EXAMINATION OF GAMING IN NURSING EDUCATION AND THE

EFFECTS ON LEARNING AND RETENTION

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EXAMINATION OF GAMING IN NURSING EDUCATION AND THE EFFECTS ON LEARNING AND RETENTION

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EXAMINATION OF GAMING IN NURSING EDUCATION AND THE

EFFECTS ON LEARNING AND RETENTION

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Tracey L. Hodges was born February 24, 1962, in Maryville, Tennessee. She graduated from Columbus State University with an Associate's Degree in Nursing in 1993. She practiced psychiatric nursing and home health for two-years in Savannah, Georgia before moving to Amman, Jordan. In Amman, Tracey worked alongside two other registered nurses in the American Embassy Health Unit. It was during this time that she began to contemplate a career in education. Upon her return to the U.S., she worked on a telemetry floor in Augusta, Georgia. In 1999 she moved to Prattville, Alabama. Tracey graduated from Auburn University Montgomery (AUM) with her Bachelor's of Science in Nursing in 2001 and began her teaching career as a clinical adjunct and temporary full-time instructor in the traditional AUM nursing program. She received her Master's of Science in Adult Health and Nursing Education from the University of South Alabama in 2002. Tracey is currently an Assistant Professor with the Troy University School of Nursing, ASN program. She has been married to Steve Hodges for 24 years. They have three children – Alan, Jeremy, and Jillian — and three grandchildren — Alison, Amber, and Archael.

DISSERTATION ABSTRACT

EXAMINATION OF GAMING IN NURSING EDUCATION AND THE EFFECTS ON LEARNING AND RETENTION

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The college environment brings together adult learners from diverse backgrounds who have different goals, personal and work experiences, and learning styles. These learners have the ability to learn in as many ways as educators have ways to teach them and learn better when actively engaged in the learning process. This reality makes it important for adult educators to incorporate a variety of teaching methods in their courses to meet the needs of these learners. Gaming is one such teaching method, with the potential to reach a wide and diverse population of adult learners.

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of pediatric cardiovascular dysfunction content. Research questions included: What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional

lecture methods of instruction? What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of instruction based on final examination scores of baccalaureate nursing students?

The sample (N = 96) was a non-probability convenience sample of available nursing students at a southeastern four-year public university. Participants were randomly divided into an experimental and a control group. To determine whether or not learning and retention differed at a statistically significant level, a repeated measures ANOVA was calculated with a significance level of .05. The results (F (2, 93) = 74.07, p < .001) indicated participant learning and retention occurred at a statistically significant level within each group, but no statistically significant difference (F (2, 93) = .654, p = .522) existed between the two groups. The results indicated both traditional (lecture) and non-traditional (gaming) teaching methods are equally effective for enhanced learning and retention of knowledge.

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Anyone who has written a dissertation knows that even though (at times) it can be an isolating experience, it is not a solitary undertaking. I would like to take this time to thank those who were instrumental in helping me complete this process.

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To my family — how can words express my gratitude? I thank God for each of you for constantly encouraging me to follow my dreams — and supporting me when I did. To my husband Steve — my soul mate and the best friend a girl could ask for! While everyone mentioned here has contributed in some way to this process, you have contributed in all ways! I love you! “FLTOC”

Style manual or journal used: Publication Manual of the American Psychological Association, 5th Edition.

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CHAPTER I. INTRODUCTION

Adult educators are continuously challenged to discover novel teaching approaches that encompass a variety of learning styles and meet the needs of adult learners, effectively enhance learning, and facilitate and motivate active student participation (Arms, Cheveney, Karrer, & Rumpler, 1984; Bays & Hermann, 1997; Beers & Bowden, 2005; Blenner, 1991; Corbett & Lee, 1992; Cowen & Tesh, 2002; Glendon & Ulrich, 1992; Gross, 1994; Gruending, Fenty, & Hogan, 1991; Hermann & Bays, 1991; Jeffreys, 1991; Kemp, Morrison, & Ross, 2004; Knowles, 1980; Lowman, 1995; Morton & Tarvin, 2001; Saethang & Kee, 1998). Henderson (2005) and others (Beers & Bowden; Kemp, Morrison, & Ross; Moran, 2005; Royce & Newton, 2007) contend nursing educators have an obligation to seek out creative teaching methods that boost student learning, to include better problem solving, decision making, critical thinking, and communication skills.

At some point in life, almost everyone will require some level of nursing care. Nursing schools, then, have an obligation to graduate competent nurses to provide this care to the public. According to the Alabama Board of Nursing (2007), nursing schools must “Enable the student to develop the nursing knowledge, skills, and abilities required for entry level practice, consistent with the scope and standards of nursing practice” (p. 4). In meeting its obligation to both the students and the communities those students will

serve, nurse educators recognize the stress nursing students face in meeting the requirements necessary to begin entry level practice. These students often face balancing work, family, and school responsibilities, to include interfacing with patients in the clinical setting (Henderson, 2005). Within the clinical setting, these students experience high levels of anxiety because they are dealing with real-life situations – situations that may result in undesirable patient outcomes if students fail to properly monitor or care for their patients. Students lack confidence in their abilities and are unsure when it comes to communicating medical information to the healthcare team (Grassi-Russo & Morris, 1981; Parkes, 1985).

For these reasons, nursing educators should strive to use educational tools that support a variety of learning styles to meet each student's learning needs. By meeting these needs, these tools would encourage students to more actively engage in the learning process and provide a means to motivate them to remain interested and stress free during the process. The challenge, then, is to accomplish this while making learning fun, exciting, and student-centered rather than teacher-dominated (Bays & Hermann, 1997; Silberman, 1996). One alternative teaching strategy that meets this challenge is gaming.

Numerous educators support gaming activities in higher education that help move learning from a historically teacher-dominated to a student-centered environment, thereby promoting active student involvement in the learning process (Allen, 1990; Alspach, 1995; Ausubel, 1968; Bloom & Trice, 1994; Bruner, 1966; Campbell & Piccinin, 1999; Chickering & Gamson, 1987; Cowen & Tesh, 2002; Ebert-May, Brewer, & Allred, 1997; Hermann & Bays, 1991; Kramer, 1995; Moran, 2005; Oblinger, 2004; Rogers, 1969).

Learning at the college level should be a shared student-teacher encounter rather than the traditional teacher-dominated approach, creating an atmosphere that increases the potential for better student understanding and retention of knowledge through active student involvement (Bays & Hermann, 1997; Golub, 1988; Kolb & Kolb, 2005; Silberman, 1996; Smith & MacGregor, 1992).

Some adult learning theorists and educators would agree with this assessment and cite active participation in the learning environment as an important component in acquiring and retaining knowledge (Ausubel, 1968; Bruner, 1966; Knowles, 1980; McKeachie, 2002; Silberman, 1996; Sullivan, 1997). Some of these same theorists and other educators would also agree that sharing varied student and faculty experiences is important to the learning process and to remembering what is learned after the learning event ends (Ausubel; Bruner; Knowles; Oblinger, 2004; Thatcher, 1990). Gaming is an approach that creates a teaching-learning environment that supports both teacher-student interaction and the students' active participation in the learning process (Bartfay & Bartfay, 1994; Bloom & Trice, 1994; Corbett & Lee, 1992; Henry, 1997; Saethang & Kee, 1998; Schmitz, MacLean & Shidler, 1991; Skinner, 2000; Sprengal, 1994).

The old saying, "I hear and I forget, I see and I remember, I do and I understand," credited to the Chinese philosopher Confucius, supports the concept of active participation in the learning process. Silberman's (1996) Active Learning Credo also stresses the importance of students taking a more active role in the learning process. Silberman, like Confucius, suggests that simply hearing or seeing is not enough to promote learning. Lecturing, the traditional method of instruction is passive in nature and less effective in meeting the needs of adult learners who have diverse backgrounds

(McKeachie, 2002; Sprengal, 1994). Conversely, educators who include collaborative learning activities in their repertoire of teaching methods promote active student involvement. Collaborative learning activities come in all shapes and sizes, with most switching the focus from the teacher's presentation to the students' application of the course material (Smith & MacGregor, 1992).

Collaborative learning is a process that allows for students to work together in a low risk practice setting that prepares them for effective group relationships in the workplace. In effect, students rely on each other rather than relying on the instructor (Bruffee, 1995). These teaching strategies can help bridge the gap among different cultures, learning styles, and ages of students (Glendon & Ulrich, 1992). Gaming is one collaborative activity that encompasses a variety of learning styles and promotes active learning process engagement by students of all ages and cultures (Hermann & Bays, 1991; Lewis, Saydak, Mierzwa, & Robinson, 1989).

Gaming is a potent educational tool that that has been touted in the literature as an effective teaching strategy (Boreham, Foster, & Mawer, 1989; Brand, 1980; Oblinger, 2004). Gaming encourages student interest and motivation to actively participate in the learning process (Klein & Frietag, 1991); enhances learning and retention of knowledge (Cowen & Tesh, 2002; DeNike, 1976); increases self-esteem (Glendon & Ulrich, 1992) and confidence (Jeffreys, 1991); and provides an environment of excitement, fun, and relaxation, which in and of itself helps reduce anxiety and positively influences the learning process (Barak, Engle, Katzir, & Fisher, 1987; Bays & Hermann, 1997; Fisher, 1976).

According to Duke and Kemeny (1989) and Fisher (1976), gaming has been a part of every culture in the history of civilization, with Duke and Kemeny reporting gaming is considered the "world's second oldest profession" (p. 166) that dates back to chess and checkers in antiquity. The 18th century saw the advent of military games, which are still in existence today (Duke & Kemeny, 1989), and Fisher contends the 20th century brought about game playing as a deliberate educational tool. While there is a wealth of information on gaming in education and business, as discovered in the review of literature, there has only been a small number of research studies published on the use of gaming and its effectiveness at the college/university level (Lean, Moizer, Towler, & Abbey, 2006). Beyond the 1990s, there is a lack of research on the use of games in nursing education programs (Henderson, 2005).

One reason for the lack of research on gaming in higher education may be the controversy that has existed, and continues to exist, over using games in the teaching process. Those who are against gaming in education believe gaming decreases the losing students' motivation and self-esteem and, therefore, impairs learning and content retention (Barber & Norman, 1989; Corbett & Lee, 1992). Conversely, those who support gaming in education view it as enhancing learning and knowledge retention, decreasing anxiety, motivating students' to learn, and adding an element of fun to the learning process (Bays & Hermann, 1997; Barak et al., 1987; Boreham et al., 1989; Brand, 1980; Cowen & Tesh, 2002; Fisher, 1976; Glendon & Ulrich, 1992; Henderson, 2005; Jeffreys 1991; Klein & Frietag, 1991; Knowles, 1980; Oblinger, 2004).

While gaming may appear to be more beneficial to the elementary school setting, games can be beneficial to adult learners as well (Burke, 2001; Duke, 1964; Morton &

Tarvin, 2001; Sprengal, 1994). Duke indicated gaming is applicable to the adult learner because gaming takes students out of the teacher-dominated environment and puts them in an active student-centered learning role. Knowles' (1980) adult learning theory, based on four critical assumptions about the characteristics of adult learners, supports the use of gaming. First, the adult moves from a state of dependency to independency (or self-directedness). Playing a game, which is student-centered rather teacher-dominated, helps promote a level of independence by giving the student active control of his or her learning (Allery, 2004; Bruner, 1966; deTornay & Thompson, 1987; Ingram, Ray, Ladeen, & Keane, 1998; Kolb & Kolb, 2005; McKeachie, 2002; Rickard et al., 1995; Royce & Newton, 2007; Schaefer & Zygmont, 2003; Smith & MacGregor, 1992).

Second, students can build learning on their accumulation of life experiences and can help others learn by sharing those life experiences with them. Gaming involves teacher and peer feedback, which is often based on individual past experiences (Alessio, 1991; Crancer & Maury-Hess, 1980; Duke, 1964; Herrman, 2002; Keutzer, 1993; Keys & Wolfe, 1990; Pennington & Hawley, 1995), and this in itself motivates the adult learner (Bartfay & Bartfay, 1994; Corbett & Lee, 1992; Gross, 1994; Kerrei, 1992; Sarason & Banbury, 2004; Schmitz et al., 1991).

Third, adults' readiness to learn becomes increasingly associated with the developmental tasks of social roles and is thereby promoted by the socialization that takes place during game playing (Coleman, 1989; Hackney, 1971; Morton & Tarvin, 2001; Oblinger, 2004; Saethang & Kee, 1998). Finally, adults move from postponing application of learning to immediacy of application and from subject-centeredness to performance-centeredness learning. Gaming provides this venue for knowledge

application to real-life situations during the learning process versus sometime after the learning process takes place (Andlinger, 1958; Barber & Norman, 1989; Boocock & Coleman, 1966; Fetro & Hey, 2000; Hanna, 1991).

Problem Statement

The primary purpose of this study was to determine whether gaming, as a method of instruction compared to the traditional lecture method, had an impact on learning and increased retention of knowledge of pediatric cardiovascular dysfunction (PCD) among nursing students enrolled in a baccalaureate nursing pediatrics course. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university.

While the review of the literature shows numerous research studies on gaming in education as a whole (Barak et al., 1987; Brand, 1980; Chambers & Abrami, 1991; Coleman, 1989; DeNike, 1976; Fisher, 1976; Frass, 1982; Ingram et al., 1998; Klein & Frietag, 1991; Lean et al., 2006; Whitely & Faria, 1989), much of the literature on gaming in nursing education is anecdotal (Bartfay & Bartfay, 1994; Bilderback, 1991; Blenner, 1991; Bloom & Trice, 1994; Cowen & Tesh, 2002; Hartsock & Lange, 1987; Jeffreys, 1991; Jones, Jasperson, & Gusa, 2000; Kolb, 1983; Morton & Tarvin, 2001; Poston, 1998; Saethang & Kee, 1998; Skinner, 2000; Sprengal, 1994; Waddell, Summers, & Hummel, 1994; Wargo, 2000). There is clear indication that research is an essential component in evaluating the effectiveness of gaming as a teaching strategy (Bays & Herman, 1997; Cessario, 1987; Corbett & Lee, 1992; Henderson, 2005; Moran, 2005; Royce & Newton, 2007).

Purpose of the Study

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of PCD content. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university.

Research Questions

1. What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction?
2. What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method instruction based on final examination scores of baccalaureate nursing students?
3. Is there a significant difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

Importance of the Study

While active and experiential-based learning activities are getting more attention, there are still relatively few studies in publication that address the variety active learning techniques used in higher education learning activities (Lean et al., 2006). Although teachers have successfully used games to facilitate learning, a review of nursing literature reveals nursing has been slow to integrate gaming as an alternative teaching method (Corbett & Lee, 1992; Henderson, 2005; Moran, 2005; Royce & Newton, 2007). In their 2003 position statement on innovation in nursing education, the National League for

Nursing (NLN) indicated that, while innovation has occurred in nursing education, it appears that it is based on shifting content within the curriculum rather than using and promoting new and creative ideas to transform the curriculum. This observation is supported by others (Cessario, 1987; Henderson; Moran; Royce & Newton), who indicate nursing literature reveals a gap in the development of innovative strategies such as gaming to aid in reinforcing and motivating student learning.

This gap is evident despite many educators that view gaming as an effective teaching method to motivate students and enhance their learning (Abruzzese, 1996; Barak et al., 1987; Bartfay & Bartfay, 1994; Bays & Hermann, 1997; Gross, 1994; Hartsock & Lange, 1987; Morton & Tarvin, 2001; Saethang & Kee, 1998; Schmitz et al., 1991; Skinner, 2000), and there was an interest in gaming in nursing academia in the early 1980s (Barber & Norman, 1989). Today, there is a lack of published research examining the effectiveness of gaming as a teaching strategy (Henderson, 2005; Moran, 2005; Royce & Newton, 2007). Pardue, Tagliareni, Valiga, Davidson-Price, and Orehowsky (2005) suggest true innovation in the classroom "requires deconstructing long-held assumptions and values" (p. 55) regarding teaching methods, which may be a contributing factor in the lack of research on gaming activities as effective tools to enhance learning. Research is essential in evaluating new teaching strategies, such as gaming (Henderson, 2005; Moran. 2005; Royce & Newton, 2007). Henderson found only a few nursing education games published beyond the late 1990s. Wargo's 2000 study *Blood Clot: Gaming to Reinforce Learning about Disseminated Intravascular Coagulation* reported student responses to questions regarding whether or not the game

met course objectives and content, reinforced that content, and encouraged group interaction. The information, though, was anecdotal.

Cowen and Tesh (2002) provided empirical data on the use of gaming with their study on the *Effects of Gaming on Nursing Students' Knowledge of Pediatric Cardiovascular Dysfunction*. The study supported the use of gaming as an effective tool for knowledge retention. Cowen and Tesh reported students in the treatment group answered 94% of the questions on the post-test correctly, while students in the control group answered only 85% correctly. This difference in test scores indicated gaming does enhance learning and retention of knowledge. Henderson (2005) suggested further research was highly recommended in the use of gaming in nursing education to further evaluate the outcome of gaming as an effective teaching method to enhance knowledge and retention.

At some point in life, everyone will require some level of nursing care. Nursing schools have an obligation to graduate competent nurses to provide this care to the public. According to the Alabama Board of Nursing (2007), nursing schools must "Enable the student to develop the nursing knowledge, skills, and abilities required for entry level practice, consistent with the scope and standards of nursing practice" (p. 4). The American Nurses Association (2003) purports there is a social contract between society and the nursing profession stating "The nursing profession remains committed to the care and nurturing of sick and well people individually and in groups" (p. 35). "In the face of increasing demands for nurses who think critically and achieve high professional standards, educators are challenged to provide meaningful student-centered education" (Moran, 2005, p. 1).

As such, it is imperative nursing educators constantly research effective teaching strategies that meet a variety of adult learner needs in order to better prepare nurses to provide care to the general population (Arms et al., 1984; Bays & Hermann, 1997; Blenner, 1991; Corbett & Lee, 1992; Cowen & Tesh, 2002; Glendon & Ulrich, 1992; Gross, 1994; Gruending et al., 1991; Hermann & Bays, 1991; Jeffreys, 1991; Knowles, 1980; Lowman, 1995; Saethang & Kee, 1998). Although gaming has been supported in the literature as a legitimate and effective teaching strategy, it is underused by nurse educators (Joos, 1984; Morton & Tarvin 2001; Royce & Newton, 2007) even though it is a teaching strategy that can help "facilitate the acquisition and application of cognitive, affective, and psychomotor knowledge" (Hillman, 2001, p. 56). Research in this area will add to the empirical knowledge of the overall premise that gaming is an effective, innovative teaching strategy that enhances learning and retention and can assist in graduating competent, safe nurses.

Assumptions

There were several assumptions associated with this research project. First, there was an assumption all nursing student participants would have approximately the same pre-test scores (prior knowledge on pediatric cardiovascular dysfunction content). Second, there was an assumption that all pre-test scores in this sample represented a normal distribution. Pre-test scores for both groups were distributed normally with a mean of approximately 48 (see Table 1). Levene's Test (see Table 2) of Equality of Error Variances (p = .547) indicated the group variance was not statistically significantly different. Therefore, the assumption of equal variance was not violated. Third, while the sample for this study was a convenience sample of available participants, the participants

were randomly assigned to the control or experimental group. Furthermore, with respect to the experimental group the participants were randomly assigned to teams within that group. Finally, participants independently obtained their scores on the pre-test, post-test, and final exam.

Table 1

Pre-test Means

Group	Mean	*n*	Std. Deviation
Control Group	48.33	48	13.58
Experimental Group	48.85	48	13.02
Total	48.59	96	13.23

Table 2

Levene's Test of Equality of Error Variances for Pre-test

Levene Statistic	df1	df2	Sig.
.366	1	94	.547

Limitations

There were several limitations to this study. First, the study could not control pre-existing differences in artistic talent and game playing abilities between the participants. Second, the sample reflected just one junior nursing class in one course, in one curriculum, in one southeastern, four-year public university. Third, eleven-percent of the participants were dropped from the study for either a failure to meet academic standards

or withdrawing consent to participate. If those individuals had remained in the study, their participation may have influenced a different final result. Fourth, the game design, pre and post-test construction, the administration of only one treatment, and/or statistical calculation errors could prove to be limitations. Fifth, the potential for jeopardizing internal validity was possible given there was one hour between lecturing to the control group and playing the game with the experimental group. During this one hour, students from the two groups could have discussed the lecture material and/or post-test content. Sixth, only 83% of the participants self-reported their VARK learning style scores.

Seventh, variables such as participant age, sex, and grade point average (GPA), and learning style preference could be limitations as well. For example, age differences can translate into experience and generational differences, which can impact ability and willingness to learn. Differences in sex can also cause differences in learning based on how society, in general, stereotypically treats males as more analytical and methodical and females as more nurturing (Nadeau, 1997). GPA could impact the study since students with higher GPAs tend to be better overall performers than those with lower GPAs. Eighth, learning style differences may impact the study if more visual and kinesthetic learners ended up in the control group (lecture), while more aural and read/write learners end up in the experimental group (game playing).

Finally, participants' demonstrating the Hawthorne effect (change in behavior because they know they are being studied) could impact the results of the study (Polit & Hungler, 1995).

Delimitations

This study did not address the socioeconomic status of the participants since, for the purposes of this study; the general socioeconomic status background of the nursing student population was considered a homogenous group.

Definition of Terms

Final examination — a 100-item comprehensive final exam, which includes a subset of questions related to pediatric cardiovascular dysfunction, developed by the Auburn University Montgomery Pediatric Instructor.

Game/Gaming — Using a researcher developed game to deliver pediatric cardiovascular dysfunction content to subjects in the experimental group. The game was facilitated by the researcher while discussion of pediatric cardiovascular dysfunction content was facilitated by the Auburn University Montgomery School of Nursing Pediatric Instructor.

Pre-test — a 20-item multiple choice test, developed by the researcher from a pre-existing School of Nursing test bank, covering pediatric cardiovascular dysfunction and administered before students received the lecture or participated in the game.

Post-test — a 20-item multiple choice test, developed by the researcher from a pre-existing School of Nursing test bank, covering pediatric cardiovascular dysfunction and administered after students received the lecture or participated in the game.

Traditional lecture format — delivery of pediatric cardiovascular dysfunction content via lecture, augmented with PowerPoint slides and opportunity for discussion. Lecture was presented by the Auburn University Montgomery School of Nursing Pediatric Instructor.

Organization of the Study

Chapter I introduces the study; provides a problem statement; covers the study's purpose; outlines the research questions; discusses the study's importance; lists the study's assumptions, limitations, and delimitations; provides a definition of terms; and addresses the study's organization. Chapter II provides a review of the literature related to gaming in education including learning theories that support gaming in education; learning and various concepts associated with learning; history of gaming in education; gaming specific to nursing education; advantages and disadvantages of gaming; conditions for successful gaming strategies; and learning style instruments. Chapter III reports the procedures used in this study. Chapter IV presents the findings of the study and Chapter V includes a summary of the study; discusses the conclusions and implications, and provides recommendations for further research.

CHAPTER II. REVIEW OF LITERATURE

Many individuals and groups have written on the post secondary teaching-learning environment (Allery, 2004; Andlinger, 1958; Boocock & Coleman, 1966; Crancer & Maury-Hess, 1980; deTornay & Thompson, 1987; Knowles, 1980; Kolb & Kolb, 2005; McKeachie, 2002; Tough, 1979). Popular among theorists and educators are topics such as the meaning of learning, how learning occurs, barriers that prevent active learning, learning styles, strategies that promote learning, and factors that motivate adults to learn. Many of these topics have an underlying theme of taking an active approach to learning. One active learning strategy that motivates students, promotes learning, and makes learning fun is gaming.

