4-9-2018

IMPACT OF PODCASTING ON LEARNING OUTCOMES IN ASSOCIATE DEGREE NURSING STUDENTS

Daira D. Wilson
University of Texas at Tyler

IMPACT OF PODCASTING ON LEARNING OUTCOMES IN ASSOCIATE DEGREE NURSING STUDENTS

by

DAIRA WILSON

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Nursing
School of Nursing

Barbara K. Haas, Ph.D., R.N. Committee Chair

College of Nursing and Health Sciences

The University of Texas at Tyler
February 2018

The University of Texas at Tyler
Tyler, Texas

This is to certify that the Doctoral Dissertation of

DAIRA WILSON

has been approved for the dissertation requirement on
February 2018
for the Doctor of Philosophy in Nursing degree

Approvals:

Dissertation Chair: Barbara K. Haas, Ph.D.

Member: Jenifer Chilton, Ph.D.

Member: Jerri Post, Ph.D.

Member: Travis Irby, Ph.D.

Chair, Department of Nursing

Dean, College of Nursing

Acknowledgements

Completing this journey has been one of the most difficult things I have ever done and it would not have been possible without the support of my chair, Dr. Barbara Haas. She provided me with the strength and courage that I needed to continue, even when I did not think that I could keep going. Thank you to Dr. Jenifer Chilton who held my hand when I needed her most. I also want to thank my committee for their wonderful suggestions on how to make this project the best that it could be. Thank you to my friends Kathy and Kelle, who walked most of this journey with me and gave me encouragement all along the way. Thank you also to my friends Heather and Liz, who provided much needed “breakfast taco therapy.” I am so thankful to my parents who encouraged me to start this journey and supported me emotionally and financially throughout. I have to reserve the biggest thanks to my family. Steve, you took the kids to the movies and to the park, you cut up apples and made dinner, all so I could have time to study. Most of all, though, you provided me with the support that I needed and you believed in me even as my own faith wavered. Thank you to my children, Maley and Bryce, for understanding when Mommy could not be there all of the time but loving me anyway. This is for you.

Table of Contents

List of Tables

List of Figures

Abstract

IMPACT OF PODCASTING ON LEARNING OUTCOMES IN ASSOCIATE DEGREE NURSING STUDENTS

Daira Wilson

Dissertation Chair: Barbara Haas, Ph.D.

The University of Texas at Tyler
February 2018

The dawn of the Information Age has provided rapid advances in technology that have improved lives and produced better tools for caring for each other. Nursing has begun to employ many of these new technologies and nurses are at the forefront of deciding how these innovations might best help patients. New technologies have made their way into schools of nursing and students are benefitting from improved learning experiences. Nursing faculty are leading the way in providing new learning opportunities to students through a multitude of technological advances. One of these advances is podcasting. Podcasting provides students the ability to listen, watch, download and manipulate content in ways that best serve their learning needs.

The purpose of this program of study was to examine how technology impacts nursing practice and education. A state-of-the-science paper explored the use of wearable technology as well as provided guidance into how nurses can develop more of these devices. This data ignited a desire to learn about how technology, specifically podcasting, is used in nursing education through the experiences of faculty as well as students. Results from this analysis led to a quasi-experimental research study delving into the use of podcasting for Associate Degree Nursing

students. While the results did not reveal a statistically significant improvement in outcomes, a close analysis of the data suggests that further research is warranted to determine if the use of podcasting as a learning supplement may benefit future generations of nursing students.

Keywords: *podcasts, nursing, technology, education, wearables*

Chapter 1

Overview of Program of Research

The impact of technology in health care is evident and new innovations now keep people safer and healthier than ever before. Technological advances such as heart monitors, continuous oxygen saturation devices and administration of medications through barcode scanning are providing information on improvements in patient safety and the quality of outcomes. New software systems and wearable devices are designed to ease the burden on health care workers and reduce the amount of time taken to perform many tasks. Electronic health records that connect health care providers with each other as well as with patients provide a way to link patients with their own health. Digital health devices such as electronic tablets and laptop computers are used in hospitals and clinics and information can be relayed to providers, patients and other involved parties such as caregivers to gather data about patients in real time, allowing caregivers and providers to respond to changes in status immediately. The Institute of Medicine (2017) states that "applications of digital health are being used to reduce inefficiencies, improve access, reduce costs, increase quality and personalize care." Nurses are at the center of much of the technology being used, but it is not clear how the nurses are affected by the prevalence of technology.

The first step in this program of research included an exploration of wearable technology and its use by nurses and other healthcare providers. Simulation in nursing education, adoption of digital medication systems, electronic health records, and wearable technologies in the fields of cardiac monitoring, stroke rehabilitation, seizure detection, hand hygiene monitors and virtual reality goggles that improve gait disturbance were reviewed. Recommendations for how nurses can be leaders at the forefront of driving new technologies through the development of products

and the understanding of the patent process were offered. Results of this overview are reported in chapter two, "*An Overview of the Application of Wearable Technology to Nursing Practice*," and published in Nursing Forum (Wilson, 2016).

Understanding the uses and application of wearable technology led to questions on how nurses are introduced to new technologies as students. Nursing employers may have expectations that graduates have utilized a variety of technological innovations during nursing school, easing the transition into practice. The use of new technologies to be used in nursing education is an area that is suitable for further exploration. One such innovation is the incorporation of supplemental educational support in the form of podcasting to improve understanding and student learning outcomes. An exploration of the use of podcasts in nursing education is reported in chapter three, titled "*The Evolution of Podcasting in Nursing Education.*" Podcasts have become a viable method of instruction in nursing programs over the past 10 years (Abate, 2013; Forbes & Hickey, 2008; Greenfield, 2011; Kardong-Edgren & Emerson, 2009; Kemp, Myers, Campbell & Pratt, 2010; McKinney & Page, 2009; Schlairet, 2010; Vogt, Schaffner, Ribar & Chavez, 2010). The current generation of nursing students are digital natives and tend to see technology as a "necessary tool for everyday life" (Forbes & Hickey, 2008). The use of podcasting as either a supplement to nursing content or as a replacement for traditional lecture was found to be an effective means of improving satisfaction with nursing courses as well as helping to review before an exam (Kardong-Edgren & Emerson, 2010; McKinney & Page, 2009). Students also felt a closer presence with instructors through the use of podcasts. However, of the studies reviewed, the majority used subjects who were BSN or graduate nurses. Very little research included Associate Degree nursing students, representing a gap in the literature.

Therefore, as the next step in this program of research, a quasi-experimental study was undertaken determine the effect of podcasting on test grades and explore student satisfaction and usage of this technology. Results of this study, *"The Impact of Podcasts on Learning Outcomes in Associate Degree Nursing Students"*, are reported in chapter four.

Theoretical Framework

The research study was guided by the Uses and Gratification Expectancy Theory (UGET) by Mondi, Woods and Rafi (2007). The primary questions addressed by the UGET are how and why students use e-learning resources to satisfy their educational needs (Mondi, Woods & Rafi, 2008). The constructs of this model are the relationships between the needs and expectations of the learner and how these needs and expectations can influence the attainment of learning goals. These needs include cognitive, affective, personal integrative, social integrative and entertainment needs (See Figure 1).

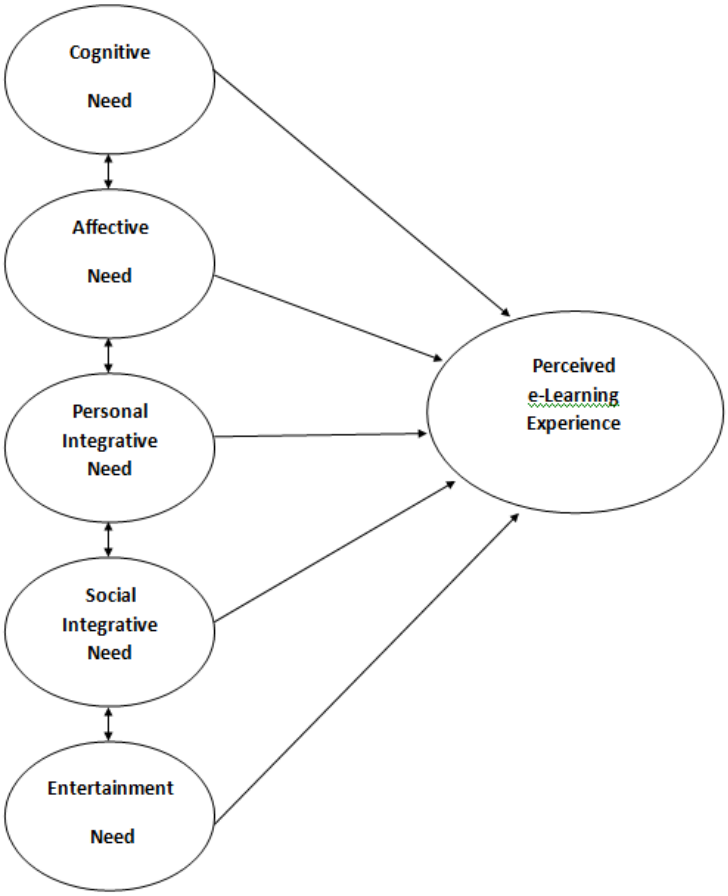

Figure 1. Uses and Gratifications Expectancy Theory

The perceived e-learning need is the personal motivation to use podcasts as an educational tool and was measured by two unit exam grades and the final exam grade as well as student perception of their acquired knowledge on a survey. The cognitive need, which is the need to seek out information and knowledge to reach learning goals was fulfilled by the intervention of the podcasts and the transcripts of the podcasts. The affective need is the degree of satisfaction, pleasant feelings and emotional fulfillment derived from using e-learning resources for educational purposes. Students expect to enjoy using e-learning resources for educational purposes (Mondi et al., 2008). The personal integrative need is the need for personal control as a self-regulated user of e-learning resources that includes when, how and why one uses

the resources. Students expect e-learning will facilitate self-paced and self-directed learning (Mondi et al., 2008). The social need is the need for social collaboration in order to integrate their e-learning resources into their learning process. Students expect social interaction and para-social presences associated with electronic media (Mondi et al., 2008). These include interactions such as those between instructor and student. The entertainment need is the tendency to seek e-learning resources that are fun and exciting, or soothing and calming. Students expect e-learning resources to be fun, exciting and entertaining (Mondi et al., 2008).

Overview of the Research Study

Prior to initiating the quasi-experimental study, Institutional Review Board (IRB) approval was obtained from the University of Texas at Tyler IRB (Appendix A) and the Austin Community College IRB (Appendix B). Following IRB approvals, students enrolled in a second semester nursing course were invited to participate in the study. Those willing to participate signed informed consents (Appendix C).

The learning style of each participant was determined by accessing the learning style assessment that is part of the Health Education Systems, Incorporated (HESI) that each student completed prior to admission. Learning styles refers to "methods of gathering, processing, interpreting, organizing and thinking about information" (Meek, Lee, Jones, Mutea & Prizevoits, 2012). Learning styles could influence how student learn best; thus this data was examined in relation to the learning boosts as well as satisfaction measures. According to HESI (2018), six learning styles are defined as:

1. Visual: Learn best by seeing. Sit in the front of the class. Associate pictures and skills to concepts. Spend time observing others and planning before taking action.

2. Auditory: Learn from general concepts to specific concepts. Reads books and study materials aloud and puts facts into songs. Enjoys verbal instructions.
3. Kinesthetic: Likes to experiment with knowledge obtained and learns best by being involved. Practice tests are helpful and does well in learns best when engaged in active movement.
4. Cognitive: Obtains information best that has personal meaning. Finds ways to make both clinical and classroom content meaningful. Needs to think concepts through and relate the information in own words.
5. Analytical: Likes things done in an orderly manner. Pays attention to details and likes preparation. Finishes one thing at a time and is logical, self-motivated, objective and consistent.
6. Global: Sensitive to others and flexible. Learns best by discussing and working with others. Sees the big picture and can read between the lines. Likes to give and receive praise.

On the last class day, participants completed a Learning Boost Survey that included questions related to use of and satisfaction with the learning boosts along with demographic data to capture specific characteristics of participants (Appendix D).

Finally, chapter five summarizes this program of research and offers recommendations for nursing education and future research. The use of technology in nursing, both in practice as well in educational settings, continues to provide new and innovative strategies to improve patient health and safety as well as to assist students in reaching educational goals. One challenge in nursing research is to continually push the boundaries of current technology to help guide nurses and to open up the possibilities of advances in the future. This program of research

is one path to providing nurses, nurse educators and students with the means to use these advances to provide excellent care.

Chapter 2

An Overview of the Application of Wearable Technology to Nursing Practice

Abstract

Problem: Wearable technology is here and nurses are going to be increasingly responsible for patients who use it. Most research in this area has been done in other fields and now is the time for nurses to be more involved in this promising technology to improve patient lives.

Methods: This paper synthesizes the current state of wearable technology, a brief history of nurse satisfaction with technology, current research about wearable technology and implications for its future use in nursing.

*Findings**:*** Other areas in healthcare are already employing wearable technology to improve gait in people with Parkinson's disease, provide automatic defibrillation in cardiac patients and monitor post-stroke rehabilitation. Nurses can be on the front lines of designing and patenting new ideas to improve the lives of their patients.

Conclusions: Nurses have always adopted the newest technologies such as electronic health records, electronic medication administration records, and simulation experiences in education. Wearable technology is the next step in this journey and the possible uses are endless. Involving patients in their own care is a major goal of nursing and more research is needed to connect patients and their caregivers to the benefits of wearable technology.

Keywords: wearable technology, electronic records, simulation, patents, innovation

An Overview of the Application of Wearable Technology to Nursing Practice

Nursing and health care are changing and evolving every day and one of the biggest changes that nurses face is the impact of technology on nursing practice. New technology is arriving each day that pushes the boundary of possibility. New devices are being developed to help people live healthier lives and to know their bodies better through a complex network of interrelated tools. We have entered an age of wearable technology; and if you are not currently wearing something that is connected to the internet, the chances are, you will be soon.

The "Internet of Things" (Burrus, 2015) is a personalized network of connected devices. Many people already have cell phones, computers, tablets, or other devices that connect them to the outside world. It is only a matter of time before these personal devices will be wearable and able to capture data about that can then be shared with others, such as friends, family and healthcare providers. The Internet of Things is significant because "an object that can represent itself digitally becomes something greater than the object by itself" (Technophobia, 2015). Professional nursing must be involved in the process of evolving and applying digital equipment which can have a profound effect on health and well-being. The era of "Big Data" is here, and gathering patient information through data capture on their personal wearable device has the potential to inform treatment decisions of health care providers at many levels.

The Institute of Medicine's (IOM) recent statement that "health providers should place a higher premium on fully involving patients in their own care" (IOM, 2012, p. 3) is a call to action to build more networks that integrate patients, as well as their wearable devices, and health care providers to connect and improve care. Wearable technologies are any devices worn on the body that can capture data such as heart rate, gait abnormalities, heart rhythms, number of

calories burned, and even hours slept. These devices can then be networked together with other devices allowing caregivers, care providers, and even friends and family to monitor functioning and have historical records on a day-to-day or minute-by-minute basis. Information from the sensors in the devices is sent to specified persons of interest via the internet. Nurses must be on the front lines of using this technology because so many clinical decisions rely on the subjective assessment data, which is the hallmark of nursing's contribution to the health of patients. Wearable technology allows for data capture that is reliable and easy to retrieve and uses objective measures to enhance clinical decisions.

Nurse Satisfaction with Technology Changes

Nurses have been inundated with technology advancements in the clinical setting for the past decade. Studies have shown varying degrees of tolerance and satisfaction with innovation. The willingness and adeptness of nurses to engage with technology advancements may be one indicator of how they will relate to the idea of wearable technology for health monitoring and promoting healthy outcomes. Early adopters of technology may have an easier path to accepting the newest innovations while nurses who lag behind and resist new innovations could face challenges as the world of health care technology continues to explode with new devices to help patients. The following discussion of the most profound innovations in healthcare will center on use of simulation in nursing education, acceptance of digital medical systems, and adoption of electronic health records. Barriers and problems will be reviewed along with studies of nurse satisfaction with the innovations.

Simulation in nursing education.

Today's nursing students are engaging in technology to gain experience with patient conditions through the use of simulation. Simulation is a burgeoning industry embraced by

nursing education which provides a link between theory and practice in a safe environment for students. As clinical space becomes more difficult to find, nursing schools are turning more frequently to simulation labs to reinforce their teachings and to provide hands-on practice for students. Because many students are familiar with technology, the transition and learning curve for adopting and using simulation technology is not difficult for them. The use of mannequins which are networked to simulation programs and the internet provide sights, sounds, and even smells to students which enhance the "real world" experience. More and more schools are using high-fidelity mannequins which allow students to practice assessments, prioritize care, practice IV starts, listen for abnormal breath sounds, and even deliver babies. Students routinely engage in a digital world, and not surprisingly, have shown wide acceptance of simulated lab experiences.

A study focusing on perceptions of high- and low-fidelity simulation methods looked at satisfaction as well as self-confidence scores after different methods of simulation were used in a nursing school lab (Tosterud, Hedelin & Hall-Lord, 2013). Eighty-six baccalaureate nursing students from years 1-3 were grouped receiving either a paper and pencil simulation, a static mannequin simulation, or a high-fidelity simulation. The findings revealed that regardless of education level, students were satisfied with the experience and felt that they had achieved self-confidence in learning. The year one students reported a mean score of 3.89 for overall satisfaction, the year two students reported a score of 3.80 and year three students reported a mean score of 3.95. The findings also showed that students were satisfied with the simulation regardless of the kind of simulation experience, indicating that methods using low to high fidelity could be used in nursing education at all levels. Nurses may be able to adapt to technology more easily if they are exposed to it early in nursing school.

