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Flipping the Classroom to Teach Population Health: Increasing the Relevance.

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ABSTRACT

In recent years, there have been multiple calls to enhance the population health and health promotion aspects of nursing programs. Further impetus has been provided by passage of the Affordable Care Act in 2010 with its focus on prevention. The need to develop students who can critically think and apply knowledge learned is crucial to the development of nurses who can integrate and apply the concepts of population-focused practice in society and a healthcare system undergoing transformation. This coupled with the ever changing needs of learners requires a different approach to content delivery and presentation. Flipped classroom courses, with an online component, offer the flexibility and technology desired by current undergraduate students. The use of a flipped classroom approach to re-design a population health course in a Midwestern nursing program resulted in stronger course evaluations from students and reflected better student understanding of the relevance of such content in a nursing curriculum.

INTRODUCTION

Nursing students have traditionally focused more strongly on acute care and medical-surgical nursing courses, often perceiving content related to population health or public health as not exceedingly relevant to their nursing education. This perception is in direct conflict with the need for all college undergraduates, including nursing students, to receive education concerning public health and to support the ability to understand and effectively address public health challenges (Institute of Medicine, 2003). This was supported in 2010 by the Institute of Medicine (IOM) report on the Future of Nursing which called for nursing programs to prepare more nurses for positions in non-acute care community based settings. In their supplement to the Baccalaureate Essentials, the American Association of Colleges of Nursing (AACN) also advocated the need for nurses to "…engage in community and population assessment, health promotion, and interdisciplinary efforts to improve health…" (2013, p. 7).

Others have echoed this call as well, reinforcing the need for a shift in focus from illness care to health promotion (Schofield et al., 2011; Mooney et al., 2011) and from individual to social and cultural (McAllister, 2010). According to Sistrom and colleagues (2011), failure to change public health curriculums to better address population health needs makes it difficult to achieve improvements in population health.   In addition, Frenk and colleagues (2010) discuss the need to redesign professional health education using "novel forms of learning that transcend the confines of the classroom" in an effort to prepare health professionals who can synthesize knowledge needed to function in an increasingly globally interdependent world (p. 1926). In response to these reports, educational programs which prepare health care professionals, including nursing, have been adding or restructuring courses to better enhance the ability of students to utilize population health concepts in practice (Riegelman, 2008).

BACKGROUND

Basis for change

While undertaking a curriculum revision, one Midwestern university four-year baccalaureate nursing program decided to address this call to action by restructuring the delivery of content related to population health. In the curriculum under revision, these concepts were taught in a third-year (junior-level) public health science course which was taken alongside medical-surgical, psychiatric, and obstetrical nursing courses, all of which included clinical hours in acute care settings. This course provided support for a fourth-year (senior-level) public health nursing course which included didactic and clinical components. The third-year public health science course was completed in a traditional lecture format and only utilized exams and one paper to evaluate learning. Students consistently complained about the lack of relevance of this course to nursing in general. Student comments included; "I have trouble seeing the big picture and how this fits into the nursing curriculum"; "…the content was definitely interesting, but there were some parts of it that I felt were very Public Health related, but not so much nursing related…", and "The material does not seem to be completely relevant to nursing…". Students also commented frequently about the design of the course, suggesting on course evaluations that faculty should find ways to "involve the students to make the class more interesting" so that students would be engaged in the material and understand the relevance to nursing. Faculty also perceived the frustration and lack of interest on the part of students. While faculty were rated strongly by students, the course generally rated between a 3.7 and 3.9 on a 5.0 point Likert scale (1=Very poor; 5=Excellent).

Student comments, course ratings and feedback from faculty who taught the fourth-year public health nursing course which built upon the existing third-year public health science course also indicated that the content was not seen as relevant. In addition, students did not appear to retain the content taught the previous year. These issues further supported the need to utilize curriculum revision to make changes in an effort to increase student understanding and application of population health principles in their approach to nursing practice. The purpose of this study is to discuss the rationale for course revision, describe the flipped classroom design, and to provide preliminary evaluation of this revised course.

Curriculum revision

Based upon course evaluations and student feedback, faculty decided to address the changing roles of registered nurses and the need for a better understanding of population health concepts. As previously noted, in the curriculum under revision, students received public health content in a third-year public health science course which provided support for a fourth-year public health nursing course. As an aspect of curriculum revision, faculty made the decision to move the public health science content to the second-year (sophomore level) with a new name and approach. The course was renamed population health; while the content was similar, the approach was from a population health perspective. The movement back to the second year was based on the hope that provision of the content earlier in the curriculum would allow the students' time to apply the concepts as they began their foundational nursing courses and prior to the strong emphasis on acute care nursing in the third year of the curriculum.

