Educational Innovations

Using a Kinesthetic Learning Strategy to Engage Nursing Student Thinking, Enhance Retention, and Improve Critical Thinking

Elissa A. Wagner, MSN, RN

ABSTRACT
This article reports the outcomes of a kinesthetic learning strategy used during a cardiac lecture to engage students and to improve the use of classroom-acquired knowledge in today’s challenging clinical settings. Nurse educators are constantly faced with finding new ways to engage students, stimulate critical thinking, and improve clinical application in a rapidly changing and complex health care system. Educators who deviate from the traditional pedagogy of didactic, content-driven teaching to a concept-based, student-centered approach using active and kinesthetic learning activities can enhance engagement and improve clinical problem solving, communication skills, and critical thinking to provide graduates with the tools necessary to be successful. The goals of this learning activity were to decrease the well-known classroom–clinical gap by enhancing engagement, providing deeper understanding of cardiac function and disorders, enhancing critical thinking, and improving clinical application. [J Nurs Educ. 2014;53(6):348–351.]

Nursing student populations have become increasingly diverse in universities and community colleges, as they consist of various age ranges, backgrounds, and cultures. Nurse educators have the added challenge of tailoring their didactic sessions to meet the learning needs of a variety of students and outcomes, as well as fostering engagement and critical thinking. To achieve these didactic teaching goals, students must possess a strong foundational knowledge in human anatomy and physiology. However, Jordan, Davies, and Green (1999) identified human anatomy and physiology as the most difficult subject in the nursing curriculum and as a significant source of anxiety for first-year nursing students. How do nurse educators meet the needs of student learning, bridge the classroom–clinical gap, increase engagement, and stimulate critical thinking? One possible solution may be to identify prominent learning styles and apply kinesthetic learning activities. Meehan-Andrews (2009) evaluated the preferred learning styles of first-year health science students in an Australian anatomy and physiology course. Using practical sessions, (i.e., laboratory-based learning), Meehan-Andrews found that “of the students that preferred a single mode of information presentation, more than two-thirds, 68%, preferred kinesthetic methods” (p. 27). Students in that course also reported increased confidence in completing tasks, carrying out instructions, documenting information, and analyzing data. Kinesthetic learning strategies use the Visual, Aural/Auditory, Read/Write, Kinesthetic (VARK) theory, which are instructional preferences originally developed by Fleming in 1987 to identify learning styles that enhance education (French, Cosgriff, & Brown, 2007). Fleming (1995) defined kinesthetic style as learning through touch and experiences. Therefore, incorporating movement, touch, motion, or cooperative learning activities into the curriculum is the basis for kinesthetic learning strategies.

Many theories exist to understand the mechanisms by which learning takes place. Learning styles can be broadly based on a number of perspectives, including (a) personality traits (i.e., those characteristics within the individual that are relatively fixed); (b) information processing (i.e., Kolb’s and Kolb’s [2005] experiential learning cycle); (c) social learning, which examines how the learner interacts in the environment; and (d) instructional preferences, such as the VARK theory (French, Cosgriff, & Brown, 2007). Kinesthetic-based practical sessions allow students to use movement and demonstration during lecture to visualize difficult
EDUCATIONAL INNOVATIONS

Anatomical Heart Model for Kinesthetic Learning

Figure. Outline of the anatomical heart used for the kinesthetic learning activity.

Kinesthetic Learning Activity

In the current study, junior-level baccalaureate nursing students in the first semester of an adult health course participated in an in-class kinesthetic learning experience designed to reinforce pre-assigned readings about cardiac function and various disorders. The learning activity was used with two groups of students during their first semester of Adult Health Medical/Surgical Nursing I in the fall semesters of 2010 and 2011. The first group consisted of 18 students, and the second group consisted of 22 students (N = 40).

