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Title: ***Identifying the effectiveness of and student perceptions of the use of podcasts in the University of Wisconsin-La Crosse's Medical Dosimetry program***

The accompanying research report is submitted to the University of **Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

Graduate Degree/Major: MS Education

Research Advisor: James Lehmann, Ph.D.

Submission Term/Year: Summer, 2012

Number of Pages: 52

Style Manual Used: American Psychological Association, 6th edition

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Hilsendager, Elizabeth D. *Identifying the effectiveness of and student perceptions of the use of podcasts in the University of Wisconsin-La Crosse's Medical Dosimetry program*

Abstract

The University of Wisconsin-La Crosse (UW-L) offers only one of two online Medical Dosimetry programs in the country. Because the field of Medical Dosimetry is based primarily on physics and calculations, custom podcasts were created in an effort to try and increase the students' understanding of this complex material that has previously been taught mainly through text-based lectures. This study sought to determine students' perceptions and actual effectiveness of custom podcasts introduced into an online Medical Dosimetry program through the University of Wisconsin-La Crosse. The students were asked to complete a survey at the end of the DOS 422/522 Radiation Dose Calculations course, which had custom podcasts ranging in length from five to 25 minutes incorporated into the text-based lectures, as well as independent files within the content section of their Desire 2 Learn (D2L) learning platform. The final exam scores also were evaluated against the scores of the previous academic class of 2010-2011 to determine whether or not test scores increased or decreased with the introduction of the custom podcasts. While the students' perceptions of the custom podcasts were extremely positive, the final exam scores were shown to actually decrease in the current class of students with the use of custom podcasts.

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Chapter I: Introduction

Medical Dosimetry is a term unfamiliar to many people but highly regarded in the field of radiation oncology. In the past, people interested in becoming Certified Medical Dosimetrists, would have to earn their way into the position through on-the-job training and passing of a national certification board exam. They would begin as a radiologic technologist (x-ray tech), then move to a radiation therapist position, and finally move into a Medical Dosimetrist position. Today, the path to becoming a Certified Medical Dosimetrist is slowly changing to include a Baccalaureate degree, graduating from an accredited Medical Dosimetry program, and passing a national certification board exam (http://www.mdcb.org/).

Currently, there are only 15 accredited Medical Dosimetry programs in the nation (http://www.jrcert.org/index.html). Out of those 15 programs that are accredited, only two of those offer their programs online, and the University of Wisconsin-La Crosse (UW-L) is one of them. Because the core courses in the Medical Dosimetry program involve complex concepts, it can be extremely difficult for students to learn the material through text-based lectures using such programs as Power Point and Soft Chalk. In addition to the text based lectures, many courses offer weekly practice problems, discussion forums, quizzes, and group projects as a way of teaching the material in order to help students retain the information. According to student feedback, those tools are felt to be beneficial in teaching some of the courses offered in the program; however, many of the courses that the students struggle with are the physics and calculation courses, where the use of text may not always be the most effective method of instruction. Ultimately, if the student is unable to gain a complete understanding of the material, there is the potential to fail the national certification board exam which is administered within a few months of the program completion.

While several courses within the program may be able to use audio and visual methods (e.g. YouTube videos or podcasts) in order to enhance the text lectures, the Dosimetry (DOS) 422/522 Radiation Dose Calculations course does not provide this option. One reason for this could be that the material covered in the course is so specific to the field of radiation physics that there are very limited public videos available. Another reason could be that the use of podcasts for educational purposes is so new that there are still many areas in the educational arena that are untouched as far as available podcasts. In fact, Vajoczki, Watt, and Marquis (n.d.) mentioned that in 2005, educational podcasts made up less than 3% of podcasts, and there were virtually no video podcasts, or vodcasts. In an effort to try and enhance the students' learning, the UW-L Medical Dosimetry program created short, custom podcasts as a way of focusing on specific information that would positively affect the students' learning. The purpose of this study was to exam the perception and effect of custom podcasts that used audio and visual tools to further explain confusing concepts, as well as to work out examples of different calculations the students would encounter in practice problems and on exams. For students who learn better through audio and visual methods, the hope was that the podcasts would create the means to make that connection with the concepts presented.

Statement of the Problem

The main problem in teaching complex concepts online is to try and deliver the information, such as that in the DOS 422/522 Radiation Dose Calculations course, in such a way that the students may increase their understanding of the material. As a result of the improved presentation format, the students will be more likely to remember the concepts presented to them, which will assist them in passing their national certification board exam. Requirements to become a Certified Medical Dosimetrist are going to be changing such that students wanting to

take the national certification board exam must be graduates from an accredited Medical Dosimetry program (http://www.mdcb.org/). Currently, there are only two accredited online Medical Dosimetry programs in the nation (http://www.jrcert.org/index.html). While the convenience of an online program provides benefits to many of the students attending higher education, the number and complexity of the classes within a Medical Dosimetry program can sometimes make it difficult for the student to learn. The concepts presented are very complex and currently rely heavily on text-based lectures and textbooks. This strong base in text-based instruction may not be sufficient for building a genuine understanding of the material. One option to enhance the students' understanding of the material was to incorporate custom podcasts into their course content. However, the perceived and actual effectiveness of using podcasts for complex content within the UW-L Medical Dosimetry program had never been evaluated. Therefore, there was a need to survey the students in the current class, which consisted of custom podcasts related to the topic of radiation dose calculations, to determine whether or not the students felt those podcasts to be helpful. In addition, the researcher evaluated final exam scores as a way to determine actual effectiveness of the custom podcasts.

Purpose of the Study

The purpose of this study was to determine the perceived effectiveness of custom podcasts in the DOS 422/522 Radiation Dose Calculations course through evaluating surveys completed by the students, as well as the actual effectiveness in evaluating the final examination scores. The scores of the 2011-2012 academic year students, with podcasts, were compared to the 2010-2011 academic year students, without podcasts, to determine whether final exams scores increased, decreased, or remained the same. There also was a survey distributed to the students in the 2011-2012 academic class to determine their perceptions of the custom podcasts

and whether or not the students felt them to be helpful. The research questions being addressed include:

1. Did the final exam scores offered in the 2011-2012 DOS 422/522 Radiation Dose Calculations course increase with the use of custom podcasts?

2. What are the students' perceptions of the value of the custom podcasts?

3. How do the students think they would have performed on the final examination without the use of the custom podcasts?

Assumptions of the Study

The DOS 422/522 Radiation Dose Calculations course previously offered lectures that were mainly text based. In an effort to try to increase students' understanding of the complex concepts presented in the course, custom podcasts were created and incorporated into the DOS 422/522 Radiation Dose Calculations course. The final exam scores from the current course were compared to the final exam scores of the previous course, which did not include the custom podcasts, to determine whether or not the podcasts proved to be effective. In addition, there was a survey that the current students completed at the end of the course, which indicated the students' perceived effectiveness of the custom podcasts.