<u>Support for redesign</u>

During the time the school was revising the curriculum, a university-wide initiative to better address the needs of learners was also underway. Faculty responsible for teaching the course were selected as fellows in this university-wide program which focused on course redesign to foster student-centered and active learning strategies. This university initiative offered funding and faculty support for innovative course redesign. Support provided included information technology, library science, and educational and instructional guidance through the university's Center for Instructional Excellence. Faculty attended workshops and worked with a support team to determine the best approach for each specific course. After participating in this process, the decision was made to offer the new population health course as a flipped classroom course design using a mix of online and in-class learning with a variety of active learning strategies. After participating in this process, the decision was made to offer the new population health course as a flipped classroom course design to meet the different learning styles and preferences of today's students (Johnson & Romanello, 2005) using a mix of online and in-class learning with a variety of active learning strategies.

The learning styles of current undergraduate students require a change in teaching approach and strategies. These students, born since 1982, are often referred to as 'millennials' and as the 'net' generation, with a preference for group projects, immediate feedback, and learning in their own time frame (Howe & Strauss, 2003; Johnson & Romanello, 2005; Mangold, 2007; Pusawiro, 2012). These students prefer innovative learning environments that are interactive and engaging, allowing them to learn through discovery (McCurry & Martins, 2010). A supportive learning environment which includes personal encouragement and feedback from teachers with an emphasis on self-motivation and responsibility is highly valued (Howe &

Strauss, 2000; Conklin, 2012; Mangold, 2007). Additionally, they enjoy learning from friends and teaching friends as they have done since childhood within the context of multiple social media platforms (Bristol, 2014; Pusawiro, 2012).

Throughout the course re-design process, faculty utilized Chickering and Gamson's (1987) principles for undergraduate education which included the use of active learning strategies, emphasized contact between faculty and students, encouraged prompt feedback and cooperation between students, and respect for different learning styles and diverse student talents among others. Flipped classroom designs address many of these principles and the characteristics of millennial learners. These designs allow for a student centered focus; increasing students responsibility for their own learning (McLaughlin et al., 2014). The emphasis on active learning strategies includes increased engagement in learning and provides greater opportunities for "peer sharing" (Boyer, 2013, p. 28). Flipped designs allow faculty to spend the time they have with students "facilitating higher order application of knowledge" in place of lectures with power points which engage learners minimally (Mehta et al., 2013 p. 1421). This enhances student understanding of the relationship between concepts, helping them to create meaning, encouraging critical thinking (Hughes, 2012) and ultimately leading to nurses who will be able to function more effectively in a rapidly changing healthcare system (Allen, 2013; Prober & Khan, 2013).

<center>FLIPPED CLASSROOM DESIGN</center>

This flipped classroom design involved 'flipping the classroom;' material that was traditionally provided in a lecture format was moved to an online format and in-class time became open for the use of active learning strategies. Multiple teaching strategies were used to

impart this online content including voice over power points, teaching videos, interactive online modules, and text readings. This flipped classroom design allowed students some flexibility during the learning process while also increasing responsibility for learning and allowing for face-to-face interactions with faculty.

Students attended class every two weeks with assessment of the outside-of-class assignments occurring via online quizzes which had to be completed prior to the start of class. This assessment strategy was done to ensure that students had completed the preparatory work deemed necessary to actively participate in the in-class activities. In-class time was dedicated to active learning and took place in a classroom specifically designed for active learning. This newly redesigned university space included small group tables with computer access and dedicated monitor screens, whiteboards and the ability for groups to easily move about and interact with each other and faculty. In-class activities supported development of an understanding of the basic tenets of population health and its utility as an approach to support the health of populations. Activities included case studies, web quests, videos with response time, and group developed presentations (see Table 1). In an effort to ensure that students focused on the tasks at hand rather than spending their group work time socializing, students were randomly assigned to groups of 3-5 during each class period. Faculty actively circulated around the room, moving from group to group to moderate and facilitate student work. At the end of each class period, depending on the activity, students would share content learned during the class using creative presentation tools such as bubbl.us and prezi.com.