A large outline of an anatomical heart was placed on the classroom floor; red electrical tape outlined the left heart structures, aorta, and systemic circulation, and blue duct tape identified the right heart structures, pulmonary artery, and pulmonary circulation (Figure). To accommodate the number of students, the heart size and floor space covered approximately 15 feet × 13 feet in the middle of the classroom. Cardboard pieces represented the mitral, tricuspid, aortic, and pulmonic valves. One student represented the lungs by tying balloons around her waist, and another student was placed at the end of the systemic circulation below the base of the heart. Both the lung and systemic circulation students held a blue and a red index card to exchange with students demonstrating blood circulation by walking through the system to signify oxygenated and deoxygenated blood. The instructor then assigned roles to the remaining students, including valves, chambers of the heart, and blood circulation. The students representing heart valves held cardboard pieces to illustrate the leaflets of the valves. Students representing chambers of the heart then stood shoulder-to-shoulder on the outline of the four chambers. The number of students in this role reflected the anatomical size of the ventricle or atrium. In this activity, five students outlined the left ventricle, three students outlined the right ventricle, and two students outlined the left and right atriums, respectively. The remaining students acted as blood circulating through the system.

The activity started with a student walking the path of normal circulation, exchanging a blue card for a red card from the lung student to represent oxygenation and then continuing through the systemic circulation to exchange a red card for a blue. The rest of the students directed the circulator through the cardiopulmonary system to reinforce their understanding of blood flow, circulation, structures, and oxygenation. As the circulating student passed through the heart structures, the other students locked elbows, and to simulate the heart contracting, they stepped inward and moved closer together to represent systole. The students stepping backward and spreading out represented diastole. The students animated valvular activity by allowing the circulating student to pass through the appropriate cardboard pieces and continue toward the next structure.

Then, the students simulated the characteristics of cardiac preload and afterload. They acted out how the cardiac muscle fibers stretch during preload by spreading farther apart from a shoulder-to-shoulder position to holding hands with outstretched arms. Students demonstrated increased venous return to the heart by increasing the number of circulating students, thus causing the outstretched arms of the ventricle students to step forward and contract more forcefully to eject the vol-

Hoke and Robbins (2005) incorporated active, holistic, and cooperative learning strategies into a didactic medical–surgical course offered for licensed practical nurses in an associate degree program. Previously, the 6-hour, 30-day course had been taught using a lecture format that frequently generated student complaints, course failures, and reports of little opportunities for learning. The seminal work by Hoke and Robbins used a qualitative method to evaluate whether active and cooperative learning activities would increase student ability to transfer didactic knowledge to the clinical setting. Several learning strategies, such as role play, video evaluation, small-group work, drawings, and presentations, were used to promote learning in the student convenience sample (N = 23). One active learning strategy divided students into small groups and asked them to illustrate key concepts of cardiovascular content through drawings. These drawings were then shared with the larger group, as students rotated through the stations and added to the existing drawings. At the conclusion of the activity, each small group presented the key concepts to the entire class.

Findings from the Hoke and Robbins study (2005) about the impact of the learning strategies on clinical success were primarily anecdotal; specifically, they were collected through course evaluations, nursing counselor feedback, and comparison of average clinical course grades. Students reported that they enjoyed the course overall, felt decreased anxiety over the course, and believed the learning strategies helped them learn. Counselors reported no complaints from students about the course, with some stating that students experienced fun in the classroom and had a high degree of learning (Hoke & Robbins, 2005). By using active learning strategies, “the authors found higher success in both didactic and related clinical courses, with the average clinical grade improving from 84.19 to 87.03 when compared to the previously taught course” (p. 352).

Kinesthetic learning strategies allow students to move around during didactic sessions, which improves motivation and interest in the content. It also provides students with a positive learning experience and enhances deeper learning through engaging in concepts that are meaningful to them.

Concepts relating to anatomy and physiology to enhance learning and retention.

