

Changes in teaching strategies to accommodate a new generation of learner: A case study

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Abstract

Generational diversity is found throughout the classrooms of higher education. The differences in generational characteristics may affect the educational experience and how one approaches learning and teaching. Faculty should be aware of these characteristics and may need to adapt their learning environment to fit the needs of today's learner. The millennial learner is accustomed to the assimilation of technology in the classroom and how it may facilitate learning. The purpose of the study was to incorporate technology and active learning in the classroom. An interactive computer-based case video scenario was created on the topic of pain management. The interactive computer-based case was compared to our standard paper case-based approach in third-year student pharmacy students. Pre- and post-tests, delivered via a survey, were used to assess the impact of video technology on student pharmacist's knowledge of pain. The pre- and post-tests were completed by 103 students, which was a 99% response rate. Analysis of covariance was conducted and showed there were no significant differences in post-test scores between video and paper groups. The majority of students (96%) perceived the video as equivalent to or better than the paper case in usefulness for their learning and student feedback suggested providing both the video and paper handout to aid in learning. Pharmacy educators should consider the incorporation of technology as a conduit for interactive learning. The addition of a computerised-case may allow millennial students to relate learning to their own generation and previous learning experiences.

Keywords: *Millennial Student, Interactive, Case Scenarios, Computer-Based, Instructional Videos, Pharmacy, Technology, Problem-Based Learning*

Introduction

In 2016, over 90% of fourth year pharmacy students comprising United States (US) classrooms were born between 1981 and 2001 and are classified as the Millennial Generation (American Association of Colleges of Pharmacy, 2016). Many of the pharmacy faculty who teach Millennial students are from earlier generations (*i.e.* Baby Boomers, Generation X). Generational characteristics suggest a different set of attitudes, beliefs, and experiences of older faculty compared to their contemporary counterparts. There are also recognised generational differences related to teaching and learning (Black, 2010). There have been many scholars who have written about the characteristics of the Millennial Generation. Most agree that this generation is very focused and goal-oriented; is highly social; is extremely knowledgeable and comfortable with technology and desires instant gratification; prefers working in groups; feels pressured and requires frequent feedback; and, are characterised as special, confident, positive, conventional, and sheltered (Howe & Strauss, 1993; Martin & Monaco, 2007; Richards, 2010; D'Souza & Rodrigues, 2015).

There has been a growth of literature surrounding the topic of how students learn and how teachers should

teach. This current research is in contrast with how faculty were taught during their own instruction. For instance, many faculty were taught to read and re-read the assigned material, attend lectures and take notes in order to study for their exams. The teaching was traditional and the learning was passive. Recent trends show a shift from a teacher-centred environment to a learner-centred environment. The generational differences have paralleled this change in teaching.

Millennial Generation students are regarded as technologically-savvy and tend to be visual learners (Shih & Allen, 2007; Pardue & Morgan, 2008). They have been called "Digital Natives", born into the world of computers, video games, and the internet (Prensky, 2001). They are used to getting their information instantaneously, thriving on immediate satisfaction. Their learning style is affected by their capacity to multitask, their need for a multidimensional classroom, and their desire for course content that is "animated and interactive" (Partridge & Hallam, 2006; Sharp, 2012). Many of today's students want the classroom to be engaging and entertaining and if it is not, they are easily distracted or disengaged.

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Pharmacy faculty are at a crossroads and are challenged with determining the best strategy to stimulate student learning. Prensky noted that “today’s students are no longer the people our educational system was designed to teach” (Prensky, 2001). The current literature suggests our learning environments must adapt to the new learner; however, educators may be skeptical with unknown learning outcomes (Jonas-Dwyer & Pospisil, 2004; Mangold, 2007; Werth & Werth, 2011). This study involved incorporating technology to make an interactive computer-based case scenario which emphasised active learning.

