Assessing the Effectiveness of Gaming as a Teaching Strategy in an Undergraduate Nursing Pharmacology Course

Anna Boneberg

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Abstract

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Nurse educators are faced with many challenges while preparing students to safely enter clinical practice. Due to technological advances in the health care field and student demographic changes, educators have been looking for alternative methods to traditional lecture format to meet the needs of current learners. Using the framework of Adult Learning Theory, this quasi-experimental two-group, repeated measures study explored the use of gaming in the classroom on cognitive performance, course engagement, and metamotivational state in undergraduate nursing students.

The study was conducted with a convenience sample of 63 nursing students enrolled in a nursing pharmacology course during the second year of the nursing curriculum. The intervention consisted of three sessions of *Kahoot!* "Teach with Slides" lasting approximately 60 minutes to reinforce course content each week during scheduled class sessions. Instruments to measure outcomes included: (a) Student Course Engagement Questionnaire (SCEQ), (b) Telic/Paratelic State Inventory (T/PSI), and (c) module examination developed by faculty.

The English Language Acculturation Scale (ELAS) was used to measure study participants' use of English providing insight to the effect of gaming on students with varied levels of English acculturation. The sample exhibited a wide range of ELAS scores, 5-25 (M = 19.95; SD = 7.32), indicating students in both groups had varying English language acculturation

levels. An independent sample *t* test showed no significant difference between intervention and control groups, $t(54) = 1.093$, $p = .140$.

The first study used a quasi-experimental two-group, pretest-posttest design to assess cognitive performance and course engagement. An independent samples *t* test showed a statistically significant difference in cognitive performance between groups, $t(61) = 2.160$, $p = .035$. English Language Acculturation was a statistically significant predictor of cognitive performance; however, there was no difference between intervention and control groups in language acculturation. There was no statistically significant interaction between group and time of testing for course engagement scores between groups over time. There was no correlation between cognitive performance and course engagement, $r(34) = .102$, $p = .565$.

The second study employed a quasi-experimental two-group, repeated measures design to assess the metamotivational states of students along with the relationship of metamotivational state to cognitive performance and course engagement. Chi-square analyses of metamotivational states between groups revealed no statistical difference between intervention and control groups. A two-way ANOVA revealed a statistically significant interaction between gaming and metamotivational state, $F(1,30) = 4.603$, $p = .041$. Paratelic students in the intervention group had statistically significantly higher course engagement, $t(18) = -3.06$, $p = .007$.

The study findings indicate that gaming is a comparable activity to non-gaming active teaching strategies such as group discussion and case studies. There was an increase in course engagement for those in the paratelic state of the intervention group indicating that those who are playful can be engaged in the classroom. The results of this study indicate that *Kahoot!* is a gaming activity that can be used in nursing education to increase cognitive performance. Further research is needed to explore other student learning outcomes.

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Chapter 1

Introduction to the Dissertation

Pre-licensure nursing education has traditionally consisted of lecture and faculty-led clinical experiences. In the classroom, nurse educators have begun to move from this traditional lecture format towards active learning strategies to address changes that have occurred in student learners. Traditional baccalaureate program faculty are seeing a majority of students who are members of Generation Z (individuals born 1997 to 2015) (Hampton et al., 2019). Generation Z learners have matured in a hyperconnected world with technology available to them since birth, which has contributed to a change in student attention span and learning styles. Using active teaching strategies in the classroom allows educators to reach various types of learners at the same time.

Gaming was introduced to nursing education in the early 1980s as an alternative to traditional lecture (Kinder & Kurtz, 2018). Educational games are different from other active teaching strategies as they include rules, goals, competition, and chance. Games have evolved from clicker response systems that were used before web-based applications became available. There are multiple web-based applications currently available for use with a wide range in types of games. Hampton et al. (2019) found that Generation Z students preferred lecture that includes the use of an audience response system. Other studies have shown that the use of games leads to increased cognitive performance (Cowen & Tesh, 2002; Ignacio & Chen, 2020; Kinder & Kurtz, 2018; Raines, 2019) and has a positive influence on learning (Sheng et al., 2019) and student satisfaction (Aljezawi & Albashtawy, 2015; Bays & Hermann, 1997; Castro et al., 2019).

The purpose of this study was to explore the effect of *Kahoot!* (*Kahoot!*, 2020) on course engagement and cognitive performance in undergraduate nursing students who are learning

pharmacology. For this dissertation study, *Kahoot!* was used as an active teaching strategy in the flipped classroom. *Kahoot!* is a web-based gaming application that has various formats of gaming activities available at varying costs. The *Kahoot!* "teach with slides" option was used in this study because it allows the inclusion of lecture slides that provide clarification of difficult points. Faculty at the study site have reported that an increased number of students with English as a second language has led to hesitation about moving from traditional lecture to a flipped classroom with active teaching strategies; therefore, English Language Acculturation was included as a study variable. Three class sessions were selected to receive the intervention of *Kahoot*! as an active teaching strategy. During these classes, students in the intervention group were able to either participate in or watch the game. After class, students in the intervention group were given a code to access *Kahoot!* remotely as a private play game. Students in the control group were given the intervention for the second half of the semester after the study surveys were completed.