Hoke and Robbins (2005) incorporated active, holistic, and cooperative learning strategies into a didactic medical–surgical course offered for licensed practical nurses in an associate degree program. Previously, the 6-hour, 30-day course had been taught using a lecture format that frequently generated student complaints, course failures, and reports of little opportunities for learning. The seminal work by Hoke and Robbins used a qualitative method to evaluate whether active and cooperative learning activities would increase student ability to transfer didactic knowledge to the clinical setting. Several learning strategies, such as role play, video evaluation, small-group work, drawings, and presentations, were used to promote learning in the student convenience sample (N = 23). One active learning strategy divided students into small groups and asked them to illustrate key concepts of cardiovascular content through drawings. These drawings were then shared with the larger group, as students rotated through the stations and added to the existing drawings. At the conclusion of the activity, each small group presented the key concepts to the entire class.

Findings from the Hoke and Robbins study (2005) about the impact of the learning strategies on clinical success were primarily anecdotal; specifically, they were collected through course evaluations, nursing counselor feedback, and comparison of average clinical course grades. Students reported that they enjoyed the course overall, felt decreased anxiety over the course, and believed the learning strategies helped them learn. Counselors reported no complaints from students about the course, with some stating that students experienced fun in the classroom and had a high degree of learning (Hoke & Robbins, 2005). By using active learning strategies, “the authors found higher success in both didactic and related clinical courses, with the average clinical grade improving from 84.19 to 87.03 when compared to the previously taught course” (p. 352).

Kinesthetic learning strategies allow students to move around during didactic sessions, which improves motivation and interest in the content. It also provides students with a positive learning experience and enhances deeper learning through engaging in concepts that are meaningful to them.

**Kinesthetic Learning Activity**

In the current study, junior-level baccalaureate nursing students in the first semester of an adult health course participated in an in-class kinesthetic learning experience designed to reinforce pre-assigned readings about cardiac function and various disorders. The learning activity was used with two groups of students during their first semester of Adult Health Medical/Surgical Nursing I in the fall semesters of 2010 and 2011. The first group consisted of 18 students, and the second group consisted of 22 students (N = 40).

A large outline of an anatomical heart was placed on the classroom floor; red electrical tape outlined the left heart structures, aorta, and systemic circulation, and blue duct tape identified the right heart structures, pulmonary artery, and pulmonary circulation (Figure). To accommodate the number of students, the heart size and floor space covered approximately 15 feet × 13 feet in the middle of the classroom. Cardboard pieces represented the mitral, tricuspid, aortic, and pulmonic valves. One student represented the lungs by tying balloons around her waist, and another student was placed at the end of the systemic circulation below the base of the heart. Both the lung and systemic circulation students held a blue and a red index card to exchange with students demonstrating blood circulation by walking through the system to signify oxygenated and deoxygenated blood. The instructor then assigned roles to the remaining students, including valves, chambers of the heart, and blood circulation. The students representing heart valves held cardboard pieces to illustrate the leaflets of the valves. Students representing chambers of the heart then stood shoulder-to-shoulder on the outline of the four chambers. The number of students in this role reflected the anatomical size of the ventricle or atrium. In this activity, five students outlined the left ventricle, three students outlined the right ventricle, and two students outlined the left and right atriums, respectively. The remaining students acted as blood circulating through the system.

The activity started with a student walking the path of normal circulation, exchanging a blue card for a red card from the lung student to represent oxygenation and then continuing through the systemic circulation to exchange a red card for a blue. The rest of the students directed the circulator through the cardiopulmonary system to reinforce their understanding of blood flow, circulation, structures, and oxygenation. As the circulating student passed through the heart structures, the other students locked elbows, and to simulate the heart contracting, they stepped inward and moved closer together to represent systole. The students stepping backward and spreading out represented diastole. The students animated valvular activity by allowing the circulating student to pass through the appropriate cardboard pieces and continue toward the next structure.