Assumption 1: The overall opinion of the use of the custom podcasts in the course of DOS 422/522 Radiation Dose Calculations will be favorable.

Assumption 2: Final exam scores in the current class of 2011-2012, with custom podcasts, will show an increase when compared to the class of 2010-2011, without custom podcasts.

Definition of Terms

The concepts covered in the online DOS 422/522 Radiation Dose Calculations course through the UW-L Medical Dosimetry program can be very complex and often difficult to understand through text-based lectures. Therefore, custom podcasts were created and implemented into the course. In an effort to try and determine the perceived and actual effectiveness of custom podcasts, a survey was completed by the students of the DOS 422/522 course to assess whether or not they thought the podcasts were beneficial to their learning. In addition, the scores of the final exam were evaluated to determine the actual effectiveness of the custom podcasts.

Custom Podcast. A custom podcast is a video and/or audio file that is used to further explain a difficult concept or demonstrate how to solve calculations. The podcasts in this study were custom made by either the instructor or members of the adjunct faculty for the Medical Dosimetry program and range in length from five minutes to 25 minutes.

Face-to-Face. The face-to-face method refers to delivering information to students where the instructor and students are in an actual classroom together.

Medical Dosimetrist. A Medical Dosimetrist is a member of the radiation oncology team that performs the medical dosimetry or "treatment planning" portion of the process.

Medical Dosimetry. Medical Dosimetry is an area of Radiation Oncology, which refers to the measurement of dose. A patient receiving radiation therapy undergoes "treatment planning," which requires a Medical Dosimetrist and Radiation Oncologist to work closely together to create an optimal plan to fully treat the tumor, while sparing as much "normal" tissue surrounding the tumor as possible. In this study, the students being evaluated are part of an online Medical Dosimetry program.

Mobile Learning. Mobile learning is a method of learning "on-the-go" through the use of cell phones, PDAs, tablets, etc.

Qualtrics Survey Tool. Qualtrics is a survey tool that is used consistently throughout the UW-L system for course and instructor evaluations. This tool was used as the main survey tool to assess students' perceptions of the use of the custom podcasts within the DOS 422/522 course.

Radiation Dose Calculations Course. Radiation Dose Calculations is a course that covers the different factors used in a calculation, which all contribute to the final dose delivered to a patient receiving radiation treatments. In this study, the survey and test comparison were done specific to the use of the incorporation of the custom podcasts in the course (DOS 422/522).

Radiation Physics. Radiation physics is a physics course that covers topics specific to radiation.

Radiobiology. Radiobiology is a course taken by students enrolled in the Medical Dosimetry program that discusses how the radiation interacts with cellular DNA to destroy cancer.

Virtual Learning Environment (VLE). A virtual learning environment is similar to a podcast but the learner may use multiple windows within the VLE to view the lecturer, their slideshow or lecture and even chat windows.

Vodcasts. A vodcast is a podcast that includes visual assistance or video. The term "podcast" in this study refers to audio and video podcasts.

YouTube Video. A YouTube video is a video that comes from the website www.youtube.com. The videos shown on the website are created by people everywhere and include personal, educational, and professional information.

Limitations of the Study

The DOS 422/522 Radiation Dose Calculations course previously relied heavily on the use of text-based lectures. In an effort to try to increase the students' understanding of the difficult concepts covered within the course, custom podcasts were created and incorporated into the course. The study was done to determine whether or not they were actually effective by evaluating final exam scores of two different courses, one with the custom podcasts and one without. There were certain limitations to this study.

Limitation 1: Because the UW-L represents only one of two online Medical Dosimetry programs in the United States, there were no other direct studies with which to compare the students' perceptions and to evaluate test scores for the use of podcasts within the course.

Limitation 2: Due to cost issues with creating professional podcasts, they were made with free computer tools and had little esthetic effect.

Limitation 3: This study only included a small sample of students. There were 15 students in the current class compared to 18 students in the previous course. A larger sample size may have shown different results.

Methodology

For this study, a review of literature was conducted in the areas of students' perceptions of podcasts in online learning, the types of podcasts used in online learning, as well as the effectiveness of podcasts in online learning in evaluating exam scores. In an effort to try and determine the areas where students felt they could benefit from the use of a custom podcast, an e-mail was distributed to the 2010-2011 DOS 422/522 Radiation Dose Calculations class asking for concepts they wish had been presented as supplementary material in the form of a custom podcast. The instructor of the course also reviewed the final exam scores from the 2010-2011

Radiation Dose Calculations course and tracked the questions whose answers received less than 50% correct. The questions were then evaluated in order to identify common themes in the concepts that were asked and those themes were compared to the e-mail feedback from the previous class to decide where the focus should lie for the custom podcasts.

After the custom podcasts were created and incorporated into the 2011-2012 course, the scores of the final exam were compared between the 2010-2011 and 2011-2012 classes of students; one class with custom podcasts and one without the custom podcasts. There also was a survey conducted of student perceptions of the custom podcasts and whether or not they felt them to be helpful in the course. Of the 15 students who completed the course, 11 of them answered the survey questions resulting in a response rate of 73%. All of the data was collected and analyzed for the results of this study.

Chapter II: Literature Review

The purpose of the study was to determine the effectiveness of podcasts in an online Medical Dosimetry program through the UW-L. More specifically, it looked at the results of the final exams between two academic classes of students enrolled in the DOS 422/522 Radiation Dose Calculations course in the Medical Dosimetry program. This study also evaluated a student survey to determine whether or not the students felt it was beneficial to have the custom podcasts presented in the course. Much of the documentation that exists on podcasts and higher education refers to face-to-face courses, where live lectures are recorded and converted to podcasts. While this information still contributes to the review of literatures for this study, there is little information available in supplementary online higher education podcasting. There is even less literature available on the effect podcasts have on students' academic performance and still even less on video podcasts. This review of literature will cover topics such as the use of podcasts in higher education and online learning, podcasts as supplementary material, students' perceptions of the overall helpfulness of podcasts in online learning, and the discussion of other studies' results in evaluating exam scores with the incorporation of podcasts into their courses.

The way some online systems are currently set up, content is delivered via "online lectures," which are mainly text-based. These are similar to the face-to-face methods of teaching in instances where the instructor uses Power Point slides to help deliver the content. The advantage of the face-to-face method, however, is that the students are listening to the teacher lecture and reading along with the slides at the same time. By presenting the information this way, the student has the opportunity to ask questions of the instructor during the actual lecture. Unfortunately, in the online setting, many students are reading the material, without audio aids or a lecturer available to answer any immediate questions. If the student does not fully understand

the information that is being presented to them, they are left with only a couple of options. The

first option is to try and figure out the material on their own time through the use of textbooks or

additional class notes. The second option is to e-mail their instructor for further clarification,

which can take time and still result in limited understanding. Consequently, if the student is

unable to comprehend the information that is presented to them, they could potentially fail their

national certification board exam upon completion of the Medical Dosimetry program.