Using computerized simulation tools to engage students in learning is an important step in increasing adaptability to healthcare technology for students. Fonseca et al. (2015) used an exploratory descriptive study to look at 14 nursing students' perceptions of an educational, computer-based simulation using a program called e-Baby. In the e-Baby simulation, the virtual pre-term baby presents with varying levels of respiratory conditions to which the students must respond. The students, all of whom had a desktop or a laptop computer, had to choose appropriate assessment tools for oxygenation of the pre-term infant, answer questions about the interaction with the baby and make decisions based on the information. The results of data showed that 100% of the students found the technology to be easy to use and all of them either agreed or totally agreed that the time of access to e-Baby was satisfactory to enrich their learning. Barriers to the simulated experience indicated by the students included occasional difficulty in accessing the program on some computers and desiring more time with the professors to answer questions after the experience. Satisfaction with new technologies such as computerized simulations with a population of nursing students can pave the way for future adaptation by nurses of technological developments.

Acceptance of digital medication systems.

The first electronic medication administration (eMAR) system was developed in 1995 by the Veteran's Administration Medical Center in Topeka, Kansas and has since been adopted across the country. This technology was developed to help decrease medication errors, streamline the medication administration process, and improve documentation (Moreland et al., 2012). The basic premise of the eMAR is having medications entered into a database and electronically identified by a barcode. The process of giving medications involves a nurse scanning the barcode on a patient's wristband and then scanning the barcode on the medication

to be given. The computer verifies the link between the patient and the correct medications allowing for a final medication check to be completed before the nurse safely administers the medication. The eMAR allows nurses to verify the five rights of medication administration, check the doctor's order, and document the medication administration while also providing links to such data as laboratory values, pain levels and vital signs (Moreland et al., 2012). Satisfaction rates in the adoption and implementation of the eMAR system have improved with increased time since implementation and modifications made to the system in response to feedback.

In a study by Culler, Jose, Kohler and Rask, (2011), medical-surgical nurses and ICU nurses were interviewed 6 and 18 months after implementation of an electronic medication administration system. Low rates of satisfaction with key functionality of the eMAR improved over the 18 month study. Satisfaction with slow logon features went from 15.4% at the beginning of the study to 92.3% after 18 months. Similarly, the satisfaction rates with a cumbersome co-signing process went from 30.7% to 92.3% and satisfaction with the application of standardized medication times went from 23.1% to 76.9% by the end of the study. While the satisfaction of excessive logon time increased, one barrier that remained an issue was the inability to logon with badges to the eMAR system. Nurses gave feedback to IT administrators and modifications to the system were made over the duration of the study. As nurses became accustomed to the technology and the technology improved, satisfaction rates also improved.

Time also played a factor in nurse satisfaction with electronic medication administration records and traditional, paper-based medication administration records. In a sample of 719 nurses, the electronic version of the MAR was associated with perceived improvement in overall nurse satisfaction, workload, teamwork, ease of documentation, drug information accuracy and patient safety across time periods of baseline, three months and six months after implementation

(Moreland et al., 2012). A barrier identified in the study was the nurses' perception of communication with pharmacy. The results found that communication was unchanged in the trends across time. Adoption of new technology may be influenced by a variety of influences such as previous use of other systems, like a paper-based system, age of the user, or the perceptions of nurses in how implementation affects patient safety. Despite barriers with the implementation of new technology, nurses consistently show increased results over time as they become more comfortable with the new systems.

Adoption of electronic health records.

Adoption and implementation of electronic health records (EHR) has been occurring for the past 30 years in an effort to ease transfer of patient data between health care providers as well to improve accessibility of information from multiple locations. Many nurses have had a love/hate relationships with early forms of electronic health records but recent research suggests that time with any new system is an important consideration for positive perceptions. Early studies of barriers to implementation and adoption of EHRs focused on physicians only (Ayatollahi, Mirani & Haghani, 2014) and included barriers such as limited training with EHRs, limited manpower in the health technology department to facilitate implementation, lack of provider willingness to learn a new computer system and security fears such as unauthorized access to patient records. Recent studies have included not only nurses but also nursing students and their perceptions and acceptance of electronic health records and ease of use.

Intensive care unit (ICU) nurses' acceptance of the EHR was studied by Carayon et al. (2011) in two cross sectional survey questionnaires given to the ICU nurses at 3 months and again at 12 months after EHR implementation. The variables on the questionnaire instrument measured technology acceptance, EHR usability and EHR usefulness. The results showed that

the ICU nurses' acceptance of the EHR technology was positive and improved over time indicating that the nurses became more familiar with the system and its functionality. Feedback was elicited from some of the ICU nurses and clinicians during the implementation process at regularly scheduled meetings and pilot testing. Because many nurses in a variety of settings use an electronic health record on a daily basis, feedback on satisfaction and ease of use are important factors to consider for designers of EHRs as well as any future healthcare technology and applications.

Adoption of new technology by students while they are in nursing school may positively influence adoption of that technology as they enter the workplace as new nurses. Nursing student experiences of using electronic health records in the clinical setting was the focus of a study that used a mixed methods design using questionnaires and focus groups of 17 nursing and midwifery students (Baillie, Chadwick, Mann & Brooke-Read, 2012). The themes presented in the study were on benefits of EHRs for care delivery and concerns about EHR systems. Benefits of EHRs included improved information accessibility which were described as increased data sharing, continuity of care, and increased accessibility to patient records. An additional benefit was better quality of records, which included comments on notes being easier to read since they were typed. Concerns about the EHRs included difficulty adjusting from paper records to computer systems, not enough computers at the clinical site, and difficulty finding some of the patient data. Despite these initial issues, developing more training experiences improved perceptions by the students of the electronic health record.

The introduction of new technology in health care demands sufficient time in training as well as in recognition of any adjustments that need to be made to improve ease of use. Nurse satisfaction with new technology can be influenced by the time it takes to understand and adopt

the technology, the access to support if problems arise and history of use of new technology. Despite the variations in adoption and satisfaction with new kinds of technology, nurses have proven themselves to be adept at making the leap toward new ideas to help patients. The introduction of wearable technologies will be an exciting step forward for nursing and may take less time to adopt now that the groundwork has been laid through the use of electronic records, simulation experiences and electronic medication administration experiences.

A Brief Look at Current Wearable Technology

Wearable technology has roots in exercise physiology, rehabilitation, and other disciplines, but the recent advances in precision have made it an appropriate tool for nurses and health care providers. These devices can sense a panorama of vital information about the user, such as physical state, location through GPS, and specific measures such as heart and respiratory rates. Wearable technology not only has sensing abilities but also diagnostic applications which are helpful to healthcare providers in making clinical decisions. Many healthy people are currently being swept along in the wearable technology wave and are using devices like Fitbit™, Apple Watch™ and Garmin Connect™ to track, analyze, and share their data. These devices can be worn like a wristwatch and used in conjunction with smartphones, tablets and computers. Storage of large amounts of personal health-related measurements is facilitated by such conveniences at "cloud technology." "The Cloud" is often used as another word for the Internet and more precisely means a storage area full of servers that is connected to the Internet ("Cloud", 2015). Storage of information in the cloud is secure and a reliable source of data sharing by multiple users. Because the information is gathered and stored in the cloud, third party individuals like health care providers, friends and family, can be granted permission to access the information to monitor the progress and even send messages of support. This provides a means

of mutual support of each other's goals and motivation to strive for more. Other wearable devices are embedded into clothing or worn like a vest which can be used in conjunction with monitors that are placed in static areas in a room.

Some research has already been done on these very new technologies in a variety of fields. These studies show the impact on health care of gathering data from one device that is worn on the body and then transferring that data to another device whereby clinicians can make decisions about treatments and outcomes. Currently much of the research on wearable technology is being done in areas other than nursing. These researchers are demonstrating that wearable technology is being used to improve patients' lives. The following section is a brief overview of current wearable technology but is not meant to be an exhaustive review of research on this topic.

Cardiac monitoring

Cardiology has been using wearables, such as Holter monitors which can record heart rhythms for a 24-hour period, for many years to track abnormal heart rhythms. A more recent addition to the endeavor is the incorporation of wearable technology in cardiology, such as the Zoll Life Vest ™. This wearable defibrillator is a vest-like device worn by people who are at risk for sudden cardiac death. If the vest senses a lethal rhythm, it alerts the patient before delivering a shock giving the conscious patient time to respond and delay a treatment shock. If a patient becomes unconscious, the vest releases a gel over the electrodes which are worn against the skin and delivers a shock of 285 joules. This device has an additional advantage of not needing a second person to find an automated external defibrillator (AED) and navigate the defibrillation process. The data from the vest is downloadable by the physician to monitor abnormal heart rhythms as well as the need for any defibrillation. Alerts can be set up to notify

the physician when an event occurs. (Zoll Medical Corporation, 2015). While implantable cardioverter defibrillators have been in use for quite a while, not all patients who have arrhythmias need to have an implanted device. Because some arrhythmias are temporary or as a result of unknown causes, a wearable device is an important option. The LifeVest ™ was worn by 354 patients in Germany over a period of 3 months to determine if this wearable cardioverter defibrillator is indicated for patients at risk for sudden arrhythmic death (Klein et al., 2009). Treatment for ventricular fibrillation was necessary for 21 episodes in 11 patients. In all but one patient, the first discharge shock of the device was successful. This study reveals that the LifeVest ™ is clearly indicated for patients with lethal arrhythmias and has the added advantage of not needing to be implanted into the patient's chest.

Post-stroke rehabilitation

Patients in rehabilitation and physical therapy are wearing pedometers and accelerometers, which are devices that provide information on how fast something is accelerating, to provide real-time feedback on exercise goals. Patients are able to be in their own natural settings while this data are being captured with unobtrusive monitoring. In the past, rehabilitation nurses had to rely on data obtained while the patient was at the clinic in a gym under artificial circumstances. A recent study testing wearable accelerometer devices for post-stroke patients to monitor progression and rehabilitation showed that wearing the non-invasive sensor resulted in promising results to physiotherapists who were able to develop an algorithm based on the input (Salazar et al., 2014). The accelerometry data were gathered while the patients performed certain prescribed tasks, such as reaching from a sitting position and pressing a target placed in front of them. The data revealed that it was possible to study functional movement and compensatory strategies for recent stroke victims using an algorithm to monitor rehabilitation.

Rehabilitation processes were developed using lightweight, unobtrusive sensors during activities of daily living which could then be developed into personalized rehabilitation protocols.

Neurologic monitoring

Epileptic seizure detection has recently been studied using a wrist-worn accelerometer which detects motion and velocity, along with a sensor for skin conductivity that is sensitive to small amounts of sweat which could indicate an oncoming seizure (Poh et al., 2012). Data are captured for each tonic-clonic seizure, and an algorithm emerges which is predictive of an oncoming seizure. The seizure detection algorithm was tested on over 4,000 hours of recordings from 80 patients and successfully predicted 94% of oncoming seizures. Previously, patients were encouraged to wear scalp EEG electrodes to obtain seizure warnings but many found these too intrusive. The algorithm can alert a caregiver to an oncoming seizure and allow for an immediate response and treatment as needed. This technology could likely save trips to the emergency room. Nurses need to know about these devices so the information can be incorporated into patient discharge teaching to include appropriate responses and safety measures.

Using wearable technology in dependent environments, such as a long term care environment, can be an asset to nurses who are charged with the protection and safety of frail and vulnerable individuals (Fraile, Bajo, Corchado and Abraham, 2010). Embedding non-invasive radio frequency identification apparatus in patient clothing and throughout a geriatric home care facility produced information about escape attempts so safety responses could occur in real-time. Additionally, information on medication and food intake as well as sensing changes in patient behavior was captured. Caregivers could respond quickly to any anomalous behaviors as well as creating behavior patterns for early detection of progressive disability or identification of new pathology.

Hand hygiene

Levchenko, Boscart and Fernie (2011) studied a monitoring system that improved nurses' hand hygiene by fitting the nurses with wearable hand hygiene monitors and tracking their events as they entered and exited patient rooms. Wall-mounted alcohol gel dispensers were equipped with sensors so that the hand hygiene events could be recorded. In addition, each of the participating nurses wore personal wearable alcohol gel dispensers that communicated with a personal wearable monitor so that all events were recorded. If a nurse entered or left a room without performing hand hygiene, the monitor sent a reminder. The results showed an increase from a baseline observational study of 4.2 hand hygiene actions per hour up to 6.42 hand hygiene actions per hour. Because hand washing is the most important tool in the fight against hospital-acquired infection, this wearable intervention has the potential to save both money and lives.

Parkinson's gait disturbances

Freezing or shuffling feet while walking can present a dangerous situation to a person with Parkinson's disease (PD) who may be at risk for falls. The use of virtual reality goggles, earbuds, and an accelerometer has been recently studied in the prevention of freezing gait in people with Parkinson's disease (Espay et al., 2010). The participants underwent training with the wearable devices and used them at home for two weeks. Virtual reality goggles are transparent glasses that can be worn over other corrective lenses or by themselves and have an LED screen embedded in the lenses. The screen replicates the patient's environment and simulates the physical presence of the patient in the real world. The patient also wears the goggles along with an accelerometer to detect movement which then triggers the goggles to display a screen of dynamic checkerboard floor tiles superimposed on the real floor. These tiles move toward the patient at the same speed as the patient's movements providing a reassuring

feedback effect which has been shown to prevent or relieve the freezing movements in PD patients allowing them to walk with a more normal fluid gait. Earbuds provide auditory cues with the sounds of the footsteps. The use of the wearable device increased walking velocity and stride length. After the study was completed, it was found that 70% of the participants continued to improve by at least 20% in walking velocity, stride length or both, and freezing episodes trended toward improvement. This study showed that gait improvement can be attained through non-pharmacologic measures.

Nurses work in a variety of fields that include neurology, cardiology, and post stroke rehabilitation and thus have already been involved in the use of wearable technology. However, nursing research is sparse in using these technologies specifically in nursing and for nurses. The technologies have been shown to improve patient outcomes in these arenas, but nurses must answer the call to study wearable technology for use in nursing practice. The research that has been done in these fields by other disciplines helps to pave the way to include these devices in nursing research. Now is the time for nursing to push for these wearable devices in our own research and to be leaders in examining the complex dimensions of patient care that can be impacted by their use.

Future applications for Nursing

The potential for new wearable technologies to enhance nursing and support patient outcomes cannot be overstated. New ideas are being generated every day that need research to support their use in health care. Future applications for wearable sensors such as FitBit ™, Apple Watch ™ and Garmin Connect ™ could provide life-changing assistance in areas such as time and distance walked, rewards for goals attained, and even encouragement to get up and stand for at least one minute every 12 hours. Nurses will be using wearable technology devices can be

used in stroke rehabilitation, bariatric recovery, home health monitoring and many others. The potential for using wearable items by patients at-risk for falls where a small sensor in their clothes can sound an alarm and send an instant alert to a caregiver or nurse is much more user-friendly and cost-effective than relying on an expensive bed. Nurses will help to manage these devices and alarms ensuring that they are on properly and that the response to the alarms is prompt.

Google Glass ™ is a wearable technology which is worn like a pair of glasses. It has a small computer attached to it which displays information on the inside of the glass and has a range of hands-free functionality and commands. Those who wear the glasses can communicate with the internet through voice commands and through a swipe bar on the earpiece of the glasses. Videos and pictures can be taken with the device and new applications are being built every day that can interact with social media, receive the weather and news, and give the wearer the ability to read e-books. This technology has the potential to be used to enhance nursing through messaging on clinical changes, updates on lab values, and updated vital signs on patients in real-time on a busy medical/surgical floor. Perhaps one day seeing nurses wearing Google Glass ™ will be as common as seeing them wear stethoscopes around their necks (Ahier, 2014). Information could be streamlined to the glasses without having to log on to the electronic health record so that more time could be spent at the bedside instead of in front of the computer. Nurses doing medication checks could do them more quickly by scanning the QR code on a medication and verifying that is the correct medication, dosage and route for the patient. Picture and video transmission will continue to be enhanced to assist in making clinical decisions. Nursing practice and patient health outcomes will be positively impacted by the use of wearable technology and more applications are being developed every day.

Implications for Nursing

People across the globe are becoming more engaged in their own health care through the use of online health apps and tools and through social media resources. According to the Dell Executive and Patient Survey (2011), 64% of patients want new technologies that enable their physician to remotely monitor their wellness by vital signs and treatment responses from a device in their own home. In addition, 61% of patients want to be provided access to their personal health records through an internet portal or private website. Many people are already engaging in the use of wellness monitoring through technology. This survey notes that 59% of patients already use a home health and wellness monitoring device such as a blood pressure tester, a glucose monitor or some other device and 56% of patients already share information electronically by a physician or hospital. Patients can play an important role in improving their own health through the use of self-care based technology (Sarasohn-Kohn, 2013).

Nursing has the potential to greatly benefit from the adoption of wearable technology. However, it is essential that nurses be involved in the development and testing of these items so we have confidence in their applicability and data. Wearable technology can provide information in a less intrusive and more reliable way. Wearing digital-reporting equipment is an overt act by the patient which encourages active participation in self-care. Having wearable devices to use in patient care empowers nurses and health care providers to be able to personalize health care based on the actual problems and needs identified by the data. While previous technology was only able to gather data in a lab or office during a patient visit, the new technologies are the next generation of personalizing patient care and being more responsive to needs. Clinical decision support using the abundance of information provided by wearable technology allows decisions to be based on any number of data points that can involve both subjective and objective data.

Support from friends and family has been consistently shown to be a factor in positive outcomes in recovery and well-being of patients (Fuller-Iglesias, 2015). With the use of wearable devices, family members can be easily alerted to issues or potential emergencies and can respond and intervene quickly. More evidence-based research using wearable technology with a nursing focus is needed. Nurses are on the frontlines of teaching about the devices, interacting with patients during the adjustment and learning periods, identifying potential emergency situations, and interpreting the data that are retrieved. However, there is no escaping the fact that the majority of the research that has been done on medically-important wearable devices has been done in fields other than in nursing. It is time for nursing to begin in-depth research using these new technologies to enhance and advance the practice of nursing. Wearable technology is simply an additional tool to provide better nursing care, and nurses must engage with the development and use of these helpful items.