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of pediatric cardiovascular dysfunction (PCD) content. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university. The research questions for this study were: (1) What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction? (2) What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of

instruction based on final examination scores of baccalaureate nursing students? (3) Is there a significant difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

The purpose of this chapter is to provide a review of the literature related to gaming in education and to support the research questions outlined above. Beginning with a discussion on learning theories that support gaming in education, this chapter will also address the learning environment and various concepts associated with learning, gaming in education, gaming specific to nursing education, advantages and disadvantages of gaming, conditions for successful gaming strategies, and learning style instruments.

Learning Theories that Support Gaming in Education

Active involvement in the learning process has had and continues to have staunch supporters who recognize the need for active student participation to increase learning and improve retention of knowledge. The late 1920's educational environment had a strong advocate for including games to help promote learning through active involvement in the learning process. Dewey (1928) postulated that games, rather than simply being used as an outlet to alleviate the monotony of the classroom experience, should be integrated into the curriculum as a strategy to help link education with real-life. Along with building intellectual and social development, Dewey indicated games have a moral value because they fill a basic human need for make-believe while simultaneously preparing for, and understanding the deeper meaning of events occurring in everyday life. While the focus of Dewey's thoughts on gaming in education was geared toward children, many of the principles he advocated also correlate with adult learning theory.

Kerrei (1992) stated, “Although we usually associate games with children, they are a creative way to teach and motivate adults” (p. 28). Adult learners are motivated by interest, curiosity, and enjoyment in the learning process (Tough, 1979) and adult learning theory suggests adults learn better when actively engaged in the learning process, especially when that learning is relevant to immediate and long-term life events (Knowles, 1980).

Knowles’ (1980) adult learning theory, based on four critical assumptions about the characteristics of adult learners, supports the use of gaming in education. The first assumption sees the adult’s concept of self moving from a state of dependence to one of independence or self-directedness. Playing a game, which is student-centered rather than teacher-dominated, gives the student active control of his or her learning and helps promote a level of independence (Allery, 2004; Andlinger, 1958; Boocock & Coleman, 1966; Bruner, 1966; Crancer & Maury-Hess, 1980; deTornay & Thompson, 1987; Ingram et al., 1998; Kolb & Kolb, 2005; McKeachie, 2002; Rickard et al., 1995; Royce & Newton, 2007; Sarason & Banbury, 2004; Schaefer & Zygmont, 2003; Smith & MacGregor, 1992). Borrowing from his own idea of therapy (which uses a person-centered approach); Rogers (1969) popularized the concept of student-centered learning in education. According to Rogers, a student-centered learning approach focuses on the student rather than the teacher and provides a greater opportunity for learning to occur. Duke (1964) agreed and further added that gaming benefits the adult learner because it allows learning to occur through discovery rather than passive receipt of lecture content.

As postulated by Bruner (1966), discovery learning is grounded in the idea of understanding the structure of the content under study. This structure of understanding requires active involvement in the learning process versus simply accepting, at face value, what another says about the subject. Regarding discovery learning, Bruner's pervading idea is learners will more likely remember the concepts they learn on their own when they learn them through structured experiences that bring forth previous knowledge. Gaming provides the opportunity to learn through discovery and brings forth previous knowledge (Berbiglia, Goddard, & Littlefield, 1997; DeYoung, 2003; Gruending et al., 1991; Ingram et al., 1998; McKeachie, 2002; Rowell & Spielvogle, 1996; Stern, 1989; Thatcher, 1990).

Knowles' (1980) second assumption about the characteristics of adult learners is they can use their accumulation of life experiences as a basis to build learning for both the individual and the group as individuals share their experiences. Ausubel (1968) suggests the learner builds or constructs understanding of a particular concept by interacting with teachers and/or peers through receptive learning. Gaming involves feedback from both teachers and peers based on their own knowledge and past experiences (Alessio, 1991; Allery, 2004; Crancer & Maury-Hess, 1980; Duke, 1964; Herrman, 2002; Keutzer, 1993; Keys & Wolfe, 1990; Morton & Tarvin, 2001; Pennington & Hawley, 1995; Saethang & Key, 1998) and this in turn motivates the adult learner (Bartfay & Bartfay, 1994; Corbett & Lee, 1992; Gross, 1994; Kerrei, 1992; Sarason & Banbury, 2004; Schmitz et al., 1991).

Knowles' (1980) third assumption about the characteristics of adult learners' deals with the adult learner's readiness to learn as learning becomes increasingly

associated with the developmental tasks of social roles. This is promoted by the socialization that takes place during game playing (Coleman, 1989; Hackney, 1971; Morton & Tarvin, 2001; Oblinger, 2004; Saethang & Kee, 1998). Developed by Vygotsky (1978), social cognition development theory provides support for Knowles' assumption. The zone of proximal development, which is an important concept embedded within social cognition development theory, explains how students develop more complex thought processes when learning occurs in a nurturing environment. Vygotsky defines the zone of proximal development in terms of limits, with the lower limit focusing on what the student knows and the upper limit focusing on the student's potential for accomplishment. While independent problem solving abilities determine the lower limit, problem solving under adult guidance or in collaboration with more capable peers determines the upper limit. Gaming activities in the educational environment promote a relaxed, nurturing atmosphere and encourage collaboration among both peers and teachers (Allen, 1990; Allery, 2004; Andlinger, 1958; Berbiglia et al.,1997; Calliari, 1991; Crancer & Maury-Hess, 1980; Hackney, 1971; Hanna, 1991; Henderson, 2005; Hermann & Bays, 1991; Saethang & Kee, 1998).

Knowles' (1980) fourth and final assumption about the characteristics of adult learners focuses on time and curricular perspectives changing from postponement to immediacy of application and from subject-centeredness to performance-centeredness. Adults seek knowledge and skills applicable to their lives in hopes of achieving a brighter and more successful tomorrow. Thus, adults participate in problem or performance-centered educational activities. Gaming addresses this assumption by providing a venue for knowledge application to real-life situations, which in turn enhances learning

(Allery, 2004; Andlinger, 1958; Barber & Norman, 1989; Bartfay & Bartfay, 1994; Boocock & Coleman, 1966; Crancer & Maury-Hess, 1980; Fetro & Hey, 2000; Hanna, 1991; Oblinger, 2004; Sarason & Banbury, 2004).

Learning

The Learning Environment

Learning is a process of progressive change. This change enables one to go from unawareness to awareness, from incompetence to competence, and from lack of understanding to understanding (Fincher, 1994). This process of progressive change can occur consciously or unconsciously through the conversion of experience and construction of new knowledge based on prior knowledge, the acquisition and practice of new skills, new attitudes, and new values necessary to live in a world of change, and involves teaching strategies that put the student at the center of learning - all of which result in active learning (Allery, 2004; Ausubel, 1968; Berbiglia et al., 1997; Boocock & Coleman, 1966; Bruner, 1966; Gibson, 1991; Knowles, 1980; Kolb & Kolb, 2005; Maag & Fonteyn, 2005; McConnell, Steer, & Owens, 2003; Oblinger, 2004; Rogers, 1969; Sarason & Banbury, 2004; Silberman, 1996; Smith & MacGregor, 1992; Woolfolk, 2004). While educators have made progress towards more active based learning in higher education (Lean et al., 2006) to meet the needs of adult learners (Bruffee, 1995; Ebert-May et al., 1997; Leinwand, 1992), many college classrooms continue to use teaching methods that suppress active student involvement (DeYoung, 2003; Diekelmann, 2005; Honeycutt, 2005; Kolb & Kolb, 2005; Long, 2004). The literature addressed several reasons why active learning strategies are not more common in higher education.

Both educators and students contribute to a lack of active learning strategies in the classroom because both often view the college classroom in the same vein – the teacher's job is to lecture and the student's job is to listen and take notes (Bruffee, 1995; Crancer & Maury-Hess, 1980; DeYoung, 2003; Kolb & Kolb, 2005; Long, 2004; Middendorf & Kalish, 1996; Woodring, 2001). The literature indicates traditional lecture is one of the oldest teaching strategies and the most widely used method for teaching (Allen, 1990; Diekelmann, Ironside, & Harlow, 2003; Gruending et al., 1991; Henry, 1997; McKeachie, 2002; Saethang & Kee; 1998; Schoolcraft & Novotny, 2006; Swenson & Sims, 2003). Therefore, there is a general sense teachers are more comfortable using lecture as the main teaching method in their classrooms. Some may be disorganized, lack a professional image of themselves, or have a fear of failure, thereby choosing a path that is not as risky as non-traditional teaching methods (Fuszard, 1995; Herrman, 2002; Stevens, 2004).

Others simply lack confidence in their own abilities to implement non-traditional strategies or see lecture as easier and more convenient, especially when teaching a significant amount of information in a short a period of time (Alexander, Murphy, & Woods, 1996; Girot, 1995; McKeachie, 2002). Conversely, there are those teachers who hold themselves and their teaching capabilities in such high-esteem they think there is no reason to change what they are doing (Leinwand, 1992). Other educators tend to rely on the use of formal testing, such as quizzes and exams, rather than non-traditional evaluation techniques because of the need to maintain tight control in the classroom (Girot; McKeachie).

Educators continue to avoid innovation in part because of their lack of understanding of nontraditional approaches to teaching and learning, their lack of imagination and reluctance to go beyond traditional teaching methods, and their tendency to teach the way they were taught when they were students (Bruffee, 1995; Chipas, 1995; Diekelmann, 2005; Leinwand; 1992; Long, 2004; Royce & Newton, 2007; Swenson & Sims, 2003). Fleming and Mills (1992) suggest educators' values and philosophies about the teaching-learning environment may impede the use of innovative teaching strategies if those values and philosophies do not align with innovative teaching methods. "The corollary is that some teachers may be reinforcing their own preferences rather than catering for those with different needs" (Fleming, 1995, p. 7).

Knowles (1980) further contends, "Many traditional teachers (and theorists for that matter) have an almost ideological attachment to the pedagogical model. It is something they have to be loyal to, enforce with sanctions (like normative grading), and protect from heresy" (p. 59). Despite an interest in novel teaching strategies, nurse educators also continue relying on the lecture method of instruction rather than using innovative strategies such as games (Royce & Newton, 2007). Games may be under-used due to a lack of understanding about their effectiveness as a teaching method (Andlinger, 1958; Joos, 1984; Morton & Tarvin 2001; Royce & Newton, 2007). At the same time, students also resist the use of innovative teaching strategies such as games. A few reasons for this are timidity, fear of embarrassment or failure, and lack of exposure to anything other than passive learning in prior learning experiences (Honeycutt, 2005; Kolb & Kolb, 2005).

Honeycutt (2005) asserted a number of students come to college lacking a clear understanding of their role within the learning process. Kolb and Kolb (2005) expand Honeycutt's thoughts by stating "many students enter higher education conditioned by their previous educational experiences to be passive recipients of what they are taught" (p. 57). Honeycutt further contends some students are timid about taking responsibility for their own learning because they were not given the opportunity to do so in their earlier educational years. As such, these students do not know how to proceed as adult learners. Games are an excellent way to introduce students to the concept of becoming adult learners. Games motivate students to learn and encourage them to take responsibility for their own learning (Berrenger & Prosser, 1991; Boocock & Coleman, 1966; Felder & Brent, 2003; Koran & McLaughlin, 1990; McKeachie, 2002; Ogershok & Cottrell, 2004; Rickard et al., 1995; Sarason & Banbury, 2004). Educators' attitudes about innovative strategies such as gaming also influence students' receptiveness or lack thereof to gaming (Gruending et al., 1991).

While some educators choose to keep students in an outdated, passive, teaching-centered learning environment and some students resist taking responsibility for their own learning (Honeycutt, 2005; Kolb & Kolb, 2005), academia is fortunate to have others committed to research that enhances learning. Educators know more today about how learning occurs and, more importantly, how little learning occurs through passive teaching methods like lecture (Felder & Brent, 2003). Allen (1990) stated "…when I walk by a lecture hall and glimpse a sea of passive, bored faces writing down information from an overhead projector, I am literally, physically repulsed" (p. 314). Allen further contends that lecturing harnesses creativity, intelligence, and energy. For reasons such as

this, past research includes evaluating the concept of active learning and its effects on student learning and outcomes (Campbell & Piccinin, 1999; Kolb & Kolb).

The available literature abounds on topics that promote active learning, to include those (such as student-centered and collaborative learning) that support the needs of adult learners (Bruffee, 1995; Chambers & Abrami, 1991; Chickering & Gamson, 1987; Cross, 1981; DeYoung, 2003; Dewey, 1928; Ebert-May et al., 1997; Galbraith, 1991; Glendon & Ulrich, 1992; Golub, 1988; Henry, 1997; Kemp, Morrison, & Ross, 2004; Knowles, 1980; Leinwand, 1992; Lowman, 1995; McKeachie, 2002; Richardson, 2005; Schaeffer & Zygmont, 2003; Schoolcraft & Novotny, 2006; Silberman, 1996; Smith & MacGregor, 1992; Stern, 1989). Learning style differences, as well as the need for educators to provide a more diverse learning environment by understanding and teaching to students' various preferences for learning, are also popular topics (Buch & Bartley, 2002; Cartney, 2000; Christensen, Lee, & Bugg, 1979; Dunn & Dunn, 1983; Fleming, 2006; Gardner, 1983; Hewitt-Taylor & Gould, 2002; Hodges, 1988; Huch, 1981; Kiersey 1978; Kolb & Kolb, 2005; Laschinger, 1986; Laschinger & Boss, 1989; Marcinek, 1983; Myers, 1962; Shaubach, 2000; Wells & Higgs, 1990).

Given both the variety of student learning styles and the cognitive learning research that reports a sizeable number of students' learning styles are better served by teaching methods other than lecture (Bonwell & Eison, 1991), it is not hard to understand how using a single teaching method like lecture makes it difficult to reach all the students in the class. Games are teaching strategies that encompass all learning styles (Hermann & Bays, 1997; Lewis et al., 1989). Smith and MacGregor (1992) stated, "As teachers, we can no longer assume a one-size-fits-all approach" (p. 1). Consequently, it is imperative

teachers integrate teaching strategies that facilitate learning appropriate to different learning styles. To do this, teachers must understand the various learning styles students bring to the classroom (Crancer & Mary-Hess, 1980).

Learning Styles

Learners in the college environment are diverse and come with different backgrounds, goals, personal and work experiences, and learning styles (Bonwell & Eison, 1991; Bruffee, 1995; Crancer & Maury-Hess, 1980; Fleming, 2006; Kemp, et al., 2004; Kolb & Kolb, 2005; Smith & MacGregor, 1992). McFarland (1997), Crancer and Maury-Hess (1980), Fleming (2006), and Kolb and Kolb indicated it is imperative for educators to consider the variety of student learning styles because the different styles drive the conclusions and judgments students make about learning, as well as how they perceive and interact within the learning environment. Fleming posits that, regardless of academic ability, everyone can learn and learn best when educators present new information through the students' perceived strengths. Addressing different learning styles in the classroom motivates students and enhances learning (Corbett & Lee, 1992; Forest, 2004).

Crancer and Maury-Hess (1980) and Kolb and Kolb (2005) indicate that differences in learning styles between learners can impact learning outcomes. As such, educators need to modify teaching styles and strategies to aid students in the learning process by including opportunities appropriate to a variety of learning styles and content areas (Baker, Simon, & Bazeli, 1987; Buch & Bartley, 2002; Cartney, 2000; Crancer & Maury-Hess; Kolb & Kolb). While students can learn information using non-preferred

learning styles, learning comes more quickly and easily if they are able to use their own preferred learning style (Corbett & Lee, 1992; Fleming, 2006; Forest, 2004). After all, learning styles are a reflection of the mind's eye and forms individual preferences for learning (Kemp et al., 2004).

As these reflections of the mind take seed, individuals start on a journey of concentrating, processing, and internalizing information that helps them remember new or complicated content (Dunn & Dunn, 1993). Kolb and Kolb (2005) indicate the learner's preference for the approach to learning falls under four categories: diverging, assimilating, converging, and accommodating. Fleming (2006) posits the actual learning style preferences fall within the categories of visual (V), aural/oral (A), read/write (R), and kinesthetic (K).

According to Kolb and Kolb (2005), the diverging individual is attentive and keeps an open mind, has wide interests in various cultures, uses the imagination, is emotional, is a people person, and achieves higher learning in environments requiring the generation of ideas (such as brainstorming sessions). The formal classroom suits this category when teaching methods include group work and individualized feedback. Fleming's (2006) aural category correlates with the diverging individual because learners who prefer the aural style are more engaged when they can learn through class and group work discussions.

The assimilating individual has the ability to understand a broad range of information and prefers concise, logical thought, with sufficient time to think through new information. Rather than being interested in other people, assimilating individuals are interested in abstract concepts and seek the logical sense in a theory rather than its

realistic implications. The formal classroom fits well with assimilators when teaching methods include lecture and the opportunity to read and explore analytical models (Kolb & Kolb, 2005). Both the aural and read/write individuals in Fleming's (2006) learning style categories would correspond with Kolb and Kolb's assimilating category. The aural individual learns through discussion, group work, and lecture, while the read/write individual prefers reading. Both categories have a penchant for lists, bullets, books, and manuals, as long as the learning is focused on the text and not pictures or diagrams.

The converging individual is capable of making decisions and solving problems when faced with seeking solutions to problems or questions. Rather than having an interest in social or interpersonal concerns, converging individuals prefer to deal with problem and technical tasks. The formal classroom appeals to the converging individual when teaching methods include simulation, experimentation, and reality-related activity (Kolb & Kolb, 2005). The kinesthetic individual learns through hands-on activities and fits nicely with the converging category. Like the converging individual, the kinesthetic learner prefers learning through real or simulated experience and practice. The main point is learning is linked with reality (Fleming, 2006).

Finally, the accommodating individual relies on his or her "gut" feeling rather than viewing situations from a logical perspective. These individuals look to other people for ideas about solving problems rather than using their own ability to analyze the situation. This category includes people who enjoy hands-on learning experiences (Kolb & Kolb, 2005). The kinesthetic learner, with a preference for hand-on experiences that connect learning with real-life, correlates with the accommodating individual (Fleming, 2006).

Clearly “the diverse learning style composition of students in any given learning environment suggests a need for equally diverse learning processes and strategies for the successful acquisition of knowledge and skills” (Kolb & Kolb, 2005, p. 29). One way to help ensure successful acquisition of knowledge and skills is to use educational games that diversify the learning environment and promote a student-centered learning focus rather than a teacher-centered focus (Allery, 2004; Boocock & Coleman, 1966; Bruffee, 1995; Crancer & Maury-Hess, 1980; Ebert-May et al., 1997; de Tornay & Thompson, 1987; Ingram et al., 1998; Kolb & Kolb; 2005; McKeachie, 2002; Rickard, et al., 1995; Sarason & Banbury, 2004; Schaefer & Zygmont, 2003; Smith & MacGregor, 1992; Stern, 1989; Royce & Newton, 2007). For example, some studies have shown a dominance of accommodating and diverging learning style preferences in students within nursing education (Christensen, Lee, & Bugg, 1979; Hodges, 1988; Huch, 1981; Laschinger, 1986; Laschinger & Boss, 1989). Consequently, games can be an effective learning strategy in nursing education because they provide the group and team student-centered atmosphere accommodating and diverging individuals prefer.

Student-Centered Learning

According to Conti (2004), while some educators continue using teacher-centered approaches in the classroom, student-centered learning has made a place for itself in higher education and is supported in the literature as a viable learning process that enhances learning (Bruffee, 1995; Galbraith, 1991; Schaefer & Zygmont, 2003). As the name suggests, student-centered learning focuses on the learner as an active participant in the learning process rather than a passive recipient of knowledge transmitted by the teacher (Allery, 2004; Bruffee; Bruner, 1966; Ebert-May et al., 1997).

Kolb and Kolb (2005) extended that notion, suggesting one main goal of the educational process is to "facilitate students through the process of constructing one's own knowledge vs. passively receiving knowledge from others" (p. 57). Giving students the opportunity to be responsible for their own learning and to be in control of that learning can increase their learning experience. When educators make the move from a teacher-centered to student-centered approach, they become facilitators rather than disseminators of knowledge (Bruffee, 1995; Campbell & Piccinin, 1999). This shift away from the typical teacher-centered environment found in many college classrooms is closely related to collaborative learning. Games, as learning strategies, may promote this role of educators as facilitators of knowledge. Educators who use collaborative learning strategies no longer view themselves as the expert conveyers of knowledge, but more as expert engineers of intellectual learning experiences (Bruffee; Merriam & Brockett, 1997; Smith & MacGregor, 1992; Thatcher, 1990).

Collaborative Learning

"Collaborative learning activities vary widely, but most center on students' exploration or application of the course material, not simply the teacher's presentation or explication of it" (Smith & MacGregor, 1992, p. 1). The literature, from various areas in higher education, demonstrates the need for students to be actively involved in the learning process (Astin, 1990; Bonwell & Eison, 1991; Bruffee, 1995; Ebert-May et al., 1997; Kuhn, 1995; Sullivan, 1997). Learning and retention of knowledge is enhanced when students are involved with their own learning, peers, and faculty (Alessio, 1991; Allery, 2004; Crancer & Maury-Hess, 1980; Duke, 1964; Herrman, 2002; Keutzer, 1993;

Keys & Wolfe, 1990; Morton & Tarvin, 2001; Pennington & Hawley, 1995; Saethang & Key, 1998; Smith & MacGregor, 1992). Collaborative learning inherently promotes social and intellectual processes. In essence, collaborative learning encourages students to form closer associations with peers, teachers, course content, and overall learning (Bruffee, 1995; Ebert-May et al., 1997; Smith & MacGregor). Inevitably, students meet with diversity in collaborative learning activities. This diversity provides opportunities for understanding differences and enhancing the students' abilities to learn to accept and resolve differences (Bruffee; Gary, Marrone, & Boyles, 1998; Smith & MacGregor; Thatcher, 1990).

Allowing for social learning experiences, versus keeping students in isolation, reduces the passiveness in the classroom. Collaborative learning activities promote students' active engagement in the learning process (Bruffee; Ebert-May et al.; Middendorf & Kalish, 1996) and, in turn, active learning enhances learning and retention (Berrenger & Prosser, 1991; Chickering & Gamson, 1987; Kolb & Kolb, 2005; McKeachie; 2002; Ogershok & Cottrell, 2004). As a collaborative, social learning activity, gaming engages students in the learning process, promotes understanding of diversity among students (Bartfay & Bartfay, 1994; Bloom & Trice, 1994; Corbett & Lee, 1992; Gary et al., 1998; Skinner, 2000), and is superior to non-traditional methods for obtaining and retaining information and applying knowledge (McKeachie; Sprengal, 1994).

Active Learning

The general consensus in education literature describes active learning as a process that transcends the passive acts of listening and taking notes. Although active

learning goes beyond the traditional teacher-centered, lecture environment (Alspach, 1995; Bruffee, 1995; Chickering & Gamson, 1987; Ebert-May, et al., 1997; McKeachie, 2002; Sullivan, 1997), what exactly is active learning? While there is no single definition, there are numerous thoughts and ideas about what active learning entails.

Active learning recognizes and respects students' diverse ways of learning. This recognition makes active learning strategies more compatible for reaching everyone in the class; thereby promoting success for all students in obtaining content knowledge and skills (Campbell & Piccinin, 1999; Chickering & Gamson, 1987; Crancer & Maury-Hess, 1980; Fleming, 2006; Kolb & Kolb, 2005). Fleming indicates that implementing teaching methods aligned with students' preferred learning styles results in greater understanding and more depth in students' approaches to learning.

Active learning is a student-centered approach that fosters "curiosity and the capacity to manage one's own learning agenda" (Stern, 1997, p. 13). This approach provides a student-centered learning environment where students become enthusiastic about and endeavor to take control and responsibility for their own learning (Bruffee, 1995; Stern). In doing so, active learning encourages students to engage their minds to solve problems and make decisions (Maag & Fonteyn, 2005; Silberman, 1996). In this way, active learning promotes analysis, synthesis, and evaluation, which comprise the higher levels of learning (Middendorf & Kalish, 1996).