Technology and Pedagogy

The question of whether or not to use podcasts in an online class, as well as what type of

media should be used, can play a large part in the quality of education that students receive. As

Tooth (2000) explained, there are basically two types of media used for distance education. One

of those types is used to teach the subject through the use of printed materials, television, and

CD-ROM. The other type of media is that which allows the teacher and students to

communicate (e.g. fax, teleconferencing, the internet). Tooth (2000) went on to say that the

purpose of using communications-based media, regardless of which format you use, is "to

improve the quality of the learning process for students…" (p. 4). The data collected by

Northrup, Lee, and Burgess (2002) agreed with Tooth. In their study, they had their students

complete an Online Learning Interaction Inventory (OLLI), which consisted of 50 questions and

addressed four different topics in online learning. Their information showed that not only did the

students report a desire to interact with audio-narrated online presentations, they also said that

innovative instructional strategies (e.g. case studies, structured games) were important to their

online experience.

The instructional use of podcasting in an online course can serve many different uses. In

a study conducted by Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009), they

tested the use of podcasts in several areas of teaching. Three of these areas included: demonstration, instruction, and feedback. The demonstration podcasts were used in a way similar to how a lab would have been used in a face-to-face environment. The teacher would demonstrate through the podcast what they were trying to explain in their lecture. In doing this, the students were able to connect the information they learned through their readings with the information they were seeing. The use of podcasts for delivering instructions was used as a way to help the students complete assignments. In one case, when students expressed confusion over the written description of the assignment, the instructor was able to record a podcast to give a more detailed description of what the assignment entailed. The feedback podcasts were delivered to either individuals or groups. The podcasts were sent to the students via an e-mail or a discussion thread and notified students that their assignments had been received, what their scores were, and the reason for the score.

What Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009) found across all areas of instructional use of podcasts was that the students found all of these podcasts to be helpful. Not only were the students able to listen to the podcasts multiple times in order to clear up any confusion with the assignment or demonstration, but they all claimed to feel more of a social presence from the instructor. Tooth's (2000) study pointed out that personal contact with a teacher, similar to a traditional classroom setting, was extremely important. He went on to say that regular and frequent contact between the teacher and student were a big reason that students remained interested in their online courses and completed their online education.

There is still a question as to the level of educational impact these podcasts can have on the students using this technology. Cebeci and Tekdal (2006) pointed out that in general, learners have psychological limits to their attention spans. According to their study, when a

podcast becomes longer than 15 minutes, the students lose interest and their comprehension of the material decreases. Andersen (2011) studied podcasts in relation to the cognitive load placed on student learning and discovered that in order to maximize learning, one should use shorter podcasts with specific learning objectives. Chan and Lee (2005) agreed with this finding, stating that learners may become distracted when there is too much information given via audio methods and will actually only remember more of the opinions and arguments as opposed to facts and figures. Schneider (2006) goes even further to state that students receiving their education through iPods are "shortchanging themselves" (p. 3, para. 6). As an assistant professor of theater and dance at Northern Illinois University, Schneider believes that podcasts are intended for the lazy students and professors who are only looking for convenience. In his opinion, podcasts are what he refers to as, "…totally bogus, a thin surrogate for real instruction…" (p. 3, para. 7) and should cause professors to be wary in a world where they could ultimately be replaced by these podcasts.

Mayer, Griffith, Jurkowitz, and Rothman (2008) conducted a study that looked at the effect of extraneous details on cognitive processing. They broke up cognitive processes into three categories: selecting, organizing, and integrating. In the selecting category, the student pays attention to relevant material and represents it in working memory. In organizing, the student mentally organizes information into a cognitive structure. Lastly, integrating allows the student to connect new information with existing knowledge. Some instructors work to incorporate extraneous information into their courses to make the material more interesting (e.g. cartoons), but when that type of information is not relevant to the core material being presented, it can hurt the student learning. When an instructor introduces extraneous material into a lesson, the cognitive processing used to understand the extraneous material is limiting deep

understanding of the core material. Although the results of their study contradict the common practice of introducing interesting extraneous information into lessons, they recommended that instructors refrain from doing so. Gurung (2004) agreed with this finding, pointing out that overuse of some aids could, in fact, also keep the students from studying in more effective ways.

Nemec (2011) wrote an article that corresponded to the findings by Mayer, Griffith, Jurkowitz, and Rothman (2008). She reviewed different teaching tools and gadgets, but emphasized that when an instructor evaluates a new tool, they need to assess whether or not the tool will help them achieve their educational objectives efficiently and in a manner that is better than the less technical and less expensive way they may currently be using. She pointed out that even if a tool is easy to use, it doesn't mean people will be able to use it well. An instructor may introduce a short video to help further explain a concept they are trying to teach. However, when a learner using the video is not computer literate, finding and playing the video may add an extra challenge, making the learning process more difficult than it needs to be for the student.

In a study conducted by Daniel and Woody (2010), they had some students in the class listen to the primary course content and the other members in the course read the primary course content. They found that not only did the students reading the text perform better on the quiz, but that even before the students received feedback from their quizzes, the students who had listened to the podcast as a primary source of content realized that the podcasts were not an effective tool for their learning. Brown and Green (2007) also mentioned that educators should not just translate long lectures into podcasts, but instead provide short segments of content as podcasts. This not only provides the learner the option to watch podcasts in a short amount of time, but also allows them to review them in whatever order they choose and in a way that makes sense to the user. Sutton-Brady, Scott, Taylor, Carabetta, and Clark (2009) agreed with Brown

and Green's (2007) findings on the length of podcasts and gave several advantages to shorter podcasts such as less download time and the ability of students to focus on shorter podcasts versus longer ones. Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009) went on to mention that while podcasts may generate enthusiasm, they may not be the most effective method of presentation.

Use of Podcasts as Supplementary Material

A paper written by Deal (2007) evaluated various types of educational uses for podcasting. Deal mentioned that in using podcasts as supplemental material, the end product has a much better record of positively influencing learning outcomes and student performance because the materials used are usually designed with clear educational goals in mind. Evans and Champion (2007) agreed with these observations as they pointed out that in addition to the use of media in online instruction, there needed to be an effective pedagogy and reflective teaching involved. In short, they stated, "…instructional planning + electronic media = excellent instructional delivery" (p. 75). Simonson (n.d.) went on to state that the recording of a lecture is a poor example of a podcast, but it is best to group the lecture into separate, single concept blocks that represent separate learning objects. For example, lecturers can break the sessions up into related topics, which when recorded can be separated into individual podcasts relating to one topic, as opposed to a full length lecture covering many topics. Cebeci and Tekdal (2006) emphasized this point mentioning that some media, such as podcasts, that are "speech-only audio" (p. 50) do not have educational values and are therefore not considered a valuable learning tool. They also described that podcasts should be designed so that there is a blending of instruction and technology. By incorporating the podcasts into a Learning Management System (LMS), students are usually able to correlate the desired learning to the understanding of the

material. While many lecturers already may do this, the podcasts become more effective when they are supplemented with examples that relate to the material.