Specific Aims

This study explored the impact of *Kahoot!* as an active teaching strategy in an undergraduate nursing pharmacology course on course engagement and cognitive performance. Four specific aims guided this study.

Aim 1

Determine the effect of gaming as a teaching strategy on cognitive performance in students in an undergraduate nursing pharmacology course.

Hypothesis 1

Nursing students who experience gaming as a teaching strategy will have more cognitive performance than students who do not experience the gaming teaching strategy.

Research Question 1.1

Does age interact with type of teaching strategy to affect cognitive performance?

Research Question 1.2

Does English language acculturation interact with type of teaching strategy to affect cognitive performance?

Research Question 1.3

What is the relationship between gender and cognitive performance?

Research Question 1.4

What is the relationship between ethnicity and cognitive performance?

Research Question 1.5

What is the relationship between race and cognitive performance?

Research Question 1.6

What is the relationship between employment status and cognitive performance?

Research Question 1.7

What is the relationship between previous degree attained and cognitive performance?

Research Question 1.8

What is the relationship between age and cognitive performance?

Aim 2

Determine the effects of gaming as a teaching strategy on course engagement in students in an undergraduate nursing pharmacology course.

Hypothesis 2

Nursing students who experience gaming as a teaching strategy in the classroom will have greater course engagement than students who do not experience the gaming teaching strategy.

Research Question 2.1

Does age interact with type of teaching strategy to affect course engagement?

Research Question 2.2

Does English language acculturation interact with type of teaching strategy to affect course engagement?

Research Question 2.3

What is the relationship between gender and course engagement?

Research Question 2.4

What is the relationship between ethnicity and course engagement?

Research Question 2.5

What is the relationship between race and course engagement?

Research Question 2.6

What is the relationship between employment status and course engagement?

Research Question 2.7

What is the relationship between previous degree attained and course engagement?

Research Question 2.8

What is the relationship between age and course engagement?

Aim 3

Explore the relationship between course engagement and cognitive performance in nursing students taking an undergraduate pharmacology course.

Research Question 3.1

What is the relationship between course engagement and cognitive performance in nursing students taking an undergraduate pharmacology course?

Aim 4

Determine the effect of gaming as a teaching strategy on metamotivational states – telic vs. paratelic - in students in an undergraduate nursing pharmacology course.

Research Question 4.1

What is the relationship between gaming as a teaching strategy and metamotivational states in students in an undergraduate nursing pharmacology course?

Research Question 4.2

Does metamotivational state interact with teaching strategy to affect course engagement?

Research Question 4.3

Does metamotivational state interact with teaching strategy to affect cognitive performance?

Changes in Methods Since the Proposal Hearing

During the Fall of 2021, data collection resulted in a low number of responses from the students at each evaluation point despite all students consenting to participate in the study. During that time, the researcher was promoted to Associate Dean Undergraduate Programs and therefore shifted from teaching to administrative duties. Due to both of these occurring, an IRB addendum was submitted to both Teachers College and D'Youville University IRBs. A gift card

worth $10 was added as an incentive to participants who completed all of the surveys. The IRB at D'Youville University, where data was collected, limited the researcher's ability to recruit participants during the second semester due to her role as Associate Dean. The researcher was only allowed to recruit those registered in the class via email and was not allowed to discuss the research project with students. IRB approval letters are included in Appendix A.

Organization of the Dissertation

This dissertation is organized into four chapters. Chapter 1 presents an overview of the dissertation study. Chapters 2 and 3 report the quantitative data collected and analyzed for the study. These chapters will be prepared for journal submission following dissertation approval. Chapter 2 presents the findings related to course engagement and cognitive performance. Chapter 3 reports the findings related to student metamotivational states in an undergraduate classroom. The final chapter provides a summary and suggestions for further research regarding gaming as an active teaching strategy in nursing education.

Dissemination

Manuscripts developed from Chapters 2 and 3 will be submitted to nursing education journals for dissemination. The first manuscript, titled, *Effect of Gaming on Course Engagement and Cognitive performance in an Undergraduate Nursing Pharmacology Course*, will be submitted to *Nurse Education Today,* a journal that publishes manuscripts related to advancement of educational pedagogy. The second manuscript, titled, *Effect of Gaming on Metamotivational States in Nursing Students in an Undergraduate Pharmacology Course*, will be submitted to *Teaching and Learning in Nursing*, a journal that publishes manuscripts related to different learning styles and instructional design. In addition, an abstract was accepted and a poster will be presented at the NLN *Education Summit 2023*.