How Can Nurses Influence the Wearable Technology Industry?

Nursing should capitalize on the wearable technology phenomenon by being visionary, vocal, and proactive. Nursing educators should empower nursing students to learn about research, development, production and marketing of inventions to help patients. Hospitals, clinics and other employers can help nurses develop new innovations that will help patients at the bedside as well as at home. Often the first step toward innovation is the hardest one to take. Having an idea for a new design, application or wearable technology is only the first step to getting that idea into a tangible invention that improves lives. This section discusses the process of applying for a patent and seeing an idea become a life-saving device.

If nurses have ideas for new technologies, they can apply for a patent on that idea through the United States Patent and Trademark Office, and it is much easier than most people think. The

United States Constitution gives Congress the right to make laws protecting patents. Patents are good for 20 years and are considered a “process, method or machine.” (United States Patent and Trademark Office, 2015). Any correspondence about patent matters should be sent to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 23313-1450. Once an idea begins to mature into an invention, the next step will be to contact a patent assistance service, which are widely available on the internet, and can help turn a great idea into a product. Patent illustrators are available to make a patent drawing as well as companies that can make 3D renderings. These drawings can assist the patent application process by showcasing and explaining the idea to get the best results. A brief warning: make sure the idea is protected before engaging with any company to keep the idea from being used without your permission. A signed confidentiality agreement or non-disclosure agreement will go a long way in keeping an idea safe (Quinn, 2015). Fees for patents can start around $70 but can increase substantially based on additional needs such as not filing electronically, late fees and design fees (United States Patent and Trademark Office, 2015). Before submitting a patent application, it is necessary to do a patent search to make sure that this idea has not already been submitted and patented. This can save time and money in the long run. A new movement that is gaining traction is the “maker” nurse mindset. Nurses have a long history of creating new items to help patients out of whatever they may have on hand at that time. Organizations such as Makernurse.org partner nurses with resources and communities of designers and developers to provide the tools that nurses need to create innovative change in health care and to help nurses design the tools they need to do their jobs better. Do-it-yourself advances in nursing are fueled by the idea that “nurses should own more of the solution, not just own the problem” (MakerNurse, 2016). This organization partners with health care facilities to encourage a culture of nurse making to develop new and innovative

technologies and products and is part of a larger parent organization called MakerHealth™ which encourages making for physicians, caregivers as well as patients. Nurses with ideas and designs about wearable technology may find organizations like these to be helpful resources in getting the technology from the idea phase to getting it into the hands of clinicians.

Summary and Recommendations

Nurse inventors are a much needed role in nursing because nurses are poised in a position to see what is needed to help patients improve and recover better than anyone else. Armed with knowledge on how to make inventions a reality, nurses now need to see their ideas through to making a new applications for patient care and improving lives. Nurse leaders should assemble teams from many disciplines to help in this endeavor and the addition of professional collaboration to make a new device will make the product even more beneficial. Partnerships with developers, designers and other members of health care teams will push wearable technology to become a powerful force in nursing practice. Nursing schools need to expose students to information on how to design, develop and patent an idea that may improve health care.

Mobile apps, smart phones, cloud data, and wearable technology are all part of the connected world whereby information from one device that is being physically worn is connected to another physical device. Wearable technology is part of the future of nursing. New wearable technology is being developed in the form of a temporary tattoo that can monitor vital signs for a week and then be discarded after wirelessly communicating with a smartphone, tablet or computer of the patient or a clinician (Hansman, 2015). Being able to “see” how patients are doing from a remote location and then intervening with improved treatments is a step closer to the goal of “transforming practice through technology.” The IOM’s recent statements about

involving patients in their own care is a call to action for nurses to be at the forefront of designing and using high quality tools such as wearable solutions to improve our care. Patient outcomes can be improved through the cyber-partnership of providers, family and friends, and patients whose use of wearable technology provides the nexus for a team approach to goal-driven healthcare.

References

Ahier, B. (2014). Google glass in healthcare. *Advanced Health Information Exchange Resources*. March, 14, 2014. Retrieved from http://www.ahier.net/2014/03/google-glass-in-medicine.html

Ayatollahi, M., Mirani, N., & Haghani, H. (2014). Electronic health records: what are the most important barriers? *Perspectives in Health Information Management,* Fall, 1-6.

Baillie, L., Chadwick, S., Mann, R., & Brooke-Read, M. (2012). Students' experiences of electronic health records in practice. *British Journal of Nursing, 21*(2), 1262-1269.

Burrus, D. (2015). The Internet of Things is far bigger than anyone realizes. *Wired*. Accessed at http://www.wired.com/insights/2014/11/the-internet-of-things-bigger/

Carayon, P., Cartmill, R., Blosky, A., Brown, R., Hackenberg, M., Hoonakker, P.,…Walker, J. (2011). ICU nurses' acceptance of electronic health records. *Journal of American Informatics Association, 18*, 812-819.

Cloud. (2015).Retrieved from http://www.pcmag.com/encyclopedia/term/39847/cloud

Culler, S., Jose, J., Kohler, S., & Rask, K. (2011). Nurses' perceptions and experiences with the implementation of a medication administration system. *CIN: Computer, Informatics, Nursing, 29(*5), 280-288.

Espay, A., Baram, Y., Dwivedi, A., Shukla, R., Gartner, M., Gaines, L., Duker, A., & Revilla, F. (2010). At-home training with closed-loop augmented-reality cueing device for improving gait in patients with Parkinson disease. *Journal of Rehabilitation Research & Development (JRRD), 47*(6), 573-582.

Fraile, J., Bajo, J., Corchado, J., & Abraham, A. (2010). Applying wearable solutions in dependent environments. *IEEE Transactions on Information Technology in Biomedicine, 14*(6), 1459-1467.

Fonseca, L. Aredes, N., Dias, D., Scochi, C., Martins, J., & Rodrigues, M. (2015). Serious game e-Baby: nursing students' perception on learning about preterm newborn clinical assessment. *Revista Brasileira de Enfermagem, 68*(1), 9-14.

Fuller-Iglesias, H. (2015). Social ties and psychological well-being in late life: the mediating role of relationship satisfaction. *Aging and Mental Health, 19*(12), 1103-1112.

Hansman. H. (2015). Tiny, tattoo-like wearables could monitor your health. *www.smithsonian.com*. (October 8, 2015). Accessed at: ttp://www.smithsonianmag.com/innovation/tiny-tattoo-wearables-could-monitor-your-health-180956862/?utm_source=facebook.com&no-ist

Institute of Medicine. (2012). Best care at lower cost: The path to continuously learning health care in America. Report Brief, September, 2012. Accessed at http://iom.nationalacademies.org/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America/Report-Brief.aspx?page=2

Klein, H., Meltendorf, U., Reek, S., Smid, J., Kuss, S., Cygankeiwicz, I., … & Moss, A. (2009). Bridging a temporary high risk of sudden arrhythmic death. Experience with a wearable cardioverter defibrillator (WC). *PACE, 33*, 353-366.

Levchenko, A., Boscart, V., & Fernie, G. (2011). The feasibility of an automated monitoring system to improve nurses' hand hygiene. *International Journal of Medical Informatics, 80*, 596-603.

MakerNurse. (2016). Retrieved from http://www.makernurse.org/faqs/

Moreland, P., Gallagher, S., Bena, J., Morrison, S., & Albert, N. (2012). Nursing satisfaction with implementation of electronic medication administration record. *CIN: Computers, Informatics, Nursing, 30*(2), 97-103.

Poh, M., Loddenkemper, T., Reinsberger, C., Swenson, N., Goyal, S., Sabtala, M.,… & Picard, R. (2012). Convulsive seizure detection using a wrist-worn electrodermal activity and accelerometer biosensor. *Epilepsia, 53*(5), e93-e97.

Quinn, G. (2015). Invention to patent 101: Everything you need to know to get started. *IPWatchdog.com*. Accessed from http://www.ipwatchdog.com/2015/09/26/invention-to-patent-101-everything-you-need-to-know-to-get-started/id=62023/

Salazar, A., Silva, A., Silva, C., Borges, C., Correia, M., Santos, R., & Vilas-Boas, J. (2014). Low-cost wearable data acquisition for stroke rehabilitation: A proof-of-concept study on accelerometry for functional task assessment. *Topics in Stroke Rehabilitation, 21*(1), 12-22.

Sarasohn-Kohn, J. (2013). A role for patients: the argument for self-care. *American Journal of Preventative Medicine, 44*(151), S16-S18.

Technopedia. (2015*). Internet of Things (IoT).* Accessed at https://www.techopedia.com/definition/28247/internet-of-things-iot

The Dell Executive & Patient Survey. (2011). Accessed from www.healthleadersmedia.com/content/261561.pdf.

Tosterud, R., Hedelin, B., & Hall-Lord, M. (2013). Nursing students' perceptions of high- and low-fidelity simulation used as learning methods. *Nurse Education in Practice, 13*, 262-270.

Wideman, M., Whittler, M., & Anderson, T. (2005). Barcode medication administration: lessons learned from an intensive care unit implementation. Agency for Healthcare Research and Quality, Volume 3: Implementation Issues. Rockville, MD. Accessed from: http://www.ncbi.nlm.nih.gov/books/NBK20569/

Zoll Medical Corporation. (2015).*What is the LifeVest Wearable Defibrillator*? LifeVest Network. Accessed at: http://lifevest.zoll.com/medical-professionals

Chapter 3

The Evolution of Podcasting in Nursing Education

Abstract

Aim: To review the research on the evolution of podcast and video podcast use in nursing education including student perceptions toward podcasting, listening and viewing habits, and the impact of podcasting on learning outcomes over the past 10 years. Theoretical frameworks, impact on nursing education and future plans for research are explored.

Background: The use of podcasts have become a viable method of instruction in nursing education. Many students are a part of the Net Generation and have grown up with technology such as podcasting. These students are at ease with the use of technology as part of the learning process. Creative uses of these audio and video files are showing great promise in fulfilling learning needs of nursing students.

Method: A literature search was performed using a variety of databases that covered the years of 2006-2016. Peer-reviewed research as well as dissertations were included in the data.

Results: Podcasts are an effective means of delivering nursing content to students. Positive feedback was found in almost all studies and satisfaction was high among all groups. Students perceived that the podcasts helped to increase their knowledge, helped them review before a test, and helped them feel cared for by faculty.

Conclusions: Student were overwhelmingly satisfied with the use of podcasts in their nursing courses. Future research should aim to find more ways to incorporate this technology into nursing education and look at how podcasts can help different populations of nursing students to achieve their goals.

Keywords: podcasts, vodcasts, nursing education, mobile learning

The Evolution of Podcasting in Nursing Education

The evolution of the Information Age has seen a multitude of new technologies that have been used for entertainment as well as education. Nursing education has benefitted from these technologies and they have been shown to support student learning and student satisfaction. However, the fact remains that there is still a dramatic shortage of nurses and the shortage continues to worsen with each passing year. The Bureau of Labor Statistics estimates that the US will be short 525,000 nurses by the year 2022 (Rosseter, 2016). This poses a threat to employers as well to quality of care that nursing provides.

Part of the problem is that many nursing schools may admit a full class but by the time graduation arrives, many students have dropped out leaving empty seats. Nursing schools need to retain students in order to provide more graduates to alleviate the nursing shortage. In order to meet the needs of the nursing workforce, an additional 30,000 nurses per year should be graduated from nursing schools (Council on Physician and Nurse Supply, 2007). Retention rates in Associate Degree Nursing Programs fall just under 80% while retention rates for Bachelor of Science Nursing Programs come in at 88% (National League for Nursing, 2016).

In 2010, the Institute of Medicine called for a change in instructional design in nursing education by stating that "The ways in which nurses were educated during the 20th century are no longer adequate for dealing with the realities of health care in the 21st century" and recommends a reexamination of nursing curricula and improvement in science and technology (IOM, 2010). Innovative methods of instruction are continually being sought out in nursing education to keep students engaged, support their academic progress and to facilitate their journey to graduation. Nursing schools have begun to employ a variety of technologies to enhance student support such as the use of electronic health records in the skills labs, high fidelity simulation mannequins used

in the simulation labs and bar coding applications for use with medication administration practice. These technologies have been researched extensively in nursing education for use in the labs. However, technological support is also needed in the classroom as an adjunct to the traditional lecture modality. The future of classroom support in nursing education could lie in mobile learning.

Mobile learning (m-learning) is being shown to have value in providing academic support for students in higher education in a multitude of methodologies. One such methodology is through the use of podcasts. Podcasts can be accessed from computers, laptops, phones, mobile devices and tablets easily and are accessible 24 hours a day. They can be listened to multiple times, can be sped up or slowed down, and can provide repetition for learners to enhance understanding of concepts as well as improving difficult medical term comprehension. The Millennial learners of today are digital natives and have grown up with technology constantly at their fingertips. They are comfortable accessing a variety of devices to listen to, watch and read about anything that they are interested in and they are able to interact with this technology and have come to expect the use of technology to support their learning. Because they are comfortable accessing information anytime and anywhere, the use of podcasts is natural extension of this ability. According to the Pew Research Center, in 2008 about 1 in 5 internet users had downloaded a podcast and the number of podcasts produced in 2013 was a little more than 91,000 (Madden & Jones, 2008).

Podcast is a combination of the terms “iPod” and “broadcast” and can be used to download music, television shows or even lectures at one’s leisure (Kardong-Edgren & Emerson, 2009). Podcasts are audio or audio and video files that can published in an MP3 format on the internet and then can be automatically downloaded to a desktop or laptop computer. From there,

if desired, the file can be transferred onto a mobile device such as a phone or tablet (Evans, 2008).

Many benefits of podcast use in the literature have been described. Lee and Chan (2016) cite the desirable attributes of podcasts as being *personal* and learner-centered, *portable* since they can be used in a variety of locations, *informal* as they keep learning a relaxed and casual activity and *ubiquitous* as they are available anytime and anywhere. In addition, podcasts can be listened to over and over to help strengthen understanding and concepts as well as being able to hear difficult terms multiple times. Being MP3 files, podcasts can easily be transferred to portable devices such as mobile phones, MP3 players and tablets which can offer a time savings to busy learners on the go (Lee & Chan, 2016). Podcasts also have the ability to be tailored to the learning styles and preferences of individual users (Harris & Park, 2008).

While some students may prefer traditional lecture as the main source of information for a class, others, such as audio learners, may prefer learning through listening to educational material in an asynchronous, non-traditional setting such as their home or in the car. Podcasts can also contribute to self-directed learning by providing mobile content with flexible access (Rogan & San Miguel, 2013). Students can choose when and where to listen to information providing them with academic self-efficacy over their learning. Learners with high self-efficacy could have an improved learning experience and may have better outcomes through the use of podcasting (Burke & Cody, 2014). When podcasting is used as a replacement or supplement for traditional lecture, benefits such as catching up with missed classes as well as reviewing material and review for tests have been cited, especially for students who have English as a second language (Strickland, Gray, & Hill, 2012; Roy & Roy, 2007). Podcasting may also effective in reinforcing concepts, remediate students who may be slow learners or have learning disabilities

(Roy & Roy, 2007). In distance education, the feeling of connection is also an important benefit of podcasting. Being able to listen to the voice of person while teaching important content could provide more of a connection with text in a book or in notes. This connection can promote student engagement which may contribute to better learning (Stiffler, Stoten, & Cullen, 2011). In addition, once podcasts are developed, they can be used over and over again in subsequent semesters.

Despite the many advantages that podcasting in education can offer, some drawbacks must be addressed as well. Podcasting alone may not work well for all learners and many students have identified the need to be in a traditional face-to-face classroom to receive instruction in addition to receiving supplemental podcasts (McKinney & Page, 2008). It also "not designed for two-way interactions" (Billings & Kowalski, 2007). If students have questions during a podcast, getting the answer will require more than just raising a hand in the classroom. Billings and Kowalski also point out that special equipment may need to be acquired to develop podcasts of high quality (p. 56), which may mean increased cost for programs (Roy & Roy, 2007). Although many students have used podcasts for entertainment or for other purposes, some may not be familiar with how to download a podcast onto a mobile device or may have problems with internet connections or bandwidth which would make downloading the podcasts much more difficult. While students may be quite familiar with podcasting, many faculty members may not be, leading to a fear of trying to produce a podcast at all. Another possible disadvantage, according to Walls, Kucsera, Walker, Acee, McVaugh, and Robinson, (2010), is that for students who are already using slide and textbooks, adding another resource may become a source of cognitive overload (p. 372). Finally, students listening to podcasts could be tempted to forego

lecture or reading of the text, missing an opportunity to have a deep comprehension of the material presented.

Podcast use in higher education has been studied in the disciplines of business and management (Evans, 2008), marine science (Copley, 2007), journalism (Huntsberger & Stavitsky, 2007), education (Walls et al., 2010), multimedia communication (Dupagne, Millette, & Grinfeder, 2015; Lazzari, 2009), information systems management (Fernandez, Simo & Sallan, 2009), dentistry (Allen & Katz, 2011; Kalludi, Punja, Rao, & Dhar, 2015; McCullar, 2011), and medicine (Bensalem-Owen, Chau, Sardam & Fahy, 2011; Narula, Ahmed & Rudkowski, 2012). Some research of the use of podcasts in nursing education has been done and, while the interest in podcasting as a developing technology produced quite a few studies early on, the number of studies in nursing education have waned over the years. More research is needed to compare the results and satisfaction with the early adopters and researchers with the current student trends and preferences.