Kao (2008) mentioned this same finding in his study. He made available to the students in engineering courses, lecture podcasts, as well as supplementary podcasts through a playlist in iTunes. The supplementary podcasts were often created in response to students' questions and included clarification on certain topics and techniques of problem solving. The site was password protected for copyright purposes, but the students could access the podcasts as often as they wanted. The instructor of the course even went so far as to redesign the contents of the course and rearrange the delivery of the lecture so the lecture podcasts would be optimal for podcast production. The instructor separated the lecture podcasts into shorter modules, lasting five to 20 minutes, with each module focusing on one main topic. The class was issued a survey at the completion of the course to evaluate the effectiveness of the podcasts. The survey results showed more than 90% of the respondents found the video podcasts useful. In his article, he stated that sound pedagogy is the fundamental rubric and should be the first principle behind adapting technology in teaching. He stated, "I believe it is plainly wrong to use technology in the classrooms simply for the sake of technology" (p. 2).

Crawford (2007) viewed it in the opposite manner. She stated that it is not the technology that creates an effective learning environment, but that in order for a learning environment to be effective, technologies must be integrated such that they will support the learners. In doing so, one will enhance the engagement of learners and focus on higher order thinking skills. Nataatmadja and Dyson (2008) pointed out that using podcasting alone will not revolutionize education but will instead give the students the knowledge they need to build on through their own discoveries.

Benefits of Podcasts on Learning

There are several benefits to the use of podcasts in online learning. As Lazzari (2009) pointed out in his study, students whose learning style is mainly auditory or visual would benefit from seeing and hearing videos that demonstrate their teacher's expressions, body language, tone, etc. This finding correlates with a study conducted by Fernandez, Simo, and Sallan (2009), who found through surveys conducted at the completion of their course that when a combination of teaching materials are used, such as auditory, visual, etc., the students improved and enhanced their learning process. One student in a survey response stated, "I found that being able to see 'real life' images etc., and listen to processes being talked about was far more beneficial than still images and text from books" (Hill & Nelson, 2011, p. 400). Panday (2009) mentioned that most people understand better with audio because "listening is instinctual, [whereas] reading and writing are not" (as cited in Chan and Lee, 2005, p. 62). In fact, Panday (2009) went on to mention that research has shown that content delivered with audio facilitates memory retention three times as much as text does. Where audio can be useful in conveying things such as feelings and attitudes, it is less effective in delivering facts.

As several other authors pointed out (Harris and Park, 2008; Donnelly and Berge, 2006; Nataatmadja and Dyson, 2008), the ability of students to use podcasts as a way to repeat lectures to pick up on points that may have been missed and the flexibility podcasts offer either of time or portability are also proving to be big benefits to their educational use. Sutton-Brady, Scott, Taylor, Carabetta, and Clark (2009) agreed with this, also mentioning additional benefits, such as the ability of non-native speakers to gain language clarification and the potential for mobile learning.

Malan (2007) took his study one step further allowing the public to also view his podcasts. What he found with his students was that while 45% of them were using the podcasts mainly as a way to review the lecture material, the public was actually using them as a tool to learn the concepts. In sharing these podcasts with the public, Malan gave anyone who desired, the opportunity to observe a Harvard lecture, giving those people that could not attend school (either because of location or financial reasons) the opportunity to still learn. Video podcasts, or vodcasts, can be created with a small budget and only moderate technology expertise (Brown and Green, 2007). The same could also be said for podcasts. Regardless, it is imperative that one weigh the cost of creating a podcast or vodcast against their effectiveness before putting forth the time, effort, and money.

Survey Feedback

There are numerous studies where the measure of success of podcasts has been shown through the results of a survey. However, the methods of sharing the podcasts with students in the courses vary from the recording of full lectures to only providing short, supplementary podcasts. Regardless of how the podcasts were used in the courses discussed, the majority of students surveyed in all of the studies, felt that the podcasts were beneficial to their learning. For example, Copley (2007) recorded full lectures in audio and video format, which he uploaded to his Blackboard Academic Suite and left for the students to view as needed. At the completion of the course, the students were asked to complete a survey on the usefulness of the podcasts. In regards to the audio only podcasts, the students gave their usefulness an overall rating of 4.4 on a five-point Likert scale (with 5= "very useful", p. 391). When answering questions regarding the video podcasts, their usefulness was rated higher than the audio only with an average score of 4.7 on the five-point Likert scale. The methods and findings of Copley's (2007) study are similar to

that of Malan (2007) who conducted a study for a Computer Science course in which audio and video podcasts were created for the lectures. These lectures were provided to the students to give them more portability of the course content and to involve them in the technology. The students were surveyed at the end of the course and the results were found to be positive overall. One student stated, "I think podcasting is a good idea. The more formats information is made available in, the better" (para. 2).

One study that was particularly interesting and also used full lecture recordings was conducted by an instructor who taught face-to-face physics courses (McDonald, 2008). He conducted the study because problem solving is such a large part of physics and when the students were busy taking notes, they had a hard time watching what example problems he was solving on the board. Or, they would copy down all the problems he was solving on the board, but not write down his explanation of how to solve them, so when the student was left on their own to study, they were not able to make sense of the material in relation to the problems that needed to be solved. In an effort to try and change the way his students would take notes, he started recording his live lectures and posting them for his students to download for up to 10 days following the live lecture. Of the 58 students that were surveyed in the course, 60% of those had downloaded at least one lecture. Of those students, 91% of them found the podcasts to be useful and the reasons for that finding ranged from reviewing notes taken to completing notes to reviewing difficult topics.

Vajoczki, Watt, and Marquis (n.d.) conducted a similar study, in which the students were all expected to attend face-to-face lectures. In addition to the live lectures, half of the class was given access to the full lecture podcasts and the other half of the class was not. The class was then surveyed to determine the answers to several questions, but the one that pertains to this

study was whether or not the podcasts improved their general understanding of the course material. More than 50% of the students surveyed in the podcast group stated that the podcasts did increase their understanding with less than 6% stating that it did not. The authors also pointed out that while only half of the class was given access to the podcasts, more than 30 students from the non-podcast sections gained access to the podcasts through someone that had access, which could demonstrate that there was a perceived value to the podcasts.

A study conducted by Goldberg and McKhann (2000) also showed positive results with their finding. Their study broke their class up into two randomly assigned groups. One group received the course content via traditional lecture, while the other group received their course content via a Virtual Learning Environment (VLE). A VLE is similar to a podcast in that the student is able to see and hear information being presented to them by the lecturer. One advantage to the VLE is that the learner may use multiple windows within the VLE to view the lecturer, the lecture material, demonstrations and even chat windows. Halfway through the course, the students were swapped to the opposite group, giving each student an equal opportunity with both the traditional lectures and the VLE. The students were asked to complete a survey at the end of the course. In this study as well, the results to the VLE were extremely positive. More than 70% of the students believed that the VLE was more effective in delivering course content than the traditional lectures. In a VLE, the content is denser, meaning the images and animations associated with the VLE are prepared in advance and displayed at the same time as the lecture, so there are no pauses at the blackboard like there would be in an actual lecture. The students also had control over the lecture delivery through the VLE, so they were able to rewind, fast-forward, return to previous segments, pause the lecture, etc. The positive responses to the above mentioned studies are contrary to studies performed by Fernandez, Simo, and Sallan

(2009) and Hill and Nelson (2011), who found that podcasting is a powerful tool when used as short supplements to lectures, but not as fully recorded lectures.