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Chapter 2

Effect of Gaming in an Undergraduate Nursing Pharmacology Course on Cognitive Performance and Course Engagement

Undergraduate nursing education consists of teaching both didactic content and clinical skills. Traditionally, nurse educators have presented didactic content through lectures (Aljezawi & Albashtawy, 2015; Kinder & Kurtz, 2018; Reed, 2020; Wang et al., 2018). Technological advancements and changes in learner characteristics, however, have led nurse educators to find different teaching strategies in the classroom. Approximately 25% to 50% of students currently enrolled in baccalaureate nursing programs are members of Generation Z, defined as being born between 1997 and 2015; these numbers are increasing as the generation matures to college age (Hampton et al., 2019). Students in Generation Z have evolved and developed in a hyper-connected world by using electronic devices that connect to the Internet since they were developmentally able to interact with them. Continued technological advances can contribute to having a decreased attention span and, therefore, lead to preferences for teaching that is exciting and engaging (Chicca & Shellenbarger, 2018). Using web-based applications to deliver content in the classroom allows nurse educators to combine lecture and other, often active, teaching strategies that accommodate various learner styles and make learning meaningful and engaging. This study aimed to examine the effect of gaming as an active teaching strategy on cognitive performance and course engagement in an undergraduate nursing pharmacology course.

Gaming

Gaming is defined as "a learning activity with rules involving chance showcasing the players' cognitive performance or skill in attempting to reach a specific learning outcome" (Billings & Halstead, 2020, p. 294). Gaming was first introduced in nursing education in the

1980s to provide a non-traditional teaching method that facilitates active learning (Kinder & Kurz, 2018). Bays and Hermann (1997) evaluated the effect of a non-simulation game, similar to *Pictionary*, on undergraduate nursing students' exam grades; they found that the game was as effective as a traditional lecture on cognitive performance acquisition. Cowen and Tesh (2002) evaluated using a multi-question game as a teaching strategy in a module on pediatric cardiovascular dysfunction for undergraduate nursing students; students in the game group had a statistically significant increase in post test scores.

Games are different from virtual simulation or role-play, as they contain a sense of competition or gameplay, and they do not represent scenarios from real clinical experiences (Reed, 2020). Games can be accessed using web-based platforms that offer students the opportunity to develop computer skills while also learning nursing-specific cognitive performance. The literature identifies a wide variety of definitions and descriptions of games and gaming in nursing education, which can lead to confusion amongst nurse educators regarding their use in the classroom.

In a review of four experimental or quasi-experimental studies on games as a teaching strategy, three positive student learning outcomes were identified: (a) cognitive performance acquisition, (b) satisfaction, and (c) engagement (Reed, 2020). These positive results suggest that gaming is a valuable teaching strategy and further study is warranted to more clearly understand outcomes for students and faculty.

One example of a game that is widely used in education is *Kahoot!* This game-based learning platform was developed in 2012 by a team from the Norwegian University of Science and Technology. The group launched *Kahoot!* publicly in 2013 (*Kahoot!*, 2020). *Kahoot!* was initially developed as a less expensive alternative to clicker technology to improve student

motivation and classroom engagement (Wang, 2015). Since then, *Kahoot!* has evolved into multiple game formats for educators to use in the classroom. When using the "teach with slides" format in *Kahoot!,* the educator plays the role of game show host, and students are the competitors. Using this format, educators can insert slides with additional content between questions to further clarify essential concepts. *Kahoot!* provides educators and students with immediate feedback during the teaching-learning process.

Kahoot! is widely used in higher education; a recent review of the literature by Wang and Tahir (2020) showed that 84% of 93 studies were conducted in the college setting. The studies had multiple designs and were used in a variety of courses, including nursing. An analysis of outcomes found that *Kahoot!* had a positive impact on the following: (a) learning outcomes, (b) classroom dynamics, (c) student anxiety, (d) student perception and engagement, and (e) teachers' perceptions (Wang & Tahir, 2020). Research in nursing education has revealed similar findings that *Kahoot!* positively influences cognitive performance and classroom dynamics (Castro et al., 2019; Hampton et al., 2019; Kinder & Kurz, 2018; Wang et al., 2018).

Course Engagement

Student engagement is a key variable that influences learning outcomes and student success. Bernard (2015) defined student engagement as

> a dynamic process marked by a positive behavioral, cognitive, and affective state exhibited in the pursuit of deep learning. This process is bound by contextual pre-conditions of self-investment, motivation, and a valuing of learning. Outcomes of student engagement include satisfaction, a sense of well-being, and personal development. (p. 8)

A combination of gaming and lecture may lead to increased student course engagement, which, in turn, could influence other learning outcomes.

A systematic review by Bond et al. (2020) revealed that many studies in higher education focused on isolated aspects of student engagement without exploring its relationship with other variables. Hampton et al. (2019) evaluated teaching methods that Generation Z nursing students preferred, finding that students ranked lecture with clicker response technology as the most engaging teaching methodology and the most effective for learning. This review also showed games to be engaging by 44.1% of nursing students surveyed, with 79% noting that they have experienced games in the nursing classroom (Hampton et al., 2019). This supports the recent and ongoing change occurring in nursing education with the addition of active teaching strategies in the classroom.

