

TEACHERS' TOPICS

Active-learning Strategies for Legal Topics and Substance Abuse in a Pharmacy Curriculum

Sarah J. Steinhardt, PharmD, JD, MS, John E. Clark, PharmD, MS, William N. Kelly, PharmD, Angela M. Hill, PharmD

University of South Florida College of Pharmacy, Tampa, Florida

Submitted January 18, 2016; accepted July 30, 2016; published February 25, 2017.

Objective. To implement active-learning strategies to engage students in learning, applying, and teaching legal and substance abuse topics.

Design. Medication Safety course student groups created films on a National Patient Safety Goal (NPSG) using a movie genre and presented them in film festival format. Pharmacogenomics course student groups taught ethical, legal, and social implications (ELSI) topics through presentation of short stories about comic book characters with genetic mutations. Students in the Drugs of Abuse course composed and performed dances depicting the mechanism of action of a drug in an in-class rave dance format.

Assessment. Course evaluations revealed student engagement with subject material and enjoyment of the creative applications, critical thinking, and collaborative aspects of the activities. Students performed well on examination questions and graded assignments.

Conclusion. These active-learning strategies facilitated students' abilities to learn, apply, and teach material in medication safety, pharmacogenomics, and substance abuse courses.

Keywords: active-learning, substance abuse, pharmacy law, medication safety, pharmacogenomics

INTRODUCTION

Teaching legal concepts and standards in a pharmacy curriculum can be challenging as it is a related yet distinct category of material from the medicinal chemistry and therapeutic case plans that pharmacy students encounter in the majority of their coursework. Laws and standards consist of dense verbiage; accordingly, reliance upon reading assignments alone to achieve student learning may prove problematic if students are reluctant to complete them.¹

The implementation of active-learning strategies using team-based, peer-to-peer presentations can motivate student enthusiasm for the subject material and stimulate engagement in learning.²⁻⁴ Research indicates Millennial learners are collaborative, creative multitaskers who are adept at technology and appreciate aesthetically pleasing presentations.^{1,5} The active-learning strategies described in this manuscript are designed for Millennial preferences and provide for application of student understanding of regulatory standards, legal

and ethical topics, and the mechanism of action of drugs into memorably inventive, collaborative learning and teaching experiences.

This manuscript describes three team-based active-learning exercises that paired substantive class material with a recreational topic, facilitating student engagement and enthusiasm for legal and substance abuse topics in three different courses. Specifically, students in the medication safety course created short films on a National Patient Safety Goal (NPSG) and presented them in a film festival format; students in the pharmacogenomics course presented short stories composed about assigned comic book characters with genetic mutations affected by ethical, legal, and social implications (ELSI) topics; and (3) students in the Drugs of Abuse elective course composed and performed dances using an assigned dance style and song to depict the mechanism of action of a drug of abuse.

These topics were targeted for active-learning purposes for reasons of practicality. Course coordinators requested the creation of active-learning strategies for an aspect of the legal and regulatory material covered in each course, and the NPSGs and ELSI topics were selected for the activities as each topic consisted of key conceptual material and contained a short list of divisible

Corresponding Author: Sarah J. Steinhardt, Department of Pharmacotherapeutics & Clinical Research, University of South Florida College of Pharmacy, 12901 Bruce B. Downs Blvd., MDC 30, Tampa, FL 33612. Tel: 813-974-0980. Fax: 813-905-9890. E-mail: ssteinha@health.usf.edu

subtopics facilitating ease of assignment to student groups.

The active-learning activities used in these courses addressed the Accreditation Council for Pharmacy Education (ACPE) Standards 2016 and The Center for Advancement of Pharmaceutical Education (CAPE) Outcomes as encompassed by ACPE Standards 1 to 4 (Table 1).

Health care educators have used entertaining approaches including film analysis and creative, team-based collaborative approaches to educate students.^{2,3,6,7,9-11} Films generating commentary and education on health issues have been observed to be a more effective way of engaging students than standard discussions warning against adverse health effects.⁶ The use of video assignments in a medical school curriculum is documented. In 2010, Terregino and Saks devised a medical education activity requiring student groups to compose 10-minute

creative performances utilizing music, dance, rap, art, skits, or poetry depicting a problem in health care delivery.⁷ Instructors analyzed the projects for coverage of core competencies and reported student and faculty engagement, teamwork, and facilitated learning for students and health care professionals. While the medical education activity was a team-based creative composition exercise similar to the NPSG video activity, the NPSG assignment differs in design with the film festival format and assigned genres, an approach which has never been published and in evaluation, as the students were measured on retention of material through administration of multiple-choice examination questions.