Van Zanten, Somogyi, and Curro (2012) conducted a study which was tailored to both on-campus students, as well as distance students. The on-campus students were able to attend a live lecture, where the distance students watched the full lecture podcasts on their computers. Both full lecture podcasts and short summary podcasts were provided to on-campus and distance students. What the researchers determined was that the students found benefit in both types of podcasts for different reasons. When asked how valuable the podcasts were for their understanding of the course, the full lecture podcasts viewed by distance students received a mean score of 6.5 and the short summary podcasts viewed by distance students received a mean score of 6.4. These results were based on a scale of 1-7 with 7 representing "strongly agree" (p. 134).

Similar to these studies was one conducted by Nataatmadja and Dyson (2008), with one difference in the study. That was the fact that the researchers never used actual lectures for the podcast, but instead created summaries of the lectures, which immediately followed the live lectures, to be used as supplements to the actual lecture. Where a normal lecture would last one hour and 20 minutes, the summaries ranged in length from 12 to 24 minutes and usually included extra materials and references the lecturer felt would be helpful to the students using the podcasts. The students were still encouraged to attend the live lectures and were awarded a certain number of points based on spot checks throughout the semester. Similar to the results of other podcast surveys, this one also showed the students found the podcasts useful. Their reasons included "helped understanding and filled in gaps" to "useful when preparing for tests" (p. 19), etc.

This study was similar to one conducted by Sutton-Brady, Scott, Taylor, Carabetta, and Clark (2009), in that it required students to attend a traditional lecture, but in this study, it offered podcasts to the students before the actual lecture as opposed to following the lecture. The podcasts ranged in length from 10 to 20 minutes and were primarily used as a way to orientate the students to the content of the lecture, which enabled the instructor to focus more of his time on the actual subject matter. The students were surveyed on the last day of the course and the results were extremely positive. When asked if the podcasts enhanced the students' learning, 96% of the graduate students and 86% of the undergraduate students surveyed strongly agreed with the statement.

While Chan, Lee, and McLoughlin (2006) conducted a study that focused more on the effect podcasts had on student anxiety and pre-conceptions, their results still showed the positive effect of podcasts. The podcasts created in their study consisted of three to five minute radio-type segments with either the lecturer or other students addressing concepts or issues the students may encounter in the course. Some of these segments included overviews of the upcoming lecture topics, assignment tips and hints, and copyright rules. While the podcasts they generated were not examinable, they were able to survey the students who had used these podcasts to determine their educational value. What they found was that most of the respondents either agreed or strongly agreed that the podcasts were educational and clarified the students' understanding of the subject.

Parson, Reddy, Wood, and Senior (2009) conducted a study that set out to determine the most effective method of distributing information to online learners. This meant they evaluated learner's feedback in relation to Power Point slides, vodcasts, and podcasts. Their study involved two phases. The first phase divided first-year students into three groups according to

the method in which they would be receiving their online material: Power Point slides, vodcasts, or podcasts. At the end of the six-week period, the students were asked to complete a survey evaluating their thoughts on the effectiveness of their method of learning content. In evaluating the first phase of students, podcasts proved to be the top-ranked item when asked which method added to their understanding, but 60.2% of the students thought that all three types of media should be available for the lectures. The second phase consisted of students in their second year of the program, who were unable to attend their usual lecture but were later given access to podcasts and vodcasts of the actual lecture. They, too, were asked to complete a survey at the end of the six-week period. The second-phase students answered similarly that all three methods would be used if they were made available. And the response to podcasts and vodcasts for the second phase of students was more positive than for the first-phase students. Vodcasts were actually given the most positive response in usefulness and helpfulness to their studies.

Cann's (2007) study found similar results, showing the video podcasts generated over five times the response rate when compared to audio files provided earlier in the course. Cann created podcasts that were supplements to the lectures and gave the students feedback on assignments and strategies for improvement. He pointed out that the students in his study found the video podcasts to be very influential. However, where his study differed from Parson, Reddy, Wood, and Senior (2009) was that Cann's (2007) students were not very receptive to the audio podcasts, where some of the students in Parson, Reddy, Wood and Senior (2009) study felt the podcasts to be the top-ranked item contributing to their understanding. Cann's (2007) findings are contrary to a study conducted by Lonn and Teasley (2009), which showed that students accessing podcasts actually downloaded the audio-only lecture podcasts more than either the video lectures or the slide shows with narration. In reviewing whether or not the audio

podcasts improved the students' learning, the responses based on instructors' and students' feedback was overall positive. There also was a positive response to the podcasts increasing scores on the students' grades, although there was no quantitative data to support this survey response.

Exam Score Evaluation

A study done by Kurtz, Fenwick, and Ellsworth (2007), used video podcasts as way to supplement material prior to students attending the actual class. The video lecture podcasts consisted of three different components: the instructor narrating slides, a group of students asking questions about the lecture, and the same students discussing questions the instructor asked. The idea behind this was that in watching the video podcasts before attending class, class time would be more suited to answering students' questions, problem solving, and working on the course project. This format was compared to the previous semester's course in which the students were required to attend live lectures, which were delivered using slide presentations. While the result of their study showed "no significant difference in exam performance," (p. 487) the final grades of the course were shown to have increased by 10%.

While Abt and Barry (2007) did not evaluate overall final grades in their course, their study did reveal final exam results that were similar to those in Kurtz, Fenwick, and Ellsworth (2007). Abt and Barry (2007) issued pre-tests and post-tests with which they evaluated the podcasts' effectiveness on student exams. After a pre-test, which was used to assess their knowledge, the students were randomly divided up into two different groups: a podcast group and a control group. Each group received the same information for the course, but one group received it through podcasts and the other group received the content in transcript form (control group). The podcasts and transcripts were used as a supplement to the regular teaching and

lectures, which consisted of 12 hours of face-to-face instruction. There were six podcasts produced for the podcast group that were in a format similar to radio (music, jingles, section breaks, etc.) and ranged in duration from five to 14 minutes. At the end of the course, the students were administered a post-test to see which groups' scores increased more. While both groups increased their scores on the tests, the difference was extremely small between the two groups, with the podcast scores increasing only 3% more than the text-only scores.