Angelo and Cross (1993) report that of all the educational goals developed by teachers, the development of these higher-order thinking skills rank number one. Girot (1995) indicated nursing educators also place greater emphasis on higher levels of learning, highlighting critical thinking as a fundamental skill. Nursing has made a move

away "…from the doing of nursing towards the thinking behind the doing" enabling nursing students to make the transition from "doing to thinking," especially in situations where critical thinking is needed (Girot, p. 388). Involvement in active learning also facilitates the integration of new information, concepts, or ideas into a database of current student knowledge (Ausubel, 1968; Bruffee, 1995; Bruner, 1966; Knowles, 1980; Kolb & Kolb, 2005). As active learning strategies, games promote critical thinking and reconstruction of knowledge (Bloom & Trice, 1994; Kuhn, 1995; McKeachie, 2002; Rowell & Spielvogle, 1996; Saethang & Kee, 1998). Galbraith (1991) postulated student-centered learning is characteristic of a collaborative relationship between educators and students, with each individual actively engaged with course content and the process of learning that content.

Active learning is collaborative and distributes the learning responsibility among the students and the teacher (Bruffee, 1995). Active learning encompasses teaching methods that result in greater student involvement with teachers and course content, and through social interaction with peers enhances learning and retention (Bruffee; Golub, 1988). In turn, collaborative learning is an active process that engages students in the entire learning environment - engagement with course content, practice of skills, and interaction with teachers and peers (Ebert-May et al., 1997; Middendorf & Kalish, 1996). In essence, collaborative learning places students in a position to become active learners versus traditional classroom environment passive learners since "some students seem to hide out in large classes" (Middendorf & Kalish, p. 3). Collaborative learning helps students take new information they receive from peers and teachers, associate it with old

ideas and knowledge they already possess, and learn something new from the process (Bruffee, 1995; Leamson, 2000; Ogershok & Cottrell, 2004).

Learning Summary

Taken as a whole, as used in this study, learning encompasses educators recognizing the differences in adult learning styles and promoting student-centered, collaborative activities that result in an environment that encourages active learning. Given this, one can easily understand how using games as an alternative teaching strategy attends to the needs of the adult learner. Games address a variety of learning styles, provide a student-centered and collaborative approach, and correlate well with an active learning agenda. The example in Figure 1 shows the relationship among the learning variables discussed in the earlier sections of this chapter and gaming as a teaching strategy.

Learning Promoted Through the Use of Games

Games promote learning by attending to the needs of the adult learner, addressing a variety of learning styles, providing a student-centered learning environment, encouraging collaboration among peers and teachers, and creating a learning milieu immersed in active learning. The needs of adult learners are quite different from those of children (Bruffee, 1995) and "an understanding of the characteristics unique to the adult learner is vital" (Arms et al., 1984, p. 284). Seventy percent of adult learning is self-directed (Cross, 1981). According to Knowles (1980), self-directedness and self-motivation are characteristic of the adult learner. These learners favor environments that cultivate active involvement in the learning process, build on previous experience, and offer practical content.

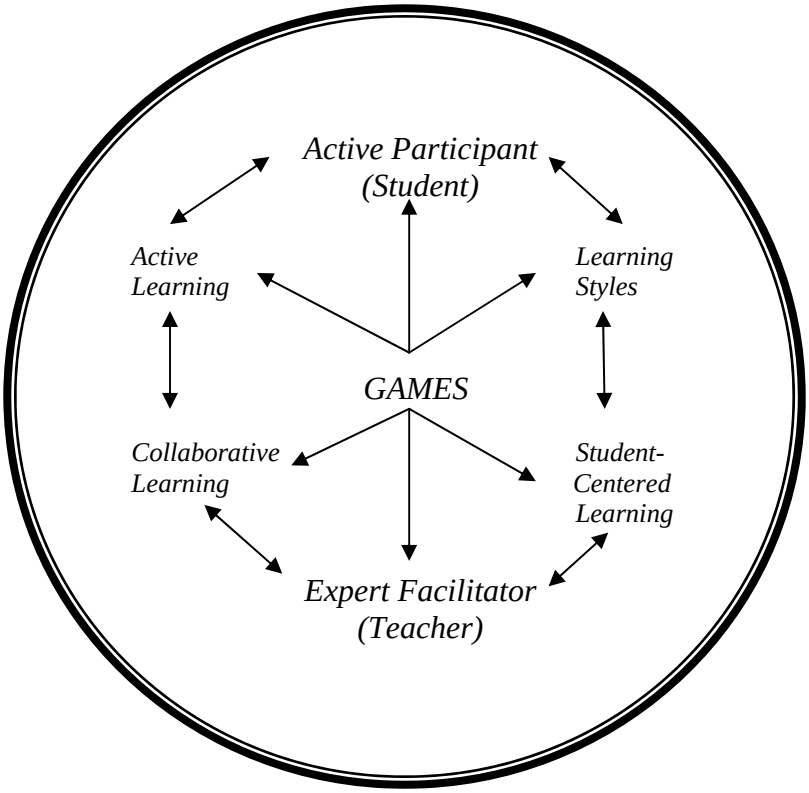


Figure 1. Relationship among Learning Variables and Games

Figure 1 created by the researcher

Royce and Newton (2007) postulated that these same self-directed, self-motivated adult learners "value gaming as a teaching strategy that demands their participation in solving problems" (p. 264). Adult learners also desire environments that promote a relaxed atmosphere, which results in an eagerness to be an integral part of learning (Knowles, 1980; Tough, 1979). Gaming is an innovative teaching method that supports these beliefs of adult learning (Burke, 2001; Duke, 1964; Kerrei, 1992; Morton & Tarvin, 2001). According to Lowman (1995) motivation is crucial to learning. Gaming as an educational tool increases motivation and interest, stimulates the desire to seek more learning opportunities, promotes diverse and imaginative thought, and provides a way for

achievement in learning (Bartfay & Bartfay, 1994; Blenner, 1991; Bloom & Trice, 1994; Boocock & Coleman, 1966; Corbett & Lee, 1992; Crancer & Maury-Hess, 1980; Hackney, 1971; Kerrei). Learning is enhanced when adults are placed in learning situations that provide opportunities to successfully acquire skills and knowledge with little failure. Games support this opportunity for success with little failure because knowledge and skill performance takes place in a non-grading, non-threatening, low-risk environment (Crancer & Maury-Hess, 1980; Fetro & Hey, 2000; Hanna, 1991; Hermann & Bays, 1991; Morton & Tarvin, 2001; Oblinger, 2004; Rodriguez et al., 1996).

Adults learn best and are more highly motivated and interested in learning when they can actively control the learning process and are involved in problem solving activities (Andlinger, 1958; Bloom & Trice, 1994; Crancer & Maury-Hess, 1980; Hackney, 1971; Hogle, 1996). The majority of adults find games structured, active, problem-solving activities that are more appealing than passive traditional methods of teaching like lectures (Schmitz et al., 1991). Adults learn better and retain more information when there is a priority on immediately discussing the information, receiving feedback, and applying what they are learning (Calliari, 1991; Lewis et al., 1989; Walljasper, 1982). Games provide this environment for discussion, feedback, and application of knowledge to real-life events, which promote learning and retention (Alessio, 1991; Allery, 2004; Crancer & Maury-Hess; Duke, 1964; Herrman, 2002; Keutzer, 1993; Keys & Wolfe, 1990; McKeachie, 2002; Morton &Tarvin, 2001; Pennington & Hawley, 1995; Saethang & Key, 1998; Schmitz et al.).

Games are inherent to sharing knowledge based on life-experiences and add much to the teaching-learning environment (Burke, 2001; Crancer & Maury-Hess, 1980).

Learning experiences are meaningful to the adult learner when his or her previous experiences are incorporated into the learning process (Allery, 2004; Ausubel, 1968; Boocock & Coleman, 1966; Bruner, 1966; Crancer & Maury-Hess; Ingram et al., 1998; Knowles, 1980; Kolb & Kolb, 2005; Lowman, 1995; McKeachie, 2002; Rickard et al., 1995; Royce & Newton, 2007; Schaffer & Zygmont, 2003; Smith & MacGregor, 1992). Given this, the challenge is for educators to add to their collection of educational tools to ensure they reach learners with diverse experiences (Gruending et al., 1991). Games benefit educators by increasing their breadth of teaching strategies, which in turn benefits their students because they can then reach the maximum number of students possible (Stern, 1989).

Gaming is an interactive process that provides learning in the cognitive, psychomotor, and affective domains (Bartfay & Bartfay, 1994; Blenner, 1991; Hanna, 1991; Lewis et al., 1989; Hillman, 2001). Educators often use Bloom's (1956) Taxonomy as a guide to develop objectives for a variety of learning activities that support the adult learner. Learning, and hence educational objectives for learning activities, fall within the cognitive, affective, and psychomotor domains. Each domain has a specified number of levels that begin with the basics and progress to more complex thinking, feeling, and doing (Woolfolk, 2004). Within this general framework lies the diversity of preferred learning styles. For example, some students learn better through the cognitive domain (prefer the aural or read/write modes of learning) and others prefer hands-on activities (the kinesthetic mode of learning). Students learn better and learn more when the learning environment includes activities that correlate to their preferred style of learning (Corbett

& Lee, 1992; Fleming, 2006; Kolb & Kolb, 2005) and games encompass a variety of learning styles (Johanson, 1992).

Games provide a multisensory approach, promote active participation in the learning process, and involve the cognitive, affective, and psychomotor domains, which results in increased knowledge retention (Lewis et al., 1989; Hillman, 2001). Games address student diversity and create a student-centered versus teacher-dominated learning environment (Allery, 2004; Bartfay & Bartfay, 1994; Bloom & Trice, 1994; Boocock & Coleman, 1966; Bruner, 1966; Corbett & Lee, 1992; Crancer & Maury-Hess, 1980; Gary et al., 1998; Ingram et al., 1998; Kolb & Kolb, 2005; McKeachie, 2002; Rickard et al., 1995; Royce & Newton, 2007; Sarason & Banbury, 2004; Schaefer & Zygmont, 2003; Skinner, 2000; Smith & MacGregor, 1992).

Rogers (1969) concept of student-centered learning has been, and continues to be, influential in academia. According to Rogers, with the student-centered approach the learning focus is on the student, not the teacher, and provides a greater opportunity for learning to occur. Playing a game is student-centered, gives the student active control of his or her learning, and helps promote a level of student independence (Allery, 2004; Andlinger, 1958; Boocock & Coleman, 1966; Bruner, 1966; Crancer & Maury-Hess, 1980; Ingram et al., 1998; Kolb & Kolb, 2005; McKeachie, 2002; Rickard et al., 1995; Royce & Newton, 2007; Sarason & Banbury, 2004; Schaefer & Zygmont, 2003; Smith & MacGregor, 1992).

Duke (1964) would agree, adding that gaming benefits the adult learner because it allows learning to occur through discovery which, again, is a student-centered process. Discovery learning does promote learning through structured experiences, which leads to

the construction of new knowledge, brings forth previous knowledge, and increases the likelihood students will retain the learning concepts (Bruner, 1966). Games not only challenge students to tap into their cognitive reservoir to apply the knowledge found there (Rowell & Spielvogle, 1996), but to reconstruct that knowledge and, in turn, promote knowledge retention (Alessio, 1991; Blenner, 1991; Bruffee, 1995; Bruner; Cowen & Tesh, 2002; Pennington & Hawley, 1995; Pierfy, 1977; Saethang & Kee, 1998; Wargo, 2000). This student-centered approach to learning is characteristic of a collaborative relationship between teachers and students resulting in active involvement and enhanced learning (Galbraith, 1991).

According to Smith and MacGregor (1992), collaborative learning assists students in learning with greater effectiveness and propels them past simple mastery of course content or ideas. Collaborative learning cultivates cooperation and teamwork and "by its very nature, is both socially and intellectually involving" (p. 2). Collaborative learning also promotes active involvement in the learning process. This encourages students to become more involved with peers and faculty, which makes for more meaningful and closer connections and has an overwhelming positive influence on retention of knowledge. Chickering and Gamson (1987) would agree, putting forth that to enhance learning one should look for a team effort rather than a solo performance. Games provide a stimulating, cooperative, socially interactive environment that necessitates shared responsibility for, and enhancement of, learning (Alessio, 1991; Bays & Hermann, 1997; Crancer & Maury-Hess, 1980; Oblinger, 2004; Pennington & Hawley, 1995).

The foremost advantage of gaming is students become active participants in the learning process versus passive observers (McKeachie, 2002).

Essentially all disciplines across college campuses have sounded the call for, and inundated the literature with, information on student active engagement in the learning process (Baldour, Field, & Gurwitz, 2001; Bruffee, 1995; Campbell & Piccinin, 1999; Chickering & Gamson, 1997; Ebert-May et al., 1997; Felder & Brent, 2003). Motivating students to become more actively engaged in the learning process requires educators to incorporate activities that consider various learning style preferences (Crancer & Maury-Hess, 1980; Kolb & Kolb, 2005); promote student-centered learning (Campbell & Piccinin); and are collaborative in nature (Hackney, 1971). Including all of these elements ultimately results in students becoming actively involved with their own learning.

Specific to nurses, Fuszard (1989) puts forth - and is supported by others in literature - that certain factors are both inherent to nurses and their work environment and are positively influenced by games. First, Fuszard indicates that as a whole nurses are a heterogeneous group with cultural diversity and age differences. As such, games can help nurses with varied backgrounds learn from each other's diversity and experiences (Hackney). Second, Fuszard contends that nurses are naturally active learners. Games are an excellent teaching strategy for active learning styles because they encourage individual self-direction, link learning theory to student practice, and provide simultaneous feedback during the learning event Crancer and Maury-Hess.

Third, to provide psychosocial support and show empathy nurses must demonstrate cultural competency in understanding their patients' varied cultures and

beliefs. Role-play during games helps promote an understanding of cultural beliefs other than one's own (Fuszard, 1989). Fourth, nursing is a complex environment and understanding within the context of this environment is crucial to safe patient care (Fuszard). Gaming promotes understanding and application of complex content like critical thinking, appropriate decision-making, and problem-solving ability (Fetro & Hey, 2000), and increases the amount of new material learned compared to other types of teaching methods (Saethang & Kee, 1998).

Fifth, in nursing education the amount of learning that takes place in the clinical environment is directly related to the number and variety of patients available for care. Conversely, games are not affected by clinical environment variables such as patient census (Fuszard, 1989). Sixth, nurses are motivated to learn, and games promote motivational learning, through feedback, self-directedness, and achievement (Crancer & Maury-Hess, 1980). Finally, nurses must have excellent communication skills (Fuszard). Games can improve communication skills by requiring students to working together in groups versus approaching the learning event from an individual perspective (Wargo, 2000).

Gaming in Education

According to Duke and Kemeny (1989) and Fisher (1976), gaming has been a part of every culture in the history of civilization. Duke and Kemeny indicated gaming, specifically the war games of chess and checkers, is considered the "world's second oldest profession" (p. 166) that dates back to antiquity. Wilson (1968) indicated games were first used in education during 3000 B.C. in China, where war game simulations called Wei-Hai and Chaturanga resembled the eventual 17th century game of chess

mentioned by Duke and Kemeny (1989); and people continue to use war games extensively today for educational and training purposes (Duke & Kemeny). The 20th century brought about game playing as a deliberate educational tool in education and business (Fisher, 1976).

Gaming Specific to Nursing Education

The nursing literature indicates nurse educators first became interested in gaming as a teaching strategy in the early 1980s (Corbett & Lee, 1992; Henderson, 2005; Moran, 2005; Royce & Newton, 2007) when encouraging active student participation was on the rise within the nursing profession (Barber & Norman, 1989). While one can find a wealth of information in literature on gaming in education and business (Allery, 2004; Allen, Jackson, Ross, & White, 1978; Andlinger, 1958; Barak et al., 1987; Boocock & Coleman, 1966; Boreham et al., 1989; Brand, 1980; Bredemeier & Greenblat, 1981; Bruffee, 1995; Buch & Bartley, 2002; Chambers & Abrami, 1991; Coleman, 1989; DeNike, 1976; DeVries, 1976; Duke, 1964; Duke & Kemeny, 1989; Faria, 1988; Felder & Brent, 2003; Fetro & Hey, 2000; Fisher, 1976; Frass, 1982; Hackney, 1971; Hasell, 1987; Hogle, 1996; Klein & Frietag, 1991; Koran & McLaughlin, 1990; Laughery, 1984; Lederman, 1992; Leinwand, 1992; Novak, 2003; Oblinger, 2004; Orbach, 1979; Peters, Vissers, & Heijne, 1998; Pierfy, 1979; Ruben, 1999; Shubik, 1989; Specht & Sandlin, 1991; Steele, 1995; Thatcher, 1990; Thiagargan, 1992; Whitely & Faria,1989; Williams, 1980), there are only a small number of published research studies reflecting the use of gaming and its effectiveness at the college/university level (Lean, et al., 2006).

Similarly, beyond the 1990s nursing education also appears to lack research on the use of gaming in education (Henderson, 2005; Moran, 2005; Royce & Newton, 2007)

despite research and anecdotal publications that suggest gaming is an active learning process with many benefits (Anderson, 1998; Barber & Norman, 1989; Bartfay & Bartfay, 1994; Bays & Hermann, 1997; Berbiglia et al., 1997; Bilderback, 1991; Blake & Goodman, 1999; Blenner, 1991; Bloom & Trice, 1994; Calliari, 1991; Cessario, 1987; Corbett & Lee, 1992; Crancer & Maury-Hess, 1980; DeYoung, 2003; Gary, Marrone, & Boyles, 1998; Glendon & Ulrich, 1992; Gross, 1994; Gruending et al., 1991; Hanna, 1991; Hartsock & Lange, 1987; Hayter, 1979; Henry, 1997; Henry, Johnson, & Ziemba, 1996; Hermann & Bays, 1991; Hodson, Brigham, Hanson, & Armstrong, 1988; Ingram, et al., 1998; Jeffreys, 1991; Johanson, 1992; Jones, et al., 2000; Joos, 1984; Kerrei, 1992; Kolb, 1983; Kramer, 1995; Kuhn, 1995; Leidy, 1992; Lewis et al., 1989; Martin & Coleman, 1994; Norris & Niebuhr, 1980; Pennington & Hawley, 1995; Poston, 1998; Rowell & Spielvogle, 1996; Saethang & Kee, 1998; Schmitz et al., 1991; Skinner, 2000; Sprengal 1992; Sprengal, 1994; Stern, 1989; Ulione, 1983; Waddell, et al., 1994; Walljasper, 1982; Wargo, 2000). There is clear indication that current research is an essential component in evaluating the effectiveness of gaming as a teaching strategy (Bays & Herman, 1997; Cessario, 1987; Corbett & Lee, 1992; Henderson, 2005; Moran, 2005; Royce & Newton, 2007).

A search of the literature using a variety of databases (CINHAL, ERIC, Medline, and EBSCO) to uncover research and other publications written at the turn of the 21st century and beyond, regarding gaming in nursing education was conducted. Keywords such as gaming, gaming in nursing education, teaching strategies, innovative teaching methods, and nursing education were used in the search. As Henderson (2005), Moran, (2005), and Royce and Newton (2007) suggested, a small number of empirically based

research studies beyond the 90s to determine the effectiveness of gaming in nursing education on learning and retention were found.

Skinner (2000) created a game (*The Sexual Dysfunction Trivia Game*) to examine whether or not the use of a game would dispel myths about the aging process and sexual dysfunction related to aging. The game was intended to teach or reinforce knowledge about sexual dysfunction and aging. The study used a pre-test/post-test design with two true/false and three open-ended questions and the sample included five staff nurses. Pre-test and post-test scores revealed playing the game increased knowledge on the physical examination, required diagnostics, and various sexual dysfunction treatment options. While participant feedback indicated the game was an enjoyable, low-stress learning experience, promoted knowledge enhancement, and reinforced current literature positions on gaming, Skinner indicated future research is needed to determine if this particular game is effective as a teaching strategy.

Another study by Jones, et al. (2000), tested the competency knowledge of staff nurses on a neuroscience intensive care unit regarding cranial nerves. The authors created the *Cranial Nerve Wheel of Competencies* game to test learning after these nurses participated in twelve cranial nerve lessons over a 12-month period (one cranial nerve per month). Participants took pre-tests and post-tests during each month's training session. At the end of the year, two teams of five members each competed in the game as a fun, non-threatening way to test learning on the twelve cranial nerves. Based on student evaluations, participants identified gaming as an exciting alternative to written exams. Like Skinner's study, this study provided anecdotal information that reinforced the variety of advantages to using gaming as an alternative teaching strategy.

Another anecdotal study was Wargo's (2000) study on *Blood Clot: Gaming to Reinforce Learning about Disseminated Intravascular Coagulation.* This study reported student responses to questions regarding whether or not the game met course objectives, reinforced content, and encouraged group interaction. Participants responded positively and indicated the game reinforced and enhanced content, group interaction, communication, and problem solving.

Morton and Tarvin (2001) added to the overall anecdotal information on gaming as an alternative teaching strategy. These individuals created *The Pain Game: Pain Assessment, Management, and Related JCAHO Standards* to disseminate up-to-date information on pain management practice and standards related to managing a patient's pain. At the authors' hospital, nurses must complete annual mandatory training through classroom and computer assisted instruction activities. The authors integrated their game into the two-hour classroom component. The gaming format allowed for an unlimited number of teams with two to four players each, with each game lasting thirty minutes. Additionally, each game included a five to ten-minute instructor game summary as part of the thirty minutes. During game play, instructors were on-hand to field questions and correct wrong participant answers. The authors gathered informal feedback from the participants and that feedback included positive statements about gaming as an effective learning tool. Participants indicated the game stimulated interest, promoted peer discussion, enhanced knowledge, and provided a more enjoyable learning environment for boring content.

Zapp's (2001) study, *Use of Multiple Teaching Strategies in a Staff Development Setting*, provided empirical data on the use of various instructional methods (video,

discussion, games) and hypothesized these methods would result in greater satisfaction and superior knowledge acquisition when compared to lecture. Zapp used a pre-test/post-test design and analysis revealed a statistically significant difference between the control and experimental groups ($t = 3.96$, $p = <.0001$) with the experimental group demonstrating higher scores than the control group. Satisfaction levels were also significantly higher ($t = 3.96$, $p = <.0001$) for participants in the experimental group. The results of this study indicate gaming, as well as other non-traditional instructional methods, enhance knowledge acquisition and satisfaction in this type of active learning environment.

Cowen and Tesh (2002) also provided empirical data on the use of gaming with their study on the *Effects of Gaming on Nursing Students' Knowledge of Pediatric Cardiovascular Dysfunction.* The purpose of the study was to determine if a combined lecture-game approach was more effective than lecture alone in enhancing student learning on pediatric cardiovascular dysfunction content. The study supported the use of gaming as an effective tool for knowledge retention. While Cowen and Tesh reported pre-test scores that showed no significant differences, they also reported students in the treatment group answered 94% of the post-test questions correctly versus only 85% for the control group. This difference in test scores indicated gaming enhances learning and retention of knowledge and student evaluations indicated the games made learning interesting and fun.

In 2003, Metcalf and Yankou published an article titled *Using Gaming to Help Nursing Students Understand Ethics.* The game was based on ethical dilemma case scenarios where two students present opposing sides on what should be done to resolve a

specific ethical dilemma. Each student was required to define the problem from their own perspective, consider their own values and how they might pertain to the dilemma, identify their professional responsibilities to the people in the scenario, consider principles such as autonomy and justice, determine legal requirements and social expectations, identify alternatives to the dilemma, and identify potential consequences of those alternatives. Results revealed the following game benefits: an increased self-confidence surrounding the identification and resolution of ethical dilemmas; an increased acceptance of others; a decreased level of judgmental attitudes; a higher stimulated interest in the topic, and a fun approach to increased knowledge.