Part of the evolution of podcasting has been a move from purely audio files to the addition of video files as a means of improved instructional design. Video podcasts or "vodcasts" have gained popularity in the past few years as the technology to produce them has come into being and the ease of production has emerged. Vodcasts may include video interviews, songs, PowerPoint slides, or simply a video of the person speaking. Griffin, Mitchell and Thompson (2009) found that students who listened to and watched a podcast with an accompanying PowerPoint that was synchronized to the audio preferred this method of learning to audio only or a PowerPoint lecture only. More faculty have become fluent in the production of various forms of podcasting and vodcasting and thus the most recent research in this medium now includes the use of vodcasts alongside or instead of audio podcasts. The purpose of this review is to trace the

research from the early days of podcast use in nursing education up until this latest generation of research which includes vodcasts as well as podcasts.

Methods

Search Strategies

In order to best focus the search for podcasting in nursing education articles, the following databases and resources were used: CINAHL, MEDLINE, PubMed, Google Scholar, and Science Direct as well as references listed in the articles reviewed. The key words included: podcast, vodcast, nursing education, and mobile learning (m-learning). The review included all published articles from January 2006- September 2016. For the sake of simplicity, the use of the word "podcast" will include both audio only as well as audio and video files unless otherwise noted. Inclusion criteria were as follows:

- In English
- Articles and dissertations focusing on podcasts in nursing education published during the past 10 years (2006-2016)
- Scholarly, peer-reviewed research articles that focused on evidence-based practice
- Scholarly, peer-reviewed research articles that included theoretical frameworks used for podcasting in nursing education

A broad search for the use of podcasting in nursing education revealed 19 articles which met criteria for full review: 17 were research articles and two others included dissertations. A total of nine articles contained a theoretical framework that supported the use of podcasts in nursing education. All of the research articles used nursing students as the subjects. In regards to methodological approach, a majority of measures used a mixed methods approach (n = 9) with some using quantitative measures only (n = 6), and a few using qualitative measures only (n = 4).

Data Evaluation

Each of the articles was analyzed for content based on sample size, use of pre and post-test measures, types of design, course delivery methodology (distance learning vs. traditionally face-to-face), type of nursing program, number of podcasts, length of podcasts, outcomes of podcast use and satisfaction with podcasts. The majority of research came out of the United States but some studied originated from the UK (McKinney & Page, 2009; Mostyn, Jenkinson, McCormick, Meade, & Lynm, 2013; Strickland et al., 2012) and Australia (O'Flaherty & Timms, 2015; Rogan & San Miguel, 2013). Sample sizes varied in size from small (n = 6) to very large (n = 1600 over a 4 year period) with the majority being less than 100 participants. Three of the articles employed a pre-test/post-test design (Barnes, 2015; Burke & Cody, 2014; Schlairet, 2010) and three used a quasi-experimental design (Barnes, 2015; McDermott, 2014; Meek, Lee, Jones, Mutea, & Prizevoits, 2012). All of the research studies used groups in a traditional face-to-face classroom except for two who used a purely online course delivery (Meek et al., 2012; Stiffler et al., 2011). The type of nursing programs studied using podcasting as an intervention were mostly Bachelor of Science in Nursing (BSN) programs (n = 10), followed by graduate programs (n = 3), Associate Degree Nursing (ADN) (n = 2), Licensed Practical Nursing (LPN) (n = 1), RN to BSN programs (n = 1), BSN and Graduate combined (n = 1) and BSN and Midwifery combined (n = 1). Two of the studies focused on English as a Second Language students (Greenfield, 2010; Rogan & San Miguel, 2013). The actual reported number of podcasts used in the experimental groups ranged from one to 14, however several of the studies simply reported that they podcasted their lectures without giving a total number. The length of the podcasts varied from 7 minutes to 2.5 hours with some studies preferring to segment the podcasts and some including the whole podcast as one file.

Definitions

Conceptual Definition

The most basic definition of a podcast is a digital file that is available over the internet that can be downloaded and played back on a variety of sources. Those who listen to podcasts can subscribe to them using an RSS (Really Simple Syndication) feed. The files will be downloaded automatically to subscribers as they are released onto a personal computer. Maag (2006), further describes the process as files being "automatically 'pushed' to a computer's desktop, saved in an audio player (e.g. Apple iTunes), and then converted from WAV files to compressed MP3 files" (p. 835). In the past ten years, this definition has evolved to include "the delivery of audio, text, pictures, and/or video to a computer or mobile learning device (Stiffler et al., 2011). Employing the subscription using an RSS feed is "what differentiates podcasting from other means of accessing media files over the internet such as direct download or streamed webcasting" (Strickland, Gray, & Hill, 2012). Podcasting now includes music, videos, Youtube™ clips, television and movies and college lectures (Kardong-Edgren & Emerson, 2008). The portability of a personal media player allows education to be accessed anytime and anyplace "taking us into the realm of mobile learning (m-learning)" (Strickland et al., 2012).

Operational Definition

Podcasting is nursing began with the recording of classroom lectures and may have been born out of the common convention of students to bring small tape recorders up to the lecture podium to record lectures (Greenfield, 2011). Early podcasting was operationally defined as "the digital recording of a didactic lecture that is then archived" (Kardong-Edgren & Emerson, 2009) and was comprised predominately of recorded classroom lectures. (Abate, 2013; Forbes & Hickey, 2008; Greenfield, 2011; Kardong-Edgren & Emerson, 2009; Kemp, Myers, Campbell &

Pratt, 2010; Maag, 2006; McKinney & Page, 2008; Schlairet, 2010; Vogt, Schaffner, Ribar & Chavez, 2010). However, other uses and definitions were soon being considered. Stiffler et al. (2011) used a podcast to explain unit expectations, as an overview of major concepts, and as a discussion of the unit assignment in an undergraduate research course. The use of podcasts as a means to record guest lecturers who were expert researchers to supplement lecture and other classroom material in an undergraduate nursing research course presented a new perspective and definition into how to efficiently incorporate podcasts into education (Strickland et al., 2012). With the objective of improving clinical communication of ESL students through innovative technology, Rogan and San Miguel (2013), utilized an intensive clinical terminology video podcast, which helped to improve student clinical preparation and confidence as well as their communication skills. Podcasting has been studied for use as case study review in a graduate nursing course and for the use of discussing exemplars and what to look for in a statistical manuscript in a statistics course (Marrocco, Kazen & Neal-Boylan, 2014).

Finally, in an Australian study by O'Flaherty and Timms (2015), podcasting was operationalized by providing student feedback on assignments as well as providing short, six to eight minute, podcast lectures of key concepts. The positive comments garnered from the study led the researchers to introduce the use of video podcasting for instruction on various types of nursing equipment as well as online simulation exercises. In the past 10 years, the uses and definitions of podcasts have grown more creative and more varied and have been able to reach a wider range of student learning types and needs.

The Purpose of Podcasts

After review of all articles and dissertations, five areas of focus emerged for the purpose of podcasts: the use of podcasted lectures as a supplement to traditional lectures (n = 15), the

comparison of podcasted lectures against traditional lectures (n = 1), the effects of podcasted lectures on knowledge retention (n = 1), the use of podcasted lectures as a replacement for traditional lectures (n = 1) and the comparison of podcasted lectures to text reading only (n = 1).

Supplemental Podcasts

The findings when studying the use of full podcasted lectures as a supplement to traditional lectures have been, for the most part, strongly positive on the side of podcasting with a few outliers. Perception of understanding and impact on grades were looked at in a study by Kardong-Edgren and Emerson (2009). These researchers found that 88% of undergraduate BSN students who accessed supplemental lecture podcasts reported that the podcasts made a difference in their understanding of the content while 77% of the students felt like listening to the podcasts made a difference in their course grades. In addition, these students reported "pleasant feelings or emotional fulfillment" using this technology. These results would support the use of podcasts as not only a tool for improvement in performance but also as a device for increased satisfaction in their courses. Schlairet (2010) found similar results of positive attitudes toward podcasting especially among second-degree and graduate students. In addition, many students looked at textbooks while listening to podcasts indicating more active learning.

Greenfield (2010) also studied the effects of podcasting on ESL nursing students as a tool for student retention. The purpose of podcasting in this study was to provide academic support to students who had failed the first exam of the semester. Of the six students who failed the first test, all were non-native English speakers. Podcasting of short 10-15 minute parts of the subsequent lectures began and the podcasts were made available for the next two exams. All of the ESL students passed the next two exams with grades in the high 70s to mid-80s and all of

them passed the course. When asked what made the difference in their grades, all of the students reported the ability to access and listen to the podcasts at any time made the difference.

Yet a different purpose for the use of supplemental podcasts in nursing education was explored by Barnes (2012) through the use video podcasts of three nursing skills: taking vital signs, inserting a Foley catheter and demonstrating a sterile dressing change. Perceived usefulness and ease of use of these video podcasts were measured in nursing students in an Associate Degree Program as well as in a Licensed Practical Nursing program. Both groups of students were found to perceive the videos as useful and easy to use. Qualitative questions centered on confidence levels while performing the skills as well as feeling capable and being able to recall knowledge. The addition of video to podcasts may be able to provide a powerful tool for the acquisition of student skills.

Further innovations in podcasting research have been the focus of a study by Strickland et al.(2012). The use of five supplemental podcasted lectures, presentation and interviews by guest speakers who were experts in their fields was shown to increase understanding of research content in undergraduate nursing students in Scotland. Students reported a positive impact on their learning and comments included a feeling of personal interaction with the guest speakers. Two other themes that emerged were convenience and satisfaction with having access to research staff to whom they normally do not have access. Integrating innovative uses of podcasts may improve understanding of key concepts in addition to review of lecture.

Creative uses of supplemental podcasting with different populations have also been noted. Rogan and San Miguel (2013) developed online technology in the form of both podcasts for student who primarily spoke English as a second language in hopes of improving their clinical communication skills. A resource podcast was developed that included 200 nursing

terms with a picture of the item as well as a vodcast of six clinical situations of nurses communicating with patients and staff in clinical scenarios typical for first year students. A majority of the students agreed or strongly agreed that the podcast and the vodcasts helped them feel prepared for clinical placement as well as using the terminology. A blended learning approach may be more helpful to students for whom communication in English is more challenging.

Similar results were found in a study by Burke and Cody (2014) who found that 86% of junior and senior level undergraduate nursing students believed that supplemental podcasts enriched their learning and 95% believed that podcasts were valuable tools for learning. In addition, these students felt that reviewing podcasted material helped them to review content that was difficult or that they did not understand well. In addition, students felt a strong desire to have podcasts in future nursing courses. Maag (2006) studied nursing students who had access to podcasted lectures on the instructor's website and in addition, the instructor posted feedback pertaining to student group projects. These students found value in having podcasted lectures as well as being able to receive feedback in a timely fashion from their instructor further supporting the various uses of podcasting in nursing education.

Podcasts used for the purpose of presenting key concepts in short blocks (6-8 minutes) rather than 1-2 hour lectures were introduced to Australian nursing students in addition to short podcasts that provided feedback on assessment tasks (O'Flaherty & Timms, 2015). Students commented that "the podcasts of the lectures and the podcasts of feedback on our assessments have made a huge difference in my understanding of topics "(p. 109). This feedback suggests that producing supplemental podcasts that are shorter in length may benefit students more and lead to better focus. Thus, the use of podcasted lectures in their entirety may require a shift in

thinking toward supplemental podcasts that synthesize information into smaller chunks of material in order to focus on the most important aspects.

Despite these positive results, some outliers found no significant impact from the use of supplemental podcasts. In a study on graduate online nursing students taking a health informatics course, the authors found no significant difference in the use of podcasted materials and traditional online lectures (Meek et al., 2012). In fact, at certain times in the course, the participants who were selected into the podcasted group vs. the traditional "Course as Usual" treatment, saw lower scores in their discussion board postings. One explanation for this may be that students decided to forego readings that were assigned in addition to podcasts and just watch the podcasts, thereby taking a shortcut to the content. However, by the end of the semester, these grades rebounded perhaps due to improvements in study habits. In spite of these findings, there was a significant difference in the satisfaction scores between the podcast group and the traditional group as well as in the student engagement scores indicating that students in the podcast group may have enjoyed having the extra resource available to them that may have met multiple learning types. McDermott (2014) found similar results in a study of RN to BSN students who were given a podcast of basic research concepts and a group who was not given the podcast. Both groups then took a test over the concepts. No significant results were found on grades between groups, however the podcast groups perceived that podcasts increased their learning.

Similarly, Kemp et al. (2010) found no significant difference between final course grades and hours of listening to podcasts. Despite these findings, students found podcasting helpful to learning difficult material as well as for reviewing for tests. Focus group students in a study by

Mostyn et al. (2013) also discussed the impact of podcasts in reviewing for tests and preferred the live recordings of the lectures that included the questions asked in class.

Comparison of Podcasted Lectures against Traditional Lectures

Scores on selected questions from an exam compared two groups of nursing students were the focus of a study by Vogt et al. (2010). Two classes of junior BSN students had content presented either by traditional lecture or through the use of podcasts. The same faculty presented the material and wrote the exam questions. No significant difference was found between the two modalities on correct responses on exam questions raising the idea of the possibility that podcasting may be as effective as a learning tool as traditional lecture. Overall satisfaction with the podcasts was high and positive experiences were reported however, many students still preferred traditional lecture classes. This preference may indicate that podcasting is better used as a supplementary tool for learning rather than as a replacement for traditional lecture.

Podcasted Lectures as a Replacement for Traditional Lectures

Many students find that hybrid learning strategies that are a combination of traditional lecture with innovative technologies such as podcasting support their learning better. This finding was supported in a study by McKinney and Page (2008) who studied undergraduate nursing taking a pathophysiology class who had two of their content modules that were traditionally taught face to face replaced with podcasted lectures. Student reinforced results from previous studies that they learn better by hearing material over and over and that this ability helped them to retain information better, especially around exam time. These students also echoed that they found the listening to the podcasts convenient and appreciated the ability to be mobile while listening. However, some students missed the ability to gain immediate feedback

on questions from the instructor indicating a need to maintain some contact with the teacher to enhance learning.

Effects of Podcasted Lectures on Knowledge Retention

A direct comparison between types of lecture delivery was studied in a group of nursing students learning pharmacology content (Abate, 2013). This study sought to determine if instructional design influenced knowledge retention and application outcomes. The three groups consisted of a traditional lecture (90 minutes), an unsegmented podcast lecture (57 minutes) and segmented podcast lecture (24 minutes, 14 minutes and 13 minutes). The students were given a multiple choice quiz and were asked to demonstrate application on a case study following the lecture type. The results showed a higher positive trend in the segmented group for both the quiz and the case study than for the other two groups. The retention of pharmacology knowledge and the application of the lecture was supported by the segmenting of podcasts into smaller lengths.

Podcasts Supplementing Text Reading

The delivery of unit expectations, unit assignments discussions and an overview of major concepts were podcasted to graduate nursing students in an online class in a study which compared the delivery of this material to delivery as a supplement to reading the text containing this information (Stiffler et al., 2011). Learning styles were determined at the beginning of the study and found that 35.3% of respondents were visual learners, 29.4% learned best through reading and writing, 17.6% were auditory learners and 17.6% declared themselves to be tactile/kinesthetic learners. Despite the preference for visual and reading and writing while learning, 100% of the students stated that they listened to the podcast more than once while only 53% of the students stated that they read the material more than once and 18% said that they did not read the material from beginning to end at all. Results of this study support the use of

podcasts as a supplemental mode of content delivery which increases the availability of content to different types of learners.

Conceptual Framework Use

Conceptual frameworks can help researchers organize and connect concepts in a meaningful way. Of the reviewed articles, only eight of the studies provided their guiding frameworks as a way to understanding the phenomenon of podcast use in nursing education. Often research articles lack a conceptual framework and the reader is left to guess the guiding principles. The frameworks that were used in the research on podcasting were overwhelmingly models that used the use, acceptance and support practices in technology as connected concepts.

Barnes (2015) and Kemp et al.(2010) chose Davis' Technology Acceptance Model which posits that user acceptance increases when the user perceives the technology as useful and easy to use. Thus the value of the podcasted material to the nursing students was mediated by how easy it was to download and listen to and the educational support that the podcasts provided to the students. Student responses to questions about perceived ease of use and usefulness were consistently positive with majority agreeing or strongly agreeing that the podcasts were helpful. Comments from students centered on the usefulness for test review and how the podcasts help to decrease anxiety before a test.

Chickering and Gamson's Seven Principals of Good Practice in undergraduate education was an important tool in the work by Maag (2006) as well as O'Flaherty and Timms (2015) in regards to the concepts of providing prompt feedback and the ability for students and instructors to interact online. This model holds prompt feedback as a valuable learning support for students and providing personalized feedback through individual podcasts may increase student engagement. Podcasts were used to provide timely feedback on key assignments in addition to

providing review of key concepts. Student responses to questionnaires were consistently positive.

The theory that using two modalities such as audio and visual media to serve as educational tools is the main driver of Mayer's Theory of Multimedia Learning Theory. The research involved the interviewing of experts as the audio source with the transcriptions available for review (Strickland et al., 2012) and through providing a podcast with an accompanying PowerPoint (Vogt et al., 2010). Students were presented with podcasts that included both audio and visual material. Feedback from students reiterated their satisfaction with podcasting overall and spoke to the fact that oftentimes the amount of reading material in nursing courses can be overwhelming. The addition of the visuals were a positive attribute. This model suggests that students who are presented with both modalities at the same time may learn more effectively. This theory supports the use of printed material along with audio podcasts as an effective way for nursing students to engage with content.

Schlairet (2010) incorporated Billings' Teaching and Learning in Web-based Environments as a model for podcast use in a study with undergraduate and graduate nursing students. The concepts of student support, faculty support and educational practices were explored. Student support was engaged through the use of a classroom-based orientation to podcasting, faculty support was given through ongoing technical support that was available to faculty throughout the study and educational practices were identified through the more frequent use of podcasts by graduate students than by undergraduates.