These results correlated to Lazzari's (2009) study, in which he demonstrated the students that were exposed to podcasting showed higher grades than the students who were not exposed to the podcasts. The students in his study not only had to listen to podcasts using a free, open source library, but they also produced podcasts. Exam results were compared between three different academic years with similar ages, gender, proficiency levels, and schooling background. While the students exposed to the podcasts showed higher grades, the differences between the scores were so small that there was no way to conclude with absolute certainty that the increase in grades was due to the podcasts alone. This finding is similar to Vajoczki, Watt, and Marquis (n.d.), who evaluated their podcast group versus the non-podcast group to determine whether or not the overall grades in the course increased with the use of podcasts. While the study showed that the number of As and Bs did go up with the use of podcasts, the increase was not significant. In addition to Lazzari (2009) evaluating test scores, he also distributed a survey to his students at the completion of the course, which addressed topics such as overall satisfaction, overall quality, etc., and showed that the survey results for the class that had been exposed to the podcasts were significantly higher than the two previous classes that had not been exposed to the podcasts.

In a study conducted by Goldberg and McKhann (2000), students in a neuroscience class were divided up into two different groups: one that received course content from a conventional lecture and another that received the same course content in a Virtual Learning Environment (VLE). Because the VLE is similar to a video podcast, the students were able to see and hear demonstrations and examples delivered via animation or the lecturer in order to give students a different perspective of the content. The students also had control over the content delivered via the VLE in terms of rewinding, fast-forwarding, etc. At the end of the course, the students were issued an essay-type exam. The results of the exam showed that scores were consistently higher for students of the VLE than scores of students in the lecture hall.

Hill and Nelson (2011) conducted a similar experiment with undergraduate university students, which incorporated six 15 to 20 minute video podcasts filmed from different field locations and made accessible through a VLE or online as a tool to download. The video podcasts were offered as a supplement to lecture material and were evaluated in effectiveness through surveys, focus groups, and reviews of exam results. What the study showed was no significant difference between exam scores of students in the course with podcasts versus students in a previous course without podcasts.

Conclusion

While the literature points to potential benefits of podcasting in higher education, there is little literature available when examining these benefits specific to online learning. What the majority of the literature did show was that the students' perceptions of the podcasts, used in any number of forms (as full lecture recordings, as supplementary material, as feedback for assignments, etc.) were positive overall. The test results for students using podcasts as opposed to those not using podcasts showed only a few positive results. Some of the studies conducted

showed little difference in exam scores, and the studies that did show a positive result in the score, mentioned the difference was so insignificant, it was hard to know whether it was the actual podcasts contributing to the increase in grades or not.

Chapter III: Methodology

The purpose of the study was to determine the students' perceptions of the custom podcasts, as well as their actual effectiveness in the DOS 422/522 Radiation Dose Calculations course in the UW-L online Medical Dosimetry program. More specifically, it looked at the results of the surveys of the students enrolled in the DOS 422/522 course to determine whether or not the students felt it was beneficial to have the custom podcasts presented in the course. Final exam scores also were evaluated to determine whether or not exam scores increased, decreased, or remained the same with the introduction of custom podcasts into the DOS 422/522 course.

Research Design

The research design for this study was quasi-experimental. A descriptive survey design was used to gather data on the variables. The independent variable was the incorporation of custom podcasts into a Desire2Learn (D2L) learning management system through an online Medical Dosimetry program. The dependent variables were the results of the survey questions and final exam scores. The control variables in this study were the instructor of the course, the course content, and the fact that all the students were online students as well as at the same place in the program.

Subject Selection and Description

Because the students in the study were formally admitted to the Medical Dosimetry program based on prior identified criteria (such as minimum GPA, minimum observation hours, letters of recommendation, etc.) this study used purposeful sampling. The population consisted of certificate and graduate students all enrolled in DOS 422/522 Radiation Dose Calculations during the spring semester of 2012. The class consisted of six females and nine males with

seven of the 15 students enrolled in a master's degree "track." The ages of the students ranged from 24 to 55. The primary aim of this project was to assess student perceptions of the video podcasts specific to their understanding of Radiation Dose Calculations, a required course within the UW-L online Medical Dosimetry program. The course covered information pertaining to the calculations of radiation dose to a specific point in the patient's body and how that dose is affected by beam modifiers, beam energies, and other factors.

Instrumentation

The survey tool used in this study was the Qualtrics tool. Qualtrics is a tool that is used throughout the UW-L and, because the students complete surveys using this tool for every course they finish, it also is one with which the students are comfortable working. The survey was developed by the researcher and a link to the survey was embedded directly into the content of the course. A note was placed in the "discussion" section of the course two days prior to the end of the course, which explained the purpose of the survey, provided the number of questions on the survey, and estimated the length of time to complete it. The survey was left open for two weeks following the last day of the course. The tool used to evaluate the final exam score was D2L. In an effort to determine which concepts for which to create custom podcasts, the researcher sent out an e-mail to the 2010-2011 academic class asking them for feedback regarding concepts for which they wished there had been custom podcasts available. The researcher also reviewed the final exam questions from that same cohort class to determine which questions received a score below 50%. A list was generated with common themes based on the questions that had received a score below 50% and was compared to the e-mail feedback from the students. The researcher worked with a physicist to try and create as many custom podcasts, which related to the concepts the students felt were needed, as possible. The podcasts

ranged in length from five to 25 minutes and were embedded in the appropriate text-based lectures through SoftChalk, as well as uploaded directly into D2L as independent files. The reason for uploading them directly into D2L as independent files was so the students would not have to read through the text-based lectures to find the custom podcast they were looking for.

Data Collection Procedures

Overall, there were 13 questions in the survey. The first 12 consisted mainly of single answers. Most of the questions in the survey were based on a five-point Likert scale and offered "strongly agree," "agree," "neither agree nor disagree," "disagree," and "strongly disagree." The exceptions to this were the first two questions in the survey, which tried to identify the number of times the podcasts were watched and in which section of the course they were watched (while reading through the text-based lectures in SoftChalk or as independent files), another question which asked for feedback on concepts they wished there had been custom podcasts created for, and the last question of the survey, which was open-ended and intended for general feedback from the students.

Data Analysis

Upon the survey close date, the researcher went in and identified the questions that directly related back to the questions in the study. There were 15 subjects enrolled in the DOS 422/522 Radiation Dose Calculations course and 11 survey responses were recorded, so each question relating to the study was broken down into overall percentages. The final exam consisted of 60 questions, for which the students were given 120 minutes to complete the exam. Students were given the opportunity to take the exam twice through the D2L system and their final score was based on the average of the two attempts. D2L broke down the test into overall

averages for the course, which was used to evaluate the current scores against the scores from last year's course.

Limitations

Several limitations in this study include the two-attempt offer for the final exam and the quality of the custom podcasts. It would have been ideal to evaluate the students on the first attempt for the exam, but in an effort to keep everything else in the course the same as it was for the previous course, against which the scores were evaluated, it was decided to leave the final exam as a two-attempt exam. The custom podcasts created were done by a single physicist with the help of only one information technology (IT) person, as opposed to a professionally recorded podcast with a studio of people.