Design

Description of the Project

The purpose of the project was to compare an interactive computer-based case scenario to the standard paper case-based approach in third-year pharmacy students at Creighton University, Nebraska, US. Various topics were considered, but in the end the topic of pain management was identified for this pilot project. This topic would be taught in two courses in the Spring semester, Pharmacotherapeutics and Dispensing and Pharmaceutical Care. The faculty participating in this project were involved in the instruction of these two courses. A small grant from Creighton University’s Office of Academic Excellence and Assessment was secured to assist with the software and hardware purchases. The pain management case was created by using a backward design technique to identify what we wanted the student to learn (Wiggins & McTighe, 1998). After objectives were identified, a paper case and a video case were created with corresponding questions. Students were divided into two groups based on laboratory session times (Lab Session 1 and Lab Session 2). The paper case was given to Lab Session 1 and the video was provided to Lab Session 2. The questions at the end of the paper and throughout the video case were identical in nature. The answers and explanation for each choice were given at the end of the case so students could further understand the critical thinking required for each question. Topics in these cases included medications, dose and dosage ranges, routes of administration, equianalgesic conversions from parenteral to oral medications, and side effect profiles. Following our current standard in the classroom, students were asked to understand the topic of pain management by traditional techniques, such as listening to lecture and reading the textbook.

Development of the Interactive Video

An interactive, computerised, case-based, game-type video was also created to parallel information in the paper case. This proved to be challenging and time consuming for the faculty who were involved in its development. The Pharmacist-Director of the Academic e-Learning and Technology Centre assisted in the creation of this video. Various multimedia applications were integrated into the computer-based case. Microsoft Office® PowerPoint was

used to prepare the basic case presentation. Videos were taken by Flip Video™ HD or captured by the software Jing Pro then incorporated into slides. In some instances, audio was embedded into the PowerPoint with the use of WavePad software. Pain dosing calculations answers were demonstrated by writing them out using Microsoft Office® One Note and captured using the Jing Pro application. The video contained slides detailing a case and asking questions regarding pain management. There were 15 four-answer multiple choice questions. The question required a correct answer in order to proceed to the following question. Each slide had to be hyperlinked to a subsequent slide. If the student chose the correct answer, the hyperlink took them to the next question in the series. If the student chose an incorrect answer, the hyperlink took them to a slide that provided the rationale as to why the answer that was chosen was incorrect. This slide was hyperlinked back to the original question and the student could not progress until it was answered correctly. iSpring Pro® software was used to convert the PowerPoint and Adobe® Flash® presentations into an animated, interactive, web-deliverable package. The final presentation was placed on our local server, making it to be accessible to all students. Because of the size of the presentation, students were informed that it would take several minutes to buffer prior to viewing (the final presentation can be viewed by contacting the author).

Evaluation and Assessment

Pre- and post-tests were used to assess the impact of video technology on student pharmacists’ knowledge of pain. A 20-question survey was conducted in the Spring semester with 104 third-year pharmacy students. One student did not complete both the pre- and post-test. The survey instrument was drafted by the authors and reviewed by content experts. The paper-based survey contained eight multiple choice, ten fill-in-the-blank, and two K-type questions (Figure 1). The pre-test was given as a Dispensing Lab activity prior to the students’ introduction to pain lectures in their didactic coursework. Subsequent to the pre-test, Lab Session 1 (n=51) students received the standard paper case method of training and Lab Session 2 (n=52) students received the video pain case scenario. The students were allowed one week to read through the paper case or view the video. Lab Session 2 students were allowed unlimited access to the video during that time. The 20-question post-test identical to the pre-test was administered during lab the following week. A comparison of each cohort’s ability to appropriately manage pain was assessed.

The pre-and post-test scores were calculated for both the paper case and video case. This survey instrument was completed by 103 students, for a response rate of 99%. Analysis of covariance (ANCOVA) was conducted to evaluate the differences in post-test scores between the video and paper groups after controlling for the pre-test scores. The covariate, students’ pre-test score was significantly related to the post-test score, $F(1, 99)=20.41$, $p<0.01$, partial $\eta^2=0.17$. There were no significant

differences in post-test scores between video and paper groups over pain management, $F(1, 99)=0.18, p=0.67$, partial $\eta^2=0.002$ (Table I). Examining the amount of time the student was engaged in each case format, the average time spent on the video was 22.9 minutes, compared to 24.5 minutes for the paper group.