Another article by Kerr and Buttercase (2003), titled *Its Your Move*, spoke to playing a game modeled after monopoly to increase staff awareness on clinical governance. The goal was to ensure staff members were educated on the importance of clinical governance and its importance in daily work life. The intent was to provide an informal and fun atmosphere where staff members were given the opportunity discuss situations, make decisions on appropriate action to remedy those situations, and identify the requirements they needed to meet to deal with those situations. For example, one scenario involved a staff nurse reporting a physician for collecting a sample from a patient in an inappropriate manner. Team members then had to decide what information they needed to gather about the occurrence, the action they needed to take, who should be involved, etc. The game reinforced two points. First, the staff members were already involved in clinical governance issues on their respective units. Second, the game enhanced knowledge on the bigger picture of clinical governance situations. Informal

participant comments indicated the game was fun and provided a relaxed atmosphere for learning.

To fulfill the requirement for doctoral study, Montpas (2004) completed her dissertation by comparing student achievement and retention on geriatric nursing concepts when participating in a game versus a lecture. The study used a quasi-experimental, pre-test/post-test, longitudinal design. Sixty-eight associate degree nursing students acted as the convenience sample for the study. While the control group (n = 33) participated in lecture, the experimental group (n = 35) was divided into two teams and played a researcher designed game based on the popular game show Jeopardy. Both groups completed a pre-test before and a post-test immediately after their participation in the lecture or game as appropriate. The researcher administered a second post-test two weeks following lecture and game play. Her four game hypotheses were:

1. There is no statistically significant difference in associate degree nursing students' achievement of geriatric concepts when taught by a 'Jeopardy' game and when taught by lecture.
2. The use of a 'Jeopardy' game is statistically more effective than lecture in associate degree nursing students' achievement of geriatric nursing concepts.
3. There is no statistically significant difference in associate degree nursing students' retention of geriatric concepts when taught by a 'Jeopardy' game and when taught by lecture.
4. The use of a 'Jeopardy' game is statistically more effective than lecture in associate degree nursing students' retention of geriatric nursing concepts (p. 42).

The results of the independent samples *t* test indicated achievement, defined by the author as "immediate recall of geriatric content" (p. 43), was statistically significantly different between groups ($t = 5.1$, $df = 66$, $p = 0.000$) with the control group demonstrating a greater increase in score from pre to post-test. Thus, hypotheses one and two were rejected. The results of the independent samples *t* test indicated that retention, "defined as long term recall of geriatric concepts" (p. 44), was also statistically significantly different between groups ($t = 2.788$, $df = 66$, $p = 0.007$) with the experimental group demonstrating the greater statistical significance. Thus, hypothesis three was rejected and hypothesis four was accepted. While study results revealed lecture to be more effective than gaming on immediate recall of geriatric content, long-term recall was greater with participants who played the "Jeopardy" game. The researcher suggested, while gaming appears to be a fun, exciting, worthwhile teaching strategy that promotes active student involvement, there must be further research to add to the empirical evidence that gaming is a viable method for learning and retention.

Henderson (2005) published an article titled *Games: Making Learning Fun*. The main premise of the article was to disseminate information on gaming, to include background, various theoretical frameworks, advantages and disadvantages, types, validity and reliability of researcher developed games, and recommendations for nurse educators considering the use of games in their courses. The author also included information on a game lab for nursing students called *Is That Your Final Nursing Answer?* After completion of nursing courses, to include adult health alterations, students participate in the game lab as an informal, fun way to reinforce previously learned content. Student self-reports indicate the gaming lab promotes interest, is a fun and

exciting way to decrease stress, and results in greater and better interaction with peers and instructors.

Similarly, Glendon and Ulrich (2005) wrote a short article titled *Using Gaming as a Teaching Strategy*. The article identified advantages of gaming and outlined two games used to help students. These games helped students learn in a fun and relaxing environment and allowed instructors to provide feedback that helped students focus their study efforts.

Frazer (2007) completed her doctoral dissertation titled *The Effect of Gaming as an Instructional Strategy on Baccalaureate Nursing Students Immediate Knowledge and Knowledge Retention*. Frazer sought to compare combining lecture with discussion versus lecture with a game concerning each combination's effectiveness on both immediate knowledge and retention of knowledge. She also sought to determine student attitudes on gaming. The study used a quasi-experimental, pre-test/post-test control group, longitudinal design. One-hundred-thirty-five baccalaureate degree nursing students from two local universities served as the study's convenience sample. The control group (n = 64) participated in lecture/discussion and the experimental group (n = 71) in lecture/game. The researcher randomly divided the experimental group into teams of four members each and then had teams compete against each other in playing the "ABG Memory" card game. Both the control and experimental groups completed a pre-test prior to and a post-test immediately after lecture or game play. The researcher administered a second post-test two-weeks following lecture and game play. Frazer indicated two research questions:

1. Is there an immediate difference in baccalaureate nursing students' knowledge of arterial blood gases when taught by a 50 minute combination of lecture and gaming or by 50 minute traditional lecture/discussion?
2. Is there a difference in baccalaureate nursing students' retention of knowledge of arterial blood gases after two weeks when taught through a 50 minute combination of lecture and gaming as compared to a 50 minute traditional lecture/discussion (p. 4)?

Frazer also generated two hypotheses:

1. Baccalaureate nursing students who were taught about blood gases through the 50 minute combination of lecture and gaming would demonstrate greater immediate knowledge of the content than students taught through 50 minutes of traditional lecture/discussion.
2. Baccalaureate students who were taught arterial blood gas content through the 50 minute combination of lecture and gaming would demonstrate greater retention of knowledge of arterial blood gases after two weeks than students taught through 50 minutes of traditional lecture/discussion (p. 5).

The results of the independent samples *t* test indicated the groups were not statistically significantly different regarding initial post-test scores ($t = .55$, $p = .585$). Thus, hypothesis one was rejected. The results of the independent samples *t* test on the follow-up post-test yielded statistically significant differences between groups ($t = 3.72$, $p < .001$) with the experimental group demonstrating the greater score. Thus, hypothesis two was accepted. While the results revealed lecture to be more effective than gaming on immediate recall of arterial blood gases, long-term recall was greater with participants

who played the “ABG Memory” game. The researcher suggests there is a disparity among immediate knowledge with different games and different populations. Therefore, further research is needed to add to the empirical evidence that gaming is a viable method for both immediate and long term knowledge.

Finally, Royce and Newton (2007), like Henderson (2005), published an article titled *How Gaming is Used as an Innovative Strategy for Nursing Education*. This informative piece discusses the advantages and disadvantages of gaming, summarizes four studies involving gaming as an innovative teaching strategy, discusses the need for research and testing, and provides implications for nursing education.

The overall literature review showed a higher number of anecdotal publications (nine), when compared to research-based studies (four), regarding gaming in nursing education. Furthermore, there was a disparity of results with regards to immediate knowledge and long-term retention; with some publications putting forth gaming had a positive effect on one or both areas and other publications demonstrating opposite results. This further adds to the need for additional research in the area of using games in the nursing education setting.

Advantages of Gaming

Literature has shown games to provide a myriad of benefits to the learner and the teacher. According to Sprengal (1994), students more readily acquire and retain information when involved in games rather than other more passive methods of teaching. Gaming allows a type of restructuring that encompasses obtaining, recollecting, and employing information, which results in higher levels of retention students can then put to use in real-world situations (McKeachie, 2002). Games are superior methods for

obtaining positive outcomes related to knowledge retention and application as opposed to other traditional methods of instruction (McKeachie). Games also provide a venue to add novelty, variety, opportunity for immediate feedback, and mentoring and motivation, all of which augment and enhance adult learning (Crancer & Maury-Hess, 1980; Fetro & Hey, 2000; Joos, 1984; Sarason & Banbury, 2004; Schmitz et al., 1991). Additionally, a gaming episode promotes learning by allowing for opportunities to discuss, reflect, apply, and evaluate information, all of which enhances learning (Thatcher, 1990). Integrating play through games is fun for both the learner and the teacher and significantly enhances the learning process (Fetro & Hey; Hillman, 2001; Sarason & Banbury).

Games add an element of fun to the learning process (Bay & Hermann, 1997; Barak et al., 1987; Boreham et al., 1989; Brand, 1980; Cowen & Tesh, 2002; Fetro & Hey, 2000; Fisher, 1976; Glendon & Ulrich, 1992; Henderson, 2005; Jeffreys 1991; Klein & Frietag, 1991; Knowles, 1980; Oblinger, 2004; Parkes 1985; Sarason & Banbury, 2004) while helping decrease stress, anxiety, and fear, which increases self-esteem and confidence (Crancer & Maury-Hess, 1980; Jeffreys). Henderson suggests that, while nurse educators are committed to achieving curricular outcomes, they are far too serious in the process. Nursing curriculum has the potential to provoke anxiety and exponentially increase fear in students. Henderson (2005) aptly suggests, “Why can’t learning be fun?” (p. 165). According to Parkes (1995), when compared to many other disciplines nursing students encounter an increased number of stressful situations in acquiring the nursing knowledge and skills required to care for the sick and bereaved.

Nursing students encounter information about death and dying on a daily basis and at times even interact with dying patients themselves. Observing a patient in the dying process often results in guilt over the death. Nursing students experience insecurity about their competence and often find it a challenge to interact and communicate with experienced nurses and other healthcare professionals (Parkes, 1995). Games are creative teaching strategies that help decrease this anxiety, enhance communication, and make learning fun (Blake & Goodman, 1999; Bruffee, 1995; Fetro & Hey, 2000; Gruending et al., 1991; Hackney, 1971). By providing the opportunity to experiment, acquire concepts, and apply skills in a real-life, relatively safe, non-threatening, risk-free environment, gaming helps decrease student anxiety (Blenner, 1991; Crancer & Maury-Hess, 1980; Fetro & Hey; Hanna, 1991; Hermann & Bays, 1991; Morton & Tarvin, 2001; Oblinger, 2004; Rodriguez et al., 1996). Henderson (2005) puts forth the notion that games bring value to the learning process and help decrease both learner and teacher stress, adding "spark" to the educational process. Using games stimulates laughter, resulting in relaxed, attentive learners who previously showed a lack of interest or were anxious about the learning environment (Leidy, 1992).

Humor has been accepted as a significant strategy in the college classroom (Hillman, 2001). Used in the appropriate context, humor benefits both teacher and student by relieving stress and anxiety, focusing attention, making learning fun, enhancing learning, and strengthening social relationships in the classroom (Hayden-Miles, 2002; Ulloth, 2002). According to Hillman, "The use of humor in the form of game playing or joke telling makes learning fun and enhances retention and application of content" (p. 58). Bartfay and Bartfay (1994) agree playing games provides a fun

aspect to the learning process and increase student interest and motivation. Sarason and Banbury (2004) stated “if we can facilitate learning in a manner that is fun and energizing, then we all win” (p. 514).

Gaming piques student interest in and motivation for learning and promotes active engagement in the learning process (Bays & Hermann, 1997; Fetro & Hey, 2000; Klein & Frietag, 1991; Saethang & Kee, 1998; Sarason & Banbury, 2004; Sprengal, 1994). Using games to promote active involvement in the learning process enhances motivation, cognitive learning, transfer, and retention of content (Andlinger, 1958; Blenner, 1991; Brand, 1980; Corbett & Lee, 1992; Cowen & Tesh, 2002; Crancer & Maury-Hess, 1980; DeNike, 1976; Fisher, 1976). Games have been found to positively influence student preparation for class, their active involvement and retention of knowledge, and overall classroom dynamics (Alessio, 1991; Pennington & Hawley, 1995). Games capitalize on the enjoyment of play and motivation to encourage learning concepts, processes, and facts (Fetro & Hey; Fisher; Sarason & Banbury); reinforce cognitive learning (Bartfay & Bartfay, 1994; Corbett & Lee, 1992; Hanna, 1991); and stimulate critical thinking (Cowen & Tesh, 2002).

Henderson (2005) suggests nursing educators have an obligation to seek out creative teaching methods that boost student learning in areas like problem solving, decision making, critical thinking, and communication. Bloom and Trice (1994) and others (Andlinger, 1958; Crancer & Maury-Hess, 1980; Hackney, 1971; Hogle, 1996), put forth the development of critical thinking, decision making, communication, and better problem solving skills is inherent in playing educational games. “Games can challenge individuals to apply the knowledge they have in their cognitive reservoir, and

thus can serve as tools to evaluate their critical thinking skills" (Rowell & Spielvogle, 1996, p. 274). During a game, the learner engages in an experience that requires them to make resolutions and decisions (Andlinger; Hackney; Thatcher, 1990). Collaboration, a form of active learning that incorporates gaming in the classroom, stimulates critical thinking, promotes a feeling of community within groups, and promotes individual responsibility for learning (Bruffee, 1995; Crancer & Maury-Hess; Glendon & Ulrich, 1992). Games provide an opportunity for students to experience decision-making processes (Andlinger; Crancer & Maury-Hess; Fetro & Hey, 2000; Hackney) and improve the interpersonal skills required to effectively function within a collaborative learning setting (Bruffee; Fetro & Hey; Hackney). In addition to the above benefits, games also help change or enhance a variety of learner characteristics such as values and attitudes (Bartfay & Bartfay, 1994; Hackney).

Disadvantages of Gaming

While there are numerous benefits in using gaming as an effective teaching strategy, like many other teaching methods there are also a number of disadvantages. The greatest disadvantage is the cost involved with respect to money and time (Bartfay & Bartfay, 1994; Bloom & Trice, 1994; Cessario, 1987; Gruending et al., 1991; Hanna, 1991; Lewis et al., 1989; Skinner, 2000). There are few educational nursing games available for purchase (Bloom & Trice; Gruending et al.). Additionally, the cost of designing a game or requesting reimbursement for buying a game are downsides to using games (Joos, 1994). In terms of time, Bloom and Trice contend developing questions for a game is just as challenging and time-intensive as developing effective questions for written exams. When compared to lecture, games also require more time to explain the

purpose and rules and to facilitate discussion when the game is over (Corbett & Lee, 1992). Games also take time from other activities that educators might otherwise implement in the classroom (Bartfay & Bartfay). Developing a creative learning tool, such as a game, often becomes a frustrating task for educators (Henry 1997; Lowman, 1995).

Playing a game itself can also become frustrating due to reasons like high noise level, students not taking the game seriously, students not following directions, or students failing to work together as a team. These frustrations can result in a chaotic environment that decreases student learning (Bartfay & Bartfay, 1994; Berbiglia et al., 1997; Bloom & Trice, 1994; Cessario, 1987; Corbett & Lee, 1992; Gruending et al., 1991; Hanna, 1991; Lewis et al., 1989; Rowles & Brigham, 2005; Skinner, 2000; Wargo, 2000). Learning may also be compromised due to student differences in preferred learning styles. Some students view playing games as useless because they do not enjoy competition and prefer to maintain a more passive role in the classroom (Richardson, 2005). Other students have a difficult time following game directions or abstracting the ideas presented in the gaming format (Bartfay & Bartfay, 1994; Corbett & Lee, 1992; Gruending et al., 1991). Still others view games as a threat since they dislike competition when associated with learning (Bloom & Trice, 1994; Cessario, 1987; Hanna) and often experience a decrease in motivation and an increase in negative feelings, emotions, and anxiety when they lose (Bartfay & Bartfay). Finally, some students simply perceive gaming as a boring way to learn and thus games decrease their motivation for learning (Bloom & Trice; Cessario).

Conditions for Successful Gaming Strategies

The literature identified two key components for successful gaming strategies: establishing rules and establishing clear directions (Ballantine, 2003; Fetro & Hey; 2000; Hayes & Childress, 2000; Metcalf & Yankou, 2003; Youseffi, Caldwell, Hadnot, & Blake, 2000). Goals or outcomes are also important for successful gaming strategies (Andlinger, 1958; Fetro & Hey). According to Norris and Niebuhr (1980), for game playing to have relevance the instructor must establish four precursors - create and agree upon group goals; determine frequency of group interaction; determine whether or not inter-group competition will exist; and determine what constitutes success with respect to the group goals. Gruending et al. (1991) agreed and contended that, because educators develop educational games with specific learning outcomes in mind, they must thoughtfully plan those games to make them effective in acquiring knowledge and achieving goals/outcomes.

Oblinger (2004) suggested that, in order for games to be effective as learning tools, educators must structure them to be congruent with the content being taught, activate previous knowledge, consider the context, include assessment and feedback, enable the transfer of knowledge, and be experiential and social. The context used during a game is important since understanding what information corresponds to a particular technique, and when to apply that information in different situations, enhances the chance of greater achievement (Andlinger, 1958; Fetro & Hey, 2000). Games must also offer feedback on students' progress and encourage transfer of knowledge from work, school, other games, and life experiences in general (Andlinger). Making connections and seeing the transfer of preexisting knowledge to a unique situation is part of playing a successful

game (Andlinger, 1958; Oblinger, 2004). Thatcher (1990) insists a debriefing period (reflecting and exploring on the gaming experience) at game completion is imperative to learning from the experience.

Learning Style Instruments

In the fields of education and psychology, literature over the last four decades demonstrated support that people of all ages "…have different yet consistent ways of responding in learning situations" (Fleming & Mills, 1992, p. 137). Aptly termed "learning styles," this predisposition to, or behaviors demonstrated in, different learning environments are preferred ways of learning (Fleming & Mills, 1992). As researchers have taken on the quest of identifying a person's learning style, different thoughts have emerged on what factors influence individual preferences. Kolb and Kolb (2005) contended physiological traits (maturation through human developmental stages) are the deciding factors contributing to individuality in learning style. Gardner (1983) proposed the idea of multiple intelligence, natural talents, and learner abilities as the catalyst for determining individual learning style preference. Myers (1962) indicates the learner's personality influences preference for learning. Kiersey and Bates (1978) suggests an individual's temperament constitutes the deciding factor and Fleming and Mills considers sensory perception (aural, visual, tactile, etc.) in terms of individual learning style preference. Clearly, there are many theories on what constitutes an individual's learning preference and this has resulted in numerous learning-style inventories to assess these preferences. For purposes of this study, though, the researcher used the ideas postulated by Fleming and Mills.

In their 1992 publication *Not Another Inventory, Rather a Catalyst for Reflection*, Fleming and Mills suggests it is impossible for teachers to accommodate the variety of learning styles students bring to the classroom. Therefore, "the most realistic approach to the accommodation to learning styles in teaching programs should involve empowering students through knowledge of their own learning styles to adjust their learning behavior to the learning programs they encounter" (p. 137). Thus, rather than developing yet another inventory to indicate an individual's preferred learning style Fleming's (2006) VARK Questionnaire indicates the learner's preferred mode for receiving and giving information. He takes it a step further by providing "help sheets" containing suggestions for modifying learning practices to assist individuals with techniques supporting their specific modal preference for information input and output. While Fleming and Mills (1992) indicated this in no way negates the need for educators to widen their repertoire of teaching strategies to reach the diversity of student learning styles, Fleming and Baume (2006) admit that the VARK Questionnaire is "…technically, not a learning style questionnaire, as it provides feedback only on one's preferred mode for communicating" (p. 4). However, it does represent a component of learning style and is therefore considered a field within learning style research (Fleming & Baume).

According to Fleming (2006), VARK stands for Visual, Aural, Read/write, and Kinesthetic, which comprise the sensory perceptual categories on the VARK Questionnaire. The questionnaire itself contains 13 questions (see Appendix A), where the answers indicate a student's preferred method for receiving/giving information and cognitive processing. Of the 13 questions, six (numbers 2, 4, 7, 8, 9, & 13) refer to the way in which learners receive information; three (numbers 1, 3, & 5) indicate how

learners give information to others; and the remaining four (numbers 6, 10, 11, & 12) refer to decision-making based on cognitive processing. Fleming developed the questions "…to be as culturally neutral as possible…" (p. 139), while admitting question seven refers to games that would require knowledge about the game in order to complete the question.

The VARK questionnaire uses a multiple-choice design and delineates answer choices as a, b, c, or d. Six questions have three answer choices and the remaining seven have four choices. The questionnaire asks individuals to respond to at least 10 of the 13 questions; accepts and encourages multiple responses per question if appropriate to a variety of individual preferences; and allows respondents to leave questions blank if they do not apply. Each category (V, A, R, & K) results in a score and the highest score identifies the respondent's preferred (dominant) mode of sending/receiving information (Fleming, 2006) (see Table 3).

Table 3

Example Score on VARK

Option	Score
Visual (V)	2
Aural (A)	4
Read/write (R)	8
Kinesthetic (K)	2

*In this scenario, the dominant score for the Read/write option indicates an R preference

Fleming (2006)

While the above example shows a single-mode preference, it is possible to have a multi-modal preference. This possibility exists because respondents can choose more than one answer for each question, thus having multiple, equal high scores in various areas (e.g., both A and R could be 8; V, R, and K could all tie at 10; etc). Chapter III provides a more detailed discussion on scoring the VARK questionnaire.

The VARK modes are broken down and described by the learner's preference for processing information. According to Fleming (2006), as the name suggests visual learners prefer to learn through sight. Information provided through drawings, graphs, pictures, or diagrams appeal to the students in this category. Conversely, the aural learner prefers to learn through hearing. These learners engage more when processing information received through lecture or communicated with others in group discussions. The read/write individual prefers the written word. These individuals learn better when assignments or content delivery include reading or writing. Finally, the kinesthetic learner prefers active engagement with the learning environment when that engagement includes a hands-on approach to real or simulated experience and practice. One must note the kinesthetic mode is actually multi-modal – it engages all senses "…because experience and practice may be expressed or 'taken in' using all perceptual modes – sight, touch, taste, smell, and hearing" (Fleming, p. 138). However, for purposes of the questionnaire it simply relates to experience and practice (Fleming & Mills, 1992).

Summary

Knowles' (1980) adult learning theory is applicable to and supports the use of gaming in higher education as an effective teaching strategy for adult learners. Adult learners want and need learning environments that allow for self-direction, active

engagement with learning, and relevance to real-life situations. They also want a learning environment that allows them to draw on their experiences. Educators must recognize students have different backgrounds and preferred ways of learning and create activities that address these diversities. Creating student-centered learning environments, to include using collaborative teaching strategies, can effectively promote active student engagement in the learning process.

Many educational disciplines have called for a move from passive to active teaching strategies. In the nursing profession, nursing educators recognize the importance in teaching nursing students how to properly solve problems, think critically, make sound decisions, and communicate effectively to maintain patient safety. Therefore, nurse educators have also raised the call for a teaching-learning environment that includes learning strategies that promote better learning and knowledge retention - specifically methods that promote active learning. Active learning is student-centered, collaborative, and encourages students to engage their minds to solve problems and make decisions.

Gaming has a rich history throughout civilization and is an active learning tool supported by literature as an effective strategy for enhancing learning and retention. Nurse educators, however, are polarized on the use of gaming in nursing education. Those who support the use of games as a teaching strategy purport that games create enthusiasm and pleasure, increase motivation, and enhance learning and retention. Those against gaming are unsure of the quality of learning students derive from games and how much learning actually occurs during a game.

While disparity does exist among educators on the use of gaming as an effective teaching strategy, it does not negate the need for educators to employ a variety of

teaching strategies. McKeachie (2002) stated “you can interest all of your students some of the time; you can interest some of your students all of the time; but you can’t interest all of your students all of the time” (p. 6). Ultimately, the educator is responsible for, and obligated to use, teaching methods that correlate with the needs and objectives of the curriculum. Adding gaming activities can help educators reach students with varying learning style preferences. Given this, Henderson (2005), Moran (2005), and Royce and Newton (2007) agree there is a need for further research to add to the empirical evidence of gaming as a viable teaching strategy before nurse educators become enthusiastic for implementing this nontraditional method of instruction in their classrooms. This study sought to help address this need by adding to the empirical evidence on gaming strategies and their effectiveness in the classroom.