English Language Acculturation

Nurse educators working with students who have English as an additional language have noted difficulty in their academic and clinical performance due to decreased English proficiency levels (Salamonson et al., 2013). Language acquisition is one integral component of the acculturation process. In higher education, specifically nursing education, there are different applications of terms and concepts between cultures that require educators to demonstrate cultural competence to foster success in the nursing curriculum (Sailsman, 2021). Through acculturation and exposure, use of English in the classroom and interactions with classmates, nursing students can develop their listening and speaking skills. Salamonson et al. (2008) noted that students with low English language acculturation scores had lower mean subject grades than their peers. With the move to active teaching strategies, nurse educators need to be aware of the effect that they may have on students who have English as an additional language ability to succeed.

Theoretical Framework

Adult Learning Theory

Before there was research regarding adult learning, educators assumed that adults learned in the same manner as children. In the early 1900s, educators noticed a difference in adult learning styles and developed theories to explain these differences (Knowles, 1978). Four propositions about adult learners have been identified: (a) adults are self-directed, (b) past work and personal experience serve as a resource for learning, (c) adults are ready to learn what is needed to advance their roles, and (d) adults use problem-based learning as cognitive performance that can be applied immediately (Knowles et al., 2005). Adults learn best when they are active participants in the learning process that takes place in a collaborative and supportive environment (Harmon & Thompson, 2018; Kinder & Kurz, 2018). Gaming is an active teaching strategy used in the classroom to gain and apply cognitive performance. Adult Learning Theory describes the educator as a facilitator of the learning process (Knowles et al., 2005). While using gaming as a teaching strategy in the classroom, a nurse educator serves as the "game show host," facilitating both cognitive performance acquisition and student engagement (Kinder & Kurz, 2018). Adult Learning Theory was used to guide this study.

Purpose

The purpose of this study was to investigate the effect of gaming as an active teaching strategy on cognitive performance and course engagement in undergraduate nursing students enrolled in a pharmacology course. The following hypotheses were tested: (a) nursing students who experience gaming as a teaching strategy will have greater cognitive performance compared to those who did not experience gaming, and (b) nursing students who experience gaming as a teaching strategy will have greater course engagement when compared to those who did not

experience gaming. The following research question was also explored: Is there a relationship between course engagement and cognitive performance?

Methods

Design

This study used a quasi-experimental two-group, repeated measures design to explore the effect of gaming in the classroom on undergraduate nursing students' cognitive performance and course engagement. Students were placed in either the intervention or control group according to their registered section. This paper reports findings from a larger study that also explored the metamotivational states of students presented in other chapters of this dissertation.

Participants

A convenience sample of second-year baccalaureate nursing students enrolled in a nursing pharmacology course at a private university located in the northeastern United States was recruited to participate in this study. Nursing pharmacology is a core course and required for all baccalaureate students to complete. All students enrolled in the course during Fall 2021 and Spring 2022 semesters were invited to participate in the study; however, those repeating the course were excluded as they had been previously exposed to the material.

Based on a power analysis using G-Power 3.2, to detect a medium effect of .5 (Cohen, 1992) at .05 significance level with a power of .80, each group required 64 participants, a total number of 128 participants was needed. The study ran over two semesters in an attempt to reach the required numbers for power.

Measures

A short demographics survey was developed by the researcher to describe the sample (see Appendix A). A second researcher-developed instrument consisted of two questions

regarding game participation and use inside and outside of the classroom (see Appendix B). The gaming use survey was administered to the intervention group with the posttest survey.

English Language Acculturation Scale

The English Language Acculturation Scale (ELAS) was developed to measure the linguistic aspect of acculturation (Salamonson et al., 2008). The ELAS is comprised of five questions with five response options: 1 = *Only non-English language(s)*, 2 = *More non-English than English*, 3 = *Both non-English and English equally*, 4 = *More English than non-English*, and 5 = *Only English*. Values assigned to the responses range from 1 to 5 (low to high). Scores are calculated by adding up each value to give an overall score with a potential range from 5 to 25. Scores are divided into three groups: (a) low: 5-13, (b) medium: 14-18, and (c) high: 19-25. Cronbach's alpha for the scale was .89 (see Appendix C). Reliability and validity were established with a sample of 273 first-year nursing students in Australia (Salamonson et al., 2008). The ELAS has been used with nursing students to investigate ESL and academic performance and has provided evidence that ESL correlates with academic performance. Students with lower ELAS scores had lower mean subject grades (Salamonson et al., 2008; Salamonson et al., 2013). The Cronbach's alpha for the ELAS during this study was .980.