A literature search revealed a report⁸ of one problem-based active-learning approach to pharmacogenomics that focused on single and multi-gene inheritance, pedigree analysis, and risk calculation; however, ELSI topics were not covered. Consequently, this manuscript represents

Table 1. Accreditation Council for Pharmacy Education (ACPE) Standards 2016 and the Center for Advancement of Pharmaceutical Education (CAPE) Outcomes (Encompassed by ACPE Standards 1 to 4) Addressed by Legal and Substance Abuse Active-learning Activities

| ACPE Standards and CAPE Outcomes | Key Elements |
|---|--|
| Standard 1. Foundational Knowledge | 1.1 Foundational Knowledge Ability to develop, integrate, and apply knowledge from the foundational sciences |
| Standard 2. Essentials for Practice and Care | 2.2 Medication Use Systems Management Manage patient health care needs using resources to optimize the safety and efficacy of medication use systems |
| Standard 3. Approach to Practice and Care | 3.1 Problem Solving Identify problems, explore strategies, design and implement viable solutions |
| | 3.2 Education Educate audiences in an effective and enduring way to impart information and assess learning |
| | 3.4 Interprofessional Collaboration Ability to actively participate and engage as a health care team member |
| | 3.6 Communication Communicate effectively verbally and nonverbally when interacting with others |
| Standard 4. Personal and Professional Development | 4.1 Self-Awareness Examination and reflection on personal knowledge, skills, abilities, beliefs, biases, motivation, and emotions that enhance or limit personal and professional growth |
| | 4.2 Leadership Demonstrate responsibility for creating and achieving shared goals regardless of position |
| | 4.3 Innovation and Entrepreneurship Engagement in innovative activities and use of creative thinking |
| Standard 10. Curriculum Design, Delivery, and Oversight | 10.12 Teaching and Learning Methods Didactic curriculum delivered via teaching/learning methods that facilitate achievement of learning outcomes, actively engage learners, promote student responsibility for self-directed learning, foster collaborative learning, and are appropriate for student populations |

an innovation in that substantive area. However, there are studies of related activities incorporating group film discussions to teach medical ethics to students.^{9,10} In 1993, Self and colleagues described an elective course on social issues in medicine which held hour-long discussions each week on a selected film and concluded course participants' scores on moral reasoning tests significantly increased indicating a positive influence on student moral reasoning.¹⁰

A dance activity involving collaboration between pharmacy and dance school faculty members has been used in a pharmacy curriculum to teach electrocardiogram basics, but a report of teaching a mechanism of action for a drug using dance has not been previously published.¹¹

In this paper, we present activities tailored to Millennial preferences to increase their engagement in learning, applying, and teaching subject material beyond reading assignments and lecture. Creativity and teamwork resulted in educational events enjoyed by the entire class.

DESIGN

This manuscript describes team-based activities in which students in three courses used an entertainment format to present substantive information. The three courses were Healthcare and Medication Safety, a two-credit-hour core course; Translational Pharmacogenomics, a three-credit-hour core course; and Drugs of Abuse, Addiction, and Law Enforcement, a two-credit-hour elective course. The goal was to engage students and assist them in learning course material through participation in a group activity. Learning objectives (Table 2) were focused on higher levels of Bloom's Taxonomy as the projects required application, analysis, synthesis, and evaluation of the substantive material.

Foundational knowledge covered included the NPSGs, laws and regulations in pharmacy practice, professional ethics in pharmacy practice, and the mechanisms of action for drugs. The NPSG activity presented practices for optimization of the medication use system in the hospital setting. All activities required problem solving to translate the substantive material into a nontraditional format, education of audiences using effective and enduring methods, verbal and nonverbal communication, use of creative thinking, shared responsibility, initiative, and contributions from group members, as well as achievement of learning outcomes through active engagement of learners with a collaborative, self-directed, student-appropriate approach.

Students in the second-year course in medication safety were introduced to the NPSGs after an immersive mock trial experience in their first year and introductory

law lectures in their first and second years. For the medication safety film festival, 10 student groups were assigned a different hospital NPSG paired with a movie genre, and instructed to compose a five- to eight-minute video. The video was to feature the assigned goal, its rationale, and elements of performance, and have a storyline and theme consistent with the assigned genre (Table 3). Students were preassigned to groups by administration each academic year, and each group consisted of approximately five students. Two groups were assigned to each film to limit the total number of films shown in the festival each year to 10. The activity was assigned within the first month of the semester and was not due until late in the semester to give students sufficient time to plan and create the video. All videos were presented in order of NPSG number using the computer and audio system in class during one 2-hour class period where a member from each group came up to the front of the class, explained the goal, then introduced and played the video. Popcorn and other snacks were brought into class to simulate a movie viewing experience and the event was titled the "Safedance" Film Festival in homage to the film industry's Sundance Film Festival.