CHAPTER III. METHODS

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of pediatric cardiovascular dysfunction (PCD) content. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university. The research questions for this study were: (1) What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction? (2) What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of instruction based on final examination scores of baccalaureate nursing students? (3) Is there a significant difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

The purpose of this chapter is to provide a description of the methods used in this study, including the research setting, selection of participants, experimental design, procedures, and instrumentation.

Research Setting

The setting for this study was a baccalaureate nursing program at a southeastern, four-year, public university located in Montgomery, Alabama. “The School of Nursing

continually endeavors to promote active learning, communication, and development of professional nursing. The teaching-learning environment promotes the development of caring and critical thinking as enduring valued processes" (Auburn Montgomery School of Nursing, 2007, p. 2). The school makes this environment possible through dialogue between the teacher (a critical agent) and the students (self-directed learners) (see Figure 2). The education program as a whole exposes nursing students to the continuum of wellness and illness throughout the human lifespan. As such, the School of Nursing integrates pediatric content within a few of its courses with the main pediatric focus presented in NURS 3740 Holistic Nursing: Infants and Children. This specific pediatrics course is available in the second semester (spring) of each school year and is where the researcher recruited the participants for this research study.

Selection of Participants

The sample for this study was a non-probability convenience sample of available nursing students at a southeastern four-year public university, enrolled in NURS 3740 Holistic Nursing: Infants and Children, spring semesters 2007 and 2008. The 2007 class had 68 students and the 2008 class 72 students. All students were invited to participate in the study on a voluntary basis.

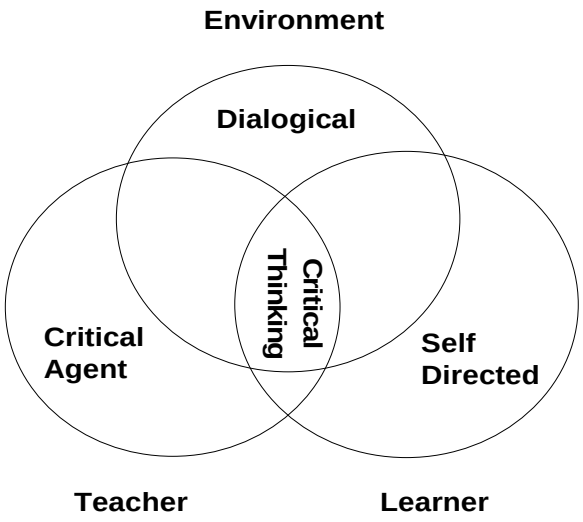


Figure 2. Auburn Montgomery School of Nursing Teaching-Learning Model
Reprinted by permission from Ramona B. Lazenby, July 10, 2008

Seventy-five percent (n = 51) of the 68 nursing students in the 2007 class and seventy-one percent (n = 51) of the 72 nursing students in the 2008 class volunteered to participate. Five students (three failed to meet appropriate academic standards and two withdrew consent to participate) from the 2007 class and one student (failed to meet appropriate academic standards) from the 2008 class were dropped from the study, accounting for a nine and two-percent attrition rate respectively. After attrition, there were 46 participants in the class of 2007 and 50 in the class of 2008. The remainder of

this study will combine these two class groups into a single sample (N = 96) for this research study.

The 46 participants from the 2007 class were randomly divided into a control group (CG, n = 24) and experimental group (EG, n = 22) and the 50 participants from the 2008 class were randomly divided into a CG (n = 24) and EG (n = 26). Each EG was further randomly divided into similar sized student teams, with the first n representing participants from the 2007 class and the second those from the 2008 class (Team 1, n = 4, 5; Team 2, n = 5, 5; Team 3, n = 4, 5; Team 4, n = 4, 5; and Team 5, n = 5, 6).

The average participant was approximately 25 years (M = 24.96) of age, with a range of 19 – 46 years. The sample included 76 Caucasians (79%) with the remaining 21% representing African Americans, Hispanic Americans, and Asian Americans. Although females comprised 85% and males 15% of the participants, this is typical of nursing student demographics. The average participant GPA was approximately 3.0 (M = 3.20). Table 4 shows a comparison of these variables between the CG and the EG.

Table 4

General Demographic Information by Group

Variable	Control		Experimental	
	n	%	*n*	%
GENDER				
Female	39	81.3	43	89.6
Male	9	18.7	5	10.4
RACE				
Caucasian	40	83.3	36	75
African Americans, Hispanic Americans, & Asian Americans	8	16.7	12	25
GPA	48	3.16	48	3.24
AGE				
Range	19 – 45		19 – 46	
Mean	24.73		25.19	

Research Design

According to the National League for Nursing (NLN) (2003), research on innovative educational teaching strategies is needed to transform passive learning environments into active learning environments. Current quantitative research is imperative as it relates to the effectiveness of active learning strategies compared with

traditional methods of teaching (Bays & Hermann, 1997; Cowen & Tesh, 2002). As such, this research study sought to add to the empirical evidence of non-traditional teaching methods – specifically gaming versus lecture and the effects on learning and retention related to PCD content.

A quasi-experimental, pre-test/post-test design was used for this research study. According to Polit and Hungler (1995), a quasi-experimental design manipulates an independent variable without having the randomization or control group required for a true experiment. While this study did use both control and experimental groups, with randomization to each group, the participants were a convenience sample of subjects available within one university and one pediatrics course. Therefore, the participants were not randomly selected from the entire population of nursing students – making this study a quasi-experimental design. The use of a pre-test/post-test design was appropriate to the study because of its use of two measurement points (Polit & Hungler). The pre-test established a baseline measure for comparison with the post-test outcome measure, with the comparison indicating effectiveness of the dependent variables used in this study. The researcher used the PCD content (five items) from the NURS 3740 Holistic Nursing: Infants and Children final exam to assess knowledge retention over time. The time lapse between the pre and post-test was one week, while the time lapse between the post-test and final exam was two months.

Within this study, the researcher used quantitative analysis to describe the data related to the research. Researchers use quantitative analysis to provide meaningful and intelligible information from the research data, helping ensure the data resembles more than just a “chaotic mass of numbers” (Polit & Hungler, 1995, p. 439). The statistical

package for the social sciences (SPSS) Windows version 15.0 software package was used to perform statistical analysis on the data. A one-way repeated-measures analysis of variance (ANOVA) with a significance level of .05 was calculated comparing test scores of participants at three different times: pre-test, post-test, and final exam. Using this approach was appropriate to this study because data collection occurred at more than one point in time (Polit & Hungler). The ANOVA was also used to determine if a difference existed between final exam scores and learning style preferences of participants. Significance was set at .05.

Procedures

The following information outlines the procedures the researcher used to prepare for and execute this study:

1. The researcher conducted a review of active learning teaching methods literature to identify potential research study topics. Bays and Hermann's (1997) game, *Draw-Learn-Win*, served as the backdrop for this research study and the game design used during the study. The original game reflects adult endocrine system content and is a modified version of the popular board game Pictionary © and the television show Win, Lose, or, Draw © (Bays & Hermann).
2. The researcher met with the School of Nursing pediatrics instructor, summer semester 2007, to discuss the research study. During this meeting, the pediatrics instructor gave the researcher permission to conduct this study during the PCD class in the NURS 3740 Holistic Nursing: Infants and Children course. According to Cowen and Tesh (2002), students cite PCD content as one of the most difficult

concepts to grasp. This makes gaming, an active teaching method, conducive to helping students learn this difficult material.

3. The researcher and the pediatrics instructor collaborated on the best approach to collect data, develop instruments, and execute course logistics. The intent was to implement the research treatment with as little disruption as possible to normal class scheduling, while ensuring students in the experimental group received the same content through game design as students in the control group.
4. The pediatrics instructor supplied the researcher with all course content related to PCD, including PowerPoint presentation with instructor lecture notes; current textbook with instructor CD; test-bank with PCD content questions; and access to the WebCT component of the course.
5. The researcher used the above information to design the game Draw-Learn-Win and to formulate, by randomly selecting and using questions from the school's existing test-bank, separate 20-item multiple choice pre (Appendix B) and post-test (Appendix C) exams. Once the researcher completed the game and exams, a panel of nurse educators (with expertise in teaching PCD content, providing pediatric bed-side nursing care, and developing test-items) reviewed all content for validity. According to Oermann and Gaberson (2006) "A panel of experts reviews the test, item by item, to determine if the items are relevant and satisfactorily represent the defined domain" (p. 25). Based on the panel's comments, the researcher completed several revisions before implementing the research study. Additionally, the pediatrics instructor designed the course syllabus to allow time to implement the research study.

6. The researcher developed a demographic information sheet (Appendix D) and a Likert-scale Student Perceptions Survey (adapted and revised for this study) from Sealover, Henderson, Sharrer, Blake, and Sweet (Henderson, 2005) (Appendix E).
7. Once all research material was complete, at the researcher's request the Assistant Dean of the School of Nursing provided School of Nursing approval (Appendix F) to conduct the study. Additionally, the Internal Review Boards (IRB) at both the study university and the researcher's attending university provided their approval as well (Appendices G through I).
8. The researcher approached potential participants during the spring semester 2007 and 2008 orientations and used an IRB required script (Appendix J) to give them an explanation of the research study. The researcher then distributed informed consent forms (Appendix K) to all participants, requiring them to sign the forms prior to participating in the research study. Participants were then given a copy of their signed informed consent forms, while the forms with original signatures were placed in a locked filing cabinet at the School of Nursing. The researcher also collected participant demographic information during orientation. This information included participants' self-reported VARK scores. The VARK was administered to participants in the previous semester by a School of Nursing faculty member as a part of her course. The participants self-scored their VARK questionnaire and it was that score that was reported on the demographics form. The researcher did not have access to participants' VARK questionnaire; therefore scores could not be verified.

9. To ensure student confidentially throughout the research study, the researcher had each participant create their own research participant identification number consisting of three letters and three digits (e.g. ASH711). This number was used in place of participant names for all data related to the study.
10. The 46 participants from the 2007 class were randomly divided into a CG (*n* = 24) and EG (*n* = 22) and the 50 participants from the 2008 class were randomly divided into a CG (*n* = 24) and EG (*n* = 26). Each EG was further randomly divided into similar sized student teams, with the first *n* representing participants from the 2007 class and the second those from the 2008 class (Team 1, *n* = 4, 5; Team 2, *n* = 5, 5; Team 3, *n* = 4, 5; Team 4, *n* = 4, 5; and Team 5, *n* = 5, 6).
11. One week prior to implementing the research treatment, both groups completed the pre-test via WebCT. The pre-test questions were exactly the same for all 96 participants. Following pre-test completion, the researcher emailed an outline/study guide (Appendix L) to all participants to help them prepare for instruction on PCD content.
12. The EG (*n* = 22, 26) participants in this study received PCD content instruction by playing the game "Draw-Learn-Win." While the original game is a modified version of the popular board game Pictionary © and the television show Win, Lose, or, Draw © (Bays & Hermann, 1997) (and reflects content on the adult endocrine system), the content was tailored to the PCD content. The research game was designed using 3 x 5 index cards, with the front of the card identifying the item the participants were to draw and the back of the card providing key concepts related to the disorder (see Figure 3). Although the researcher facilitated

the game, the pediatrics instructor for the School of Nursing was on hand to assist with discussion of key points after each team "drew" the picture related to their topic. The researcher explained the rules of the game prior to play: 1) two different students from each team will draw the selected item every time their team has a turn, 2) team-mates will be allotted one minute to guess the answer/item, 3) other teams will be able to "steal" an answer/item if the drawing team does not guess within its one minute time limit, 4) points will be awarded for either a correct guess or a steal, and 5) two-hours will be allotted to play the game from start to finish (Hermann & Bays, 1991).

13. The pediatrics instructor used traditional lecture format to instruct the CG (n = 24, 24) participants on PCD content. The instructor augmented the lecture with PowerPoint slides and opportunity for discussion.
14. The CG participants attended the lecture in the morning and the EG participants played the game in the afternoon of the same day to control (minimize) "talk" between the participants in the groups. This was done to help maintain, as much as possible, the validity of the research study.
15. The researcher administered the post-test immediately following the game for the EG participants and lecture for the CG participants. All post-test questions were exactly the same for all 96 participants. However, while the post-test and pre-test questions covered the same content the questions used on the two exams were not the same.
16. Participants used WebCT to complete a course required final exam approximately two months following game play and lecture. After the pediatrics instructor

submitted participants' final course grades, the researcher then collected the 96 participant responses specific to the PCD questions (Appendix M) for analysis and assessment of long-term retention. The final exam contained five items related to PCD content. Two of the five items were written (no diagrams) and the remaining three were visual (pictures of the heart relating to a specific pediatric cardiovascular disease process). The five items were the same for all 96 participants.

17. The researcher then combined the 2007 and 2008 data for final analysis.

Front of 3x5 index card (not drawn to size)

Coarctication of the Aorta
and
Decreased Femoral Pulses

Back of 3x5 index card (not drawn to scale)

Key Concepts:

Constriction of the aorta causes the lower extremity pulses to be decreased while upper pulses are normal, especially in the right arm because the pulses in the arm are fed by the aortic arch.

Figure 3. Example Game Question

Instrumentation

The researcher used several instruments for this study, including a researcher developed demographic form, student perceptions survey, a 20-item pre and post-test; and five-item subset of PCD content from a faculty developed final exam; and the VARK Questionnaire developed by Neil Fleming (2006). This section will provide information on each instrument as it related to scoring and/or reliability and validity.

Demographic Form

The demographic form is a direct questionnaire designed to elicit information about research participants' age, sex, race, GPA, and self-reported VARK scores. While the information was used to describe the sample, provide general comparisons between the CG and EG participants, and determine if a significant difference existed between final exam scores and learning style preferences, these items were not scored.

Student Perceptions Survey

A researcher developed Student Perceptions Survey was adapted and revised for this study from Sealover, Henderson, Sharrer, Blake, and Sweet (Henderson, 2005). The author and her colleagues developed the 5-point Likert-scale (1 = strongly disagree to 5 = strongly agree) in 2000 for student feedback on the game lab the authors developed titled *Is That Your Final Nursing Answer?* EG participants in the current study completed the survey to provide their perceptions on the effectiveness of gaming as an educational tool. The responses allowed the researcher to explore the following major concepts concerning gaming: whether or not it provided fun and excitement, encouraged active participation and learning, provided a stress free environment, was an effective learning tool, increased confidence related to PCD content, and motivated students.

Pre-test/Post-test/Final Exam

The researcher randomly selected questions from the School of Nursing's existing test-bank to develop the pre and post-tests. The pediatrics instructor developed the final exam, which covered all course content. Five of the 100 final exam items covered PCD content. The 20-item multiple choice pre-test measured participant prior knowledge regarding PCD content. Immediately following implementation of the independent variables for the study, the 20-item multiple choice post-test was administered. While the pre and post-test scores did not reflect in the students' overall course grade, the subset of PCD items on the final exam did count as part of the overall final exam score and, therefore, as part of the students' overall course grade.

The School of Nursing, where the research study took place, stated in its 2007 Proposal for the Development of a Valid & Reliable Test Bank that "The overall goal for the school is to achieve a reliable, valid test bank for every course in the curriculum in which testing is the means of evaluation" (Schutt, Lazenby, Hodges, Morris, & Norman, (p. 1). Three factors are important in understanding the validity and reliability of a multiple choice test. These are the difficulty factor (DF), the discrimination index (DI), and the use of effective distracters. Each multiple-choice test item undergoes statistical analysis for the DF and DI (Schutt, et al.). Therefore, for the purposes of this study the researcher chose to focus on these two statistical analyses.

The DF measures the percentage of respondents answering a question correctly, with the formula being D = c / n (where D is the Difficulty Factor, c is the number of correct answers, and n is the number of respondents). The easier a question is to answer, the higher the DF for that question. For example, a value of one (1) indicates all

respondents answered the question correctly (Schutt, et al., 2007). Therefore, educators should expect to see high DF values when the purposes of their tests are to evaluate whether or not their students have grasped the subject matter on those tests (Oermann & Gaberson, 2006). Conversely, DF values between 0.3 and 0.7 are the most effective if an educator designs the test to differentiate between achievement levels. See Table 5 for the DF values the School of Nursing uses as its guideline to help educators determine whether or not to keep, revise, or reject a question based on the questions' DF.

Table 5

Test item decision making scale for DF

DF	Recommendation
0.19 or <	Reject or revise question
0.20 – 0.29	Marginal, question needs improvement
0.30 – 0.39	Reasonably good discrimination
0.40 or >	Very good discrimination

According to Oermann and Gaberson (2006) and Schutt, et al. (2007) the DI identifies how well an item response discriminates between those respondents who score high on the test overall and those who score low on the test overall. To calculate the DI, use the formula DI = (a – b) / n (where DI is the discrimination index, a is the response frequency of the upper quartile that got the question right, b is the response frequency of the lower quartile that got the question right, and n is the number of respondents in the upper quartile). A positive value means the higher scoring students (for the overall test) selected the correct option more often than the lower scoring students. A negative value

indicates the lower scoring students tended to select the correct option more often than the higher scoring students. A value of zero (0) indicates there is no difference between the two groups. This lack of difference could be that all respondents answered the question correctly or all answered incorrectly regardless of their overall test scores (Oermann & Gaberson). Ideally, the DI will be a positive value between 0.3 and 0.7 – which shows good test item discrimination. For those test items with a DI of zero (0), the faculty member can calculate the DF and use that value to determine how to interpret the appropriateness of the test item (Schutt et al., 2007). See Table 6 for the DF and DI results for all test items used in this study.

The DF for the test items on the pre-test showed 55% were extremely difficult and 45% were within the range of reasonably good to very good discrimination. Since the purpose of the pre-test was to measure prior knowledge regarding PCD content, having 55% of the items measure extremely difficult was not unexpected. Conversely, having 45% measure reasonably good to very good discrimination was not expected since the test was designed to measure knowledge before exposing the participants to the PCD content. Therefore, it is important to look at potential reasons for these good levels of discrimination. First, students may have successfully guessed the correct answer (Oermann & Gaberson, 2006).

Table 6

Item Statistics

Pre-test			Post-Test			Final Examination		
Item	DF	DI	Item	DF	DI	Item	DF	DI
1	.26	.38	1	.66	.29	1	.67	.67
2	.20	.29	2	.83	.13	2	.85	.33
3	.12	.38	3	.79	.29	3	.61	.75
4	.69	.38	4	.88	.17	4	.85	.25
5	.32	.33	5	.93	.13	5	.72	.63
6	.11	.33	6	.29	.25			
7	.27	.33	7	.67	.42			
8	.31	.54	8	.75	.13			
9	.08	.38	9	.83	.29			
10	.92	.17	10	.30	.29			
11	.32	.46	11	.69	.46			
12	.43	.04	12	.57	.38			
13	.38	.17	13	.59	.67			
14	.02	.33	14	.86	.25			
15	.26	.33	15	.23	.17			
16	.10	.42	16	.55	.42			
17	.05	.38	17	.20	.42			
18	.42	.13	18	.88	.33			
19	.32	.33	19	.82	.25			
20	.06	.46	20	.61	.38			

DF = Difficulty Factor; DI = Discrimination Index

Second, even though the researcher asked the students to review no PCD content material prior to completing the pre-test there may have been some who, out of fear of embarrassment of doing poorly, may have done so anyway. Third, the participants completed the pre-test online and without a proctor. Therefore, any one of them could have used reference material to help answer some or all of the questions (Oermann & Gaberson). Finally, while the School of Nursing does not teach PCD content in other courses it does expose students to pathophysiology of the adult heart and assessment of the pediatric patient. Students may have successfully relied on that knowledge to assist them in correctly answering pre-test PCD test items.

The DI results for the pre-test showed 75% of the test-items discriminated well between the higher and lower-scoring students. Since this pre-test was designed to determine participant knowledge before exposure to the PCD content, one may have expected each test item DI to discriminate poorly between the higher scoring and lower scoring participants since each theoretically began with no knowledge of PCD content. Therefore, the test items with good DIs could indicate the higher scoring students (1) were better able to transfer knowledge from similar material in other courses to assist them in determining the correct responses on the PCD pre-test and/or (2) were concerned about being embarrassed if they did poorly on the pre-test and therefore reviewed PCD content material prior to the pre-test against the researcher's request.

On the post-test, the DF showed 85% of the test-items falling within the range of reasonably good to very good discrimination and the DI revealed 40% of the test-items discriminated well between the higher and lower-scoring students. While these percentages may seem contradictory (overall good DF versus marginal DI), there is at

least one possible explanation for this difference – a number of test items fell just outside the lower end of the good DI range. If the researcher considered these test items to have at least marginally good DIs, the overall percentage with good DIs would increase from 40% to 75%.

The subset of PCD content questions on the final exam resulted in 100% of the test items within the range of reasonably good to very good discrimination. At the same time, 80% of the items discriminated well between the upper and lower-scoring students.

VARK Questionnaire

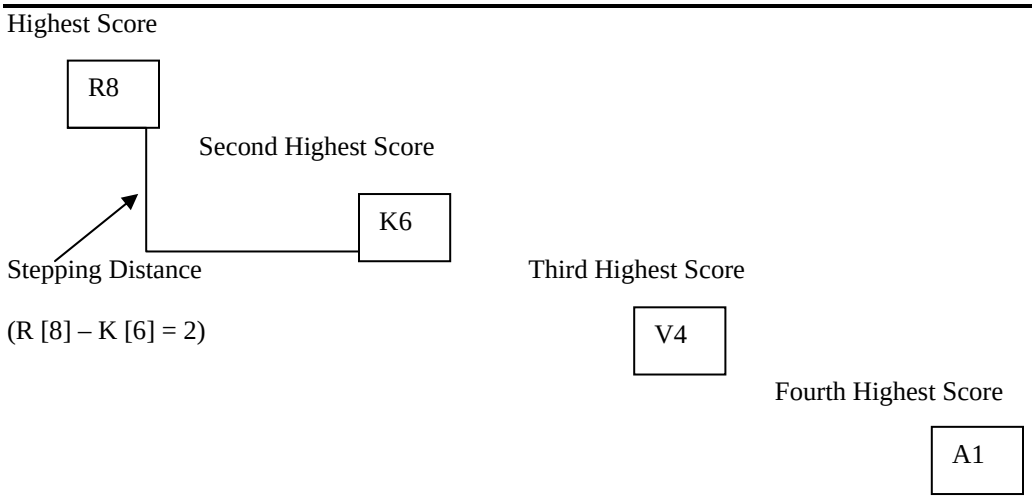
According to Fleming (2006), VARK stands for Visual, Aural, Read/write, and Kinesthetic, which comprise the sensory perceptual categories on the VARK Questionnaire. The questionnaire contains 13 questions that use a multiple-choice design with answer choices delineated as a, b, c, or d. Six questions have three answer choices and the remaining seven have four choices. The questionnaire asks individuals to respond to at least 10 of the 13 questions; accepts and encourages multiple responses per question (if appropriate to a variety of individual preferences); and allows respondents to leave questions blank if they do not apply. Each category (V, A, R, & K) results in a score and the category with the highest score identifies the respondent's preferred (dominant) mode of sending/receiving information.

Fleming (2006) indicates that scoring the VARK is a four step process. The first step is to record the participant's profile of preferences. Preferences V, A, R, & K correspond with the answer choices of a, b, c, & d respectively. The subtotal of each response (a, b, c, & d) is calculated for each of the 13 questions. The four subtotals are then summed to obtain the grand total (a = 4 + b = 1 + c = 8 + d = 6 = 19).

The second step requires the respondent to sort his or her scores in descending order. The highest score indicates the dominant learning preference. In this example, response type (c), which represents Read/Write, had the highest score, followed by Kinesthetic (d), Visual (a), and Aural (b). The stepping distance is then calculated. For example, the distance between R (highest score) and K (second highest) is 8 – 6 = 2. These calculations continue for K to V and V to A. See Table 7 for an example of this process (Fleming, 2006).