The concept that students will perform a task when it is meaningful to their learning goals is a tenet of the Uses and Gratification Expectancy Model (2008) used by Kardong-Edgren and Emerson (2009). Cognitive needs, affective needs and personal integrative needs guided the

design of this study. The cognitive needs construct is manifested as students "seeking information and understanding" while the affective needs construct is the "search for pleasant feelings and emotional fulfillment achieved through e-learning technology" (p. 399). The personal integrative use then is the need by the student to feel self-regulated and competent. This construct was demonstrated in the students' ability to go at a pace that best met the objectives of learning.

Transformation Learning Theory (1981) was the theory of choice for Marrocco et al. (2014) in a study of graduate nurse education through podcasting. Transformational Learning Theory is a continuous process that helps learners gain "a better understanding of self, perspective, and meaning through communication with others" (p. 49). After posing a question that challenges previously held belief, the learner may feel unease at challenging assumptions. After self-reflection, the learner can accept, reject or simply question the status quo. This study used faculty to create podcasts for the first time, challenging their own long-held beliefs on the importance and necessity of face-to-face lecture.

A model that uses supplemental educational podcasts as a meaningful cultural activity is the basis of the Cultural Historical Activity Theory that was used in the study by McDermott (2014). This theory holds that students, teachers, podcasts and learning are all connected in a cultural, historical and social process. The knowledge gained is contextual, so the acquisition of contextual knowledge then is used as scaffolding for nurse educators who can then build on previous knowledge. Podcasting can then be used to reinforce knowledge and help students connect concepts.

The multitude of uses of podcasting in nursing education have necessitated the use of a variety of theoretical and conceptual frameworks for study. While there is no clear consensus or

standardization of these theories, the themes of the uses and making of meaning in the uptake of technology seem to be the overarching guiding frameworks for these studies and each, although very different, are well supported by the research.

Findings and Discussion

The focus of this part of the review will be the examination of the impact of podcasting on nursing education through the exploration of perceptions toward podcasting, listening and viewing habits, and the impact on learning and performance. A total of eight studies looked at perceptions of students toward the use of podcasts in their education. These attitudes ranged from the value of podcasting in the classroom to perceived usefulness and ease of use to perceived advantages and disadvantages of use. Two of the studies looked at habits associated with listening and/or viewing podcasts in the educational setting which included how often students downloaded the podcasts as well as when and where they downloaded the podcasts most often. A mixture of perceptions and habits were studied in two of the articles. Learning performance data was collected in four of the studies and two of the studies examined the combination of habits and learning performance. Learning performance measures included course grades, test grades for ESL students, and knowledge retention and application scores.

Perceptions toward Podcasting in Nursing Education

Students who had access to podcasted lectures, interviews and supplementary material had overwhelmingly positive responses as well as satisfaction scores. Student described podcasted material as valuable in studying and in enhancing understanding (Maag, 2006; Mostyn et al., 2013; Schlairet, 2010; Vogt et al., 2010; O'Flaherty & Timms, 2015) and easy to understand (Meek et al., 2012; Strickland et al., 2012). In the study by Stiffler et al. (2011), 82% of the students recommended that the other students who would take their same course in the

future listen to the podcasts. Some students perceived that there was a stronger interpersonal connection between the student and the instructor which resulted in a stronger feeling of caring (Forbes & Hickey, 2008; Maag, 2006; Strickland et al., 2012). Just hearing the voice of the lecturer was comforting to some proving that, despite some possible faculty reservations in producing an unknown technology, podcasts do not have to be professional grade quality to be useful to student learning. For students who were listening to recordings of live lectures, some enjoyed the fact that they could hear questions that had been posed in class as they may have had the same questions and they liked being able to hear the answers clearly (Mostyn et al., 2013). Positive comments about podcasting were abundant in the literature. One student who accessed the podcasts of her lectures indicated she would "put on a pot of coffee and spend Sunday morning with Dr. E." (Kardong-Edgren & Emerson, 2008, p. 400). Another student commented that, in the future, she would always prefer to take classes from professors who provided podcasts over those who did not (Forbes & Hickey, 2008). Other comments included the preference of learning through listening because they did not like reading texts and they preferred having access to what content they really needed to know (McDermott, 2014; O'Flaherty & Timms, 2015). The preference for listening to podcasts over reading texts was reinforced in the comment "reading can often be tiring and you can often zone out. The podcasts suited my learning style better" (Strickland et al., 2012, p. 213). Another student commented "When you hear someone else talk about something as well from a slightly different perspective, you can think 'oh yeah actually I can understand that' and so that was quite useful as well actually" (Mostyn et al., 2013, p. 5).

The theme of feeling that the podcasts were worthwhile because of the ability to listen to them repeatedly was common in these studies and was highlighted in the articles with

populations of students with English as a Second Language (Forbes & Hickey, 2008; Greenfield, 2010; Marrocco et al., 2014; Mostyn et al., 2013). These students stated that the ability to pause, rewind and have time to look up words that they did not know was extremely helpful to them and made a difference in their success in the course. In fact, among the six ESL students who accessed podcasts in the study by Greenfield (2010), they believed that being able to listen to the podcasts was the *only* thing that helped them improve their test scores, after failing the first test, as well as their subsequent success in the course. Perceptions toward podcasted material revealed positive feelings and responses by students indicating that podcasts can be an important driver of student satisfaction in courses as well as retention rates in nursing courses.

Listening and Viewing Habits

While students listened and viewed podcasts in a variety of conditions and situations, several habits were seen over and over among nursing students. Because many nursing students are part of the Net Generation and are assumed digital natives, assumptions could be made that the portability of having digitally recorded lectures is an attribute that students would take advantage of in their learning methods. However, some surprising results were obtained in the review of research on how the podcasts were accessed. In almost every study reviewed, the majority of students chose to access podcasts at home and in front of their computers rather than accessing them through an MP3 player on the go (Burke & Cody, 2014; Forbes & Hickey, 2008; Kardong-Edgren & Emerson, 2008; Kemp et al., 2010; McDermott, 2014; Mostyn et al., 2013; Stiffler et al., 2011; Schlairet, 2010; Strickland et al., 2012). This could indicate that students prefer having a more study-like environment to have time to think about what is being said versus the ability to listen while multi-taking. In fact, in the study by Kemp et al. (2010), multi-tasking while listening to educational content in a podcast was found to have detrimental effects

to retention of knowledge and is counter-productive in trying to learn unfamiliar concepts. The ability to retain or think critically about nursing concepts and content requires concentration in an unhurried environment and time on task.

While multi-tasking activities such as exercising, doing housework or driving while listening to podcasts was not supported, activities such as taking notes, looking at textbooks and reviewing PowerPoints while listening to podcasts were cited as ways which helped increase learning (Forbes & Hickey, 2008; Kardong-Edgren & Emerson, 2008; Schlairet, 2010; Stiffler et al., 2011). This form of active engagement may have increased satisfaction with the use of podcasts through more and deeper engagement with material as well as with being able to reinforce what they were learning at time. Some students were able to successfully multi-task while listening to lectures (McKinney & Page, 2008; Vogt et al., 2010). This may indicate that the content of the lectures themselves may be what makes the difference in the ability to listen and perform other functions. Content that requires in-depth concentration may not lend itself as easily to the anytime, anywhere mobility of other types of podcasts that are used for entertainment purposes.

Another surprising result was in regards to the effect of podcasts on classroom attendance in nursing courses. Despite the possible temptation to miss class with the availability of podcasted lectures, absenteeism not supported in the literature where several found no effect of podcasting on classroom attendance (Forbes & Hickey, 2008; Kardong-Edgren & Emerson, 2008; Schlairet, 2010;). Although podcasting can be seen as an extension of the classroom, the lack of effect on classroom attendance indicates the value that student place on being there in person. This fact would quiet detractors who may think that students would automatically decide to opt out of lecture if given the choice. It could also indicate that students who attend lecture

may have a higher affinity for accessing as many resources as possible, such as supplemental podcasts, to gain more knowledge.

If a student does have to be absent from class, one benefit to podcasting may be that is can provide an opportunity for anyone who misses class to still be able to meet course objectives while still being responsible for the content of the course (Delaney, Pennington, & Blankenship, 2010).

When asked about the specific reasons why students listened to podcasts, a variety of responses were given but one consistent reason was that podcasts were an excellent tool when reviewing for a test (Forbes & Hickey, 2008; Kemp et al., 2010; Mostyn et al., 2013; Schlairet, 2010). Many of these studies found a spike in podcast usage just before an exam was to be given. This is perhaps one of the greatest assets of podcasting educational content: the ability to revisit and reinforce content through multiple repetitions of listening or viewing material. Words or ideas that may have lost during lecture can be reviewed over and over until the content is clear. When this occurs, the student can use that content as context for learning and use the information as scaffolding for future themes. A majority of students accessed the individual podcasts multiple times to better understand the information (Abate, 2013; Burke & Cody, 2014; Greenfield, 2010; Kardong-Edgren & Emerson, 2008; McKinney & Page, 2008; O'Flaherty & Timms, 2015; Stiffler et al., 2011; Vogt et al., 2010). Some students were pleased with the convenience of just being able to sit in class and listen rather than trying to furiously take notes, trying to make sense of what was being said, especially among the ESL students (Forbes & Hickey, 2010; Greenfield, 2010).

Impact on Learning Outcomes

The perception of being supported while going through nursing school is essential to students and may influence whether or not students stay in a nursing program which they perceive as quite challenging. Overall, students had the perception that podcasts improved their performance, helped them feel more prepared and confident, helped them to understand and learn the material and helped them achieve their learning outcomes (Forbes & Hickey, 2008; Kardong-Edgren & Emerson, 2008; Marrocco, et al., 2014; McDermott, 2014; McKinney & Page, 2008; Mostyn et al., 2013; O'Flaherty & Timms, 2015; Rogan & San Miguel, 2013; Schlairet, 2010; Strickland et al., 2012). This feeling of the availability of an educational support tool may have led to the high scores on satisfaction with podcasts and may have increased their engagement with the content. Feeling supported by faculty in the achievement of educational goals may lead to higher retention rates and thus higher graduation rates. Many students also felt that the addition of podcasts to their learning tools made a difference in their course grades (Burke & Cody, 2014; Kardong-Edgren & Emerson, 2008).

In the review of research articles that measured actual grades or scores, mixed results were found. In a study by Abate (2013), students who were placed in a segmented podcast group were found to have higher scores on a multiple choice test and on a case study assignment than students who were in the unsegmented podcast group or the traditional lecture group. This indicated that a positive impact on student learning could be attained through the use of shorter, segmented podcasts. Additionally, improvements in test scores were also found in a group of ESL students who had failed their first test and then subsequently were provided podcasts as an educational supplement. All six students passed the next two tests and all of them passed the class (Greenfield, 2010). Despite these successes, no significant differences in correct answers

on tests were found three of the studies (Vogt et al., 2010; McDermott, 2014; Meek et al., 2012) indicating that, while podcasts could be used just as effectively for knowledge gain as traditional methods, some uses of podcasts will not show actual improvement of test scores. In light of the fact that test scores in these studies did not go up, one important fact is that satisfaction scores remained very high for each of these groups indicating that podcasts were still valued by the students as helpful to them.

Issues with the Technology

While multiple advantages were cited by students in the use of podcasts to meet educational needs, some problems with the technology arose during these studies. The most often cited reason for not using the podcasts at all by students was the fact that they simply did not know about the availability of the podcasts (Mostyn et al., 2013; Rogan & San Miguel, 2013). Others reasons for dissatisfaction with the podcasts were that they took too long to download and students did not have the proper support such as bandwidth or modems (McKinney & Page, 2008; Strickland et al., 2012), and, importantly, there was not sufficient orientation to the use and downloading of this technology (Vogt et al., 2010; Marrocco et al., 2014; Mostyn et al., 2013). Other issues such as poor sound, static and missing segments were issues for some students who had the desire to use the podcasts but were simply unable to do so (Marrocco et al., 2014).

The results of some of these studies may have come out differently if the technical support had been in place from the beginning. The authors of several of these studies acknowledged that the importance of a full orientation to using podcasts is essential to be able to appropriately measure outcomes. Effective training and orientation when providing a new technology to students and faculty cannot be overstated. Learning outcomes can certainly be

impacted by the proper instruction given to students and staff so time must be taken before any new technology is implemented to ensure buy-in from the faculty and full understanding from the students.

Insight for the Advancement of Nursing Education

The main question that must be answered for any review is this: Is the research sufficient to confirm the effectiveness of the intervention? After reviewing this literature, a wealth of information exists on how students feel about podcasts being added to their courses as well as how they are using them. Listening habits and patterns of usage have been well documented. On these modalities, the effectiveness of podcasting has been confirmed. However the gaps that remain in the research do so due to the fact that effectiveness is measured in many different ways and for many, actual impact on learning may be the only true test of the intervention. The results of this research and the outcomes that have been measured have now laid the groundwork for future research that needs to occur. However, when looking at the impact on learning through the use of test questions and course grades, more questions need to be raised regarding the ability of these test scores to reflect knowledge retention and the ability to think critically rather than the ability of the students to just get the answer correct. In addition, if student are providing overwhelmingly positive satisfaction scores and report consistently positive feelings about the use of podcasts, perhaps the next step is to look at the effects of podcasts on student retention rates, especially among at-risk students. Students who speak English as a Second Language have shown improvements in scores when other students have not thus the need for more research among ESL students would be justified.

As the evolution of video podcasting continues, more issues should be considered and studied. Characteristics specific to video podcasting need to be addresses such as how these

videos impact learning, the quality of the video and graphics that are used, the attributes of the speaker such as tone of voice and level of engagement with the audience, length, and how to effectively divide these vodcasts into segments (Kay, 2012).

The literature on the use of educational podcasting in nursing education could use the inclusion of more standardization in the measures, more longitudinal studies and the use of best practices for lengths of podcasts and the possible superiority of video podcasts to just audio files. Many students discussed the use of podcasts primarily when it came time to review for tests. More research that targets this use is needed to see what the best uses and purposes for use may be. Many of the studies were done in the environment of the BSN nursing student. More studies should include the Associate Degree Nursing students, as their needs and attributes are often different than traditional BSN students as far as being older, having families, currently working full-time while going to school, and often having more males and foreign-born students in their cohorts. Because retention rates are lower for ADN programs than BSN programs, more ways to provide student support to improve outcomes and increase retention rates should be explored. The inclusion of more diversity into nursing research should be a goal of all future studies as the changing face of this country necessitates that nurses are able to deliver appropriate cultural care.

Incorporating Podcasting into Nursing Education

The future of podcasting may also lie in collaborative work between nursing students and students in other disciplines of the health sciences. Group projects, case studies and best practice research may be improved through students working together, producing podcasts for each other with feedback, and being able to show each other visually how they are use critical thinking in problem solving. The filming and addition of video files may be of help in walking students, step-by-step, through learning about nursing skills. Students could use these video podcasts

while they practice in the skills lab performing skills. Being able to watch someone perform a skill, following along, and hearing rationale may be helpful in the retention of the steps of the skills. Podcasts may also offer an opportunity for remediation by recording a student's performance in the skills lab and then using this as a tool for teaching (Delaney et al., 2010). Physical assessments could be taught using podcasts that could then be played back on a phone or laptop that is placed on a table next to the mannequin while a student practices assessing each body system and students may benefit from hearing the voice of the instructor walk them through an assessment. More video as well as audio podcasts could be made teaching students about therapeutic communication through exemplars of dialogues between "students" and "patients." These examples are limited to nursing education but other uses of podcasts could and should be studied for practicing nurses as well.

Conclusions

Podcasts have evolved over the years from being used as a simple audio file of a taped lecture in the classroom to the more frequently used supplementation of content for remediation and clarification to promote students in nursing education. Audio files have given way to video files with audio support in order to engage students who are not only audio learners but also students who learn best through audio and visual methods. The purpose of this article was to review the current literature on the use of podcasts in nursing education and to forge a path of where future research should go. Radical changes in nursing education that are being called for by the IOM include the incorporation of technology in the classroom to prepare the nurses of tomorrow. The technology of podcasting has been consistently rated positively in student satisfaction surveys. Nursing students who are more satisfied in their classes may be more likely to stay in school when times get challenging. Keeping nursing students in school will help to

produce more graduates who are ready to enter the workforce and slow the impending nursing shortage.

References

Abate, K. (2013). The effect of podcast lectures on nursing students' knowledge retention and application. *Nursing Education Perspectives, 14*(3), 182-185.

Allen, K. & Katz, R. (2011). Comparative use of podcasts vs. lecture transcripts as learning aids for dental students. *Journal of Dental Education, 75(*6), 817-822.

Barnes, L. (2015). Perceived ease of use and usefulness of podcasting in nursing skills competence. *Nursing Theses and Capstone Projects*. Paper 215.

Billings, D. & Kowalski, K. (2007). Using podcasts for nursing education. *The Journal of Continuing Education in Nursing, 38*(2), 56-57.

Burke, S. & Cody, W. (2014). Podcasting in undergraduate nursing programs. *Nurse Educator, 39*(5), 256-259.

Bensalem-Owen, M., Chau, D., Sardam, S. & Fahy, B. (2011). Education Research: Evaluating the use of podcasting for residents during EEG instruction. *Neurology, 77*, e42-e44.

Copley, J. (2007). Audio and video podcasts of lectures for campus-based students: production and evaluation of student use. *Innovations in Education and Teaching International, 44(*4), 387-399.

Council on Physician and Nurse Supply (2007). Finding solutions to a health care staffing shortage. http://www.physiciannursesupply.com/

Delaney, E., Pennington, N., & Blankenship, M. (2010). The role of podcast lectures in associate degree nursing programs. *Teaching and Learning in Nursing, 5*, 54-57.

Dupagne, M., Millette, D., & Grinfeder, K. (2009). Effectiveness of video podcast use as a revision tool. *Journalism & Mass Communication Educator, 64(*1), 54-70.

Evans, C. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education, 50*, 491-498.

Fernandez, V., Simo, P., & Sallan, J. (2009). Podcasting: A new technological tool to facilitate good practice in higher education. *Computers & Education, 53*, 385-392.