Pharmacology Cognitive Performance

The cognitive performance questions consisted of a 75-item faculty-developed module exam that was reviewed by three faculty content experts. The module exam consisted of 25 multiple-choice questions from each of three topics: (a) cardiovascular drugs, (b) hematologic drugs, and (c) respiratory drugs. The examination was blueprinted using Bloom's Taxonomy with the majority of the questions at or above the level of understanding (see Appendix D). Item analysis included calculation of Kuder-Richardson Formula 20 (KR-20) for internal consistency,

p values for item difficulty, and point bi-serial (PBI) values for item discrimination. The KR-20 was .65 for the examination, indicating a good reliability for a nursing examination that covers multiple concepts and topics (McGahee & Ball, 2009).

Student Course Engagement Questionnaire

Student course engagement was measured using the Student Course Engagement Questionnaire (SCEQ), which was developed to evaluate engagement in college-age students (Handelsman et al., 2005). The original 27-item SCEQ was revised to 25 items on the final version after factor analysis. Handelsman et al. (2005) noted that four factors accounted for 42.69% of the variance: (a) skills engagement, (b) emotional engagement, (c) participation/interaction engagement, and (d) performance engagement. Reliability of the student engagement factors ranged from .76 to .82. The instrument is scored using a Likert-type scale where a 1 indicates "*less like me*" and a 5 indicates "*more like me*." The instrument is scored by obtaining a total score along with a score for each subscale. The total score can range from 5 to 150 with higher scores indicating higher levels of student engagement (see Appendix E). The SCEQ was evaluated for validity in higher education settings by enlisting 40 undergraduates with various majors and course enrollment. Several regression analyses were performed to evaluate the role that engagement plays in class grades and revealed that the student engagement factor explained 26% to 30% of the variance in course grades, illustrating the construct validity of the scale (Handelsman et al., 2005).

A literature search revealed use of the SCEQ in multiple higher education settings, with four studies that included samples of undergraduate nursing students. In 2012, Swan used the SCEQ to measure minority undergraduate nursing students' engagement in learning activities and found Cronbach's alphas ranging from .805 to .878 for the SCEQ subscale and .943 overall.

Brown et al. (2017) used the SCEQ to evaluate undergraduate nursing students' engagement in an introductory human anatomy and physiology course at a large publicly funded higher education institution. Cronbach's alphas ranged from .765 to .812. Callahan (2019) used the SCEQ to evaluate associate degree and baccalaureate degree nursing students' engagement in a flipped learning module and found subscale Cronbach's alphas ranging from .803 to .92. Hampton et al. (2020) used the SCEQ in a descriptive, cross-sectional design evaluating the teaching and learning preferences of Generation Z nursing students. The Cronbach's alpha was .83 for the total engagement score and greater than .70 for all subscales. In the current study, Cronbach's alphas for the SCEQ were .948 (pretest) and .928 (posttest).

Procedure

Permission to use the ELAS and SCEQ was obtained. The module exam was developed by the researcher in the role as course coordinator. The exam was reviewed by three faculty teaching in the course and adjusted after each administration based on item analysis results. Institutional Review Board (IRB) approval was granted by both Teachers College and the study site. Second year nursing students enrolled in the course during Fall 2021 were informed about the study both verbally and in writing during the first class of the semester. Students enrolled in the course during Spring 2022 semester were informed in writing via email starting the first week of classes until the start of the intervention. Students signed an electronic consent form if they agreed to participate in the study. The informed consent was posted as a file on the learning management system for easy review by students. Those who chose to opt out of the study still received the teaching strategy assigned to their section of pharmacology. Due to low study enrollment an incentive was added and students in the Spring 2022 semester who consented to participate and completed all surveys received a $10 gift card. The incentive increased the

completion rate of the surveys by students who chose to participate and receive the gift card. The students who were assigned to the control group were able to participate in the *Kahoot!* activities for the second half of the semester after completion of the study (see Figure 2.1).

Intervention Group Experience

The teaching strategy used by all faculty in the undergraduate pharmacology course is a flipped classroom model. In this model, students receive instruction prior to coming to the classroom in the form of a recorded lecture. Faculty then use active teaching strategies to facilitate learning in the classroom. The faculty of the intervention group changed during the second semester of data collection due to administrative changes within the department.

To control for the use of a flipped classroom, the study period was during the second module of the semester. This approach allowed students to adjust to the teaching strategy, as many other nursing faculty in the program use a traditional lecture format. Participants completed the pre-test survey consisting of demographics, ELAS, and SCEQ. They were presented with the intervention of gaming, *Kahoot!*, during three class periods. Each *Kahoot!* was in the "lecture and learn" style that is a mixture of questions and slides to clarify difficult topics. This version of *Kahoot!* includes music, timed questions, and a leader board, which gives students an entertaining gaming session. Each session of *Kahoot!* lasted 1 hour of the 3-hour class period with the remainder of the time spent working on other non-gaming active teaching strategies. Students were also granted access to the *Kahoot!* in individual game play mode after class to be used as a strategy to study for the exam. Participants then completed the posttest survey consisting of the module exam during their scheduled class time. The SCEQ and gaming use survey were emailed to students for completion after they completed the examination.