One example of the productions was a video that taught NPSG.03.06.01, which covers Medication Reconciliation. The group was assigned the superhero film genre and they created a video titled, "Med Reconciliator vs. Dr. Chaos." The text of the NPSG was presented at the beginning of the video and a group member explained the rationale for the goal and then showed a patient room with an elderly patient and a health care team involved in several treatment protocols illustrating the elements of performance for the goal. During the video, Dr. Chaos made choices inconsistent with the requirements of the goal, at which point Med Reconciliator flew in and made appropriate recommendations to save the elderly patient by correcting the medication reconciliation process.

The ELSI activity alters the format to require students to teach the assigned issue with a group presentation including case law and historical events, then demonstrate their understanding of the issue through application by creating a story where an assigned genetically mutated Marvel Comics X-Men character is affected by the ELSI topic. Student performance on multiple-choice examination questions measured retention of concepts and student written comments on course and faculty evaluations provided feedback on engagement with and enjoyment of the material. The pharmacogenomics core course enrolled third-year students who were completing their introductory pharmacy practice experiences in community and institutional settings. For the ELSI storytelling activity entitled Pharmacogenom-X, student groups were

Table 2. Learning Objectives for Legal and Substance Abuse Active-learning Activities

| Course and Description | Activity | Learning Objectives |
|--|--|---|
| Health Care and Medication Safety Interdisciplinary core course providing a teamwork-based learning experience focused on human errors and patient safety in health care settings. | National Patient Safety Goal Film Festival | Examine the Hospital NPSGs including their elements of performance, Medication Management Standards, and Joint Commission survey requirements; Consider the role pharmacy plays in upholding the NPSGs, Medication Management Standards, and Joint Commission survey requirements; Transform knowledge of NPSGs/The Joint Commission into a genre film to teach subject material; Build video creation and editing skills. |
| Translational Pharmacogenomics Core course providing an introductory exposure to how genetic determinants/predisposition affect human and animal response to medications and other environmental chemicals. | Pharmacogenom-X: Pharmacogenomics Ethical, Legal, and Social Implications Issues Storytelling Presentation | Discuss current ELSI issues affecting or anticipated to affect patients utilizing pharmacogenomic treatments; Create a story illustrating an ethical, legal, or social implications issue in pharmacogenomics; Construct a multiple-choice question conveying a key concept to the ethical, legal, or social implications issue in your presentation. Explain the mechanism of action of a particular drug of abuse; |
| Drugs of Abuse, Addiction, and Law Enforcement Elective course providing pharmacology and effects of drugs of abuse, treatment of addiction, and legal implications of substance abuse | Drugs of Abuse Mechanism of Action In-Class Rave Dance | Invent an original dance depicting the mechanism of action of a drug combined with an assigned dance style; Perform an original dance composition in class showing effective nonverbal communication skills; Teach the mechanism of action for an assigned drug through dance and a verbal presentation. |
| All Courses | All Activities | Apply creativity and critical-thinking skills to a group project; Develop verbal and nonverbal communication and presentation skills; Function as an effective, collaborating member of a group. |

Table 3. Medication Safety Film Festival: National Patient Safety Goal (NPSG) & Movie Genre Pairs

| NPSG Goal Assignment | Movie Genre |
|---|---------------------------|
| Goal 1: Identify Patients Correctly NPSG.01.01.01 – Patient identifiers | Crime/Detective/Spy Movie |
| Goal 2: Improve Staff Communication NPSG.02.03.01 – Getting important test results to the right staff person on time | Action/Adventure |
| Goal 6: Use Alarms Safely NPSG.06.01.01 – Ensure alarms are heard and responded to on time | Romance |
| Goal 3: Use Medicines Safely NPSG.03.04.01 – Labeling medicines | Horror |
| Goal 3: Use Medicines Safely NPSG.03.05.01 – Taking extra care with patients who take medications to thin their blood | Superhero Movie |
| Goal 3: Use Medicines Safely NPSG.03.06.01 – Medication reconciliation | Western |
| Goal 7: Prevent Infection NPSG.07.01.01 – Hand washing | Fantasy |
| Goal 7: Prevent Infection NPSG.07.03.01 – Prevent difficult to treat infections NPSG.07.05.01 – Prevent post-surgical infections | Science Fiction |
| Goal 7: Prevent Infection NPSG.07.04.01 – Prevent blood infections from central lines NPSG.07.06.01 – Prevent catheter infections | Art Film |
| Goal 15: Identify Patient Safety Risks NPSG.15.0.01 – Find out which patients are most likely to try to commit suicide | Comedy |
| Universal Protocol: Prevent Mistakes in Surgery Wrong person, wrong site, wrong procedure | |

assigned an ELSI topic paired with a character from Marvel's X-Men comic book series, which focuses on a group of individuals with genetic differences from the general population (Table 4). Student groups consisted of approximately five students each. Each group created an eight-minute presentation for the class that included the following: substantive information on their ethical, legal, or social implication issue including authentic examples, case law, arguments and controversy surrounding the issue, and relevant past and current information; the comic book biography of their character including his/her super powers; the story the group had composed about the character to whom they had assigned a real genetic polymorphism to demonstrate how the character was affected by the assigned ethical, legal, or social implication issue; and, on the final slide, one multiple-choice question the group had composed that covered an important concept in the presentation to test audience knowledge and attention. The comic book characters are racially and ethnically diverse, so students were able to research and present on various polymorphisms that occur more frequently in specific racial or ethnic populations. Some of the characters had no discernible racial or ethnic background and were deemed wild card characters, so the students could select any genetic

polymorphism they desired for the story. It took three hours for all 20 groups to present.