Then, the students simulated the characteristics of cardiac preload and afterload. They acted out how the cardiac muscle fibers stretch during preload by spreading farther apart from a shoulder-to-shoulder position to holding hands with outstretched arms. Students demonstrated increased venous return to the heart by increasing the number of circulating students, thus causing the outstretched arms of the ventricle students to step forward and contract more forcefully to eject the vol-
volume (i.e., circulating students) through the pulmonic and aortic vessels. By doing this, students could visualize and discuss how cardiac fibers reach their physiologic limit, which leads to disorders such as congestive heart failure (CHF) and cardiomyopathy. The students then demonstrated decreased circulating volume due to hemorrhage or dehydration, which decreases venous return and cardiac output. The decrease in cardiac preload was represented by eliminating two to three students from the circulation group. Discussion ensued about the alterations and related etiologies of the effects on stroke volume, cardiac output, and symptoms a patient may exhibit. After participating, the students were able to better relate pathophysiology to objective and subjective findings in the clinical setting.

Students then demonstrated cardiac afterload by ejecting (i.e., moving closer together and stepping forward) the circulating students through the pulmonary and aortic valves. Students holding cardboard pieces representing the valves allowed circulating students to pass through. Increased pulmonary vascular resistance was demonstrated by adding more students to the pulmonary artery, making it difficult to eject the students into the pulmonary vasculature. Similarly, systemic vascular resistance was represented in the same way, except students were placed along the aortic artery walls, thus narrowing the aorta and making it difficult to eject the circulating students out into the systemic circulation. In addition, students representing the semilunar valves demonstrated stenosis by making it difficult for the circulating students to pass through the structure, further increasing cardiac afterload. Cardiac regurgitation was demonstrated by allowing one to two circulating students to “fall back” into the ventricle and mix with the incoming circulation. Each demonstration was followed by discussion and questioning on cardiac disorders that contribute to pathophysiological changes, symptomology, and interventions. These activities helped students to better understand hemodynamic changes that lead to pulmonary complications and heart failure.

The learning activity continued with demonstrations of how medications affect the cardiac system. Students role played antihypertensive effects on peripheral vascular resistance and beta blocker and calcium channel blocker actions, as well as the effects of digitalis. Allowing students to ask questions, demonstrate the pathophysiology, and discuss the effects on the heart helped them to better understand the medication actions and nursing implications for administration.

Using kinesthetic learning activities helped students to develop a good understanding of cardiac function. In addition, they were able to understand more complex conditions, such as CHF and basic conduction disorders. The students demonstrated CHF by its various etiologies, including valvular disease, chronic hypertension, and myocardial infarction. They demonstrated right- and left-sided heart failure, with the ventricular students exhibiting poor contractility and the circulating students performing ineffective cardiac output with the “backing up” of blood into the pulmonary and systemic circulations. Students could visualize heart organ engagement and relate patient symptoms to the disease process. Questions asked by students and the instructor throughout the activity stimulated critical thinking and the analysis of newly learned information.

Finally, students were given a piece of yellow string and assigned to represent the sinoatrial node, the atroventricular node, the bundle of His, bundle branches, and Purkinje fibers. Students were placed on the anatomical heart to represent cardiac conduction areas and held string to connect the circuit. Normal conduction was demonstrated by shaking the string in a wave fashion to send the stimulus from student to student in the pattern. To represent a complete conduction cycle, the sinoatrial node student shook the string and began the conduction cycle. The atroventricular node student slowed the string shaking (i.e., stimulus) to delay conduction transmission to the ventricles. Then, the shaking stimulus was conducted to the bundle of His, bundle branches, and Purkinje fibers to complete the cycle. Tachycardia, bradycardia, and atrial fibrillation were also demonstrated to increase student understanding of how conduction disorders affect cardiac function, preload, afterload, and related symptoms.

Discussion
Faculty observation in the classroom and clinical settings was used to evaluate the impact of the kinesthetic learning activity. During the activity, it was evident to faculty that class discussion was deeper and student engagement was higher. Students intensely discerned the impact of cardiac and conduction disorders on cardiac function. In addition, they identified nursing interventions, better understood pharmacological interventions, and identified relevant outcomes for patients with cardiac disease. This increased understanding was evidenced by improved test scores on cardiac disease-related questions and overall examination scores in relation to previous examinations, although specific quantification of the improvement was not calculated due to this being a new nursing program with only two comparison cohorts. In the weeks following the activity, students self-reported a greater understanding of concepts related to cardiac function. They also reported a greater satisfaction with the learning experience and requested additional kinesthetic activities for future lectures.