Table 1. Course Activities and Expected Outcomes

ACTIVITY	EXPECTED OUTCOME
Healthy People 2020 Activity	✓ Identify the nation's health goals ✓ Evaluate various sources of population health data

	✓ Identify the role of multiple determinants in development of disease
County Health Rankings	✓ Evaluate various sources of population health data ✓ Explore the population health impact of chronic disease ✓ Increase awareness of population health approaches to chronic disease
Rate Calculation Worksheet	✓ Recognize the use of rates as a basic tool to compare populations ✓ Calculate and interpret rates commonly used in population health
Natural History of Disease Web quest	✓ Use the natural history of disease model in the assessment of a population health problem ✓ Differentiate among the levels of prevention, active versus passive prevention, and population-focused prevention strategies versus individual-focused strategies
Outbreak Investigation Case Study	✓ Explore the use of epidemiology as a framework for conducting investigations and for making population-focused decisions
Hazardous Air Pollutants Web quest & Windshield Survey	✓ Identify the impact of environmental hazards on population health
Final Course Project[*]	✓ Discuss the relationship between lifestyle behaviors, social determinants, and health outcomes ✓ Outline public health's core functions and essential services ✓ Describe a population model for health

Important themes and concepts related to the Ten Essentials of Public Health, Healthy People 2020, epidemiology, and determinants of health were continuously woven throughout course activities culminating in a group completed final project presentation. The final course project was modeled after an assignment found in the Johns Hopkins School of Public Health Open Courseware site (Mosley & Mmari, 2006) and was designed to foster critical thinking among students about the determinants of prominent public health issues such as obesity, lung cancer, and heart disease, and the relationships between these determinants. Students were required to look at the health issue not from an individual focus, which they are so accustomed to

in nursing, but from a population health perspective. The first portion of the project involved development of a concept map depicting the determinants of the disease and the relationship between them. Students then developed population-level interventions taking into consideration the Ten Essentials of Public Health, Healthy People 2020, and the levels of prevention. Students were encouraged to use the County Health Rankings website (Robert Wood Johnson Foundation, 2013) to review existing innovative programs from across the United States that addressed the assigned health issue.

Reflective journaling after class was also used multiple times throughout the semester to encourage students to critically think through and process complex issues such as environmental health, genomics, social determinants of health and global concerns discussed in class. This journaling was graded via a rubric which encouraged students to concisely reflect and focus their journal entry on the population health implications of the week's topic. As well, either at the start or end of class, faculty would briefly summarize the important content learned for the day.

The objective of using a flipped design to deliver population health content was to increase the relevance of the content to their future practice as healthcare providers. Faculty expected that this new delivery model would result in more engaged, interactive learners who would retain and apply knowledge gained more effectively. Another expected outcome was that students would become aware of the relevance of this information to their nursing practice and develop a positive attitude towards the content and its utility, ultimately preparing them for nursing roles outside of the acute care setting. Lastly, faculty hoped to improve student ability to

critically think about population health issues and determinants of health which play such an important role in health outcomes.

EVALUATION METHODS

Procedures and participants

The design of this study was descriptive and exploratory. A convenience sample of sixty-four third year nursing students enrolled in the public health science course and ninety-three second year nursing students enrolled in the population health course were included in this study. A majority of these students are considered traditional college students. At the end of each course, students voluntarily completed both an on-line university sponsored course evaluation and an in-class paper survey specifically evaluating the flipped classroom design. It is important to note that neither evaluation survey was mandatory. Therefore, more students completed the in-class paper survey than the on-line university survey. This process was approved by the University Committee on the Use of Human Research Subjects.

Evaluation measures

The on-line, university sponsored course evaluation is distributed to all students enrolled in classes at the end of each semester. This evaluation is made up of course and instructor specific Likert-scaled items. For the purpose of this evaluation study, only six course specific questions relevant to evaluation of a flipped design were asked in both the previous and current course. Therefore, only these six items are included in this study. In addition to the general course evaluation conducted by the university, course faculty developed a tool to assess student thoughts concerning the flipped classroom design and active learning strategies. The tool was developed using statements retrieved from the university's course evaluation question pool,

information received during the faculty training program, and other freely available online sources. This additional survey tool was used in both the fall and spring semester. Faculty also compared their experiences with student learning and application in both the traditional class and flipped classroom course.

Statistical analyses

Descriptive statistics were used to summarize all variables. To compare university sponsored evaluations between courses, paired t-tests were used. Statistical significance was set at $p < 0.05$.

EVALUATION RESULTS

University student-based course evaluations

There were no statistically significant differences in the university course evaluations between the traditional and flipped classroom courses (see Table 2). However, on average, students in the flipped classroom rated the course more positively than students in the traditional class. Furthermore, students in the flipped classroom course felt there was increased practical application of subject matter and greater use of multiple methods to involve them in their learning. There was slightly less agreement that the climate of the flipped classroom was conducive to learning when compared to the traditional class.