One example was a group presentation on the ethical issue of genetic discrimination and stigmatization. The group was assigned the X-Men character Magneto who is a villain in the comics, fighting against all humans who he perceives are engaging in genetic discrimination against genetically mutated individuals. The group began the presentation by defining the terms genetic discrimination and stigmatization, then discussed the Genetic Information Nondiscrimination Act (GINA) and outlined the protections provided under federal law to prevent genetic discrimination for health insurance eligibility or coverage and employment purposes. The group then presented an example of an actual genetic discrimination lawsuit, *The Equal Employment Opportunity Commission (EEOC) v. Burlington Northern Santa Fe Railroad Co.*, which involved a railroad company's employees, who were all afflicted with a genetic condition predisposing them to develop carpal tunnel syndrome.¹² The company forced employees filing workman's compensation claims for carpal tunnel syndrome to undergo blood tests for genetic testing in an attempt to deny coverage to them as predisposed individuals. Stigmatization was addressed with a discussion on the social attitudes toward patients

Table 4. Pharmacogenomics ELSI Storytelling Presentation Activity: ELSI Issue and Character Pairings

| Issue | X-Men Character |
|--|--|
| Ethical Clinical research subjects and pharmacogenomics: balancing harms and benefits, selection of subjects for studies | Wolverine Race: Caucasian Origin: Canada |
| Ethical Genetic discrimination and stigmatization | Magneto Ethnicity: Ashkenazi Jew Origin: Germany |
| Ethical Privacy and confidentiality of genetic information | Mystique Race/Ethnicity: Wildcard Origin: USA |
| Legal Informed consent | Lady Deathstrike Race: Asian Origin: Japan |
| Legal Ownership of data and samples | Storm Race: African-American Origin: New York, USA |
| Legal Intellectual property | Professor Charles Xavier Race: Caucasian Origin: New York, USA |
| Legal Disclosure obligations and reporting requirements | Gambit Race: Caucasian Origin: Louisiana, USA |
| Social Testing in vulnerable populations and availability of testing | Nightcrawler Race/Ethnicity: Wildcard Origin: Germany |
| Social Genetic testing and race/ethnicity | Silverfox Race: Native American Origin: USA |
| Health disparities | |
| Social Education of health care professionals in pharmacogenomics | Beast Race/Ethnicity: Wildcard Origin: Illinois, USA |

with AIDS or mental illness and the potential for similar experiences occurring with genetically diverse individuals who may not respond to particular treatments or who are afflicted with particular diseases. The group then described Magneto's powers of magnetism. Since the character is an Ashkenazi Jew, for his genetic polymorphism, they stated he was heterozygous for the cystic fibrosis transmembrane conductance regulator (CFTR) polymorphism W1282X. They created a story where he was employed as an instructor at the Professor Xavier School for Gifted Youngsters, but was denied life insurance coverage due to his genetic polymorphism. They explained how the federal law GINA does not protect against genetic discrimination in life insurance coverage and mentioned that state laws where he was employed did not have additional protections in place. The story concluded with Magneto leaving his employment and resuming his plans to conquer the world. The group's multiple-choice question listed four scenarios, and the audience had to identify which of the options were

examples of genetic discrimination and stigmatization. The Drugs of Abuse elective course enrolled third-year students who were completing their introductory pharmacy practice experiences in community and institutional settings. The dance activity was one of several activities implemented in the Drugs of Abuse course, which had a general format of one hour of lecture followed by one hour of activity every week. The dance performances served as a review activity for all drug classes covered in the course. The dance was called an in-class rave as inspired by the illicit substance ecstasy, which is commonly ingested at dance parties called raves. The rave dance activity had a logical, direct connection to the substantive material and provided a format with which to reinforce the lecture information on illicit substances. For the dance activity, student groups were assigned a drug of abuse paired with a popular song and dance style then required to create, perform, and teach a dance to the class that illustrated the mechanism of action of the drug (Table 5). Students drew a drug name out of a container, thereby creating a group of