Chapter IV: Results

The purpose of the study was to determine the students' perceptions of the custom podcasts, as well as their actual effectiveness in the DOS 422/522 Radiation Dose Calculations course in the UW-L online Medical Dosimetry program. More specifically, it looked at the results of the surveys of the students enrolled in DOS 422/522 to determine whether or not the students felt it was beneficial to have the custom podcasts presented in the course. Final exam scores also were evaluated to determine whether or not exam scores increased or decreased with the introduction of custom podcasts into the DOS 422/522 course.

Subject Selection and Description

Because the students in the study were formally admitted to the Medical Dosimetry program based on prior identified criteria (such as minimum GPA, minimum observation hours, letters of recommendation, etc.) this study used purposeful sampling. The population consisted of certificate and graduate students all enrolled in DOS 422/522 Radiation Dose Calculations during the spring semester of 2012. The class consisted of six females and nine males with seven of the 15 students enrolled in a master's degree "track." The ages of the students ranged from 24 to 55. The primary aim of this project was to assess student perceptions of the video podcasts specific to their understanding of Radiation Dose Calculations, a required course within the UW-L online Medical Dosimetry program. The course covered information pertaining to the calculations of radiation dose to a specific point in the patient's body and how that dose is affected by beam modifiers, beam energies and other factors.

Amount of Times the Podcasts Were Viewed

The first question on the survey addressed how many times the students watched the podcasts. Of the 11 respondents that participated in the survey, 10 (91%) of them watched the

podcasts at least one to two times, with the 11th person stating they only watched some of the podcasts that were offered. Of the 10 students that watched them all, four of them (36%) responded that they watched them more than two times each.

When the Podcasts Were Viewed within D2L

Because the podcasts were embedded directly into the text-based lectures offered through SoftChalk, as well as independent files within the content section of D2L, the researcher wanted to establish whether or not the students took advantage of the independent podcasts. When the students were asked when they watched the podcasts, it was discovered that three out of the 11 (27%) of them only watched the podcasts that were embedded directly within the text-based lectures. While this has no bearing on the overall perceived effectiveness of the custom podcasts within the course, it is indicative that not all students took advantage of the independent podcasts located within the content section of D2L. However, eight out of the 11 (73%) of the students surveyed did, in fact, use the independent custom podcasts. This question is directly associated to question number eight in the survey, which stated, "I preferred having the direct link to view the podcasts in the content section of the course vs. having to read through the lectures to gain access to the podcast," where eight out of 11 (73%) of respondents either agreed or strongly agreed with this statement.

Understanding the Concepts Covered

Questions four and six related directly to students' understanding of the concepts covered within the DOS 422/522 course. Question four stated, "I feel I would have learned more in this course if there had been more podcasts." In response to this question, eight out of 11 (73%) students either agreed or strongly agreed with this statement, whereas the remaining three respondents neither agreed nor disagreed with the statement. Tying into this same idea was

question number six, which stated, "There were some concepts I felt I would have understood better if a podcast had been used." The responses to this question were somewhat similar to question four, where the 73% of respondents either agreed or strongly agreed with this statement. However, one person out of the 11 (9%) that completed the survey actually disagreed with this statement.

Perceived Benefit of the Podcasts

Question number nine on the survey stated, "Overall, I thought the podcasts were helpful." One hundred percent of the students that responded to the statement agreed with it and an overwhelming majority of the students (91%), even strongly agreed with this statement (Table 1). This demonstrates that there is a perceived benefit to adding custom podcasts to online courses. Similar to this question was question number 13, which stated, "I would like to see more podcasts incorporated into other courses within the Medical Dosimetry program." Again, 11 out of 11 (100%) respondents indicated that they agreed with this statement, with 73% of them strongly agreeing (Table 2). While the answers to these questions seem to prove an overwhelming benefit to the inclusion of podcasts in the DOS 422/522 Radiation Dose Calculations course, there were still the final exam scores to evaluate in order to determine their *actual* effectiveness.

Table 1

Overall, I thought the podcasts were helpful

#	Answer		Response (n=11)	%
1	Strongly Agree		10	91%
2	Agree		1	9%
3	Neither Agree nor Disagree		0	0%
4	Disagree		0	0%
5	Strongly Disagree		0	0%

Table 2

I would like to see more podcasts incorporated into other courses within the Medical Dosimetry

program

#	Answer		Response (n=11)	%
1	Strongly Agree		8	73%
2	Agree		3	27%
3	Neither Agree nor Disagree		0	0%
4	Disagree		0	0%
5	Strongly Disagree		0	0%

Review of Final Exam Scores

When reviewing the class average final exam score from the previous year's class (2010-2011) to the current class (2011-2012), the results showed that when averaging the two final-attempt scores together, the overall average of the class was actually lower in the current class

with the use of custom podcasts as compared to the previous year's class without podcasts. The exam averages were 89.28% for the non-podcast course and 88.74% for the podcast course, which shows very little difference, but still a decrease in scores nonetheless. When the researcher went back and averaged the first attempt only for the final, there was an even larger percentage difference in comparing exam scores. The first-attempt average score for the non-podcast course was 82.64%, whereas the first-attempt average score for the custom podcast course was 76.24%, indicating that the podcasts made no difference at all in actual effectiveness when evaluating final exam scores.

Perceived Versus Actual Effectiveness

One of the last questions on the survey stated, "I feel I scored higher on the final exam with the use of podcasts than I would have without the podcasts." In reviewing the results, eight out of 11 students (73%) responded that they would either agree or strongly agree with this statement, leaving 27% of the students neither agreeing nor disagreeing (Table 3). None of the students that responded to the survey disagreed with the statement, which leads one to wonder what the scores of the current class would have been without the custom podcasts in the course.

Table 3

I feel I scored higher on the final exam with the use of podcasts than I could have without the podcasts

#	Answer		Response (n=11)	%
1	Strongly Agree		6	55%
2	Agree		2	18%
3	Neither Agree nor Disagree		3	27%
4	Disagree		0	0%
5	Strongly Disagree		0	0%

Chapter V: Discussion

The purpose of the study was to determine the students' perceptions of the custom podcasts, as well as their actual effectiveness in the DOS 422/522 Radiation Dose Calculations course in the UW-L online Medical Dosimetry program. More specifically, it looked at the results of the surveys completed by the students enrolled in DOS 422/522 to determine whether or not the students felt it was beneficial to have the custom podcasts presented in the course. Final exam scores also were evaluated to determine whether or not exam scores increased or decreased with the introduction of custom podcasts into the DOS 422/522 course. The study was conducted to determine the answers to the following research questions:

1. Did the final exam scores offered in the 422/522 Radiation Dose Calculations course increase with the use of custom podcasts?