Forbes, M. & Hickey, M. (2008). Podcasting: Implementation and evaluation in an undergraduate nursing program. *Nurse Educator, 33*(5), 224-227.

Greenfield, S. (2011). Podcasting: A new tool for student retention? *Journal of Nursing Education, 50*(2), 112-114.

Griffin, D., Mitchell, D., & Thompson, S. (2009). Podcasting by synchronizing PowerPoint and voice: What are the pedagogical benefits? *Computers & Education, 53*, 532-539.

Harris, H. & Park, S. (2008). Educational usages of podcasting. *British Journal of Educational Technology, 39*(3), 548-551.

Heilesen, S. (2010). What is the academic efficacy of podcasting? *Computers & Education, 55*, 1063-1068.

Huntsberger, M. & Stavitsky, A. (2007). The new "podogogy": Incorporating podcasting into journalism education. *Journalism and Mass Communication Educator, 7*, 397-410.

Institute of Medicine of the National Academies. (2010). The future of nursing: Focus on education. (Report Brief, October 2010).

Kalludi, S., Punja, D., Rao, R., & Dhar, M. (2015). Is video podcast supplementation as a learning aid beneficial to dental students? *Journal of Clinical and Diagnostic Research, 9*(12), CC04-CC07.

Kay, R. (2012). Exploring the use of video podcasts in education: A comprehensive review of the literature. *Computers in Human Behavior, 28*, 820-831.

Kardong-Edgren, S., & Emerson, R. (2009). Student adoption and perception of lecture podcasts in undergraduate bachelor of science in nursing courses. *Journal of Nursing Education, 49*(7), 398-401.

Kemp, P., Myers, C., Campbell, M., & Pratt, A. (2010). Student perceptions and the effectiveness of podcasting in an associate degree nursing program. *Teaching and Learning in Nursing, 5*, 111-114.

Lazzari, M. (2009). Creative use of podcasting in higher education and its effect on competitive agency. *Computers & Education, 52*, 27-34.

Lee, M. & Chan, A. (2007). Pervasive, lifestyle-integrated mobile learning for distance learners: an analysis and unexpected results from the podcasting study. *Open Learning: The Journal of Open, Distance and e-Learning, 22(*3), 201-218.

Madden, M. & Jones, S. (2008). Podcast downloading 2008. Pew Research Center: Internet, Science and Tech, http://www.journalism.org/media-indicators/podcasting-number-of-hosted-podcasts/

Maag, M. (2006). Podcasting: An emerging technology in nursing education. In: Park, Hyeoun-Ae, Murray, Peter, Delaney, Connie (Eds.), Consumer Centered Computer Supported Care for Healthy People, Proceedings of Ni2006. IOS Press. The Netherlands.

Marocco, G., Kazer, M., & Neal-Boylan, L. (2014). Transformational learning in graduate nurse education through podcasting. *Nursing Education Perspectives, 35(*1), 49-53.

McCullar, J. (2011). Podcasts: The use of podcasting in dental hygiene education. RDH, September. www.rdhmag.com.

McDermott, J. (2014). The effect of supplemental podcasts on test scores of RN to BSN research course students. Retrieved from CINAHL. ISBN: 9781321123869.

McKinney, A. & Page, K. (2009). Podcasts and videostreaming: Useful tools to facilitate learning of pathophysiology in undergraduate nurse education? *Nurse Education in Practice, 9,* 372-376.

Meek, J., Lee, M., Jones, J., Mutea, N., & Prizevoits, A. (2012). Using podcasts to help students apply health informatics concepts: Benefits and unintended consequences. *CIN: Computers, Informatics, Nursing, 30*(8), 426-439.

Mostyn, A., Jenkinson, C., McCormick, D., Meade, O., & Lynm, J. (2013). An exploration of student experiences of using biology podcasts in nursing training. BMC Medical Education, 13(12), 1-8.

Narula, N., Ahmed, L. & Rudkowski, J. (2012). An evaluation of the '5 minute medicine' video podcast series compared to conventional medical resources for the internal medicine clerkship. *Medical Teacher, 34*, e751-e755.

National League for Nursing (2016). Retention rates in RN programs. http://www.nln.org/newsroom/nursing-education-statistics/retention-rates-in-rn-programs

O'Flaherty, J. & Timms, H. (2015). The implementation of innovative initiatives to enhance distance learning for Australian undergraduate nursing and midwifery students. *Journal of Nursing Education and Practice, 5*(1), 107-114.

Rogen, F. & San Miguel, C. (2013). Improving clinical communication of student with English as a second language (ESL) using online technology: A small scale evaluation study. *Nurse Education in Practice, 13*, 400-406.

Rosseter, R. (2016). American Association of College of Nursing. http://www.aacn.nche.edu/media-relations/fact-sheets/nursing-shortage

Roy, A. & Roy, P. (2007). Intersection of training and podcasting in adult education. *Australian Journal of Adult Learning, 47*(3), 479-491.

Schlairet, M. (2010). Efficacy of podcasting: Use in undergraduate and graduate programs in a college of nursing. *Journal of Nursing Education, 49*(9), 529-533.

Strickland, K., Gray, C. & Hill, G. (2012). The use of podcasts to enhance research-teaching linkages in undergraduate nursing students. *Nurse Education in Practice, 12*, 210-214.

Stiffler, D., Stoten, S., & Cullen, D. (2011). Podcasting as an instructional supplement to online learning. *CIN: Computers, Informatics, Nursing. 29*(3), 144-148.

Vogt, M., Schaffer, B., Ribar, A., & Chavez, R. (2010). The impact of podcasting on the learning and satisfaction of undergraduate nursing students. *Nurse Education in Practice, 10*, 38-42.

Walls, S., Kucsera, J., Walker, J., Acee, T., McVaugh, N., & Robinson, D. (2010). Podcasting in education: Are students as ready and eager as we think they are? *Computers & Education, 34*, 371-378.

Chapter 4

The Impact of Podcasts on Learning Outcomes in Associate Degree Nursing Students

Abstract

Nursing faces a looming shortage of practitioners; nursing schools must provide more graduates to fill the needs. Attrition rates, which are high for Associate Degree Nursing (ADN) students, may be alleviated using educational tools such as podcasts to improve test grades therefore increasing retention. This study explored whether supplementing instruction with video podcasts improved student performance on achieving learning outcomes. Two cohorts of Associate Degree Nursing students received either podcasts or transcripts as supplemental learning ("learning boosts") in each of 12 learning modules. Using a quasi-experimental design, test grades were recorded at the end of the semester and surveys with questions on satisfaction and usage were distributed. Results showed no difference in test grades between treatment groups. Thematic content revealed high satisfaction and usage as well as a desire to have podcasted material available in other classes. Despite student perception of improvement in knowledge acquisition as well as an appreciation for being able to use podcasts when it is convenient, this promising technology has not yet been shown to provide an improvement on test grades or shown an impact on helping nursing students attaining educational goals.

Keywords: *nursing education, podcasts, mobile learning (m-learning),*

The Impact of Podcasts on Learning Outcomes in Associate Degree Nursing Students

Nursing is facing a dramatic shortage of nurses that is getting worse with each passing year. The Bureau of Labor Statistics estimates that the US will be short 649,100 nurses by the year 2024 (Rosseter, 2017). This shortage poses a threat to quality of care. Many nursing schools turn away qualified applicants due to a lack of resources. The National League of Nursing reports that 77% of Associate Degree Nursing Programs and 45% of Baccalaureate Nursing Programs were forced to turn away qualified applicants (National League for Nursing, 2016). In order to alleviate the shortage, it is essential that nursing students remain enrolled and graduate. Retention rates in Associate Degree Programs historically fall just under 80% compared with almost 90% in baccalaureate programs (National League for Nursing, 2007). New strategies for retention of students, which may include new technologies that support learning, improve grades and increase retention rates, should be explored by nursing schools.

The evolution of the "Information Age" has seen a multitude of new technologies used in nursing education. Nursing instructors seek innovative methods of instruction to keep students engaged, support their academic progress and facilitate graduation. The future of classroom support in nursing education could lie in mobile learning (m-learning) technologies, such as podcasts with both audio and video capabilities, which are accessible outside of class at the touch of a button. Many nursing students have grown up with technology and are comfortable using podcasts as a means of entertainment. The next step is to determine if podcasts can be a powerful tool to enhance education and to retain students. According to the Pew Research Center, 21 % of Americans ages 12 or older stated that they had listened to podcast in the past month (Vogt, 2016). Podcasts can be easily accessed from computers, laptops, mobile devices and tablets and are accessible 24 hours a day. Podcasts can be listened to multiple times, sped up

or slowed down, and provide repetition for listeners to enhance understanding of concepts as well as improve difficult medical term comprehension.

Educational tools such as podcasts for nursing students could improve learning outcomes such as test grades and increase retention rates in nursing schools. Understanding student satisfaction with podcasts and usage behaviors while using podcasts can provide important information about the use of technology as a supplemental learning tool. Students who use podcasts as a supplement to learning content may find fewer challenges in reaching their educational goals. Retaining students is a key to providing more nurses in the workforce, alleviating the nursing shortage and improving quality of care. Therefore, the purpose of this study is to determine whether supplementing instruction with video podcast technology improves student performance on achieving learning outcomes.

Literature Review

Podcasts

Podcasting has its roots in the tape recordings of classroom lectures and may have been born out of this common convention (Greenfield, 2011). Early podcasting was operationally defined as "the digital recording of a didactic lecture that is then archived" (Kardong-Edgren & Emerson, 2009, p. 398) and was comprised predominately of recorded classroom lectures (Abate, 2013; Forbes & Hickey, 2008; Greenfield, 2011; Kardong-Edgren & Emerson, 2009; Kemp, Myers, Campbell & Pratt, 2010; Maag, 2006; McKinney & Page, 2009; Schlairet, 2010; Vogt, Schaffner, Ribar & Chavez, 2010). Podcasts, initially used as a replacement for traditional lecture as well as a tool to deliver online lectures, have continued to evolve. Examples of newer uses include a way to provide an explanation of expectations and an overview of major concepts at the beginning of a course, as feedback on assignments and case studies and to discuss

exemplars in statistical manuscripts (Marrocco, Kazer & Neal-Boylan, 2014; O'Flaherty & Timms, 2015; Stiffler, Stoten, & Cullen, 2011). When audio podcasts with handouts of PowerPoint ™ slides were provided to BSN undergraduate nursing students as a replacement for online lectures, understanding of concepts improved (McKinney & Page, 2009) and positively influenced course satisfaction and student engagement for graduate students (Meek, Lee, Jones, Mutea, & Prizevoits, 2012).

During the past 10 years, podcast production became more creative and varied and reached a wider range of student learning types and needs. Part of the evolution of podcasting has been a move from purely audio files to video files as a means of improved instructional design and reaching a wider variety of learners. Video podcasts or "vodcasts" have gained popularity in recent years as newer technology and ease of production have emerged. Vodcasts may include video interviews, songs, PowerPoint slides, or simply a video of the person speaking. More faculty have become fluent in the production of various forms of video podcasting and thus the most recent research in this medium now includes the use of video alongside or instead of audio podcasts. In regards to technology, findings indicated that technical support and a full orientation to podcast use is essential to promote optimum outcomes (Marrocco et al., 2014; Mostyn, Jenkinson, McCormick, Meade, & Lynm 2013).

Satisfaction with Podcasts

Both BSN and graduate nursing student perceptions of podcasts were overwhelmingly positive and satisfaction was high. Students described podcasted material as valuable when studying, providing improved comprehension of content (Mostyn et al., 2013; O'Flaherty & Timms, 2015; Schlairet, 2010; Vogt et al., 2010) and ease of understanding (Meek et al., 2012; Strickland, Gray, & Hill., 2012). Stiffler et al. (2011) reported that 82% of the students

recommended that future students listen to the podcasts. Some students perceived that there was a stronger interpersonal connection between the student and the instructor which resulted in a greater sense of caring (Strickland et al., 2012). Just hearing the voice of the lecturer was comforting to some suggesting that, despite some possible faculty reservations about producing an unknown technology, podcasts do not have to be professional grade to be useful to student learning (McKinney & Page, 2009).

Usage Behaviors

Several habits were noted among BSN and graduate students while they listened and viewed podcasts in a variety of conditions and situations. Because many nursing students are familiar with technology, it might be assumed that students would take advantage of podcast portability and engage in multi-tasking activities such as exercising, doing housework or driving while listening to podcasts. However, the majority of students chose to access podcasts at home while taking notes, looking at textbooks and reviewing PowerPoints while listening to podcasts rather than in a mobile learning environment (Burke & Cody, 2014; McDermott, 2014; Mostyn et al., 2013; Strickland et al., 2012) suggesting that students preferred a study-like atmosphere to think about what is being said. On the other hand, Vogt et al. (2010) found that some students found ease of accessibility in various locations to be an asset, suggesting that the lecture content may be what makes the difference in the ability to listen and perform other functions.

Other Benefits

Students reported additional benefits of podcast use throughout the literature. When used as adjunct to learning nursing skills, BSN students who used podcasts reported significant improvement in skill performance and perceived them to be useful as well as easy to use (Barnes, 2015). Baccalaureate students felt podcasts were helpful especially for review before

tests, that they helped improve grades (Kardong-Edgren & Emerson, 2010), and that they enriched learning (Burke & Cody, 2014). When students were given a podcast of introductory course information as well as online reading materials, only 82% of students reported reading the online material from beginning to end while 100% of the students listened to the podcast from beginning to end (Stiffler et al., 2011). The vast majority (85.7%) of students who listened to podcasts agreed or strongly agreed that podcasts helped them understand course concepts (McDermott, 2014) and 77% reported a positive impact on their learning experience (Strickland et al., 2012). Sixty percent of English as a Second Language (ESL) students who viewed a clinical terminology podcast reported feeling better prepared for using clinical terminology (Rogan and San Miguel, 2013). In addition, test grades and retention rates improved in ESL students who were previously failing and subsequently listened to podcasts (Greenfield, 2011).

Impact on Learning Outcomes

Various learning outcomes were reported largely based on perception. Overall, BSN students perceived that podcasts helped them feel more successful and confident in clinical practice (Rogan & San Miguel, 2013), helped them to understand and learn the material (McKinney & Page, 2009; O'Flaherty & Timms, 2015; Schlairet, 2010) and helped them achieve their learning outcomes (Strickland et al., 2012). Many students also felt that the addition of podcasts made a difference in their course grades (Burke & Cody, 2014; Kardong-Edgren & Emerson, 2010). When students were involved in making their own podcasts as part of a class assignment, student engagement improved, especially with hesitant or shy students (Marrocco et al., 2014).

The effect of podcasts on academic achievement have been mixed. Abate (2013) found that BSN students who listened to podcasts recorded in multiple short segments had higher

scores on a multiple-choice test and a case study assignment than students who listened to an unsegmented podcast. Despite student perception of grade improvement, podcasts had no significant effect on test performance in three studies; however, satisfaction scores remained high (Vogt et al., 2010; McDermott, 2014; Meek et al., 2012). Reasons cited for the lack of significant results included student inexperience with podcasting (Vogt et al., 2010), fatigue due to the extra time needed to listen (McDermott, 2014), and the possibility of students feeling that they could "get by" with just listening to podcasts instead of doing the required readings (Meek et al., 2012).

Nursing research over the past ten years has revealed that BSN and graduate students who used podcasts as supplementary educational tools have been highly satisfied and felt the most benefit when using them to review for a test. The impact on test grades has shown mixed results. A gap in the literature reveals a lack of studies comparing podcasts to text-only transcripts of the podcasts as well as studying the use of podcasts in a population of Associate Degree nursing (ADN) students.

Theoretical Model

The study was guided by The Uses and Gratification Expectancy Theory (UGET) by Mondi, Woods and Rafi (2007). The UGET posits that students will use specific e-learning resources to satisfy their cognitive, affective, personal integrative, social and entertainment needs in order to obtain the gratifications of the perceived e-learning experience. These needs drive choices of learning resources and influence learning expectations. Students make deliberate, active decisions about e-learning resources that are most likely to satisfy their needs and to help them to attain their goals, termed their perceived e-learning experience. Each of the needs may

positively influence each other and ultimately positively influence the perceived e-learning experience.

In the current study, cognitive need was represented by podcasts; affective need was determined by satisfaction with the podcast; and personal integrative need was assessed through usage of podcasts. The social integrative need was represented by perceived connection to faculty and the entertainment need was assessed by the sense of enjoyment when using the podcasts. Exam grades were used to represent the perceived e-learning experience.

Aims

This study sought to determine how the use of podcasts, the level of satisfaction with the podcasts, the usage of the podcasts, perceived connection to faculty, and the perceived entertainment value influence test grades as compared to a group who received transcripts of the podcasts. The purpose of this quasi-experimental post-test only study was to determine whether supplementing instruction with video podcast technology improved student performance on achieving learning outcomes. The relationship among study variables was also explored.

Research Questions

1. Is there a significant difference on test scores between ADN students who receive supplemental podcasts compared to ADN students who receive transcripts of the podcasts?
2. How do students describe their podcast or transcript learning experience with regard to satisfaction, social connection, and entertainment value?
3. How do students describe the way they use the podcasts or transcripts?
4. What are the relationships among learning styles, the type of learning boost used, and satisfaction?

Sample

Following Institutional Review Board approval, a convenience sample of two cohorts (cohort 1, n = 71; cohort 2, n = 54) of second semester Associate Degree nursing students enrolled in a medical-surgical course were recruited between June and September 2017.