Table 5. Drugs of Abuse Mechanism of Action In-Class Rave Dance: Drug, Song, and Dance Style Pairings^a

| Drug | Dance Style | Song |
|------------------------|--|---|
| Heroin | Cheerleading (2014 & 2015) | Stefani, Gwen. "Hollaback Girl." <i>Love. Angel. Music. Baby.</i> Interscope, 2005. |
| Methamphetamine | Hip Hop (2015) | Ronson, Mark & Mars, Bruno. "Uptown Funk." <i>Uptown Special.</i> RCA, 2014. |
| Cocaine | Hip Hop (2014) | Ice, Vanilla. "Ice Ice Baby." <i>To the Extreme.</i> SBK Records, 1990. |
| | Hip Hop (2015) | The Weeknd. "Can't Feel My Face." <i>Beauty Behind the Madness.</i> Republic, 2015. |
| Alcohol | Waltz/Rockafella Skank Dance (2013 & 2014) | New Politics. "Harlem." <i>A Bad Girl in Harlem.</i> RCA, 2013. |
| | Country Line Dance (2015) | Shelton, Blake. "Neon Light." <i>Bringing Back the Sunshine.</i> Warner Bros. Nashville, 2014. |
| | Hip Hop (2014) | Foxx, Jamie ft. T-Pain. "Blame It (On the Alcohol)." <i>Intuition.</i> J, 2009. |
| Sedative Hypnotics | Country Line Dance (2013) | Church, Eric. "Drink In My Hand." <i>Chief.</i> EMI Nashville, 2011. |
| | Ballet/Modern Interpretive Dance (2015) | Sia. "Chandelier." <i>1000 Forms of Fear.</i> RCA, 2014. |
| | Ballet/Modern Interpretive Dance (2014) | Del Rey, Lana. "Summertime Sadness." <i>Born to Die.</i> Interscope, 2012. |
| Ecstasy | Hip Hop (2013) | The Notorious B.I.G. "Hypnotize." <i>Life After Death.</i> Bad Boy Records, 1997. |
| | Square Dance/Barn Dance (2015) | Walk the Moon. "Shut Up and Dance." <i>Talking is Hard.</i> RCA, 2014. |
| | Rave Dance (2013 & 2014) | Miley Cyrus dance mix (various) Ke\$ha dance mix (various) |
| Opioids and Naloxone | Ballroom Dance (2014) | Grande, Ariana & Azalea, Iggy. "(One Less) Problem." <i>My Everything.</i> Republic, 2014. |
| 12 STEPS Program Steps | Bollywood Dance (2015) | Bleachers. "I Wanna Get Better." <i>Strange Desire.</i> RCA, 2014. |
| Nicotine | Country Line Dance (2014) | Musgraves, Kacey. "Blowin' Smoke." <i>Same Trailer Different Park.</i> Mercury Nashville. 2013. |
| LSD | Girl Group Dance (2013) | Spears, Britney. "(Hit Me) Baby One More Time." <i>...Baby One More Time.</i> JIVE, 1998. |
| Marijuana | Boy Band Group Dance (2013) | One Direction. "What Makes You Beautiful." <i>Up All Night.</i> Columbia, 2011. |

^aFinal dance was a Soul Train processional of all groups followed by a freestyle dance to the song "Shake It Off." (Swift, Taylor. "Shake It Off." 1989. Big Machine, 2014.)

approximately four to five students for each drug/song/dance-style combination. Prior to performing their dance, the students also were required to give a three- to five-minute presentation covering the history, use, mechanism of action, and physiological and psychological effects of their drug, and explain how their dance illustrated the mechanism of action of the drug. Student groups had the option to create an eight- to 10-minute dance that they performed themselves as a group, or they could create a dance that involved participation from the entire class. There were nine dances total; seven composed and performed by the students, one composed and performed by the professor with the students, and one freestyle dance with a "Soul Train" procession that involved all groups. Groups were encouraged to dress up

or use props as appropriate. Group pictures were taken prior to the dances, then groups presented and danced in the order in which the instructor placed them on the schedule which was referred to as the "Dance Card." The audio for the dances was provided via YouTube music videos played over the computer and audio system in the classroom. The elective course was held in a large laboratory classroom with mobile desks and a wide, open space to use as a dance floor.

An example of a presentation was a country line dance created on the mechanism of action of alcohol in the body to a country drinking song "Neon Light" by Blake Shelton. The students' presentation covered background information on ethanol, a description of the effects and mechanism of action, and an explanation of how their

dance depicted the mechanism. The group of four students performed the dance, with two students representing the GABA receptor who line danced across from each other on the dance floor and one student as a chloride ion which passed through the channel by two-stepping. Then the fourth student represented ethanol and line danced over to the GABA receptor students and linked arms with the GABA receptor and then the rest of the class two-stepped through the channel as chloride ions hyperpolarizing the membrane, demonstrating the potentiation of the effects of GABA binding to the GABA receptors through the presence of ethanol. They also showed the inhibitory effect that ethanol has on NMDA receptors, by depicting the NMDA receptor as two students line dancing. Once the student representing ethanol linked arms with one side of the receptor, the receptor closed and the students line danced together, illustrating prevention of the effects of NMDA.