Control Group Experience

Students in the control group received the same flipped classroom instructional method without the gaming intervention. Active teaching strategies for this group included group discussion work and case studies. The pre and posttest study surveys were completed during the same time period as the intervention group. The faculty assigned to the control group remained the same for both semesters of data collection.

Data Analysis

Data analysis was completed using IBM SPSS Statistics version 28.0.0 software. Demographic variables were analyzed using descriptive statistics: (a) Mann-Whitney U (age), (b) chi-square test of homogeneity (ethnicity), and (c) Fisher's exact test (race, previous degree, and employment status). An independent *t* test was used to determine the difference in cognitive performance score means between groups. A multiple regression analysis was conducted to determine if there was a relationship between age, gender, race, ethnicity, previous degree held, employment status, or English language accommodation and cognitive performance. A linear regression analysis with interaction variables was conducted to determine if age and teaching strategy have an effect on cognitive performance. A mixed ANOVA was conducted to determine the relationship between time and group on students' engagement with appropriate follow-up analysis to aid in the interpretation of results. A multiple regression analysis was conducted to determine if there was a relationship between age, gender, race, ethnicity, previous degree held, employment in health care, unemployed, or English language accommodation and posttest course engagement. A linear regression analysis with interaction variables was conducted to determine if age and teaching strategy have an effect on course engagement. A Pearson's product

moment correlation (*r*) was calculated to explore the relationship between cognitive performance and course engagement.

Results

A total of 146 students enrolled in the undergraduate nursing pharmacology course over two semesters (37 in Fall of 2021 and 109 in Spring 2022). A total of 63 students consented to participate in the study (43.3% participation rate): (a) intervention group had 39 students and (b) control group had 24 students. The number of responses fluctuated for each assessment (see Table 2.1).

Demographic Variables

Participant ages ranged from 19 to 40 years (M = 22.24; SD = 4.432). An independent t test indicated that there was no statistically significant difference in age between groups, $t(32) = -1.294$, $p = .102$. The sample was predominantly female (79.4%). The sample included students representing diverse backgrounds: Asian (6.3%), Black (12.7%), White (60.3%), and other (7.9%). This diversity is representative of the school of nursing in which the study was conducted. Students enrolled in the study have various levels of previous education with the majority entering directly out of high school (61.9%). Study participants had various levels of employment at the time of this study. Table 2.2 presents the demographic variables. There were no statistically significant differences between the control and intervention groups in any demographic variables examined.

English Language Acculturation Scale

The participant ELAS scores ranged from 5-25 (M = 19.95; SD = 7.32) representing a wide range of English language acculturation in the sample. An independent t test indicated no

statistically significant difference in English language acculturation between groups, $t(54) = 1.093$, $p = .140$, indicating that they were homogeneous.

Cognitive Performance

An item analysis evaluation was conducted by the faculty assigned to teach the course on the 75-item module exam. Four items were removed due to analysis scores indicating that they were poor questions. Three of the items needed to be adjusted to indicate the correct answer as they were mis keyed. The 71 remaining items were analyzed with a KR-20 score ($r = .65$) indicating good reliability for a nursing exam with multiple topics covered. The point biserial index (PBI) ranged from -.05 to .45. Item difficulty index (p-value) ranged from .43 to 1 with 23 items above the acceptable high of .8 indicating that the questions were easy and should be re-evaluated.

An independent-sample t test was conducted to determine if a difference existed between the module exam scores (cognitive performance) in the group receiving the intervention of *Kahoot!* ($n = 39$) and those in the control group without gaming ($n = 24$). Results showed that there was a statistically significant difference, $t(61) = 2.160$; $p = .035$, on the module exam (cognitive performance) between the intervention ($M = 78.75$; $SD = 7.29$) and control group ($M = 74.1987$; $SD = 6.62$). Table 2.3 presents the descriptive statistics for cognitive performance.

A multiple linear regression analysis was conducted to determine if there was a relationship present between the demographic characteristics and cognitive performance. A low response rate on the demographic survey caused a need to dichotomize all variables except age and ELAS scores when conducting the analyses. The overall regression model was not statistically significant, $F(8, 30) = 0.877$, $p = .550$, $R^2 = .242$, indicating that demographic

variables were not significant predictors of cognitive performance. Table 2.4 presents the regression analysis for each demographic variable.

A linear regression analysis with interaction variable was conducted to determine if a relationship was present between ELAS scores and cognitive performance and if group assignment and ELAS scores interacted to predict cognitive performance. The overall regression model was statistically significant, $F(3,55) = 2.835$, $p = .047$, $R^2 = 0.141$; English language acculturation was a significant predictor of cognitive performance. However, there was no statistically significant interaction of English language acculturation with group. Table 2.5 shows the coefficients of the predictors of this linear regression.

Course Engagement

A mixed ANOVA was conducted to test for an interaction between time (pre and post) and group (intervention and control) on student course engagement. There was no interaction noted between time and group with course engagement, $F(1.32) = 0.617$, $p = .491$. There was, however, a statistically significant main effect between subjects, $F(1,32) = 6.703$, $p = .014$, indicating that there was a statistically significant difference in student course engagement scores between the intervention and control group. Table 2.6 shows the mixed ANOVA analysis on course engagement.

