certain time-consuming burdens intrinsic with content publication.

Using podcasting will enable a broad range of material to be made available through an efficient distribution channel. The student will be able to subscribe to these podcasts, and will automatically receive the information when it is made available.

The delivery of the material will be accomplished with a dynamic web site for the cohort of students enrolled on the module. This site will be developed with ASP.NET with a SQL server database backend. This will allow deployment of material in a secure and efficient manner, allowing the capability, if needed, to give restricted access. It is recognised that the delivery system must be dexterous enough to cater for all ability levels. The entire Podcast/RSS concept hinges largely on the user possessing a broadband connection to the internet and to a smaller extent on them having a good working knowledge of the internet and software. To broaden accessibility the delivery must also incorporate a more traditional download system alongside the podcasting mechanism.

## 6. DISCUSSION

This paper has provided a summary of pedagogic research activities within a range of higher education institutions. The account has focused mainly on the role of audio and mp3 players within the educational domain. In particular, the extent of the use of iPods and the accompanying software iTunes has shown the potential of this technology and the openness of students to engage with it.

An overview of the plans by the authors to provide multimedia material for a technical undergraduate module has also been given. The project has several aims which will develop throughout the academic year. Initially audio enriched slides for FAQs and a glossary of common terms will be produced prior to the course commencement. During the term, video footage will be recorded for a number of lectures and tutorials and will be synchronised with the accompanying slides using MS Producer. Throughout the duration of the project, students will be asked to provide anonymous feedback, with the aim of highlighting areas of key concern in the course. By targeting a portion of the syllabus it is hoped that it will enable analysis on possible impact on performance.

It is felt that providing this supplementary material will be of particular advantage to students with special educational needs such as those who have hearing or visual impairments that make following a lesson in a lecture hall a more difficult task, and also for those who are not native English speakers. Furthermore, students with physical difficulties that might find attending all lectures difficult will find great benefit in having the ability to follow missed lessons. With the introduction of legislation (2005/06), Special Education Needs and Disability Order (SENDO/SENDA) [17], this will surely become a vital educational tool.

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