Resources used for the activities included class time, student preparation time, and classroom space and resources. The film festival and dance activity required two hours of class time, while the pharmacogenomics presentations took three hours of class time. Students required more preparation time for the film festival and dance activity; accordingly, the assignments for the film festival and dance activity were distributed at least a month in advance to allow time for meetings, brainstorming, practice, and project completion. Classroom resources including the computer and audio system were used to display the videos and presentations, and students used their own iPhones and video editing software to make the films.

EVALUATION AND ASSESSMENT

The evaluation of these activities was determined exempt by the University of South Florida Institutional Review Board. For all three activities, student engagement was assessed based on students' free-text responses on course and faculty evaluations. For the dance activity, a one-page feedback write-up was obtained from each group describing their experience with the activity. Student learning was evaluated for all activities with student grades on the assignments as determined by the instructor using faculty-developed analytic rubrics. The same instructor evaluated all projects for all activities. Additionally, test questions covering the material for medication safety and pharmacogenomics evaluated student learning.

The majority of learner perceptions were gleaned from course evaluations (Medication Safety, 2013 and 2014; Pharmacogenomics, 2014 and 2015; and Drugs of Abuse, 2013, 2014, and 2015) and faculty evaluations

from 2013, 2014, and 2015. No evaluation questions directly addressed engagement, so the free-text responses were reviewed for specific comments on the activities to assess student engagement. Students could enter a comment on course evaluations for the questions: "Please comment on at least TWO aspects of the course that you enjoyed and helped you learn" and "Provide constructive feedback for recommendations on improving any aspect of this course." On the faculty evaluations, students entered free-text responses for the questions: "Please describe at least two things the instructor did whether in lecture, assignments, outside of class, or through assignments or resources that helped you learn" and "What constructive feedback would you provide to the instructor to enhance their teaching effectiveness?" Student engagement for the dance activity was evaluated from the results of the one-page write-up for the dance activity. Student engagement (ie, motivation to learn, attentiveness, eagerness to learn) and student enjoyment (ie, perceptions of or experiencing the concept of "fun" during activities) are two distinct areas for assessment. For all three activities, students reported engagement to learn the material and provided some constructive feedback (Table 6). Students also reported that they enjoyed all the activities and working with their groups.

An example of the rubric used for the NPSG Film Festival is provided in Table 7. Each activity had a similar analytic rubric constructed by the instructor that placed weight on different assignment requirements and provided a specific, step-wise description of excellent versus poor performance. The majority of the points for each assignment evaluated the substantive content and accuracy. The pharmacogenomics exercise also included a peer evaluation rubric that was worth three out of 15 points.

Students performed well on test questions for medication safety and pharmacogenomics. Data for the 2014 Medication Safety Quiz and 2014 and 2015 Pharmacogenomics final examination were extracted from ExamSoft. For medication safety in 2014, there were four questions covering the NPSGs and for the pharmacogenomics course, there were three questions in 2014 and five questions in 2015. Student performance on the four NPSG/Joint Commission film festival questions was an average of 98.9% correct responses (average point biserial of 0.04) showing that the majority of the class correctly answered questions on how pharmacy staff members respond to a Joint Commission surveyor, patient identifiers, proper medication labeling procedures, and the NPSG's role within the Joint Commission standards. For the 2014 Pharmacogenomics questions, 91.4% of students answered the three questions correctly (average point biserial

Table 6. Summary of Student Responses to Legal and Substance Abuse Active-learning Activities From Course and Faculty Evaluations and One-Page Write-up for the Dance

Medication Safety Film Festival Videos

Positive Feedback

- Enjoyable to make with group members
- Different and interesting
- Learned more from them than from just listening to lectures
- Fun activity that engaged the class
- Fun way to learn
- Much needed change of pace during the semester when students are stressed

Constructive Feedback

- Make assignment worth more points for the effort involved
- More clear direction for assignment/guidance on video software
- Provide assignment ahead of time

Pharmacogenomics Storytelling Presentations

Positive Feedback

- Enjoyable and helped me learn
- Fun, memorable and interesting
- Theme made learning the material fun

Constructive Feedback

- Make assignment worth more points for effort involved

Drugs of Abuse Mechanism of Action Dance

Positive Feedback

- Enjoyed working on dance with group members
- Activity required creativity and critical thinking
- Fun, enjoyable, and memorable
- Enjoyed learning and teaching aspect of assignment
- Good way to reinforce concepts discussed in lecture

Constructive Feedback

- Some discomfort performing in front of class; request possibility to make video instead of live performance
 - Give students freedom to choose drug, song, and dance style
 - Make sure room temperature is optimal for performance
 - More time to compose and practice dances in and out of class
 - Select drugs with more well-defined mechanisms of action for dances
-

of 0.10) and for 2015, 93.8% of students answered the five questions correctly (average point biserial of 0.16). The point biserials for the examination items were low to moderate indicating a strong performance from both high and low scoring students. The majority of questions used on the pharmacogenomics examinations were selected from student projects [2014 (66%); 2015 (60%)] and instructor composed questions for both NPSG and pharmacogenomics focused on broad concepts accounting for the reduced point biserial value. For improved assessment of student performance and increased discernment between items, the instructor should compose all examination items and purposefully elevate and vary item difficulty on future examinations.