Methodology

Throughout the semester, students attended lectures on eight medical-surgical concepts and four lab concepts. A total of 12 downloadable video podcasts, 5-10 minutes in length, were produced that summarized the material from each of the module and lab lectures. Students were provided links to one of two treatments, either podcasts or transcripts to the podcasts, called "learning boosts," in each of their student learning modules. The learning boosts were developed as a supplement to usual course materials such as learning guides, vocabulary lists and case studies. Each nursing concept learning boost contained a similar format that included content on a disease process and a case study of a historical figure or celebrity. Each lab learning boost format reviewed the reason the skill was performed as well as sample nursing documentation of the skill. The podcasts were developed in Camtasia ™, a podcast development tool. This tool allows production of downloadable audio and video files and has functionality such as video with a web camera, PowerPoint ™ slide presentation, and graphic and video embedding capability. Multi-pronged teaching strategies are needed to address various learning styles, thus the podcasts included video, audio, text and pictures. The transcripts were verbatim narratives of the podcast information and prepared as a Microsoft Word™ document. Students were able to access the links to the learning boosts at any time during the semester. Accessing the podcasts or transcripts was not mandatory nor a part of the test or final grades. Students received friendly,

conversational style emails on a weekly basis reminding them of the availability of the learning boosts.

Students were assigned a treatment group based on the semester (either summer or fall) they were enrolled in the course. Students were able to access the treatments via their computers, phones, tablets or other digital devices. The summer cohort received transcript learning boosts; the fall cohort received the podcast learning boosts. Instructors used the same Blackboard course shell with the same objectives, PowerPoint presentations, readings and modules for both cohorts. At the end of the semester, the Learning Boost Survey included questions on demographics, satisfaction and usage with the learning boosts, and feedback on the social and entertainment aspects. The survey contained open-ended qualitative questions, dichotomous answer questions, and a Likert-type question about perceptions of knowledge attainment, satisfaction, usage, engagement, and feelings of entertainment from the treatments. Student learning styles were captured upon application to the nursing program and were used with permission. All students complete the Health Education Systems Incorporated (HESI) Admission Assessment which includes a report of the student's predominant learning style. The learning style is determined by answers to a quiz that the students fill out during the assessment. At the end of the course, test grades of each of the module exams and the final exam were collected for all participants and entered into the SPSS data file.

Findings

Demographics

Of a potential 138 nursing students enrolled, 128 originally agreed to participate. Of this group, one student dropped the class prior to beginning and two others dropped the class prior to

study completion, leaving a final sample of 125 participants. Ages ranged from 21-59 years with a mean of 31.7. The sample was primarily female and Caucasian (Table 1).

Table 1. *Study Sample Demographics*

Demographic Variable	Number (%)
Race	
Asian	8 (6%)
Black / African-American	13 (10%)
Caucasian	95 (76%)
Other	7 (5%)
No response	2 (3%)
Ethnicity	
Hispanic	44 (35%)
Non-Hispanic	79 (63%)
No response	2 (3%)
Marital Status	
Single	60 (48%)
Married / partner	65 (52%)
Children	
Yes	60 (48%)
No	65 (52%)
Employment	
Full-time	18 (14%)
Part-time	67 (54%)

Not employed	33 (26%)
Other	5 (4%)
No response	2 (2%)
English as a First Language	
Yes	98 (80%)
No	24 (19%)
No response	3 (1%)

Students were assigned to a transcript group (n=71) or a podcast group (n=54). Independent t-test showed no differences between groups based on age. Chi-square analysis showed no differences between groups based on gender, race, marital status, primary language, children, or employment status.

In addition to demographics noted, learning style was assessed through participant results on a pre-admission HESI test before entering the nursing program. A majority (n = 90; 72%) of students were kinesthetic learners, with 10 (8%) auditory learners, seven (6%) cognitive learners and five (4%) identified as visual learners. Missing data was reported for 13 (10%) participants.

Effect of Type of Learning Boost on Exam Scores

A one-way ANOVA test was performed to determine the effect of the type of learning boost type on test scores (Table 2). No significant differences on exam scores were noted between the two different learning boost groups.

Table 2.

Comparison of Exam Scores by Type of Learning Boost

Exam	Transcript Group (n = 71)	Podcast Group (n = 54)	F (df)
Exam One	84.65	83.09	1.432 (1,123)
Exam Two	82.64	83.0	.670 (1,123)
Final Exam	82.65	81.71	.601 (1,123)

Satisfaction, Social Need, and Entertainment Need

Participants were asked to rate their satisfaction for their assigned learning boost on a scale of 1-10. The mean score on the Satisfaction Scale was 9.07 for the transcript group and 8.98 for the podcast group, indicating no significant difference between the two groups based on independent sample t-test. Responses to questions assessing social need found that 83.2% of students stated that the email reminders encouraged them to look at the learning boosts while 98.4% of students responded that the informal style of the learning boosts helped them to feel more connected to the content. These responses were consistent across both treatment groups. Questions pertaining to the entertainment need asked “Were the learning boosts engaging to you?” and “Did the addition of celebrities with certain illnesses and conditions help you remember the content better?” The majority (96%) of students in both groups stated that the learning boosts were engaging and 83% answered the addition of the celebrities to the learning boosts helped with content retention, with a slight preference shown by the transcript group.

Perceived Usefulness of Learning Boost

In response to the Perceived e-Learning Experience, 98% (n=123) of participants perceived the learning boosts to be helpful in gaining knowledge. In response to the question about the Affective need, "How did the learning boosts affect your understanding of the lecture content?" most students stated that they helped identify key points (n=110), many said that they clarified confusing content (n=63) and some students noted other ways that the learning boosts affected their understanding. Examples of these responses included "*helped bring it all together like glue to everything I studied*" and "*easier to follow, more organized.*" A majority of the respondents stated the learning boosts would be helpful in other courses through comments such as "*it would definitely help focus my studies to the most important facts."*

Learning Boost Usage

The Personal Integrative Need was examined through usage of the learning boosts. Ninety-seven percent (n=121) of respondents in both the transcript group and the podcast group stated that they used the learning boosts in their modules. When asked why they used the learning boosts, the majority from both treatment groups used them after class to help understand the content (n=60), with the next most frequently cited reasons as being before class to prepare and to review for an exam. Other reasons given for using them were "*before reading as a quick overview*," and "*for making my own patho cards."*

In response to where students used the learning boosts most, a majority of participants (n=108) used the learning boosts at home, while others stated they used them at school, (n=24) at the library (n=23), studying with friend (n=21) and in the car or on public transit (n=19). Other places where students used the learning boosts included at work, at a coffee shop, and with a

study group. Overall, the transcript group showed a slight preference for using the learning boosts compared to the podcast group at these locations.

Frequency of Learning Boost Use

When asked how often they used their learning boosts, 33% of students stated 'occasionally' (3-5 times during the semester), 32% used them 'often' (6-8 times during the semester), 12% used them 'frequently' (9-12 times during the semester), 17% stated they used them 'a lot' (>12 times, accessed at least one boost more than once), and only 5% stated that they used them 'rarely' or 'not at all'. Within the group assignments, the transcript group used the learning boosts more often in all categories except for 'frequently.'

Relationships among Learning Style, Type of Learning Boost, and Satisfaction

To determine any relationship among the learning style, type of learning boost used, and scores on the Satisfaction Scale, spearman's rho was performed. The correlation analysis indicated no significant relationships among the variables.

Qualitative Responses

The perception of helpfulness was explored through the question, "Did you perceive the learning boosts to be helpful in your course?" A majority of students agreed that the Learning boosts were helpful and identified three major areas of benefit: (a) Learning boosts helped summarize the lecture and reading content; (b) Learning boosts identified the key points to focus upon; (c) case studies improved ability to remember content. Statements provided in support of these themes included "*They really summarized the important concepts of the material," "It helps me narrow down the main points of each subject"* and *"I think the case studies helped to have a reference to put the knowledge to. I liked having real-life situations to help give perspective to material."* Other students commented that the learning boosts helped to reinforce

the material and helped them focus. Student felt that they gained knowledge through using the learning boosts.

Nearly every student (n=124) stated that the learning boosts would be helpful in other courses. Responses included reasons such as focus and clarification, "*They help focus studying*" and "*If a student is confused on a subject, they help clarify and outline important information*" to being a tool for review, *"I wish I had these in all of my nursing classes! All classes, actually. It's just a great review*."

When asked about what they liked least about the learning boosts, most students (n=67) left the answer blank or said "nothing." Two themes emerged among those who did respond to the question; formatting and desiring more information such as medications, charts or visuals. The transcript group was given text-only transcripts of the podcasts and some commented that they disliked how the documents were formatted. Each learning boost transcript had the same general outline with an introduction, risk factors, clinical manifestations, diagnostic tests, treatment/medications, nursing considerations, the case study and "three things you must know about (disease). Some students stated that the text was single spaced and therefore difficult to read. Others said that more paragraphs would have been helpful and still another said the "wall of text" was less desirable when frequently using the boosts. Another theme that emerged was the desire to have more material included. Comments included a desire for review questions, having optional audio, need for more charts and graphics, a desire for more discussion of anatomy and the inclusion of more medications. Despite these comments, overall satisfaction was indicated with several comments about what they liked least about the learning boosts stating that they "*were not available sooner or for every class."*

In response to the question, "What did you enjoy most about the learning boosts?" students responded with a multitude of answers that included the case studies, simplicity and ease of understanding, that the content was focused, and that they were clear and concise. Some examples of student comments included *"The fact that I could listen and also print out the transcripts," "Made me feel like I was on the right track," "The simplicity of a few pages worth of information allowed me to retain the content better"* and *"The connections with celebrities/real cases made me feel more connected to the material because it happens in real life."* Of note is the fact that out of all responses to this survey question, only five students left the question blank indicating an overall satisfaction with the learning boosts.

Discussion

Despite overall satisfaction with the use of the learning boosts by both treatment groups, it does not appear that podcasts of course content significantly affects satisfaction or test grades among a sample of ADN students. These findings are congruent with those of Vogt et al. (2010), McDermott (2014), and Meek et al. (2012), who determined podcasts did not improve test scores among BSN or MSN students. Historically, most students in this course have a B average and this continued to be the case with these two cohorts. Grades from prior years were not available for comparison but future research should include looking at specific number grades for differences such as overall averages increasing from an 82 to an 89, which could be significant. Having specific scores on prior exams would provide for a more robust analysis. Randomization among treatment groups as well as the inclusion of a control group for comparison to determine if either of these learning boosts would affect test grades when compared to no learning boost should also be included in future studies.

Overall, students in both the podcast and the transcript groups reported high levels of satisfaction, similar to the findings reported by Mostyn et al. (2013), O'Flaherty and Timms (2015), Schlairet (2010),and Vogt et al. (2010). Students in both treatment groups were equally satisfied with the learning boost and test grades remained similar across both groups. This could indicate that students in both groups enjoyed using them; however, the fact that they used them and were satisfied with them was not a significant factor in test performance.

The learning styles of the students did not seem to affect how satisfied a student was with the type of learning boost assigned. Learning boosts with audio and video included would seem to lend themselves more readily to the auditory or visual learner, however, this was not the case as more students who self-identified as kinesthetic learners showed more satisfaction than the other groups. Since the type of learning boost used did not seem to make a difference, faculty who are interested in using podcasting in the classroom may want to choose the most economical or easiest to produce. Another recommended option is to produce both types of learning boosts and let the students choose which type suits their needs best.

Students reported that the learning boosts were helpful in gaining knowledge but actual test scores did not support this claim. Future research may want to include re-testing for content retention at a later date. Students in nursing courses will ultimately all need to access prior knowledge in order to be successful on the National Council Licensure Exam-RN ® (NCLEX) and an important question may be to determine if the perception of gained knowledge will translate to encoded knowledge that can be accessed while taking the NCLEX. The inclusion of learning boosts in other courses was desirable to students in both the transcript group and the podcast group stating that the learning boosts provided a good review of material. Because learning boosts are produced in a sustainable manner, students have the ability to download the

podcasts and keep them for future review without needing to access prior online course material which may be difficult in an online learning format or with learning management systems that will eventually become unavailable to students.

Although many students stated that there was nothing that they did not like about the learning boosts, issues with formatting and the lack of inclusion of more visuals and information were cited by some as reasons for not liking them. Students in the transcript group were the ones who noted the most problems with formatting as the podcast group were provided with multiple pictures and graphics to supplement the voice-over PowerPoint podcast that were assigned to them. Problems with reading the text of the transcripts may have presented a barrier to learning and being able to retain information. However, this does not account for why the podcast group did not show significantly higher test scores. Faculty who produce podcasted material for future classes may consider developing the transcripts in easy-to-read formats to decrease any issues with learning.

Many reasons were cited regarding what students liked best about the learning boosts and overall it appears that students appreciated having them available and accessible at any time. The addition of case studies using celebrities seemed to have been helpful in understanding information and making connections between the disease process and the real-life person. Future research may benefit nursing students by helping them connect nursing content with figures from the entertainment world through including this strategy in other case studies as well as lecture materials. Making connections with known celebrities and personalities may also improve retention of knowledge of content.

The inclusion of podcasting into nursing education has consistently shown that students enjoy this addition of technology into their learning modalities but it has not yet demonstrated

that test grades improve through their use. Faculty may want to consider other designs for podcasting as well as the inclusion of additional material such as review questions and quizzing. While many students enjoyed using the podcasts, they ultimately want to use technology to help improve grades and reach their educational goals.

The purpose of this study was to determine the efficacy of podcasting as an effective method to improve learning outcomes among associate degree nursing students, who have been historically underrepresented in related research. The results for the ADN students were similar to their counterparts in BSN and MSN programs indicating that type of nursing program does not appear to make a difference in the use of these educational strategies. These results provide support for applying evidence-based educational strategies across different nursing degree programs.

Summary

Nursing education continues to seek out new and innovative ways to connect with students and facilitate learning. The use of technology to enhance classroom content continues to show promise in helping students achieve their educational goals. Podcasts may be used as a continuation of classroom learning in providing instruction and review as downloadable files that can be accessed digitally at any time and in any place. When students are able to access classroom content at their convenience, learning has fewer challenges and students are able to be successful in their courses. A continued challenge for faculty is to reduce barriers to learning while keeping rigor high and students engaged. Keeping nursing students in school is an important step toward increasing graduation rates and supporting the nursing workforce. Providing extra support to students through the use of podcasts may help students attain their goal of becoming a nurse.

References

Abate, K. (2013). The effect of podcast lectures on nursing students' knowledge retention and application. *Nursing Education Perspectives, 14*(3), 182-185.

Barnes, L. (2015). Perceived ease of use and usefulness of podcasting in nursing skills competence. *Nursing Theses and Capstone Projects*. Paper 215.

Burke, S. & Cody, W. (2014). Podcasting in undergraduate nursing programs. *Nurse Educator, 39*(5), 256-259. doi: 10.109/NNE.0000000000000059

Forbes, M. & Hickey, M. (2008). Podcasting: Implementation and evaluation in an undergraduate nursing program. *Nurse Educator, 33*(5), 224-227.

Greenfield, S. (2011). Podcasting: A new tool for student retention? *Journal of Nursing Education, 50*(2), 112-114. doi: 10.3928/01484834-20101230-06

Kardong-Edgren, S., & Emerson, R. (2009). Student adoption and perception of lecture podcasts in undergraduate Bachelor of Science in nursing courses. *Journal of Nursing Education, 49*(7), 398-401. doi: 10.3928/01484834-20100224-04

Kemp, P., Myers, C., Campbell, M., & Pratt, A. (2010). Student perceptions and the effectiveness of podcasting in an associate degree nursing program. *Teaching and Learning in Nursing, 5*, 111-114. doi:10.1016/j.teln.2010.01.006

Maag, M. (2006). Podcasting: An emerging technology in nursing education. In: Park, Hyeoun-Ae, Murray, Peter, Delaney, Connie (Eds.), Consumer Centered Computer Supported Care for Healthy People, Proceedings of Ni2006. IOS Press. The Netherlands.

Marocco, G., Kazer, M., & Neal-Boylan, L. (2014). Transformational learning in graduate nurse education through podcasting. *Nursing Education Perspectives, 35(*1), 49-53. doi: 10.5480/10-421.1

McDermott, J. (2014). The effect of supplemental podcasts on test scores of RN to BSN research course students. Retrieved from http://repository.mnu.edu/sites/default/files/MNU%20Faculty%20McDermott%20Podcasts%20Nursing%20Dissertation.pdf.

McKinney, A. & Page, K. (2009). Podcasts and videostreaming: Useful tools to facilitate learning of pathophysiology in undergraduate nurse education? *Nurse Education in Practice, 9,* 372-376. doi: 10.1016/j.nepr.2008.11.003

Meek, J., Lee, M., Jones, J., Mutea, N., & Prizevoits, A. (2012). Using podcasts to help students apply health informatics concepts: Benefits and unintended consequences. *CIN: Computers, Informatics, Nursing, 30*(8), 426-439. doi: 10.109/NXN.0b013e31825108d1

Mondi, M., Woods, P., & Rafi, A. (2007). Students' 'uses and gratification expectancy' conceptual framework in relation to e-learning resources. *Asia Pacific Educational Review, 8(*3), 435-449.