A multiple regression analysis was conducted to determine if there was a relationship present between the demographic characteristics and posttest SCEQ scores. The small response rate on demographics caused a need to dichotomize all variables except age and ELAS scores when conducting the regression. The overall regression model was not statistically significant, $F(8,21) = 1.437$, $p = .269$, $R^2 = .469$, indicating that demographic variables were not significant

predictors of cognitive performance. Table 2.6 shows the regression coefficients for each demographic variable.

A linear regression analysis with interaction variable was conducted to determine if a relationship was present between ELAS scores and course engagement. The overall regression model was not statistically significant, $F(3,33) = 1.832$, $p = .163$, $R^2 = .155$, indicating that English language acculturation was not a significant predictor of course engagement accounting for 15.5% of variance in the model.

Relationship between Course Engagement and Cognitive Performance

A Pearson correlation coefficient was computed to assess the relationship between course engagement and cognitive performance. There was no statistically significant correlation between the two variables, $r(34) = .102$, $p = .565$.

Discussion

The aim of this study was to evaluate the effect of using *Kahoot!* in an undergraduate nursing pharmacology course on cognitive performance and course engagement through different analyses to see if *Kahoot!* was an active teaching strategy that can be used in undergraduate nursing education. There was no statistically significant relationship between the two outcomes of cognitive performance and course engagement in this sample. This result was unexpected based on previous experience using the intervention in the classroom where students who participated in the *Kahoot!* had higher course grades. The instrument used in this study measured course engagement and *Kahoot!* may not have been enough to increase a student's interest in a course with difficult content. The control group had no statistically significant change in course engagement while the intervention group had lower course engagement after the intervention despite remaining higher than the control group. The students' dislike of the

flipped classroom modality, as noted on faculty evaluation, may have played a role in the decrease in course engagement over time.

There was a statistically significant difference in cognitive performance between groups, indicating that *Kahoot!* is an effective way for students to increase cognitive performance in nursing pharmacology. These findings are similar to those in previous studies using gaming in nursing education (Cohen & Tesh, 2002; Coveney et al., 2022; Ozdemir & Dinc, 2022; Reed, 2020; Taveres, 2022; Wang & Taher, 2020).

There were no statistically significant differences regarding the effect of *Kahoot!* on course engagement. While this study's findings did not suggest that *Kahoot!* is a better approach, they do support the use of *Kahoot!* as an option for active teaching similar to other approaches. Ozdemir and Dinc (2022) found that the use of gaming in the classroom has positive outcomes on course engagement, emotions, and attitudes. The use of *Kahoot!*, in particular, has been shown to decrease student anxiety compared to a paper-pencil quiz (Abd El-Aziz Mohamed et al., 2022).

The statistically significant difference in cognitive performance between groups indicates that *Kahoot!* is a teaching strategy that aligns with Adult Learning Theory principles. The game provides adult learners with the ability to be self-directed as they can choose to participate or be an observer in the classroom. Students are also able to participate individually at home while still using a game format, allowing students to use previous experiences with gaming to decide if the activity assists in their ability to learn. *Kahoot!* allows adult learners to apply the knowledge they are learning while continuing to learn through this problem-based teaching strategy. Despite there not being evidence that *Kahoot!* is a better approach than other strategies, the results support the principles of Adult Learning Theory because *Kahoot!* allows students to apply

previous learned content while nursing faculty for the course serve as a facilitator of the learning process.

Limitations

While several limitations exist in this study, a strength was allowing students time to adjust to the use of a flipped classroom prior to obtaining study measurements. Faculty members who were facilitating the course had been using this modality for at least two semesters prior to the beginning of the study, which gave them a chance to gain experience with leading a flipped classroom. This course was one of the first to strategically adopt the flipped classroom modality as a way to improve student outcomes due to pharmacology being a historically difficult course in nursing education.

Use of a convenience sample limits the generalizability of the findings to other populations despite the groups being homogeneous. Randomization of the study participants was not possible due to the sample being nursing students enrolled in a required course; however, the demographic survey analysis results indicated homogeneity between groups. The lack of student participation in the study along with poor response rate did not allow the study to reach adequate power for generalizability.

A cognitive performance pretest was not administered in this study. This would have allowed the evaluation of cognitive performance development over time comparing the intervention group with a group that did not use gaming as a teaching strategy. Self-report instruments were used, which could have led to a decrease in response rate. This was evident in student feedback that they did not have time to participate in research on the faculty members' evaluations at the end of the first semester.

The COVID-19 pandemic caused decreased course enrollment; therefore, participants had to be recruited over two semesters. Despite the extended time in recruitment, the sample size did not increase enough to reach adequate power. During the second semester, the intervention group was taught by a different professor due to the first professor (primary researcher) taking an administrative position. This change in professor may have caused a threat to the internal validity of the study because of a possible lack of treatment fidelity.