2. What are the students' perceptions of the value of the custom podcasts?

3. How do the students think they would have performed on the final examination without the use of the custom podcasts?

The basic design for this study was quasi-experimental and a descriptive survey methodology was used to collect the data. The independent variable in the study was the incorporation of the custom podcasts into the course. The dependent variables were the responses to the research questions listed above, as well as the final exam scores. The control variables included the instructor of the course, the course content, and the fact that all the students were online students as well as at the same place in the program. The subjects in the study were all formally admitted to the Medical Dosimetry program based on prior identified criteria (such as minimum GPA, minimum observation hours, letters of recommendation, etc.) this study used purposeful sampling. The population consisted of certificate and graduate

students all enrolled in DOS 422/522 Radiation Dose Calculations during the spring semester of 2012. The class consisted of six females and nine males with seven of the 15 students enrolled in a master's degree "track." The ages of the students ranged from 24 to 55. The survey was open for the students to complete in the last two days of the course and was left open for two weeks following the completion of the course. There was a link to the survey embedded directly into the course.

The survey was performed through the Qualtrics system and consisted of 13 questions. The majority of the first 12 questions were single answer, using mainly five-point Likert scale answers ranging from "strongly agree" (1) to "strongly disagree" (5). Two of the questions were open-ended intended for student feedback. Upon the survey closing, the researcher was able to go back into the survey to review and compile the results. The results were used to evaluate the key questions within the research study. The final exam scores were averaged over the entire class and compared to the previous year's students that did not have the custom podcasts incorporated into the course.

Limitations

The DOS 422/522 Radiation Dose Calculations course previously relied heavily on the use of text-based lectures. In an effort to try and increase the students' understanding of the difficult concepts covered within the course, custom podcasts were created and incorporated into the course. The study was done to determine whether or not they were actually effective by evaluating final exam scores of two different classes of students-one with the custom podcasts and one without. There were certain limitations to this study.

Limitation 1: Because the UW-L represents only one of two online Medical Dosimetry program in the United States, there were no other direct studies to compare the students' perceptions and evaluation of test scores for the use of podcasts within the course.

Limitation 2: Due to cost issues with creating professional podcasts, they were made with free computer tools and had little esthetic effect.

Limitation 3: This study only included a small sample of students. There were 15 students in the current class compared to 16 students in the previous course. A larger sample size may have shown different results.

Discussions

When reviewing two research questions that stated, "There were some concepts I felt I would have understood better if a podcast had been used," and "I feel I would have learned more in this course if there had been more podcasts," it was discovered that the majority of the class did, in fact, feel that a podcast would have been helpful in clarifying certain concepts via a custom podcast. This finding is consistent with the studies performed by Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009) and McDonald (2008), which demonstrated that it was beneficial when students were able to connect the information they learned through their readings with the information they were seeing. The study conducted by Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009) showed that the use of podcasts for delivering instructions was used as a way to help students complete assignments. The study by McDonald (2008) demonstrated that allowing students access to lecture podcasts helped them solve complex physics problems they may have missed during the class. In response to the second question, "I feel I would have learned more in this course if there had been more podcasts," 72% of respondents agreed or strongly agreed with this statement, further emphasizing the need for

more podcasts to be included into the online environment. Due to the complex nature of the DOS 422/522 Radiation Dose Calculations course, there are many areas where the concepts could be considered confusing to the subjects. This knowledge, together with evaluating the responses to the survey questions, could support the idea of more podcasts being incorporated into the course.

Another question that asked whether the subjects felt that overall the podcasts were helpful showed that all 11 students that responded to this question (100%) agreed that overall, the podcasts were helpful (with 91% of them strongly agreeing). This finding correlated with the research performed by Evans and Champion (2007), which stated, "…instructional planning + electronic media = excellent instructional delivery" (p. 75). Cebeci and Tekdal (2006) also discussed the topic of podcasts in online learning by stating that podcasts should be designed so there is a blending of instruction and technology. By incorporating the podcasts into a Learning Management System (LMS), as well as directly into the lectures, students are able to correlate the desired learning to the understanding of the material. While both of these studies discussed "instruction" through podcasting and planning with technology, one would hope that through this excellent instruction using the inclusion of custom podcasts, the students would find the use of this technology to be helpful to their material. The study by Brown, Brown, Fine, Luterbach, Sugar, and Vinciguerra (2009) supported this by showing that students found podcasts used in all areas of instruction to be helpful. Through careful planning and the incorporation of podcasts into a LMS, students will hopefully gain more knowledge and continue to find the use of podcasts to be helpful. Because of the complexity of the courses within the Medical Dosimetry program, more effort needs to be put into the creation of podcasts into all of the courses to help the students have a better understanding of the material being presented.

The question, "I feel I scored higher on the final exam with the use of podcasts than I could have without the podcasts" showed that 73% of the respondents either agreed or strongly agreed with this statement. What is interesting to note is that when evaluating the final exam scores of the current class to last year's class, without custom podcasts, the exam scores actually decreased. The decrease in the students' scores on the final exam is contrary to what Beylefeld, Hugo, and Geyer (2008) found with their exam scores. Upon looking at questions answered specific to their podcast topic, the marks were significantly higher than the modules used without podcasts. Hill and Nelson (2011) showed their exam results showed no significant difference in scores in courses with podcasts added as supplementary material and those offered without podcasts.

The last survey response pertaining to this study was the one which stated, "I would like to see more podcasts incorporated into other courses within the Medical Dosimetry program." Either because the students' perceptions were such that the custom podcasts helped them to score better on the exam, or simply because they enjoyed them, they were interested in having more custom podcasts created in other courses within the online Medical Dosimetry program. This response correlates back to the studies performed by other researchers (Beylefeld et al., 2008; Copley, 2007; Sutton-Brady, 2009; Parson et al., 2009;), which showed the majority of their respondents indicating they would like podcasts in other modules too.

Conclusions

The use of the custom podcasts in the DOS 422/522 Radiation Dose Calculations course showed that most students felt the custom podcasts were beneficial to their learning within the course. However, regardless of this perception, the class of students being evaluated actually had an overall lower average score on the final exam when compared to the previous students'

scores, which did not include custom podcasts. Based on the findings of this study, several conclusions were drawn. Probably most important, was that the students agreed overall that the use of the podcasts within the course was helpful. The students indicated they would not only like to have more podcasts incorporated into more courses within the Medical Dosimetry program, but they also felt they scored higher on the final exam, as well as felt as though they gained more from the course with the use of the custom podcasts versus without them. However, when looking at the scores of the final exam, the podcasts were actually shown to have no positive correlation to their scores.

Recommendations

Based on the findings and conclusions of this study, several recommendations were proposed: further research should include the amount of times the students view the podcasts and when they view them (e.g., reading through the lectures, before taking a quiz). Also, a survey should be conducted regarding the length of the podcasts to try and determine how long a podcast can be before the student will quit watching it. Lastly, further research should evaluate the type of learner a student is through the use of a questionnaire and evaluate their specific exam results to determine if the audio and visual learners' scores would increase on the final exam with the use of custom podcasts.

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