Mostyn, A., Jenkinson, C., McCormick, D., Meade, O., & Lynm, J. (2013). An exploration of student experiences of using biology podcasts in nursing training. *BMC Medical Education, 13*(12), 1-8. Retrieved from http://www.biomedcentral.com/142-6920/13/12

National League for Nursing. (2007). Retention rates in RN programs, 2006-2007. NLN DataView ™. Retrieved from http://nln.matrixdev.net/docs/default-source/newsroom/nursing-education-statistics/AS0607_23.pdf-pdf.pdf

National League for Nursing. (2016). Percentage of programs that turned away qualified applicants by program type, 2016. NLN DataView ™. Retrieved from http://www.nln.org/newsroom/nursing-education-statistics/biennial-survey-of-schools-of-nursing-academic-year-2015-2016

O'Flaherty, J. & Timms, H. (2015). The implementation of innovative initiatives to enhance distance learning for Australian undergraduate nursing and midwifery students. *Journal of Nursing Education and Practice, 5*(1), 107-114. doi: 10.5430/jnep.v5n1p107

Rogen, F. & San Miguel, C. (2013). Improving clinical communication of students with English as a second language (ESL) using online technology: A small scale evaluation study. *Nurse Education in Practice, 13*, 400-406. doi: 10.1016/j.nepr.2012.12.003

Rosseter, R. (2017). American Association of College of Nursing. Retrieved from http://www.aacnnursing.org/News-Information/Fact-Sheets/NursingShortage

Schlairet, M. (2010). Efficacy of podcasting: Use in undergraduate and graduate programs in a college of nursing. *Journal of Nursing Education, 49*(9), 529-533. doi: 10.3928/01484834-20100524-08

Strickland, K., Gray, C. & Hill, G. (2012). The use of podcasts to enhance research-teaching linkages in undergraduate nursing students. *Nurse Education in Practice, 12*, 210-214. doi: 10.1016/j.nepr.2012.01.006

Stiffler, D., Stoten, S., & Cullen, D. (2011). Podcasting as an instructional supplement to online learning. *CIN: Computers, Informatics, Nursing. 29*(3), 144-148. doi: 10:109/nCN.ObO13e3181fc3fdf

Vogt, M., Schaffer, B., Ribar, A., & Chavez, R. (2010). The impact of podcasting on the learning and satisfaction of undergraduate nursing students. *Nurse Education in Practice, 10,* 38-42. doi: 10.1016/j.nepr.2009.03.006

Vogt, N. (2016). Podcasting: Fact sheet. Pew Research Center: Journalism and Media. Retrieved from: http://www.journalism.org/2016/06/15/podcasting-fact-sheet;/

Chapter 5

Conclusions and Recommendations

This portfolio presented an overview of the use of technology by nurses and nurse educators to improve patient outcomes and ADN student learning. The ultimate goal of this program of research is to identify strategies that result in attaining educational goals, increasing retention in nursing schools, and to alleviate the nursing shortage. An initial foray into the world of wearable technology was undertaken through a state-of-the-science paper which revealed a prevalence of technology that is currently being used by nurses as well as other health care professionals to increase patient safety, improve access to records and provide better tools for efficiency in the workplace. A deeper understanding of how nurses are using technology led to a question of how nursing students are introduced to the technology in school as a supplement to their learning resources. An examination of how podcasting and other instructional approaches have been used as both a supplement to and a replacement for traditional lecture over the past 10 years followed. This paper examined not only how podcasting was being used by faculty to support student success but also how students responded to this new way of presenting material. A need for a deeper understanding of the student experience with the use of podcasts drove the final research project involving the design, production of and delivery of podcasts for ADN students as a supplemental resource with medical-surgical topics.

Results of this research were positive, however some limitations of the design were noted. While many researchers now recommend the use of an attention control group rather than a true control group that does not receive the treatment, this study may have benefitted from the addition of a true control group for purposes of comparison. It may be of interest to determine if a group who received no supplemental instruction intervention had similar test grades to the

podcast and the transcript groups. Another limitation was the lack of test grades available from previous groups. Comparing previous test grades to current test grades in which students were exposed to the treatments may reveal richer results. While many of the students historically got B's on the tests, looking at specific numeric grades (e.g. a grade of 81 versus a grade of 88) could shed more light on any effects that the treatments offered. Examining this type of continuous data could lead to richer information in determining if the type of learning boost or even the presence of the learning boosts made any difference in test grades among the sample of ADN students.

Future research in this area would benefit from the inclusion of underserved populations such as students for whom English is not the primary language or students with learning disabilities. These populations may derive the most benefit from video podcasts by being able to watch them repeatedly and having the ability to pause and absorb the content. Testing the use of podcasts among different courses for different levels of students and employing the use of multi-site centers in schools of nursing could also benefit researchers to hone in on the most appropriate populations for this type of technology. Podcasting has been shown to provide benefits to nursing students, regardless of the level of student. Whether MSN, BSN or ADN students, all are capable and eager to use technology to benefit their learning. The goal of future research should be to determine how best to use technology to support and retain nursing students.

References

Abate, K. (2013). The effect of podcast lectures on nursing students' knowledge retention and application. *Nursing Education Perspectives, 14*(3), 182-185.

Burke, S. & Cody, W. (2014). Podcasting in undergraduate nursing programs. *Nurse Educator, 39*(5), 256-259.

Forbes, M. & Hickey, M. (2008). Podcasting: Implementation and evaluation in an undergraduate nursing program. *Nurse Educator, 33*(5), 224-227.

Greenfield, S. (2011). Podcasting: A new tool for student retention? *Journal of Nursing Education, 50*(2), 112-114. doi: 10.3928/01484834-20101230-06

Health Education Systems, Inc. (2018). Retrieved from: http://docs.hamptonu.edu/student/HESI_A2_Personality_Profiles_20140205141059.pdf

Institute of Medicine of the National Academies. (2017). Using technology to advance global health. (Meeting, May 2017).

Kardong-Edgren, S., & Emerson, R. (2010). Student adoption and perception of lecture podcasts in undergraduate Bachelor of Science in nursing courses. *Journal of Nursing Education, 49*(7), 398-401. doi: 10.3928/01484834-20100224-04

Kemp, P., Myers, C., Campbell, M., & Pratt, A. (2010). Student perceptions and the effectiveness of podcasting in an associate degree nursing program. *Teaching and Learning in Nursing, 5*, 111-114. doi:10.1016/j.teln.2010.01.006

McKinney, A. & Page, K. (2009). Podcasts and videostreaming: Useful tools to facilitate learning of pathophysiology in undergraduate nurse education? *Nurse Education in Practice, 9,* 372-376. doi: 10.1016/j.nepr.2008.11.003

Mondi, M., Woods, P., & Rafi, A. (2007). Students' 'uses and gratification expectancy' conceptual framework in relation to e-learning resources. *Asia Pacific Educational Review, 8(*3), 435-449.

Mondi, M., Woods, P., & Rafi, A. (2008). A 'uses and gratification expectancy model' to predict students' 'perceived e-learning experience.' *Educational Technology & Society, 11*(2), 241-261.

Schlairet, M. (2010). Efficacy of podcasting: Use in undergraduate and graduate programs in a college of nursing. *Journal of Nursing Education, 49*(9), 529-533. doi: 10.3928/01484834-20100524-08

Vogt, M., Schaffer, B., Ribar, A., & Chavez, R. (2010). The impact of podcasting on the learning and satisfaction of undergraduate nursing students. *Nurse Education in Practice, 10,* 38-42. doi: 10.1016/j.nepr.2009.03.006

Wilson, D. (2016). An overview of the application of wearable technology to nursing practice. *Nursing Forum*, July.

Appendix A

The University of Texas Institutional Review Board Approval

THE UNIVERSITY OF TEXAS AT TYLER

3900 University Blvd. • Tyler, TX 75799 • 903.565.5774 • FAX: 903.565.5858

Office of Research and Technology
Transfer Institutional Review Board

May 25, 2017

Ms. Wilson,

Your request to conduct the study *Impact of Podcasts on Learning Outcomes in Associate Degree Nursing Students,* IRB#Sp2017-97 has been approved by The University of Texas at Tyler Institutional Review Board under expedited review. This approval includes the written informed consents that are attached to this letter, and your assurance of participant knowledge of the following prior to study participation: this is a research study; participation is completely voluntary with no obligations to continue participating, and with no adverse consequences for non-participation; and assurance of confidentiality of their data.

In addition, please ensure that any research assistants are knowledgeable about research ethics and confidentiality, and any co-investigators have completed human protection training within the past three years, and have forwarded their certificates to the IRB office (G. Duke).

Please review the UT Tyler IRB Principal Investigator Responsibilities, and acknowledge your understanding of these responsibilities and the following through return of this email to the IRB Chair within one week after receipt of this approval letter:

- This approval is for one year, as of the date of the approval letter
- **The Progress Report form must be completed for projects extending past one year.** Your protocol will automatically expire on the one year anniversary of this letter if a Progress Report is not submitted, per HHS Regulations **prior** to that date (45 CFR 46.108(b) and 109(e): http://www.hhs.gov/ohrp/policy/contrev0107.html
- Prompt reporting to the UT Tyler IRB of any proposed changes to this research activity
- Prompt reporting to the UT Tyler IRB and academic department administration will be done of any unanticipated problems involving risks to subjects or others
- Suspension or termination of approval may be done if there is evidence of any

serious or continuing noncompliance with Federal Regulations or any aberrations in original proposal.

- Any change in proposal procedures must be promptly reported to the IRB prior to implementing any changes except when necessary to eliminate apparent immediate hazards to the subject.

Best of luck in your research, and do not hesitate to contact me if you need any further assistance.

Sincerely,

Gloria Duke, PhD, RN

AUSTIN COMMUNITY COLLEGE DISTRICT

Office of Institutional Effectiveness and Accountability

5930 Middle Fiskville Road • Austin, Texas 78752-4390 • Phone 512/223-7036 • Email oieinfo@austincc.edu • Fax 512/223-7029

Austin Community College
Research Review Committee
Letter of Agreement

DATE: May 30, 2017

TO: Daira Wilson
14967 Doria Drive
Austin, TX 78728

Kelle Howard, Nursing Professor

FROM: Soon O. Merz

On behalf of the Research Review Committee of Austin Community College, I am pleased to inform you that the proposal you submitted, "Impact of Podcasts on Learning Outcomes in Nursing Student" has been approved.

If you wish to pursue this proposal, please sign and return this letter to the Office of Institutional Effectiveness and Accountability by June 16, 2017. All ACC-based research must be completed within one year of this agreement, unless otherwise stated.

Soon O. Merz — 5/30/17

Soon O. Merz
Chair, ACC Research Review Committee
VP for Effectiveness and Accountability

Date

Appendix C

Informed Consent

THE UNIVERSITY OF TEXAS AT TYLER
Informed Consent to Participate in Research
Institutional Review Board #

Approval Date:

1. **Project Title:** Impact of Podcasts on Learning Outcomes in Nursing Students

2. **Principal Investigator:** Daira Wilson RN, MSN

3. **Participant Name:**

4. **Simple Description of Project Purpose:** Faculty want students to be successful. We are trying to find the best ways to help students learn. In this study, you will have access to additional course materials in what we are calling "Learning Boosts". You will be asked at the end of the course about your experience using the learning boosts. Group test averages will be examined to see if one kind of learning boost is better than another. You have been introduced to a new teaching strategy called the Learning Boost for this class. The purpose of this project is to see how you would respond to this new teaching strategy and if it had an impact on your test grades or final exam grades. We also want to learn about how satisfied you are with this additional teaching tool and how you used them throughout the course.

5. **Research Procedures: <u>If you agree to be in this study, we will ask you to do the following things:</u>**

    a. Allow the researcher to use your test grades and your learning style to determine the effectiveness of the learning boost. Your name will not be associated with the report of the results.
    b. Complete two short surveys at the end of the semester that will take approximately 10 minutes. .

6. **Potential Risks:** There is minimal risk associated with this study. It will require a time commitment of approximately 10 minutes at the end of the semester.

7. **Potential Benefits:** This study may not benefit you personally. However, findings from this study may help future students by informing faculty of the most effective way to convey important course content.

Understanding of Participants:

8. I have been given a chance to ask any questions about this research study. The researcher has answered my questions. I understand any and all possible risks.

9. If I sign this consent form I know it means that:

- I am taking part in this study because I want to. I chose to take part in this study after having been told about the study and how it will affect me.
- I know that I am free to not be in this study. If I choose to not take part in the study, then nothing will happen to me as a result of my choice.
- I know that I have been told that if I choose to be in the study, then I can stop at any time. I know that if I do stop being a part of the study, then nothing will happen to me.

10. I have been promised that that my name or other identifying information will not be in any reports (presentations, publications) about this study unless I give my permission. The UT Tyler Institutional Review Board (the group that makes sure that research is done correctly and that procedures are in place to protect the safety of research participants) may look at the research documents. This is a part of their monitoring procedure and will be kept confidential.

11. If I have any questions concerning my participation in this project, I will contact the principal researcher: Daira Wilson RN, MSN, at (512) 771-8203, dwilson26@patriots.uttyler.edu.

12. If I have any questions concerning my rights as a research subject, I will contact Dr. Gloria Duke, Chair of the IRB, at (903) 566-7023, gduke@uttyler.edu.

CONSENT/PERMISSION FOR PARTICIPATION IN THIS RESEARCH STUDY

I have read and understood what has been explained to me. I give my permission to take part in this study as it is explained to me. I give the study researcher permission to register me in this study. I have received a signed copy of this consent form.

_____ _____

Signature of Participant Date

_____

Witness to Signature

13. I have discussed this project with the participant, using language that is understandable and appropriate. I believe that I have fully informed this participant of the nature of this study and its possible benefits and risks. I believe the participant understood this explanation.

_____ _____

Researcher/Principal Investigator Date

Appendix D

Learning Boost Survey

Directions: Please respond to each question. Use the back of the page if you need more room for your answers.

Perceptions

1. Did you perceive the learning boosts to be helpful in gaining knowledge? Yes No
2. If yes, why do you think they helped you?

Satisfaction

3. How did the learning boosts affect your understanding of the lecture content?

   ____ Did not make a difference

   _____ Helped identify the key points each week

   _____ Clarified confusing content

   _____ Other (please specify)

4. Would learning boosts be helpful in other courses?

   No: If no, why not?

   Yes: If yes, why?

5. On a scale of 1-10 with 1 being unsatisfied and 10 being very satisfied, please rate your satisfaction were your Learning Boosts? (circle your response)

   Dissatisfied Satisfied

   1 2 3 4 5 6 7 8 9 10

Usage

6. Did you use the Learning Boosts in your modules?

_____ Yes
_____ No (skip to Q8)

7. If Yes:

    a. Why did you use the Learning Boosts *the most*? (Select one).

    _____ Before class to prepare
    _____ After class to help understand the content
    _____ To review for an exam
    Other (please specify):

    b. Where did you use your learning boosts the most? (Check all that apply).
    _____ At home
    _____ At school
    _____ In the car / on public transit
    _____ At the library
    _____ Studying with friends
    Other (please specify):

    c. How often did you use your learning boosts?
    _____ Did not use
    _____ Rarely (once or twice during the semester)
    Occasionally (3-5 time during the semester)
    Often (6-8 times during the semester)
    _____ Frequently (9-12 times during the semester)
    _____ A lot (> 12 times, accessed at least one boost more than once)

Social

8. Did the email reminders encourage you to look at the learning boosts?

_____ Yes
_____ No

9. Did the informal style of the learning boosts help you feel more connected to the content?
_____ Yes
_____ No

Entertainment

10. Were the learning boosts engaging to you?

_____ Yes

_____ No

11. Did the addition of celebrities with certain diseases and conditions help you remember the content better?
    _____ Yes
    _____ No

12. Please tell us what you liked least about the learning boosts:

13. Please tell us what you enjoyed most about the learning boosts:

Demographics Survey

Directions: Please respond to all questions

1. With which gender do you most closely identify?
   ___ Male
   ___ Female

2. What is your age in years? _____

3. What is your marital status?
   ___ Single
   ___ Married / Living with a partner

4. Do you have any children?
   ___ Yes If Yes, how many?
   ___ No

5. What is your race?
   ___ American Indian or Alaska Native
   ___ Asian
   ___ Black or African American
   ___ Hispanic or Latino
   ___ Native Hawaiian or Other Pacific Islander
   ___ White, non-Hispanic
   ___ Other

6. Is English your first language?
   ___ Yes
   ___ No

If No, what is your first language?

7. What is your employment status?
   ___ Full-time
   ___ Part-time
   ___ Not employed outside the home

Thank you for responding to the survey!

Biosketch

NAME: Wilson, Daira D. (MSN, R.N., CNE)

POSITION TITLE: Doctoral Student

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
Texas A & M University	BS	06/1990	Microbiology
The University of Texas at Austin	MSN	06/1994	Nursing
The University of Texas at Austin	Post-MSN	06/1998	Adult Health Focus
University of Texas at Tyler Tyler Texas	Ph. D.	06/2018	Nursing

A. Personal Statement

My program of research is about the use of technology in nursing practice and nursing education. My initial interest was in the current research on wearable technology in health care and how nurses and other health care professionals are using the newest devices. I then began to have an interest in nursing education and how technology could be used to improve student success. I have been teaching nursing for almost 20 years and so am qualified through my experience to add to this science. I have taught online classes and now will use the results of my research to improve the educational experiences of nursing students. My research project involved the use of podcasting as a supplemental educational tool to support learning. I am a strong advocate of the use of technology as a supportive tool in education and ensuring that technology is used purposefully. Supporting students throughout their nursing school years is imperative to retaining students and getting them to graduate and enter the workforce. I intend to continue pursuing new and appropriate technologies to support nurses and nursing education.

B. Positions and Honors

Activity	Beginning Date	Ending Date	Related To	Institution
Recovery Room Team Leader for yearly medical	2000	current	Volunteer	Austin Smiles

missions to El Salvador, Guatemala and Mexico				
Professor	2014	current	Associate Degree Nursing	Austin Community College
Associate Professor	2000	2014	Associate Degree Nursing	Austin Community College
Admissions Committee Member	2013	Current	Associate Degree Nursing	Austin Community College
Clinical Instructor and Lab Instructor	1997	2000	Bachelor of Science Nursing	The University of Texas at Austin
Charge Nurse	1998	2004	Clinical Nursing	North Austin Medical Center
Staff Nurse	1995	1998	Clinical Nursing	North Austin Medical Center
Home Health Nurse	1994	1995	Clinical Nursing	Texas Home Health

C. Academic and Professional Awards

2017 Digital Fellowship in the Use of Technology to Improve Core Courses $4000
2017 NLN/Nurse Tim Nurse Educator Scholarship $1000

D. Memberships in Professional Societies

2013-Current National League for Nursing
2015-Current Texas League for Nursing

E. Contribution to Science

Wilson, D. (2016). An Overview of the Application of Wearable Technology to Nursing Practice. *Nursing Forum*, July.