Figure 1: Sample questions from the pain management pre- and post-test

Pain Management Pre- and Post-test	
Sample Questions	Selection
What medication has an active metabolite that may cause adverse drug reactions in patients, such as nephrotoxicity and seizures?	A. Codeine B. Hydromorphone C. Meperidine D. Oxycodone
If a patient experiences shortness of breath and severe hives while taking morphine, what may be an appropriate alternative?	A. Codeine B. Fentanyl C. Hydromorphone D. Oxycodone
Of the following side effects, which would a patient be LEAST likely to develop a tolerance to?	A. Constipation B. Nausea and vomiting C. Respiratory depression D. Sedation
Which medication would be used to counter the effects of opiate overdose?	A. Buprenorphine B. Nalbuphine C. Nalfon D. Naltrexone
Which medication increases peristalsis to help relieve constipation in a patient taking an opioid pain reliever?	A. Bisacodyl B. Colace C. Docusate D. Surfak
A patient had been taking sustained-release oral morphine 60mg every 12 hours. His family just managed to get him to take his last oral dose two hours ago. He is admitted to your hospital and can no longer take pills. His pain is well controlled. You wish to start him on an IV infusion of morphine. How do you convert to parenteral morphine and what is the dose?	Fill in the blank
A physician calls you and needs a recommendation. He is considering long-term treatment options for one of his patients. He would like to initiate extended-release morphine to his patient who is currently taking eight Percocet (oxycodone 5mg/acetaminophen 325mg) tablets per day. Please recommend an appropriate "equivalent" morphine dosing regimen.	Fill in the blank

Table I: Results from the pre- and post-test of the pain management case delivered via paper or video

	Paper Case (n=51)	Video Case (n=52)
Pre-test scores	mean = 8.27 SD = 2.998	mean = 8.52 SD = 2.918
Post-test scores	mean = 15.06 SD = 2.22	mean = 15.17 SD = 2.109
Time spent on case	24.5 minutes	22.9 minutes

In addition, an eight-question case assessment form was provided to students in both groups. Students were asked to provide feedback on the amount of time they spent reviewing the case and answering questions regarding the usefulness of the video. One hundred and one students completed this survey (two in the paper case group and one in the video group did not complete the survey). Forty-six out of the 51 students who received the video case stated that they preferred this method of delivery over the paper case. Forty-nine students out of 51 students who received the video case stated that they perceived the video as equivalent to or better than the paper case in usefulness for their learning. Ninety-three percent (n=94) of all student participants said that the case format (paper or video) was helpful to their learning. Additional data collected, such as student preference, number of times videos viewed, and student's perception of video usefulness can be viewed in Table II.

Table II: Post-Exercise Student Survey

	Paper Case (n=50)	Video Case (n=51)
Did the explanation of right and wrong answers help you to learn the concepts?	Helpful 44 Neutral=6 Not helpful at all=0	Helpful=50 Neutral=1 Not helpful at all=0
Did you review the answers and explanation for all choices as you went through the case?	Yes, all choices=20 Yes, some choices=29 No, not at all=1	Yes, all choices= 6 Yes, some choices=39 No, not at all=6
If you had the paper case, did you print off the paper?	Printed case=9 No printing=41	
If you had the video case, how many times did you view the videos?		Replay once=36 Replay twice=11 Replay three times=3 Replay four times=1
If you had the video case, how would you assess the usefulness for your learning?		Better than paper=37 Equivalent to paper=12 Less than paper=2
If you used the video case, would you have preferred paper?		Preferred video=46 Preferred paper=5

Qualitative data were collected from student reflections, and theme analysis was conducted by a group of pharmacy faculty members with expertise in this field. The most prominent theme from students in both groups was students' desire to have both the video and the paper handout available to them. Each group wanted access to both formats. Another common theme was that students liked the explanation to a correct or incorrect answer offered to them, if they did not understand the question or why a specific answer was correct. Selected comments from student are provided in Table III.