Table 2. University student-based course evaluations compared between new and old courses

Course Evaluation (5.0 Likert-Scale)[*]	Previous Health Course (n=64)	Current Population Health Course (n=29)	t-test p-value
Overall, I would rate this course as:	3.74±0.23	4.08±0.16	0.48
Course activities help me learn the material:	4.14±0.31	4.19 ±0.51	0.48

The climate of this class is conducive to learning:	4.26±0.19	4.17±0.37	0.49
Relationships among course topics are clearly explained:	4.26±0.19	4.11±0.20	0.49
The practical application of subject matter is apparent:	4.06±0.40	4.21±0.20	0.50
In this course, many methods are used to involve me in learning:	4.31±0.21	4.40±0.19	0.50

*1=strongly disagree; 5=strongly agree

Student survey of flipped classroom design

Overall, students were enthusiastic about the flipped classroom design (see Table 3). The majority of students indicated that the new course design allowed them greater flexibility and the ability to control the pace of learning, leading to a feeling of being more responsible for their own learning. They also indicated that it was a supportive, active learning environment which enhanced interaction and engagement. Importantly, students agreed that there was good balance between in-class and online activities which led to effective learning. Student comments included; "I enjoy the case studies and working together. The case studies that we have had this semester have allowed critical thinking and kept me engaged throughout the entire two hour class period"; "I liked having different activities and not the 'same old lecture' course. I liked the group work and the classroom setting was great"; "I enjoyed the hybrid format of this course. I still felt like I was learning new, relevant information while only attending class every other week"; and "…I became more aware of problems in the population". Lastly, students reported that the flipped classroom course design increased their critical thinking particularly in relation to current population health problems and 68% of the students felt there should be more courses designed this way.

Table 3. Student survey of flipped classroom course design and use of active learning strategies[*] (n=93)

The course met my expectations	4.0
The mix between face to face and online learning was a good balance	4.3
The course design allowed for more flexibility	4.6
I could control the pace of my own learning	4.2
I could organize my time better	4.1
I felt more responsible for my own learning	4.2
The course design enhanced student interaction and engagement	4.2
The amount of work required outside of class time was reasonable	3.9
I feel that I learned and retained the content better than if it had been a traditional lecture course	3.5
It was an active learning environment	4.3
I felt like the learning environment was supportive	4.1
Faculty used creative teaching strategies in this course	4.4
The amount of communication and interaction between student and faculty in this hybrid course was sufficient for effective learning	4.3
Required assignments in this hybrid course encourage the application of knowledge and skills learned in class to current population health problems	4.3
I believe that using a hybrid course design is more effective than traditional teaching methods	4.1
I prefer hybrid courses to traditional face-to-face courses	4.0
Students can use more critical thinking processes in a hybrid course than in a traditional face-to-face course	4.0
These should be more courses designed like this course	4.1

[*]1=strongly disagree; 5=strongly agree

<u>Faculty observations</u>

The effectiveness of the flipped classroom design was most evident in the student's final projects. The final project (described earlier) required groups of 3-4 students to develop a presentation on a chosen population health topic. This project was also completed by students in the final offerings of the previous curriculum's third-year public health science course which overlapped the new curriculum's second-year population health course for one year. Project presentations in both courses were graded by the same faculty using the same rubric. Overall,

faculty noted that the second-year students appeared to have a better grasp of these health issues from a population health perspective than their third -year peers in the previous curriculum. The third-year students tended to predominantly focus on the things that could be done from a medical and individual perspective, not the broader societal and contextual issues that impact development of health problems such as cardiovascular disease and obesity. However, this may have been due in part to the strong focus on acute care in the junior year versus the new curriculum which paired the population health course with sophomore-level courses in nursing fundamentals, health assessment, pathophysiology, and evidence-based practice.

CHALLENGES

While outcomes were generally positive, some students initially struggled with the flipped classroom design. This course was one of the first in the school of nursing to implement this approach to learning; students were accustomed to being told exactly what they needed to know via lectures and uneasy about the perceived indirect approach to learning. Some of the students reported difficulty staying organized without in-person faculty contact every week, while others found the quizzes challenging and did not see the importance of completing them prior to class. Students also felt that the out of class work was excessive at times, not accounting for the amount of class time they were being given nor the amount of course preparation generally required outside of class for a traditionally taught course. The assignment to random groups was initially not well-liked; students wanted to sit with their friends. Additionally, early in the semester as in most classes, the same individuals participated and responded during each class session. As the semester progressed however, students became much more interactive and became very comfortable with sharing the work that they had done. In fact there were times

when class time did not allow for all groups to present their work; students were disappointed and asked if they would be allowed to do so during the next class session.