Instructor evaluation in the clinical setting demonstrated improved student application of the newly attained knowledge through more accurate concept maps, recognition of symptoms, and clinical care. In addition, faculty noted more in-depth understanding of cardiac-related medications during premedication administration questioning. Students readily related individual patient pathophysiology to medications and interventions in their concept maps and clinical discussions more accurately, when compared with previous discussions. This improved understanding was evident in the ability of students to explain medical interventions and the effects of medications to their patients. Postconference discussions related to cardiac disorders demonstrated student didactic knowledge in relation to individual patients’ symptoms, interventions, and medication actions.

One example of improved understanding and application of knowledge after the kinesthetic activity occurred in the clinical setting when a student was preparing to administer a patient’s scheduled metoprolol for treatment of hypertension and atrial fibrillation. The student noted hypotension during the morning vital signs assessment and quickly related the finding to recent volume loss, secondary to gastrointestinal bleeding. The student...
was able to critically think about the pathophysiology of gastro-intestinal bleeding and how it affected the circulating volume, the patient symptoms, and the assessment findings. She then analyzed the medication class, the mechanism of action, and the side effects of the patient’s current status and concluded that holding the medication would be appropriate. Her findings were supported by the attending physician, and she continued to monitor the patient throughout the day. The student reported a greater understanding of cardiac disorders, medications, and interventions because of her participation in the classroom activity. She expressed that a deeper understanding provided her with improved confidence in the clinical setting and a more productive clinical experience overall.

Using more kinesthetic learning activities with students may help to improve information transfer, problem solving, critical thinking, understanding of key concepts, and overall satisfaction with teaching methods. Using discussion and questioning related to the activity allowed students to make connections between theory and clinical practice. It also reinforced the nursing process and improved student ability to develop plans of care that are holistic and individualized.

Limitations

The kinesthetic learning strategy used in this activity was limited to 18 participants in the first cohort and 22 in the second cohort, therefore limiting its ability to be generalized to a larger population. However, with larger classroom sizes and student samples, this activity becomes difficult in terms of student involvement and room for movement around the classroom, and it may lead to the disengagement of students not directly participating in the activity. One way to minimize disengagement barriers would be to provide critical thinking questions to the students not directly participating kinesthetically to encourage discussion. The students not participating kinesthetically could also direct others, pose questions, determine interventions, and provide feedback to the students actively participating in the activity. This structure would provide the educator with opportunities to provide clarification, stimulate thinking, and expand on discussions that foster learning and critical thinking even with larger class sizes. Other barriers to using this learning activity would be the educator’s ability to direct the activity appropriately for learning, the ability of all students to visualize the activity, and the time needed for preparation.

If this kinesthetic learning activity were to be conducted again, the findings may be more reliable if presented through an empirical research design. Designs that could provide more generalizability include quasi-experimental, qualitative research, and mixed-method designs. Educators using a mixed-method design would benefit from both quantitative and qualitative data, which would support the outcomes of the kinesthetic intervention on student learning. Examination scores and test item scores can be evaluated for quantitative data; however, understanding the views of the individuals by using qualitative methods may provide a greater depth of knowledge to explain why the teaching–learning methods were successful.

Conclusion

This kinesthetic learning activity may provide nursing educators with new ways to present didactic information in the classroom and to increase engagement, enhance retention, and stimulate critical thinking. The strategies outlined could be adapted to other physiological concepts, such as fluid and electrolyte changes, acid–base balance, lung disorders and gas exchange, and kidney function. They could also be expanded to increase understanding in nursing orientations and patient education activities. Any opportunity to add kinesthetic activities to learning can help to reinforce the course content and provide the learner with deeper understanding and better knowledge retention in the care of patients.

References