DISCUSSION

The active-learning activities were hypothesized to increase student engagement and result in positive student perceptions of learning of the subject material. Results of

the course and faculty evaluations, student write-ups, and performance on assignments and test questions support this hypothesis.

Performance on assignments showed students communicated effectively and applied their creative, critical-thinking skills to combine the diverse subject material. All student groups performed well on the assignments. The mean percent score for the Pharmacogenom-X assignment was $98.9\% \pm 1.1\%$. The NPSG and Rave activities were evaluated on general inclusion of components including content (both), choreography (Rave), performance (both), and timing (both). Each group satisfactorily met the requirements on the rubrics and earned a grade of 100% on those assignments. Students reported favorable opinions of the activities in terms of facilitating their engagement and learning of the concepts.

Some limitations identified for all activities included insufficient time for student preparation and some content challenges. The small number of test questions used to

Table 7. Grading Rubric for National Patient Safety Goal "Safedance" Film Festival Assignment (Rubric Sample)

| Grand Jury Prize | | Honorable Mention | Shown at Festival | | Not Selected for Showing | | Total |
|----------------------|---|--|--|--|--------------------------|---------------------------------------|---------|
| Assessment Criteria | Excellent | Good | Average | | Poor | | Score |
| Presentation Content | 25 pts Accurate and complete communication of all NPSG components | 15 pts Accurate and complete communication of most NPSG components | 5 pts Accurate, but incomplete communication of NPSG components | 1 pt Inaccurate, incomplete communication of NPSG components | | | |
| | 20 pts Excellent, expressive execution of lines; clear preparation; engages audience; creative innovative effort | 15 pts Clear delivery of lines; clear preparation; attempts to engage audience; respectable creative effort | 10 pts Stumbles over lines; some preparation evident; discernible characters and some appropriate emotion displayed; some attempt at creativity | 5 pts Read lines; no preparation; evident failure to put forth a good faith effort; lack of creative effort | | | |
| Timing | 5 pts Performed in 5 to 8 minutes | | | | | 0 pts Under/over time requirements | ____/50 |
| Total Score | | | | | | | |

assess learning for the topics was an assessment limitation. Also, the number and difficulty level of the questions should be increased in the future. Additionally, student learning should be compared to that of students in a control group not using an active-learning activity to ascertain the ability of the activities to increase student learning. Specific improvements for each assignment are discussed below.

For the inaugural assignment of the medication safety film festival, the students were given only one week's notice to complete the assignment, and many reported it took several hours. These findings identified the need for students to be given more time to complete the project. For successive classes, the assignments were sent out earlier and the due date was later in the semester to ensure the students had adequate preparation time. Additionally, the point allocation for the assignment for the first class was 10 points, and the students requested an increase in the value of the assignment to reflect the amount of effort and time put into it. Thus, the points allocated for the assignment were increased to 50 the following year. Finally, some students who had less experience with technology requested more guidance and assistance with video production software and editing.

The presentations for the film festival revealed a need to emphasize to students that the NPSGs assigned were the NPSGs for hospitals because a minority of student groups used a retail rather than a hospital setting for their film. This could have been due to variations in students' exposure to institutional practice, leading them to choose a practice setting because it was the setting with which they were most familiar. Arguably, proper medication labeling is also applicable to retail practice, so the videos ultimately illustrated the goal, but in subsequent courses, the instructor emphasized in the instructions that the assignment covers the hospital NPSGs. Students also required more detailed instruction on inclusion and presentation of the elements of performance in the films. The initial group of films included a Western film in which the handwashing technique was shown incorrectly at the end, when the demonstrator turned the faucet off with their clean hands instead of a paper towel. Future classes were advised on this error. Additionally in 2014, Joint Commission survey requirements and Medication Management Standards were included along with the NPSGs as topics for student films, and the content covered in the course was expanded.

In the pharmacogenomics course, students did not have difficulty creating stories explaining how their X-Men character experienced a legal, ethical, or social implication issue. The assignments revealed a potential need to expand on the gene patent law component of the course

as student groups assigned this issue ventured off topic into general patent law. Most of the groups' presentations were accurate and the stories they composed comfortably met the requirements for the activity. In the future, it may be beneficial to obtain directed feedback on this particular assignment as not every student commented on the activity in the course evaluations.