DISCUSSION

When considering the benefits to student learning, three themes emerged during the analysis of the evaluation data: student engagement, flexibility in learning, and student ownership of learning. Students who prepared for class ahead of time were engaged in class activities and discussion. This level of engagement is typically not seen in traditional lecture format courses. Furthermore, this course design afforded flexibility to students who can schedule their online course work to best fit their schedules and facilitated student accountability for their learning.

However, as previously stated, student challenges were also identified. Previous evaluation research of flipped course designs mirrored our findings. For example, previously identified student challenges in flipped designs include 1) discomfort with the move away from in class lectures which told students directly what they needed to know to recorded formats delivered online, 2) the large amount of preparation required outside of class, and 3) resistance to doing work at home that was traditionally received in a lecture format (Hamdan et al., 2013; Crews & Butterfield, 2014). In other research, students also expressed difficulty and dissatisfaction with the poor quality and/or ineffectiveness of recorded faculty lectures (Conner et al., 2014; ; Enfield, 2013; Maher, Lipford & Singh, n.d).

From a faculty standpoint, teaching in flipped classroom courses may initially be uncomfortable as it necessitates a shift from presenter to facilitator. It can take a substantial

amount of time to create learning activities that foster student interaction and active learning. Students may initially resist this new form of learning and have difficulty completing the preparation necessary for in class activities. These challenges are also echoed in the literature. Herreid and Schiller (2013) surveyed faculty members of the National Center for Case Study Teaching in Science and identified several common challenges of flipped designs. These challenges include increased time spent in course preparation to find or create quality online or video resources and understanding that often students do not put in the time required outside of class to be prepared for in-class activities (Herreid & Schiller, 2013).

However, it is the belief of the authors that the strengths of this approach outweigh the concerns. Flipped classroom courses allow flexibility in the proportion and timing of online versus face-to-face interaction which give educational programs and faculty the flexibility to meet the needs of the school, course and students.

Based upon the success of the initial offering of the course in a flipped classroom design, faculty have opted to continue to refine the approach. One change that will be made in the next offering of the course is a move from online quizzes to in-class quizzes. These five to ten question in-class quizzes will take place at the start of class and will be completed using an in-class student response system. Faculty believe that students will be more likely to read the pre-class assignments more thoroughly when faced with an in-class quiz since they will not be able to rely on their textbook or notes as they did with the online quizzes (Caldwell, 2007).

While this course will continue to be updated and modified, this flipped classroom course re-design has proven to be a successful strategy to enhance the understanding and relevance of

population health-based concepts among sophomore-level nursing students. This course model could be used throughout other nursing curriculums and with other nursing courses to facilitate active learning strategies and foster critical thinking. However, it is important to note that the success of this course is based only on one school of nursing's experience with one course. Furthermore, before this course was offered for the first time, it took over a year to develop with much debate and discussion among faculty.

Limitations

Limitations of this study include the use of a small sample of students during one academic year. These students are typically traditional students from one geographic area of the country, and may not be representative of undergraduate nursing students overall. Furthermore, the results might have been skewed by higher completion rates for the in-class evaluation versus the on-line evaluation.

FUTURE IMPLICATIONS

The ability to demonstrate the effectiveness of flipped classroom course designs may help support other faculty as they attempt to design courses to more effectively meet the needs of today's learners. The use of a flipped classroom approach encourages students and faculty to rethink how learners learn and teachers teach. Embracing new teaching methods, course designs, and technology allows more flexibility for faculty and students, and addresses the needs of students with differing learning styles. Changing the teaching styles of nursing faculty to accommodate the needs of current learners can be difficult since faculty have often succumbed to the belief that they must specifically impart every important piece of information to students via

traditional lecture formats (Jokinen & Mokinnen, 2013). Many faculty do not feel comfortable with the use of active learning strategies where they feel students are left to sort out the important facts via case activities or other active learning strategies. This is in direct conflict with the need to use a variety of technologies compatible with the expectations of today's learner. Active learning strategies can help to foster the development of intentional learners who are able to pull together information from multiple sources to support decisions related to problems encountered as students move from the classroom to the real world (American Association of Colleges and Universities, 2002). Lindeman (2000) supported the need for nursing education programs to meet this challenge by revising curriculums to include increased group work among students, reflective practices, self-awareness activities, and the use of electronic databases and multimedia. A flipped classroom course design supports the use of strategies such as these effectively with nursing students.

CONCLUSION

Future research needs to be conducted to more effectively compare student outcomes for courses which use different teaching methods and designs. Evaluation of the level of content retention and the ability of student's to critically apply the content would also be useful to determine if such course designs increase the level of student understanding and ability to critically think through issues facing both individuals and populations.

CONFLICT OF INTEREST STATEMENT

The authors have no reported conflicts of interest.

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