Table III: Selected student reflection comments

<ul style="list-style-type: none"> • I liked that it gave reasoning why an answer was right or wrong for every possible answer. • I loved the case modules on video. Interactive software like the one used for the pain case involves 3 types of learning (visual, auditory, + reading) therefore, in my mind maximizes brain stimulation + overall learning. • I liked the video but I tend to remember things better if I can see it on paper. Maybe you could do a combination of video and paper to accommodate people with varying learning styles. • The video reviewed material too slowly; I prefer the faster pace I get with paper. • The calculations were difficult to see. I would have recommended that the equi-analgesic chart be available as a pop-out.

Figure 2: Video-Handout Case Assessment

Case Assessment
Please estimate the amount of time you spent reviewing the case: _____
Did the explanation of right and wrong answers help you to learn concepts? Circle one: Helpful Neutral Not helpful
Did you review the answers and explanations for <i>all</i> choices as you went through the case? Circle one: Yes, all choices Yes, some choices No, not at all
If you had the paper case, did you print off the paper? Circle one: Yes No
If you had the video case, how many times did you view the videos? (<i>i.e.</i> Did you replay the videos to hear the answers and explanations?) _____ time(s)
If you had the video case, how would you assess the usefulness for your learning? Circle one: Better than paper Equivalent to paper Less than paper
If you used the video case, would you have preferred paper? Circle one: Yes No
Comments - Please list any likes, dislikes, or suggestions.

Discussion

Pharmacy educators must be aware of the differences in learning styles of their students and adjust their teaching practices. One means of doing so is to evolve with the technology being used to train future practitioners. The use of technology allows faculty and students to move away from the traditional method of lecture-style teaching to a more interactive role both in and outside of the classroom. The benefits of active learning include a deeper understanding of the material, improved critical thinking skills, and greater retention of information.

Successful students are those that are engaged during the learning process (Bain, 2004). Educators should explore avenues to optimise active learning and student engagement in the classroom. Although the understanding and application of technology can be time-consuming, many universities offer programmes to assist faculty with the development of these methods.

The creation of a multimedia, interactive pain management case-based scenario was an innovative approach to incorporate active learning into pharmacy education. Other health professions faculty have had favourable outcomes on student learning by incorporating videos in their courses (Bergin & Fors, 2003; De Leng *et al.*, 2007; Chi, Pickrell, & Riedy, 2014). Although this study showed no statistically significant differences in knowledge between the paper and the video case post-test, the comments suggest that students enjoyed the audio/visual interactive component of the video gaming case.

Limitations

One major limitation of this study was that all students received pain management lectures in both the Dispensing and Pharmaceutical Care course and the Pharmacotherapeutics course prior to taking the post-test. Repetitive exposure to the material (lectures over pain, discussion, and case studies) may have contributed to both the paper case and video case groups performing equally well on the post-test. Another factor that should have been considered is the students’ preference in learning styles. An alternative approach would have been to assign students with a method of presentation based on their learning style. An interesting circumstance based on the feedback from both cohorts suggested that a combination of the paper and video gaming case might have been most beneficial in the learning process, since it allows the student to choose either or both of the training techniques.

Implications

Educators are challenged to stimulate curiosity and increase student engagement in the classroom. Higher education must adapt to their learning environment to accommodate the evolving nature of college students. Many Millennial Generation students are bored with traditional learning methods and desire self-directed, interactive learning opportunities. Immediate feedback is an important component for their learning. The creation of an interactive computer-based scenario was our initial attempt in recognising and adapting to the way our Millennial Generation students learn.

Future plans include expanding it to other Pharmacotherapeutic’s topics, such as hypertension and diabetes. Other plans include using these video encounters as remediation for students who struggle with topics in pharmacy practice skills laboratories. In the first attempt, a considerable amount of time was spent developing an interactive and web-deliverable activity.

After resolving these issues, future products will be created more efficiently. Newer technology applications provide a method to incorporate video, audio, and interactive quiz questioning and will improve production of these programmes.

Conclusion

There are certainly opportunities to increase the use of video technology and interactive scenarios for presentation to the Millennial Generation students. These should translate into more engaging and interactive learning experiences for future practitioners. Pharmacy educators must be encouraged to incorporate this type of technology for interactive learning into the pharmacy curriculum.

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