Table 7

VARK Scoring Step Two



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The third step is to find where the total score (19) falls within the provided VARK ranges in order to determine what standard stepping distance (for eventual comparison to the individual stepping differences for the participant scores) will be used for discovering if a single, bi-modal, tri-modal, or multi-modal learning preference exists. Table 8 shows the four possible total score ranges with their associated standard stepping distances. In

this example, 19 fell within the first range and corresponds to a stepping distance of one (Fleming, 2006).

Table 8

VARK Scoring Step Three

Grand Total of Four VARK scores	Stepping Distance
14 – 21	1
22 – 27	2
28 – 32	3
>32	4

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The fourth step compares the standard stepping distance determined in step three to the participant's stepping distances as discovered in step two. This comparison determines whether or not the participant has single or multiple learning preferences. If the stepping distance between the participant's highest and second highest scores is larger than the standard stepping distance determined in step three, then the participant has a single preference. In this example, the participant's stepping distance is two. When compared to the standard stepping difference of one, this indicates the participant has a single preference for Read/Write. Conversely, if the participant's stepping distance had been equal to or less than the standard stepping difference then that would have indicated more than one preference. In that case, the participant would continue comparing the stepping distances between the remaining scores to determine whether or not there was a bi-modal, tri-modal, or multi-modal preference (Fleming, 2006).

Finally, the VARK process also determines whether or not the strength of a single preference is mild, strong or very strong. If the difference between the highest score and

the other three scores is six or more, the single preference is strong. Conversely, if a two point difference separates the highest score and the other scores, as in the example provided, the preference is mild (Fleming, 2006).

Fleming (2006) provided the following statement regarding the reliability of the VARK Questionnaire:

> The questionnaire was not designed to be reliable in terms of consistency of scores over a long period of time. Instead, the questionnaire was designed to provide students with effective learning strategies to use on their learning preference(s). Over the course of a student's career it is likely that some modes will become strengthened, some will dominate and others may be under utilized, therefore it is difficult to say that a student taking this test each year for twelve consecutive years will obtain similar scores each year. On the other hand, if a test-retest occurs within a few weeks it is likely that the scores received will be similar (p. 56).

Since the VARK indicates a profile and not a score, it is not beneficial to conduct longitudinal research with the VARK Questionnaire. "It is hypothesized and accepted that individual VARK profiles will change with age and experience" (p. 56).

Conversely, because the VARK is not a semantic quiz its content validity is strong since it is based on a respondent's experiences. Additionally, when correlated with students' self-perceptions of their learning styles and their study strategies Fleming (2006) reported "the VARK instrument was remarkably consistent" (p. 57). He cited a Hurd and Bonwell conducted study, which reported this strong correlation between the

students' study strategies and their VARK profile. The results of Hurd and Bonwell's study show that those respondents with a V, A, or K preference used a variety of study strategies, especially those that correlated with their own preference (except R). Those respondents with a strong preference for R correlated almost entirely with R strategies (Fleming). See Table 9 for the study strategies and learning preferences correlation put forth in the Hurd and Bonwell study.

Table 9

Study Strategies and Learning Preferences Correlation

Students' Study Strategies used	Students' Modality Preferences from the VARK Questionnaire			
	V	A	R	K
V	.46*	.21*	.04	.27*
A	.28*	.34*	.15	.33*
R	.09	.12	.54*	.08
K	.24*	.17	-.05	.44*

*significance level .001 Reproduced by permission from the author, June 14, 2008

Summary

This study was conducted at a four-year public university in the southeastern region of the United States. The sample consisted of 96 baccalaureate nursing students enrolled in NURS 3740 Holistic Nursing: Infants and Children. This quasi-experimental, pre-test/post-test design examined two different methods of instruction (gaming versus lecture) with regards to the impact on learning and retention of knowledge of PCD content. This study also examined the difference between participants' preferred learning styles and final exam scores. The researcher used a one-way repeated-measures ANOVA

to statistically analyze the learning that occurred from pre to post-test, as well as the long-term retention from post-test to final exam. The significance level was set at .05. The ANOVA was also used to determine if a significant difference existed between final exam scores and learning style preferences of participants. Significance was set at .05. The researcher also collected data on the participants' demographics, including age, race, sex, GPA, and self-reported VARK scores. Finally, the researcher used a Student Perceptions Survey to determine participants' perceptions about the effectiveness of gaming as an educational tool.

CHAPTER IV. RESULTS

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of pediatric cardiovascular dysfunction (PCD) content. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university. The research questions for this study were: (1) What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction? (2) What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of instruction based on final examination scores of baccalaureate nursing students? (3) Is there a difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

The purpose of this chapter is to present the research study findings for this quasi-experimental, pre-test/post-test design as they address the three research questions. This chapter will also explore participant perceptions about the game used in this study. The final research sample consisted of 96 junior level baccalaureate nursing students.

The researcher used the statistical package for the social sciences (SPSS) Windows version 15.0 software package to analyze the quantitative data. For research

questions one and two, this analysis included calculating a one-way repeated-measures analysis of variance (ANOVA) with a significance level of .05 to compare participants' pre-test, post-test, and final exam scores. For research question three, the researcher used the ANOVA to determine if significant differences existed between final exam scores and learning style preferences of experimental group (EG) participants. The significance level for this test was also .05.

Research Questions #1 and #2

1. What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction?
2. What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of instruction based on final examination scores of baccalaureate nursing students?

The study design consisted of measuring previous knowledge, learning, and retention of knowledge on PCD content. The independent variables were the use of gaming to deliver PCD course content to the EG and the use of traditional lecture format to deliver PCD course content to the control group (CG). The dependent variables were changes in performance from pre-test to post-test scores and post-test to final exam scores.

Both the CG and EG had 48 participants. The 46 participants from the 2007 class were randomly divided into a CG (n = 24) and EG (n = 22), while the 50 participants from the 2008 class were randomly divided into a CG (n = 24) and EG (n = 26). Levene's Test of Equality of Error variance revealed no statistically significant differences on the pretest (F(1, 94, = .366, p = .547), post-test (F(1, 94, = .039, p = .845), or final exam

(F(1, 94, = .026, p = .872). Therefore, the study did not violate the assumption of equal variances.

Calculated measures of central tendency revealed both groups had approximately the same pre-test means, while the post-test mean for the EG was higher when compared to the CG.. Similarly, mean values on the final exam were slightly higher for the EG when compared to the CG (see Table 10).

To determine whether or not learning differed at a statistically significant level from pre-test to post-test and post-test to final exam, a repeated measures ANOVA was calculated with a significance level of .05. The results (F (2, 93) = 74.07, p < .001, η^2 = .614) indicated participant learning occurred at a statistically significant level within each group from prior knowledge (pre-test), to learning (post-test), to knowledge retention (final exam), but no statistically significant difference (F (2, 93) = .654, p = .522, η^2 = .014) between the two groups. Descriptive statistics also indicated learning occurred within groups as seen by an increase in CG pre to post-test means of 14.7 and post-test to final exam means of 10.8, while EG pre to post-test means increased 18.3 and post-test to final exam means 7.9. However, the ANOVA results revealed that neither the traditional lecture method of instruction nor the gaming method made a significant difference in learning or retaining PCD content.

Table 10

Means and Standard Deviations for Pre-test, Post-test, and Final Exam and p Values from ANOVA

Test	*n*	*M*	*SD*	*p* value
Pre-Test				
Control Group	48	48.3	13.6	
Experimental Group	48	48.8	13.0	
Post-Test				
Control Group	48	63.0	12.1	
Experimental Group	48	67.1	11.5	
Final Examination				
Control Group	48	73.8	21.1	
Experimental Group	48	75.0	21.6	
Significance of ANOVA				
Within Groups				< .001
Between Groups				.522

N = 96; M = Mean; *SD* = Standard Deviation

Research Question #3

3. Is there a significant difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

This study also sought to examine if there was a significant difference between EG participants' learning style preference and final exam scores. Eighty-eight percent

(n = 42) of the 48 EG participants self-reported their VARK scores. According to Silberman (1996), “few students are exclusively one kind of learner” (p. 5). Instead, most have multiple learning preferences. In this study, 67% (n = 28) of the EG participants reported multi-modal learning preferences. Fleming (2006) contends that individuals with multi-modal preferences have little to no difference between two or more singular modes (as determined by their VARK scores) and, therefore, could have any combination of these individual modes (e.g., VA, VAR, AR, VK, or even VARK). Based on the multi-modal preference, the individual will move between these learning modes to use the one most applicable to the given learning environment. For example, if the learning environment involves the knowledge and use of a physical skill the multi-modal individual will choose the kinesthetic mode if that is part of his of her multi-modal preference. The other 33% (n = 14) of EG participants reported a single learning preference. These individuals rely primarily on that single learning preference regardless of the learning environment. For example, if the individual prefers the visual mode the individual will look for learning strategies that include pictures, graphs, depictions, etc. (Fleming, 2006). Table 11 shows the variety of learning preferences among study participants.

The final exam contained five items related to PCD content. Two of the five items were written (no diagrams) and the remaining three were visual (pictures of the heart relating to a specific pediatric cardiovascular disease process). One might expect those students with Visual (V) or Kinesthetic (K) learning preferences to choose the correct answer on the visual items more often than those with Aural (A) or Read/write (R)

preferences. However, in this study there was no significant difference between these various learning style groups and the ability to answer the picture questions correctly.

Of the 42 participants who reported their VARK scores, 26% (n = 11) scored 100%, 45% (n = 19) scored 80%, and 29% (n = 12) scored 60% or less on the final exam cardiac subset. In each of these groups, a significant number of respondents (100%, 79%, and 83% respectively) reported a single K learning preference or a multi-modal preference that included at least a V, K, or both V and K. Conversely, only 21% and 17% respectively reported A, R, or A/R preferences.

In analyzing the number of correct picture answers for each learning preference style group, there was no significant difference noted between groups. Those who scored 100% were all single K or multi-modal with V, K, or V and K, and answered all three picture questions correctly. However, at the other end was a single R preference participant who scored 40% on the final exam cardiac subset with the only two correct answers being the pictures. In between, one multi-modal VARK respondent answered zero picture questions correctly and a number of A, R, and A/R respondents answered two of three picture questions correctly.

To further analyze the learning style to final exam differences, the researcher calculated a one-way ANOVA to determine whether or not a significant difference existed between EG participants' learning style preferences and their final exam scores. The results ($F(1, 40) = .088$, $p = .769$) indicated no statistically significant difference existed between preferred learning styles and final exam scores.

Table 11

EG Participants' Learning Preferences

Preference	*n*	% of Total
Single-Preference		
V	0	0
A	3	.07
R	2	.05
K	9	.21
Total	14	.33
Multi-Preference		
VR	3	.07
VK	1	.02
AR	1	.02
AK	2	.05
RK	4	.1
VAR	1	.02
VRK	3	.07
ARK	4	.1
VARK	9	.21
Total	28	.67 *

V = Visual; A = Aural; R = Read/write; K = Kinesthetic
* = due to individual rounding, column total does not add to .67; however, in total 28/42 is rounded to .67

Findings Related to Student Perceptions

Forty-four (92%) of the 48 EG participants completed a Student Perceptions Survey to provide their perceptions on the effectiveness of gaming as an educational tool. Six of the ten responses allowed the researcher to explore the following major concepts

concerning gaming: whether or not it provided fun and excitement, encouraged active participation and learning, provided a stress-free environment, was an effective learning tool, increased confidence related to PCD content, and motivated students to prepare for class. Mean scores for each of the six questions were calculated using Microsoft Excel 2007 (see Table 12). More than 90% of the EG participants agreed or strongly agreed gaming is a fun and exciting way to learn, encourages active participation and learning, and is an effective learning tool in nursing education; 80% agreed or strongly agreed gaming provides a stress-free environment conducive to learning; more than 70% agreed or strongly agreed gaming motivated them to prepare before coming to class; and almost 60% agreed or strongly agreed playing the game provided them confidence in their understanding related to PCD content (See Table 13).

Table 12

Means for Student Perceptions Survey

Question	Tally of Responses					*M*
	Strongly Disagree				Strongly Agree	
	1	2	3	4	5	
The game was a fun and exciting way to learn difficult pediatric content.	2		1	13	28	4.48
The game encouraged active participation and learning on the part of the student.	2		1	13	28	4.48
The game provided a stress-free (decreased anxiety) environment conducive to learning.	2	2	5	14	21	4.14
I believe gaming is an effective learning tool in nursing education.	1	1	2	19	21	4.32
I am confident in my understanding of the concepts related to pediatric cardiovascular dysfunction.	1	5	12	18	8	3.61
Playing the game motivated me to complete the required reading assignments before coming to class.	1	6	5	17	15	3.89
Overall Mean						4.15

N = 44

Table 13

Percentage of Students that chose Strongly Agree or Agree

Question	*n*	%
The game was a fun and exciting way to learn difficult pediatric content.	41	93
The game encouraged active participation and learning on the part of the student.	41	93
The game provided a stress-free (decreased anxiety) environment conducive to learning.	35	80
I believe gaming is an effective learning tool in nursing education.	40	91
I am confident in my understanding of the concepts related to pediatric cardiovascular dysfunction.	26	59
Playing the game motivated me to complete the Required reading assignments before coming to class.	32	73

N = 44

The Student Perceptions Survey also asked participants to provide responses to "What I liked Best" and "What I liked Least" statements and provided an "additional comments" section as well (see Appendix N for a complete list of all comments). The researcher found these comments overall positive.

Summary

This chapter presented the results of this quasi-experimental, pre-test/post-test, design study as they addressed the three research questions. The researcher used SPSS for Windows (software package 15.0) to analyze quantitative data, which included using a

repeated-measures ANOVA to compare differences between EG and CG pre-test, post-test, and final exam scores. The study also presented measures of central tendency on the pre-test, post-test, and final exam. Using a one-way ANOVA, the researcher also sought to determine if a significant difference existed between EG participants' learning preference and their final exam scores. Finally, the results of a Student Perceptions Survey found that 91% of EG participants perceived gaming as an effective learning tool in nursing education.

CHAPTER V. SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The primary purpose of this study was to examine if the use of gaming would have an impact on learning and retention of knowledge of pediatric cardiovascular dysfunction (PCD) content. This study also examined whether or not a difference existed between final exam scores and learning style preferences among nursing students attending a baccalaureate nursing program at one southeastern, four-year public university.

The research questions for this study were: (1) What is the difference on pre and post-test scores of baccalaureate nursing students participating in gaming and traditional lecture methods of instruction? (2) What is the knowledge retention level when using gaming as a method of instruction versus the traditional lecture method of instruction based on final examination scores of baccalaureate nursing students? (3) Is there a significant difference among final exam scores between students who participated in gaming as the primary method of instruction and their learning style preferences?

The purpose of this chapter is to provide a summary of the study, discuss the conclusions and implications of the findings as they relate to the study's research questions and participants' perception of gaming, and provide recommendations for future research.

Summary

The college environment brings together adult learners from diverse backgrounds who have different goals, personal and work experiences, and learning styles. These individuals learn better when actively engaged in the learning process and have the ability to learn in as many ways as educators have ways to teach them. These realities make it important for adult educators to incorporate a variety of teaching methods in their courses to meet the needs of these diverse adult learners. Gaming is one such teaching method that has the potential to reach a wide and diverse population of adult learners. Therefore, this researcher examined the use of gaming as an effective teaching tool to determine if gaming enhanced learning and retention of knowledge.

The study answered the first and second research questions by analyzing participants' test-item responses using the repeated-measures ANOVA. This analysis compared the differences between experimental group (EG) and control group (CG) participants to determine if gaming resulted in enhanced learning and retention of knowledge on PCD content. Within each group, the results revealed learning occurred at a statistically significant level from pre-test to post-test and post-test to final exam for all participants. However, when comparing the two groups against each other the results revealed no statistical significance between them.

The study answered the third research question by using a one-way ANOVA to determine if a significant difference existed among EG participants' learning style preferences and their final exam scores. Results revealed no significant differences between participants with different learning styles and their ability to answer the final exam questions correctly.

Finally, the researcher analyzed participant responses to a Student Perceptions Survey to address participant perceptions related to the use of gaming in nursing education as an effective educational tool. The means were calculated for the six questions related to the study. The results identified that more than 50% of the participants found the gaming activity a fun and exciting way to learn PCD content in a stress-free environment. Participant responses to the survey also revealed the game encouraged active preparation for class participation; encouraged active participation in the learning process; and indicated participants judged gaming an effective learning tool that helped increase confidence related to PCD content. Written survey comments supported these positive results.

Conclusions

To summarize, the researcher drew 12 conclusions from this research study. The first eight relate directly to the study limitations; and nine through 12 relate to the pre and post-test, final exam, and Student Perceptions Survey.

Conclusion #1 - The study could not control pre-existing participant differences in artistic talent and game playing abilities. These differences could have impacted the results since the game required participants to draw pictures as part of the gaming process. During game play, more than a few participants commented on their inability to draw.

Conclusion #2 - The sample reflected just one junior nursing class, in one course, in one curriculum, in one southeastern four-year public university. Therefore, generalizing the study findings to the entire nursing student population is limited (Gall, Gall, & Borg, 2005).

Conclusion #3 - Eleven percent of the participants were dropped from the study before it was completed (four failed to meet appropriate academic standards and one withdrew consent), decreasing the overall number of participants. These individuals may have influenced a different final result had they remained in the study. While Polit and Hungler (1995) purport 30 participants in each group is sufficient for conducting research, for this study it is possible having only 48 participants in each group (EG and CG) may have impacted the results.

Conclusion #4 - The game design, pre and post-test construction, single treatment administration, and/or statistical calculation errors could have affected the study findings. For example, while the pediatric instructor confirmed the game design correlated well with the PCD content some participants became confused about the game rules during actual game play. This confusion resulted in participant disagreements, which caused brief disruptions during the gaming session. Some students become frustrated when participants do not understand or follow directions and such frustrations can result in a chaotic environment that decreases student learning (Bartfay & Bartfay, 1994; Berbiglia et al., 1997; Bloom & Trice, 1994; Cessario, 1987; Corbett & Lee, 1992; Gruending et al., 1991; Hanna, 1991; Lewis et al., 1989; Rowles & Brigham, 2005; Skinner, 2000; Wargo, 2000).

While the pre and post-test items for lecture and game play material came from a pre-existing School of Nursing test bank perhaps the particular mix of questions on these exams impacted the results. For example, the post-test DF showed 85% of the test-items fell within the range of reasonable to very good discrimination. Conversely, the DI revealed only 40% discriminated well between higher and lower-scoring students. This

meant that participants in both groups answered almost equally as well on most test-items. While 100% of the final exam PCD content test items had reasonably good to very good discrimination and 80% discriminated well between the upper and lower-scoring students, there was not enough discrimination to show a statistically significant difference between groups on the repeated-measures ANOVA.

Administering only one research treatment, rather than multiple treatments, could have impacted the results. “In some experiments, the treatments are such brief duration that it is not reasonable to expect an effect on the research participants’ learning or other outcomes” (Gall, Gall, & Borg, 2005, p. 143).

Statistical calculation errors, to include incorrect variable set-up, could have affected the results. However, for this study the researcher did have three other people with a background in statistics review the statistical analysis to validate it was performed correctly.

Conclusion #5 - The potential for jeopardizing internal validity was possible given the one-hour break between the CG lecture and the EG game play. During this time, students from the two groups could have discussed the lecture material and/or post-test content. Ideally, these two events would have taken place simultaneously in two different locations. However, for this study this was not possible due to the time constraints imposed by the overall School of Nursing course schedule.

Conclusion #6 - Variables such as participant age, sex, and grade point average (GPA) could have impacted the study results. For example, age differences can translate into experience and generational differences that can impact a student’s ability and

willingness to learn. Differences in sex can also cause learning differences if the participants' learning style preferences were affected by society's tendency to view males as more analytical and methodical and females as more nurturing (Nadeau, 1997). While GPA could have impacted the study since students with higher GPAs tend to be better overall performers than those with lower GPAs, this did not appear to be the case for this study since results indicated no statistically significant differences between high and low scoring students.

Conclusion # 7 - Learning style differences could have impacted the study, especially if the CG (lecture) had more visual (V) and kinesthetic (K) learners than aural (A) and read/write (R) and/or the EG (gaming) had more A and R than V and K. Additionally, only 83% of the participants self-reported their VARK learning style scores. If the remaining 17% had reported their scores, the final result may have been different.

For this study, learning styles of the EG participants had no impact since results showed no statistically significant difference between EG participants' learning preferences and their ability to correctly answer cardiac sub-set visual test-items on the final exam. This may have been due to the fact that 67% of the EG participants reported multi-modal preferences that included at least V, K, or V and K. According to Silberman (1996), "few students are exclusively one kind of learner" (p. 5). Therefore, with the majority of EG participants reporting a multi-modal preference one would not expect significant differences between the participants in the EG due solely to learning style preferences.

Conclusion #8 - One problem with experimental studies is the potential for participants' to change their behavior because they know they are being studied. Known as the Hawthorne effect, the changes participants demonstrate could impact the results of the study (Polit & Hungler, 1995). For example, participants in this study completed the pre-test online (via the WebCT component of the pediatrics course). While participants were asked not to review content related to PCD for this test, some demonstrating the Hawthorne effect may have done so. This could have resulted in higher pre-test scores which could have impacted the comparison results between the pre-test and post-test. To help decrease the incidence of the Hawthorne effect, many researchers use a double-blind study (participants are unaware of whether they are in the CG or EG) (Polit & Hungler). Unfortunately, the Hawthorne effect could not be controlled for this study because of the nature of the treatment (gaming) and Internal Review Board requirements for providing informed consent on what the treatment entailed.

Conclusion #9 - The results related to learning (as evaluated by pre-test to post-test analysis) support the inconsistencies found in the literature review of different research findings. For example, Zapp's (2001) study used various instructional methods, to include games, and revealed a statistically significant difference between the EG (game) and the CG (lecture) with the EG demonstrating higher scores on the post-test than the CG. In their study on gaming, Cowen and Tesh (2002) also reported those who participated in gaming scored significantly higher on the post-test than those who attended lecture. Conversely, Montpas (2004) reported the CG (lecture) demonstrated a greater increase in score from pre to post-test when compared to the EG (gaming) and

Frazer (2007) reported no statistically significant differences between EG and CG participants. This last study is consistent with the researcher's findings in this current study.

Conclusion #10 - The results related to retention of knowledge (post-test to final exam) are inconsistent with the literature review of the two research studies discovered for gaming and its impacts on retention of knowledge. The Cowen and Tesh (2002) study supported the use of gaming as an effective tool for knowledge retention. These researchers reported students in the gaming group answered 94% of the post-test questions correctly versus 85% for the lecture group. Likewise, Montpas (2004) reported the results of an independent samples *t* test indicated retention of geriatric concepts was statistically significantly different between groups with the gaming group demonstrating the greater statistical significance. These results are in contrast to the current study, which indicated no differences between groups.

Conclusion #11 - Participant responses (93%) on the Student Perceptions Survey reported the gaming activity was fun, exciting, and encouraged student participation and learning. The literature supports this finding, describing games as fun and exciting and putting forth they encourage participation and enhance learning (Speers, 1992; Waddell, et al., 1994). Ninety-one percent of participants also responded gaming is an effective learning tool in nursing education and 80% indicated gaming provided a stress-free environment conducive to learning. This is consistent with much of the literature, which addresses the positive benefits of gaming as it related to reducing stress (Calliari, 1991; Gruending, et al., 1991; Joos, 1984; Stern, 1989). Finally, 73% indicated participating in the game motivated them to prepare for class and 59% indicated it

improved their confidence regarding their knowledge of PCD content. This study supports the need for active learning activities like gaming to help learn this difficult content since Cowen and Tesh (2002) put forth students cite PCD content as one of the most difficult topics to learn.