In the Drugs of Abuse Mechanism of Action Course, some students noted that combining the mechanism of action for a drug with a dance style was challenging as it was a different way of approaching an assignment than what they had previously experienced. To assist students in successive years, the instructor provided presentation examples from previous years and gave an example of the dance the instructor composed for the mechanism of action of cocaine to show how to execute the assignment, perform it, and teach the dance to the class. Some of the dances were videotaped by the students, and future classes may benefit from viewing those examples of the rave dances. Students suggested having a class period devoted to working on the exercise so the instructor would be present to facilitate as necessary and students would have more time to learn the mechanisms. Some students reported feeling anxiety initially about performing in front of the class, but during actual performances, the students were enthusiastic and did not outwardly exhibit signs of anxiety. Further development of the activity will include a pre- and post-test to assess student learning before and after lecture and their perceptions of the dance experience to compare with previous years.

An improvement implemented was an increase in the number of dances from the initial year the activity was held. Originally, there were 22 students enrolled in the course and six dances performed, but in 2014 and 2015, the number of dances was increased to nine along with a group freestyle dance number to add variety and to accommodate increased student enrollment in the elective course (from 26 students in 2014 to 34 students in 2015).

While both activities show similar results for high student engagement, the mechanism of action in-class rave dance format differs by serving as a method to review a variety of drugs covered throughout the course and could be applied to other courses to reinforce previous topics covered earlier in the semester. While both activities involve students creating a dance, one was learned and performed in class regarding electrocardiograms (EKGs) and the other was created outside of class and performed in class regarding a mechanism of action for an illicit substance. Students learned basic dance steps for the EKG activity from dance instructors, while students composed and performed dances for the rave activity

using instructional YouTube videos. The EKG dance activity measured retention of the material with post-test evaluations, while the rave activity measured student performance and ability to successfully translate the chemical mechanism of action into a dance.

The approach of pairing a substantive course topic with a recreational theme can be used in any pharmacy course and is applicable across other interdisciplinary health care fields. Instructors could break down topical material for most subjects and separate them into genres and assign students to make a film on that topic using the genre and present them as one cohesive film festival. Similarly, courses teaching ethical or legal cases that affect people and generate stories could use the storytelling presentation with any cast of characters to facilitate students' creativity and provide a venue for them to apply their knowledge in an entertaining and memorable way to teach their peers. The mechanism of action activity is applicable to any course that teaches the mechanism of action for drugs and there is potential for collaboration with schools of dance.

SUMMARY

The film festival, storytelling presentations, and in-class rave dance activities paired legal and substance abuse topics with entertaining, recreational activities to engage Millennial student teams to learn, apply, and teach subject material. Results of course and faculty evaluations, student write-ups, and performance on assignments and test questions supported student enthusiasm for substantive topics, engagement with the learning experience, and provided evidence for positive student perceptions of the learning experience. With creative application, this combination approach may be applied to almost any course within a pharmacy curriculum or other health care disciplines to stimulate student interest in learning.

REFERENCES

1. Twenge JM. Generational changes and their impact in the classroom: teaching Generation Me. *Med Educ.* 2009;43(5):398-405.
2. Allen RE, Copeland J, Franks AS, et al. Team-based learning in US colleges and schools of pharmacy. *Am J Pharm Educ.* 2013;77(6):Article 115.
3. Atayee RS, Singh RF, Best BM, Freedman BA, Morello CM. An active-learning assignment involving peer-to-peer presentations to improve pharmacy students' attitudes and knowledge of dietary supplements. *Am J Pharm Educ.* 2012;76(6):Article 113.
4. Gleason BL, Peeters MJ, Resman-Targoff BH, et al. An active-learning strategies primer for achieving ability-based educational outcomes. *Am J Pharm Educ.* 2011;75(9):Article 186.
5. Roberts DH, Newman LR, Schwartzstein RM. Twelve tips for facilitating millennials' learning. *Med Teach.* 2012;34(4):274-278.
6. Hibbert B. A film festival for health. *BMJ.* 2013;347.

American Journal of Pharmaceutical Education 2017; 81 (1) Article 4.

7. Terregino CA, Saks NS. Creative group performances to assess core competencies in a first-year patient-centered medicine course. *Med Educ Online*. 2010;15.
8. Munson A, Pierce R. Flipping content to improve student examination performance in a pharmacogenomics course. *Am J Pharm Educ*. 2015;79(7):Article 103.
9. Self DJ, Baldwin DC. Teaching medical humanities through film discussions. *J Med Humanit*. 1990;11(1):23-29.
10. Self DJ, Baldwin DC Jr, Olivarez M. Teaching medical ethics to first-year students by using film discussion to develop their moral reasoning. *Acad Med*. 1993;68(5):383-385.
11. Schultz KK, Brackbill ML. Teaching electrocardiogram basics using dance and movement. *Am J Pharm Educ*. 2009;73(4):Article 70.
12. EEOC v. Burlington Northern Santa Fe Railway Co. No. 02-C-0456 (E.D. Wis. 2002).