Conclusion #12 - While the results of this study indicated no statistically significant differences in learning and retention of knowledge between participants who played a game or those who attended lecture, learning and retention of knowledge did occur within each group. Therefore, this study indicated both the traditional method of lecture and the non-traditional method of gaming are equally effective for enhanced learning and retention of knowledge. At the same time, the participants' Student Perceptions Survey responses indicated gaming is a valuable educational tool. This is consistent with the literature, which indicated gaming is an additional teaching method nurse educators could use to address a variety of learning styles in helping meet the needs of adult learners (Arms, et al., 1984; Bays & Hermann, 1997; Cowen & Tesh, 2002; Glendon & Ulrich, 1992; Hermann & Bays, 1991; Jeffreys, 1991; Knowles, 1980; Lowman, 1984; Morton & Tarvin, 2001; Saethang & Kee, 1998).

Implications

While this study was conducted within a School of Nursing, the implications of the study are relevant to other disciplines within higher education classrooms as well. Nurse educators have an obligation to graduate competent nurses who have the skills to solve problems, make sound decisions, think critically, and communicate effectively to safely care for their patients (Henderson, 2005). Therefore, teaching strategies that enhance learning those skills are imperative to nursing education. Based on the

researcher's observations and the participants' verbal and written comments, the gaming session provided a collaborative learning environment that encouraged participants to further develop their communication, critical thinking, decision making, and problem solving skills.

Knowles' (1980) Adult Learning Theory served as the conceptual framework for this study and the use of gaming as a teaching method. Therefore, aspects of Knowles' theory were evident in this study. First, many participants reported the gaming motivated them to take responsibility for their own self-directed learning. In order to play the game, they prepared for class when they normally did not do so. Second, during game play the teacher shared her pediatrics disease process experiences with the participants. This directly correlates with Knowles' second assumption about adult learners, that learning is built on the accumulation of life experiences and sharing those experiences can help others learn. Third, an adult's readiness to learn becomes increasingly associated with the developmental tasks of social roles and is thereby promoted by the socialization that takes place during game playing. The researcher observed this throughout the gaming session.

In summary, it is clear there is a disparity among various research studies on the effects of gaming in the educational environment. However, each time a researcher completes and reports the results of a study that data adds to the overall information on this subject. As the number of studies increase, researchers should be in a better position to draw a more informed conclusion as to the benefits (or lack thereof) of gaming in the adult education environment.

Recommendations

(1) Future studies using this particular game (whether keeping the PCD content or changing the content to fit another topic area) should attempt to enlarge the sample population. Researchers should complete power analysis to determine the ideal number of study participants for providing valid results. Where possible, beginning participant numbers should exceed the power analysis number to compensate for potential attrition rates prior to study completion. The researcher should also select participants from a variety of geographical locations and multiple nursing levels (junior and senior students) since gaming could potentially benefit one level of student over another. To help implement this recommendation, the researcher should consider collaborating with other researchers at several different schools in several different geographical locations. Additionally, recommend the researcher implement a variety of gaming formats since one game may produce better results than another.

(2) Recommend the researcher field test the pre and post-test instruments, as well as analyze their scores using Cronbach's alpha coefficient, prior to using them in the study. This will determine instrument reliability before study use and allow the researcher to adjust the instrument if it is found to be marginally valid or invalid. Additionally, recommend the researcher develop a separate study exam versus using the test items from the existing course final exam. This would help ensure equity in the number of test-items between the pre and post-tests when compared to the final exam and should provide a more reliable assessment of long-term retention.

(3) Recommend the researcher conduct more than one treatment. If the researcher wanted to use the same course content throughout the study, the researcher could

accomplish this by finding a school that offered a particular course multiple times per year versus once per year. If the researcher was willing to use different course content, the researcher could revise the game for each content area so treatments were conducted with the same group of students in a variety of courses.

(4) Where possible, recommend the researcher conduct the game and the lecture in different locations during the same instructional period. This may help avoid the potential for jeopardizing internal validity of the study.

(5) Recommend the researcher include variables such as age, sex, and GPA in the statistical analysis to determine if these variables impact the study. This may be important given the student diversity found in many nursing education programs.

(6) Recommend the researcher administer the VARK questionnaire as part of the study rather than relying on participants' self-report of VARK scores. This may help increase the return rate of VARK scores adding to the overall validity of the study. Additionally, recommend that the researcher use other learning style instruments to determine if various instruments affect the results in a different way. Furthermore, recommend the researcher explore participant motivation and its potential impact on study outcomes. For example, were any of the EG participants motivated to learn the material prior to the gaming exercise in order to simply win the game or impress their friends? At the same time, were any of the CG participants less motivated given their participation in lecture only? In either case, could that have affected the study's outcome?

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APPENDIX A

VARK QUESTIONNAIRE

VARK

visual aural read/write kinesthetic

The VARK Questionnaire – English Version (version 3)

How Do I Learn Best?

This questionnaire aims to find out something about your preferences for the way you work with information. You will have a preferred learning style and one part of that learning style is your preference for the intake and output of ideas and information.

Choose the answer which best explains your preference and circle the letter next to it. Please circle more than one if a single answer does not match your perception.

Leave blank any question which does not apply, but try to give an answer for at least 10 of the 13 questions

When you have completed the questionnaire, use the marking guide to find your score for each of the categories, Visual, Aural, Read/Write and Kinesthetic. Then, to calculate your preference, use the Scoring sheet (available in the "advice to teachers" section of the VARK web site).

1. You are about to give directions to a person who is standing with you.
   She is staying in a hotel in town and wants to visit your house later.
   She has a rental car. I would:
   a. draw a map on paper
   b. tell her the directions
   c. write down the directions (without a map)
   d. collect her from the hotel in my car

2. You are not sure whether a word should be spelled 'dependent' or 'dependant'. I would:
   a. look it up in the dictionary.
   b. see the word in my mind and choose by the way it looks
   c. sound it out in my mind.
   d. write both versions down on paper and choose one.

3. You have just received a copy of your itinerary for a world trip. This is of interest to a friend. I would:
   a. phone her immediately and tell her about it.
   b. send her a copy of the printed itinerary.
   c. show her on a map of the world.
   d. share what I plan to do at each place I visit.

4. You are going to cook something as a special treat for your family. I would:
   a. cook something familiar without the need for instructions.
   b. thumb through the cookbook looking for ideas from the pictures.
   c. refer to a specific cookbook where there is a good recipe.

5. A group of tourists has been assigned to you to find out about wildlife reserves or parks. I would:
   a. drive them to a wildlife reserve or park.
   b. show them slides and photographs
   c. give them pamphlets or a book on wildlife reserves or parks.
   d. give them a talk on wildlife reserves or parks.

6. You are about to purchase a new stereo. Other than price, what would most influence your decision?
    a. the salesperson telling you what you want to know.
    b. reading the details about it.
    c. playing with the controls and listening to it.
    d. it looks really smart and fashionable.

7. Recall a time in your life when you learned how to do something like playing a new board game. Try to avoid choosing a very physical skill, e.g. riding a bike. I learnt best by:
    a. visual clues -- pictures, diagrams, charts
    b. written instructions.
    c. listening to somebody explaining it.
    d. doing it or trying it.

8. You have an eye problem. I would prefer the doctor to:
    a. tell me what is wrong.
    b. show me a diagram of what is wrong.
    c. use a model to show me what is wrong.

9. You are about to learn to use a new program on a computer. I would:
    a. sit down at the keyboard and begin to experiment with the program's features.
    b. read the manual which comes with the program.
    c. telephone a friend and ask questions about it.

10. You are staying in a hotel and have a rental car. You would like to visit friends whose address/location you do not know. I would like them to:
    a. draw me a map on paper.
    b. tell me the directions.
    c. write down the directions (without a map).
    d. collect me from the hotel in their car.

11. Apart from the price, what would most influence your decision to buy a particular textbook:?:
    a. I have used a copy before.
    b. a friend talking about it.
    c. quickly reading parts of it.
    d. the way it looks is appealing.

12. A new movie has arrived in town. What would most influence your decision to go (or not go)?
    a. I heard a radio review about it
    b. I read a review about it.
    c. I saw a preview of it.

13. Do you prefer a lecturer or teacher who likes to use:?
    a. a textbook, handouts, readings
    b. flow diagrams, charts, graphs.
    c. field trips, labs, practical sessions.
    d. discussion, guest speakers.

The VARK Questionnaire – English Version Scoring Chart

Use the following scoring chart to find the VARK category that each of your answers corresponds to. Circle the letters that correspond to your answers

e.g. If you answered b and c for question 3, circle R and V in the question 3 row.

Question	a category	b category	c category	d category
3	A	R	V	K

Scoring Chart

Question	a category	b category	c category	d category
1	V	A	R	K
2	R	V	A	K
3	A	R	V	K
4	K	V	R	
5	K	V	R	A
6	A	R	K	V
7	V	R	A	K
8	A	V	K	
9	K	R	A	
10	V	A	R	K
11	K	A	R	V
12	A	R	V	
13	R	V	K	A

Calculating your scores

Count the number of each of the VARK letters you have circled to get your score for each VARK category.

Total number of **V**s circled =	
Total number of **A**s circled =	
Total number of **R**s circled =	
Total number of **K**s circled =	

Calculating your preferences

Use the "Scoring Instructions" sheet (available in the "advice to teachers" section of the VARK web site) to work out your VARK learning preferences.

APPENDIX B

RESEARCHER DEVELOPED 20-ITEM MULTIPLE CHOICE PRE-TEST

Researcher Developed 20-item Multiple Choice Pre-test

RESEARCH PARTICIPANT IDENTIFICATION NUMBER_____

1. The nurse caring for an infant with congestive heart failure (CHF) is monitoring the infant closely for early signs of exacerbation. Which of the following alerts the nurse of the development of CHF?

    a. Bradycardia during feedings
    b. Slow and shallow breathing
    c. Diaphoresis during feedings
    d. Pallor

2. The physician has prescribed oxygen PRN for the child with CHF. In which of the following situations does the nurse administer the oxygen to the child?

    a. When drawing blood for electrolyte values
    b. During feeding
    c. When the mother is holding the child
    d. When changing the child's diapers

3. The infant with CHF is receiving diuretic therapy. Which of the following is the most appropriate method to assess urine output?

    a. Insert a Foley catheter
    b. Weigh the diapers
    c. Compare intake and output
    d. Measure the amount of water added to the formula

4. A 4-month-old who has a congenital heart defect develops congestive heart failure and is exhibiting marked dyspnea at rest. This finding is attributed to:

    a. Pulmonary edema
    b. Anemia
    c. Hypovolemia
    d. Metabolic acidosis

5. An infant with heart failure is admitted to the hospital. Which goal has the highest priority when planning nursing care?

    a. The infant will have digoxin by the bedside
    b. Administer medications on time
    c. Skin integrity will be addressed
    d. The infant will maintain an adequate fluid balance

6. The nurse reviews the chart of an infant admitted to the intensive care unit. The diagnosis is documented as a right-to-left cardiac shunt. Which of the following physiological alterations occurs in this condition?

    a. Blood is shunted to the left side of the heart
    b. The right side of the heart functions under greater pressure than the left side
    c. Oxygenated and unoxygenated blood mix
    d. Oxygenated and unoxygenated blood do not mix

7. An infant on the ward is receiving digoxin and diuretic therapy. The nurse knows that which of the following choices indicates no toxicity?

    a. Heart rate less than 100, no dysrhythmias
    b. Heart rate greater than 100, no dysrhythmias
    c. Heart rate 80 – 100
    d. Vomiting

8. The nurse is caring for an infant with tetralogy of Fallot. The nurse recognizes that the infant is experiencing a hypercyanotic episode. The initial nursing action is to:

    a. Call the physician
    b. Elevate the head of the bed
    c. Place the infant in a knee-chest position
    d. Administer carbon dioxide whiffs

9. The nurse is aware that a common adaptation of children with tetralogy of Fallot is:

    a. Slow, irregular respirations
    b. Decreased red blood cell count
    c. Subcutaneous hemorrhages
    d. Clubbing of fingers

10. A child with tetralogy of Fallot has been admitted. What equipment is most important to have at the bedside?

    a. An oxygen setup
    b. Morphine
    c. A blood pressure cuff
    d. A thermometer

11. The clinic nurse reviews the record of a child just seen by the physician. The physician has documented a diagnosis of a suspected Stenotic lesion. Which of the following symptoms documented in the record is most commonly found in this disorder?

    a. Subclavian bruit
    b. Cardiac murmur
    c. Pallor
    d. Gastric regurgitation

12. Alice White, 10-years-old, has been hospitalized for two weeks with rheumatic fever (RF). Alice's mother questions whether her other children can catch the RF. The nurse's best response is:

    a. It is caused by an autoimmune reaction and is not contagious
    b. The fact that you brought Alice to the hospital early enough will decrease the chance of her siblings getting it
    c. You appear concerned that your daughter's disease is contagious
    d. Your other children should be taking antibiotics to prevent them from catching RF

13. When examining the laboratory work of a child with the diagnosis of rheumatic fever, the nurse would expect the findings to demonstrate:

    a. A negative-C reactive protein
    b. An elevated reticulocyte count
    c. A positive Antistreptolysin titer
    d. A decreased erythrocyte sedimentation rate

14. A 9-year-old girl with rheumatic fever is asking to play. Which diversional activity is the nurse likely to offer?

    a. Walking to the gift store
    b. Coloring books and crayons
    c. A dancing contest
    d. A 300 piece puzzle

15. A newborn is diagnosed with coarctation of the aorta. The baby is discharged with a prescription for digoxin (Lanoxin) 0.01 mg po q12h. The bottle of digoxin is labeled 0.01 mg in ½ teaspoon. The nurse should teach the mother to administer the medication by using:

    a. A nipple
    b. The calibrated dropper in the bottle
    c. A plastic baby spoon
    d. The small size baby bottle with 1 oz of water

16. The nurse is planning care for a two-week-old infant who has a congenital heart defect. Which of the following actions is not appropriate?

    a. Using a soft "preemie" nipple for feedings
    b. Providing passive stimulation
    c. Allowing him to cry to promote increased oxygenation
    d. Placing him in orthopneic position

17. A newborn with a cardiac defect is fed in the semi-Fowler's position. After the nurse feeds and burps the infant and changes the infant's position, the infant has a bowel movement and almost immediately becomes cyanotic, diaphoretic, and limp. These symptoms are most likely caused by the:

    a. Burping
    b. Bowel movement
    c. Formula
    d. Position change

18. A 10-year-old with ventricular septal defect (VSD) is going to have a cardiac catheterization. Which of the following needs to be a high priority for the nurse to assess?

    a. Capillary refill
    b. Breath sounds
    c. Arrhythmias
    d. Pedal pulses

19. A child returns to the unit following a cardiac catheterization. The statement on the child's progress made during the change-of-shift report 2 hours after the catheterization that should be questioned by the oncoming nurse would be that the child:

    a. Is on bed rest with bathroom privileges
    b. Has a pressure bandage over the entry site
    c. Has voided only 100 mL since the procedure
    d. Has to have the blood pressure checked every 2 hours

20. A 3 ½ -year old child returns to the room after a cardiac catheterization. Post-procedure nursing care for the child should include:

    a. Encouraging early ambulation
    b. Monitoring the insertion site for bleeding
    c. Restricting fluids until blood pressure is stabilized
    d. Comparing blood pressure in affected and unaffected extremities

APPENDIX C

RESEARCHER DEVELOPED 20-ITEM MULTIPLE CHOICE POST-TEST

Researcher Developed 20-item Multiple Choice Post-test

RESEARCH IDENTIFICATION NUMBER_____

1. The nurse provides home care instructions to the parents of a child with CHF regarding the procedure for administration of digoxin (Lanoxin). Which of the following is not a component of the plan?

    a. If the child vomits after medication administration, repeat the dose
    b. Take the child's pulse before administering the medication
    c. Do not mix the medication with food
    d. If more than one dose is missed, call the physician

2. The nurse is aware that in infants with congestive heart failure (CHF):

    a. The illness is an acquired congenital anomaly
    b. The treatment differs vastly form adult treatment
    c. Treatment is experimental because infants rarely develop CHF
    d. Digoxin (Lanoxin) and furosemide (Lasix) are the most commonly used medications

3. The mother of a 5-month-old infant with congestive heart failure questions the necessity of weighing the infant every morning. The nurse's response should be based on the fact that this daily information is important in determining:

    a. Renal failure
    b. Fluid retention
    c. Nutritional status
    d. Medication dosage

4. The nurse is caring for a child with a diagnosis of a right-to-left shunt. The most common assessment finding in this disorder is which of the following?

    a. Cyanosis
    b. Diaphoresis
    c. Growth retardation
    d. These children are asymptomatic

5. A child with transposition of the great arteries and patent ductus arteriosus (PDA) receives prostaglandin E_1 (PGE_1). The mother of the child is a registered nurse and asks the nurse why the child needs the medication. The most appropriate response is:

    a. "To maintain an adequate hormonal level"
    b. "To maintain the position of the great arteries"
    c. "To maintain patency of the ductus arteriosus"
    d. "To prevent cyanosis"

6. A 4-year-old with tetralogy of Fallot is seen in a squatting position near the bed. The nurse should:

    a. Administer oxygen
    b. Take no action if he looks comfortable but continue to observe him
    c. Pick him up and place him in Trendelenburg's position in bed
    d. Have him stand up and walk around the room

7. The nurse is aware that the aim of palliative surgery for children with tetralogy of Fallot is to directly increase blood flow to the:

    a. Brain
    b. Lungs
    c. Myocardium
    d. Right ventricle

8. When attempting to identify the presence of tetralogy of Fallot in an infant, the nurse should understand that:

    a. In the absence of cyanosis, poor sucking is insignificant
    b. Many infants retain mucus that may interfere with feeding
    c. Feeding problems are fairly common in infants during the first year
    d. Poor sucking and swallowing may be early indicators of heart defects

9. The nurse receives a telephone call from the admitting office and is told that a child with rheumatic fever (RF) will be arriving at the nursing unit for admission. The initial nursing assessment during admission includes which of the following?

    a. History of sore throat or unexplained fever within the past 2 months
    b. History of unexplained nausea and vomiting
    c. History of unexplained headaches
    d. History of back pain

10. A 10-year-old child is admitted with rheumatic fever. In addition to carditis, the nurse should assess the child for the presence of:

    a. Arthritis
    b. Bronchitis
    c. Malabsorption
    d. Oliguria

11. A 10-year-old has been diagnosed with rheumatic fever and is now being discharged. What statement made by the parents shows an understanding of long-term care?

    a. "She will need penicillin each day"
    b. "She will need antibiotic prophylaxis when she has dental work"
    c. "We will have yearly checkups"
    d. "The murmur will always go away by adolescence"

12. Christopher, 2 months, is suspected of having Coarctation of the aorta. The cardinal sign of this defect is:

    a. Clubbing of the digits and circumoral cyanosis
    b. Pedal edema and portal congestion
    c. Systolic ejection murmur
    d. Decreased blood pressure in lower extremities

13. Two-week-old Jonathon has a patent ductus arteriosus. Prior to administering digoxin the nurse should:

    a. Take the apical pulse for 30 seconds and multiply by 2
    b. Give the medication if his pulse is 92, but notify the physician
    c. Take the radial pulse for 1 full minute
    d. Give the medication after finding that the pulse is 135 beats/minute

14. An infant born at 39 weeks gestation is sent to the intensive care nursery. The nurse suspects a possible cardiac anomaly when the admission assessment reveals:

    a. Projectile vomiting
    b. An irregular respiratory rhythm
    c. Hyperreflexia of the extremities
    d. Unequal peripheral blood pressures

15. An infant with cardiac disease has been admitted to the nursery form the delivery room. Which finding helps the nurse differentiate between a cyanotic and an acyanotic defect?

    a. Infants with cyanotic heart disease feed poorly
    b. The pulse oximeter does not read above 93%
    c. Infants with cyanotic heart disease usually go directly to the operating room
    d. Cyanotic heart disease causes high fevers

16. A cardiac catheterization is scheduled for a 5-year-old with a ventricular septal defect to:

    a. Identify the degree of cardiomegaly present
    b. Demonstrate the exact location of the defect
    c. Confirm the presence of a pansystolic murmur
    d. Establish the presence of ventricular hypertrophy

17. Discharge instructions for a child following a cardiac catheterization should include:

    a. Giving a sponge bath for the first 3 days at home
    b. Using ice compresses to relieve swelling at the entry site
    c. Limiting fluid intake for the next 3 days to prevent nausea
    d. Returning to the clinic in 5 days for removal of the pressure dressing

18. When caring for a 4-month-old infant with tetralogy of Fallot and congestive heart failure, the nurse should:

    a. Force nutritional fluids
    b. Provide small, frequent feedings
    c. Measure the head circumference daily
    d. Position the infant flat on the abdomen

19. A 4-year-old is admitted to the hospital for a diagnostic workup for Pulmonic Stenosis. The nurse understands that Pulmonic Stenosis is:

    a. Narrowing of the valve between the left atrium and left ventricle
    b. Hardening of the valve between the right atrium and right ventricle
    c. Hardening of the lining of the pulmonary artery at a point close to the lungs
    d. Narrowing of the valve between the right ventricle and the pulmonary artery

20. Prior to discharge form the newborn nursery at 48-hours-old, the nurse knows that murmurs are frequently assessed and are most often due to which factor?

    a. A ventricular septal defect
    b. Heart disease of the newborn period
    c. Transition from fetal to pulmonic circulation
    d. Cyanotic heart disease

APPENDIX D

DEMOGRAPHIC DATA COLLECTION FORM

Demographic Data Collection Form

RESEARCHPARTICIPANT IDENTIFICATION NUMBER_____

SEX: _____ AGE _____

RACE: Please check one

Caucasian _____

Other _____

VARK SCORES:

V_____

A_____

R_____

K_____

APPENDIX E

STUDENT PERCEPTIONS SURVEY

Student Perceptions Survey

RESEARCH PARTICIPANT INDENTIFICATION NUMBER: _____

Question	**Strongly Agree**				**Strongly Disagree**
1) The game was a fun and exciting way to learn difficult pediatric content.	1	2	3	4	5
2) The game encouraged active participation and learning on the part of the student.	1	2	3	4	5
3) The instructor and researcher obtained sufficient feedback from students during the game to assess student understanding of the class materials.	1	2	3	4	5
4) The game provided a stress free (decreased anxiety) environment conducive to learning.	1	2	3	4	5
5) I believe gaming is an effective learning tool in nursing education.	1	2	3	4	5
6) I am confident in my understanding of the concepts related to pediatric cardiovascular dysfunction.	1	2	3	4	5
7) The amount of material covered during the game was appropriate for the time allowed for play.	1	2	3	4	5
8) Playing the game motivated me to complete the required reading assignments before coming to class.	1	2	3	4	5
9) The questions I had about the material were answered during the gaming session.	1	2	3	4	5
10) I felt comfortable asking questions during the game about material I didn't understand.	1	2	3	4	5

What I liked most:

What I liked least:

Additional comments:

Adapted from: Sealover, P, Henderson, D., Sharrer, V., Blake, T., and Sweet, S. (2000). Is that your final nursing answer? Lab, Ohio University: Zansville (as cited by Henderson, 2005). Some questions changed by this researcher to fit current study.

APPENDIX F

PERMISSION LETTER FROM AUBURN MONTGOMERY SCHOOL OF NURSING TO CONDUCT STUDY

AUBURN
MONTGOMERY

October 26, 2007

Dear Dr. Grandjean,

It is my understanding that Tracey Hodges is enrolled in the Adult Education doctoral program and plans to conduct research related to gaming as an educational strategy. I further understand that she plans to collect data from the students enrolled in NURS 3740 Holistic Nursing: Infants and Children, using control and experimental groups. The control group will be educated on pediatric cardiovascular content through lecture and the experimental group will play a game on the same content. The course faculty of record, Michelle Schutt, will present the lecture and be present to facilitate discussion of key points during the game conducted by Ms. Hodges.

Ms. Hodges will approach all the students enrolled in NURS 3740 on the first day of Spring semester 2008 and ask if they would be willing to participate. It is my understanding that participation is strictly voluntary and Ms. Hodges will explain all potential risks and benefits associated with the study to each participant.

I am pleased that Auburn University Montgomery School of Nursing can assist in Ms. Hodges' efforts.

Sincerely,

Ramona Browder Lazenby, EdD, CRNP
Assistant Dean and Associate Professor of Nursing
Auburn University Montgomery School of Nursing

AUBURN UNIVERSITY AT MONTGOMERY
SCHOOL OF NURSING
P.O. Box 244023, Montgomery, AL 36124-4023; Telephone: 334-244-3658; Fax: 334-244-3243, www.aum.edu

APPENDIX G

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD (IRB)

APPROVAL TO CONDUCT 2008 STUDY

AUBURN
UNIVERSITY

Office of Human Subjects Research
307 Samford Hall
Auburn University, AL 36849

Telephone: 334-844-5966
Fax: 334-844-4391
hsubjec@auburn.edu

January 3, 2007

MEMORANDUM TO: Tracey Hodges
Education Foundation, Leadership and Technology

PROTOCOL TITLE: "Examination of Gaming in Nursing Education and the Effects on Learning and Retention"

IRB AUTHORIZATION NO: 07-272 EP 0712

APPROVAL DATE: December 21, 2007
EXPIRATION DATE: December 20, 2008

The above referenced protocol was approved by IRB Expedited procedure under 45 CFR 46.110 (Category #7):

> "Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies."

You should report to the IRB any proposed changes in the protocol or procedures and any unanticipated problems involving risk to subjects or others. Please reference the above authorization number in any future correspondence regarding this project.

If you will be unable to file a Final Report on your project before December 20, 2008, you must submit a request for an extension of approval to the IRB no later than December 6, 2008. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to December 20, 2008, you must suspend the project immediately and contact the Office of Human Subjects Research for assistance.

A Final Report will be required to close your IRB project file. You are reminded that you must use the stamped, IRB-approved informed consent when you consent your participants. Please remember that you must keep signed informed consents for three years after your study is completed.

If you have any questions concerning this Board action, please contact the Office of Human Subjects Research.

Sincerely,

Niki L. Johnson, JD, MBA, Director
Office of Human Subjects Research
Research Compliance Auburn University

Enclosure
cc: Dr. Jose Llanes
Dr. Maria Witte

APPENDIX H

AUBURN UNIVERSITY MONTGOMERY INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL TO CONDUCT 2008 STUDY

AUBURN
MONTGOMERY

November 7, 2007

MEMORANDUM

TO: Tracey Hodges

FROM: Kyle Taylor, Interim Chair, AUM IRB

RE: Your proposal for research,
Old title: "Gaming: Is it all for Fun or Does Learning Occur in the Process"
New title: "Examination of Gaming in Nursing Education and the Effects on Learning and Retention, " **IRB file #2007-02**..

The previous research proposal has been approved in accordance with guidelines set forth in *45 CFR 46* (Code of Federal Regulations) under category 7 of the expedited review process. Your extension has been granted for IRB file #2007-02 until November 7, 2008. The title change from "Gaming: Is it all for Fun or Does Learning Occur in the Process," to "**Examination of Gaming in Nursing Education and the Effects on Learning and Retention**" has been documented as well. Please make sure that all your documents include the new title change.

Please contact me immediately, if you require additional time to complete your study or if you encounter unforeseen circumstances that affect your protocol. Please do not make any changes to your protocols. In the meantime, please retain this document as record of your review.

Good luck with your study!

AUBURN UNIVERSITY AT MONTGOMERY
Office of Sponsored Programs, Institutional Review Board
P.O. Box 244023, Montgomery, AL 36124-4023; Telephone: 334-244-3250; Fax: 334-244-3895, www.aum.edu

APPENDIX I

INSTITUTIONAL REVIEW BOARD (IRB) LETTER FROM 2007 AUM STUDY

Auburn University Montgomery
School of Sciences
Department of Biology
Division of Clinical Laboratory Sciences

January 10, 2007

MEMORANDUM

TO: Tracey Hodges

FROM: Kyle Taylor, Interim Chair, AUM IRB

RE: Your proposal for research, Gaming in Education, "Gaming: Is it all for Fun or Does Learning Occur in the Process," **IRB file #2007-02.**.

Thank you for submitting your revisions to the research proposal as cited above. The research proposal has been approved in accordance with guidelines set forth in *45 CFR 46* (Code of Federal Regulations) for expedited review.

Your review is active for one calendar year from the date of this memo. Please contact me immediately, if you require additional time to complete your study or if you encounter unforeseen circumstances that affect your protocol. Please do not make any changes to your protocols. In the meantime, please retain this document as record of your review.

Good luck with your study!

Attachment 3

P.O. Box 244023 Montgomery, Alabama 36124-4023 • 334.244.3606 Fax 334.244.3146

APPENDIX J

RECRUITING SCRIPT

Recruiting Script

Introduction: Hi, my name is Tracey Hodges. I am a doctoral student at Auburn University and I am conducting a study for my dissertation topic.
Invitation to participate: You were selected as a potential participant for a research study entitled "Gaming in Nursing Education and the Effects on Learning and Retention" because you are presently enrolled in NURS 3740: Holistic Nursing: Infants and Children. All of you are invited to participate in this study that will evaluate the effectiveness of gaming as an educational tool related to the delivery of content in NURS 3740. I will study the impact of this alternate teaching method on enhanced student learning, retention of knowledge, learning styles, and student perception of this educational tool.

Agreement to participate: If you agree to participate, I will need for you to sign an informed consent form. The form states that you agree to the following: Participants will be randomly assigned to a control group (lecture) or an experimental group (gaming). The gaming group will be further randomly assigned to teams for playing the game. Whether you are assigned to the control group or experimental group, both groups will get the same content. Mrs. Schutt will complete the lecture on pediatric cardiovascular content and I will facilitate the game for the same content, however, Mrs. Schutt will facilitate discussion of key points during the game. As a part of the study both group participants will fill out a demographic sheet (age, sex, race (Caucasian or other), VARK scores - VARK scores will be self-reported from the VARK Learning Styles Inventory that you completed in NURS 3710: Professional Nursing Concepts I), take a 20-item multiple choice pre-test and a 20-item multiple choice post-test developed by me . The comprehensive final exam for the course will contain cardiovascular pediatric questions developed by Mrs. Schutt. I will complete an item analysis on those questions only as a part of the study to test long term retention of content. I will access your student files to obtain your current GPA. The gaming group will fill out a satisfaction survey at the end of the study.

Anticipated risks: The risks associated with this study are minimal but could include a breach in confidentiality, or psychological/social discomforts, or feelings of coercion to participate. Some researchers believe that playing a game can lead to feelings of failure if a participant is on the losing team, or self-esteem may be decreased. Measures have been taken to try and alleviate any such problems. However, should you need to discuss your feelings about participating in the game; you can speak with me, Ms. Schutt, your advisor, or someone at the AUM counseling center. Contact information for each of these individuals is attached to the informed consent form.

Confidentiality of Data: All information obtained about you will remain confidential (in a locked filing cabinet within the School of Nursing, a locked filing cabinet in the researcher's home, or on a password protected computer) and will only be disclosed to others supporting this research endeavor. For further provision of confidentiality, you will choose a code (3 letters and 3 digits e.g. ASH711) that will be used as your research

participant identification number on all study related items. The demographic sheet has an area for you to write this number in. The list of participant research identification numbers and corresponding names will remain locked in a filing cabinet in the school of nursing. I will be the only person with have access to those numbers/names in the event that you forget your number or any data that needs to be clarified. Otherwise, all data will be coded with your number to ensure confidentiality. Mrs. Schutt will also have access to the pediatric cardiovascular dysfunction questions on the final exam and the results of the exam (she developed the final exam questions). However, she will not release the questions related to the study for participants until after the final course grade has been entered. She will also not participate in recruitment efforts, be present for delivery of informed consent, or have access to pre and post-test scores. Mrs. Schutt will also not know who has chosen to participate or not for the lecture group, but it will be impossible to keep that knowledge from her with the gaming group because in order for you to have been placed in that group you would have had to sign the informed consent form.

How the Study will Help: Your participation will greatly benefit future students and will support efforts to improve teaching effectiveness in the Auburn University Montgomery (AUM) School of Nursing, other schools of nursing, and education as a whole.

Decision to Participate or Not and Withdrawal of Consent: Your decision whether or not to participate will not prejudice your future relations with Auburn University, AUM or the School of Nursing. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. If you do decide to withdraw from the study, you may also withdraw any information that has been collected about you.

If you have any questions concerning the study, presently or in the future, I will be happy to answer/address those concerns. You can contact me by email at hodgetl@auburn.edu or by phone at (334) 546-7697 or (334) 361-8404.

APPENDIX K

INFORMED CONSENT

Auburn University

Auburn University, Alabama 36849-5221

Educational Foundations,
Leadership, and Technology
4036 Haley Center

Telephone: (334) 844-4460
Fax:(334) 844-3072

INFORMED CONSENT

You were selected as a potential participant for a research study entitled "Examination of Gaming in Nursing Education and the Effects on Learning and Retention" because you are presently enrolled in NURS 3740: Holistic Nursing: Infants and Children. All of you are invited to participate in this study that will evaluate the effectiveness of gaming as an educational tool related to the delivery of content in NURS 3740. I will study the impact of this alternate teaching method on enhanced student learning and retention of knowledge. I will also examine the relationship between your test scores and your preferred learning style.

If you agree to participate, I, Tracey L. Hodges, RN, MSN will review your self-reported demographic data (age, sex, race, VARK scores – from the VARK Learning Styles Inventory you completed in NURS 3710: Professional Nursing Concepts I), pre and post-test scores as well as final exam scores (only the questions pertaining to the study), your responses to a survey concerning the effectiveness of the educational tool, and your current GPA. Data collection will take place on five separate days, including today.

The risks associated with this study are minimal but could include a breach in confidentiality, psychological/social discomforts, or a feeling of coercion to participate. Some researchers believe that playing a game can lead to feelings of failure if a participant is on the losing team, or self-esteem may be decreased. Measures have been taken to try and alleviate any such problems. However, should you need to discuss your feelings about participating in the game; you can speak with me, Ms. Schutt, your advisor, or someone at the AUM counseling center. Contact information is attached to the last page of this document. Additionally, to help decrease the risk of students' feeling coerced to participate, measures haven been taken to reduce this risk and include the following: your instructor has not and will not take place in recruiting efforts, nor will she be present during the delivery of informed consent. Furthermore, she will not have access to pre and post-test scores, nor will she release questions from the final exam related to the research study for participants until after all final course grades have been entered. Finally, while your instructor will not know who chose to participate or not for those students in the lecture group, it is impossible for her not to know who chose to participate for those students in the gaming group because you would have had to sign an informed consent form to be placed in that group.

Participant Initials _____

I will reiterate that your decision to participate will not influence your relationship or your course grade with the researcher, Mrs. Schutt, AUM School of Nursing, or AUM as a whole. Participation is strictly voluntary.

To help ensure confidentiality of your data, all information obtained about you will be kept in a locked filing cabinet within the School of Nursing, a locked filing cabinet in the researcher's home, or on a password protected computer. For further provision of confidentiality, you will choose a code (3 letters and 3 digits e.g. ASH711) that will be used as your research participant identification number on all study related items. The list of participant identification numbers will be accessible to the researcher in the event you forget your number and need to retrieve it. The code list will be kept at the School of Nursing and all other data will be kept at the researcher's home. Once the dissertation has been completed, all hard copy data will be shredded and data stored in the researcher's computer will be permanently deleted.

There is no direct compensation for participation in the research study. However, your participation will greatly benefit future students and will support efforts to improve teaching effectiveness in the Auburn University Montgomery (AUM) School of Nursing, nursing education, and general education as a whole. The data collected from the study will be analyzed and will be used in the researcher's dissertation. The results may also be published in professional journals or presented at professional conferences.

Your decision whether or not to participate will not prejudice your future relations with Auburn University, AUM, or the School of Nursing. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. If you do decide to withdraw from the study, you may also withdraw any information that has been collected about you. Your final course grades will not be affected whether or not you choose to participate (while the final exam does count toward your final grade, the questions related to the study will be included on the exam whether or not the study takes place. The final exam was developed by Mrs. Schutt, so she will have access to the questions related to the study and the results of the exam, however, she will not release questions related to the study to the researcher until after final course grades have been entered).

If you have any questions concerning the study, presently or in the future, I will be happy to answer/address those concerns. You can contact me by email at hodgetl@auburn.edu or by phone at (334) 546-7697 or (334) 361-8404; or you may contact Dr. Maria Witte at (334) 844-3078, (wittemm@auburn.edu).

For more information regarding your rights as a research participant you may contact the Office of Human Subjects Resource at (334) 844-5966 (hsubjec@auburn.edu).

Participant Initials _____

Once you have signed below indicating your willingness to participate, you will be given a copy of this form to keep for your records.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's Signature _____ Date_____

Participants printed Name _____

Principle Investigator _____ Date_____

Principle Investigator's Printed Name _____

APPENDIX L

PEDIATRIC CARDIOVASCULAR DYSFUNCTION

CONTENT OUTLINE/STUDY GUIDE

NURS 3740/41 Holistic Nursing: Infants & Children

Pediatric Cardiovascular Dysfunction Content
Outline/Study Guide

Reading Assignment: Chapter 34

1. Describe basic cardiac structure and physiology.
2. Describe essential components of the history and physical examination in assessing the child's cardiovascular system and discuss the purpose of various procedures used in diagnosing cardiac dysfunction.
3. Outline nursing measures for the care of a child undergoing cardiac catheterization including precatheterization and postcatheterization care and home care preparation.
4. Identify relative pressures in cardiac structures.
5. Identify the four causes of congestive heart failure (CHF) and discuss the three major clinical manifestations of CHF in children, the four goals of treatment for children with CHF, and the nursing care management of a child with CHF and his or her family.
7. Discuss the two groups of drugs—digitalis and angiotensin-converting enzyme (ACE) inhibitors—used to improve myocardial function in children with CHF and procedures for safe administration.
8. Identify pharmacologic and nonpharmacologic strategies to remove accumulated fluid and sodium in a child with CHF.
9. Identify the incidence of congenital heart disease (CDH) in children and discuss maternal, familial, and individual risk factors for CDH.
10. Discuss the hemodynamics, clinical manifestations, therapeutic management, and nursing care indications for infants and children with hypoxemia.
11. Compare traditional and newer classifications of congenital heart defects.
12. Describe the cardiac defects characterized by increased pulmonary flow—atrial septal defect, ventricular septal defect, atrioventricular canal defect, and patent ductus arteriosus—including pathophysiology, clinical manifestations, and treatment.

13. Describe the obstructive cardiac defects of coarctation of the aorta, aortic stenosis, and pulmonic stenosis, including pathophysiology, clinical manifestations, and treatment.
14. Describe defects characterized by decreased pulmonary flow—tetralogy of Fallot and tricuspid atresia—including pathophysiology, clinical manifestations, and treatment.
15. Describe the mixed cardiac defects—transposition of the great arteries or great vessels, total anomalous pulmonary venous connection, truncus arteriosus, and hypoplastic left heart syndrome—including pathophysiology, clinical manifestations, and treatment.
16. Discuss essential components of nursing care management of a child with CHD and his or her family.
17. Describe the pathophysiology, clinical manifestations, and therapeutic and nursing care management, including prophylactic antibiotic therapy, of a child with bacterial endocarditis.
18. Describe the etiology, clinical manifestations (including Jones criteria), and diagnostic evaluation of rheumatic fever and its therapeutic and nursing care management in children.
19. Discuss the pathophysiology, clinical manifestations (including cardiac involvement), and diagnostic evaluation of Kawasaki disease and its therapeutic and nursing care management in children.
20. Discuss the etiology, clinical manifestations, diagnostic evaluation, and management of hypertension in children.
21. Discuss the etiology, clinical manifestations, diagnostic evaluation, and therapeutic and nursing care management of hyperlipidemia in children and adolescents.
22. Identify two types of cardiac dysrhythmias seen in children.
23. Discuss pulmonary artery hypertension, including etiology, clinical manifestations, therapeutic management, and nursing care indications.
24. Describe cardiomyopathy and its therapeutic and nursing care management.
25. Discuss indications for heart transplantation.

APPENDIX M

PEDIATRIC FACULTY DEVELOPED FINAL EXAM QUESTIONS:

PEDIATRIC CARDIOVASCULAR DYSFUNCTION

Pediatric Faculty Developed Final Exam Questions:
Pediatric Cardiovascular Dysfunction

RESEARCH PARTICIPANT IDENTIFICATION NUMBER_____

1. The nurse is caring for a child suffering from congestive heart failure (CHF). The child's mother appears confused regarding the goal of treatment. The nurse explains that the goals of treatment of CHF in children include all of the following except:

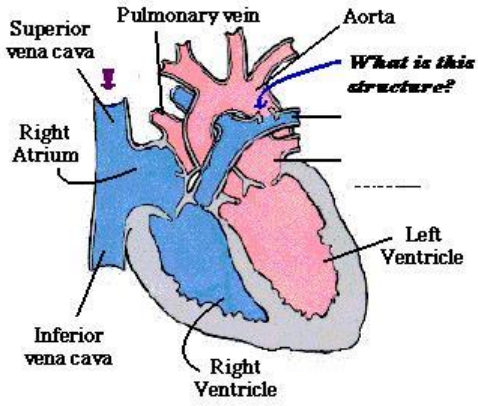
    a. To keep metabolic demands as high as possible
    b. Remove accumulated fluid
    c. To increase cardiac contractility
    d. To improve cardiac function and tissue oxygenation

2. The nurse is caring for an infant with Tetralogy of Fallot. Following a heel stick to obtain a blood gas sample, the infant develops severe cyanosis. Which of the following actions by the nurse is not appropriate?

    a. Give versed subcutaneously
    b. Place the infant in a knee-chest position
    c. Administer 100% oxygen by face mask
    d. Remain calm and support the family

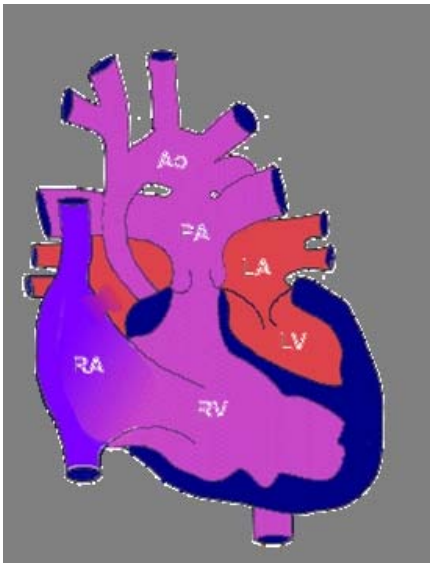
3. The purple arrow in this picture is pointing to what anatomic structure?

    a. Ductus Arterious
    b. Foramen Ovale
    c. Ductus Venousus
    d. Aortic Valve



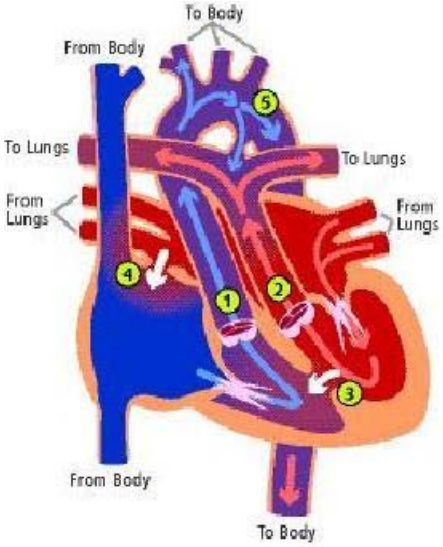
4. This is an illustration of which of the following congenital heart defects?

    a. Hypoplastic Left Heart Syndrome
    b. Tricuspid Atresia
    c. Tetrology of Fallot
    d. Truncus Arteriosus



5. This is an illustration of which of the following congenital heart defects?

    a. Transposition of the Great Vessels
    b. Total Anomalous Pulmonary Connection
    c. Truncus Arteriosus
    d. Tricuspid Atresia



APPENDIX N

STUDENT SURVEY WRITTEN COMMENTS

STUDENT SURVEY WRITTEN COMMENTS

What I liked Best:

- “The way the material was broken down and demonstrated”
- “The interaction of the facilitator and the students. She was very helpful and I didn’t feel anxious when I wasn’t sure what to draw”
- “Drawing”
- “I liked using this method to stimulate learning”
- “This game was active learning”
- “It was fun”
- “Fun times”
- “I liked the timed drawing. It made you think quick”
- “The ability to participate actively in the educational learning process”
- “The interaction”
- “Teamwork”
- “I felt comfortable to ask questions and it was stress free”
- “It was a fun way to learn material”
- “Getting the individuals to work as a group”
- “Drawing the content that was to be guessed”
- “It made being involved in lecture easier, and also provided for an easy way to remember defects”
- “The ability to participate more in class”
- “Playing the game”
- “Broke up lecture – people were verbal and it was relaxed”

- “Working in groups”
- “A different way of learning”
- “This was a good way to combine my learning needs and maximize my personal understanding of material during class time!”
- “Figuring out what the drawing was”
- “Learning with a game and using visuals”
- “The relaxed atmosphere, group participation”
- “The game was really fun and I enjoyed it”
- “The competitive edge”
- “Fun, relaxed!”
- “It was fun”
- “I enjoyed the game. It made it easier to understand the material”
- “The interaction”
- “Guessing”
- “Low stress”
- “game …fun”
- “Playing game and learning at the same time”
- “I liked the interactive part of the learning because it can be difficult to learn simply listening for a long period of time”
- “A comfortable environment where everybody got to participate”
- “Figuring out what the drawing was”

What I liked Least:

- “The way the other teams were designated for the steal”
- “The terms”
- “Sometimes could not see drawing board”
- “Lengthy”
- “We could use more time to play the game”
- “It was a lot of info, so I was overwhelmed”
- “The time it took to play the game is not conducive to a large class”
- “I liked the class presentation better”
- “I thought we weren’t supposed to look at the PowerPoint so it made the game tougher”
- “The anxiety of not knowing which content would be asked when it was my turn to participate”
- “Time limit. Not enough time to explain everything”
- “Allow more time, it felt rushed at times”
- “The game was stressful to me because it was so competitive”
- “Drawing the actual picture”
- “A lot of information to cover”
- “Afternoon class”
- “I forgot to review material before class”
- “Only one chance to steal the answer”

- “We all should have been more prepared”
- “I didn’t know all the information related to pediatric cardiovascular dysfunction”
- “I didn’t feel prepared enough”
- “Some of the pre-game instructions were unclear”
- “Waiting for my team’s turn”
- “The game rules could have been laid out better”
- “Going over our allotted time for the game”
- “Long class time”

Additional Comments:

- “Designate 1 person from each team to write down answer to steal and give 1 point if the other teams have right answers”
- “This was a good idea. You need a judge to keep the rules”
- “This was a fun way to learn”
- “It was a great game. It helped me see the different heart conditions in a new way”
- “Overall the gaming lecture seemed more effective as a teaching technique as evidenced by the eagerness for class participation”
- “I liked it and Learned”
- “This was definitely the best motivational and accommodating teaching method I have yet to experience”
- “I liked it and learned”
- “This was a fun way to learn”
- “I would do the first part of class as a lecture and the second part a the game”

- “Rules need to be more solid and clarified”
- “It would be better to make sure everyone understood the rules before the game”
- “Word Bank”