Implications

The results of this study provide nurse educators with evidence to support the use of *Kahoot!* as an active teaching strategy while facilitating undergraduate education. As nurse educators are challenged with developing ways to improve student outcomes while adapting to everchanging student population, *Kahoot!* can increase cognitive performance compared to flipped classroom only. In this study, demographic variables had no impact on cognitive performance, indicating that various types of learners can be exposed to this teaching strategy and potentially have an increase in cognitive performance.

Despite there being no correlation between course engagement and cognitive performance in this study, course engagement remains an important part of nursing education. There was no statistically significant difference in engagement between the group that received the intervention *Kahoot!* and those who did not. However, posttest scores were higher in the group that received the *Kahoot!* intervention, as compared to those who did not receive gaming as an active teaching strategy. There was a statistically significant relationship between English language acculturation scores and cognitive performance; however, there was no statistically significant difference between intervention and control group. Future studies evaluating *Kahoot!* and engagement could use analytics provided by the application to evaluate course engagement

at different time points. Such research could help nurse educators explore the influence of a variety of variables on course engagement over an academic semester. Researchers could evaluate cognitive performance development over time by adding a pretest in pharmacology content to the study design. By utilizing the different question types, research can be conducted to evaluate the use of *Kahoot!* as an active teaching strategy in undergraduate nursing education to determine its ability to prepare students for the NextGen NCLEX after graduation and prior to entry into practice.

Conclusion

Higher education, including undergraduate nursing education, has been challenged with changes in technical advances and student demographics. These issues have forced nurse educators to look for teaching strategies that equip a new generation of learners to be prepared to practice as safe and effective nurses. This study showed that *Kahoot!* can provide an active teaching strategy that improves cognitive performance in undergraduate students who participated in the activity compared to those who did not. Although there was no statistically significant difference between groups over time in course engagement, the results indicate that this teaching approach can serve as an alternative to non-gaming active teaching strategies. More research is necessary to evaluate the effect of gaming in the classroom on other student outcomes.

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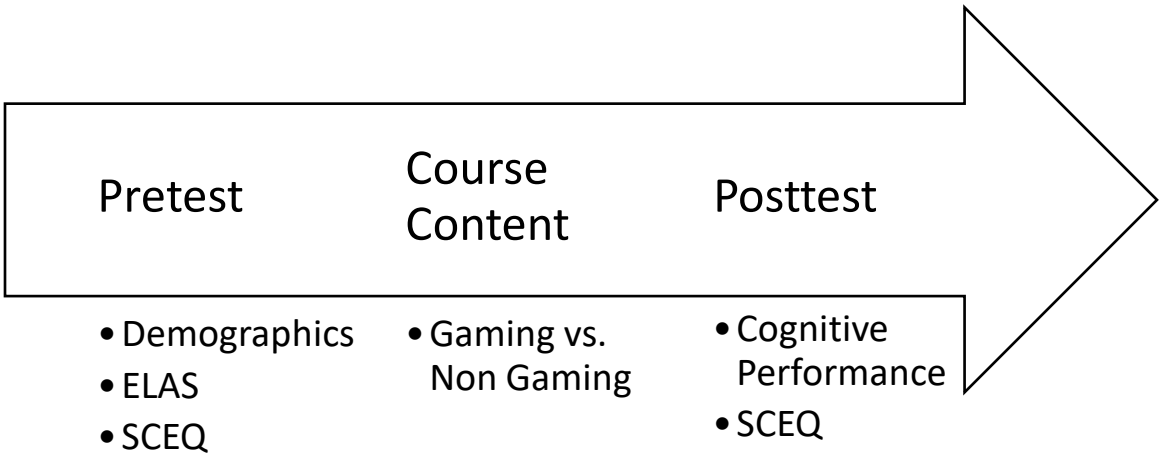
Figures

Figure 2.1

Study Procedure



Tables

Table 2.1

Number of Responses for Each Survey

Instrument	Intervention Group	Control Group Group
Consent	39	24
ELAS	38	18
Pretest SCEQ	38	18
Pretest T/PSI	38	14
Time 1 T/PSI	31	15
Time 2 T/PSI	30	17
Time 3 T/PSI	30	17
Posttest SCEQ	22	12
Cognitive performance	39	24

Table 2.2

Demographic Characteristics of Study Participants

Demographic Variable	Flipped Classroom (n=24)		Flipped Classroom plus *Kahoot!* (n=39)		Sample		*p*-value[a]
	n	%	*n*	%	*n*	%	
Gender							0.123
Female	17	70.8	33	84.6	50	79.4	
Male	0	0	5	12.8	5	7.9	
No answer	7	29.2	1	2.6	8	12.6	
Ethnicity							1.0
Hispanic	1	4.2	3	7.7	4	6.3	
Non-Hispanic	16	66.7	33	84.6	49	77.8	
No answer	7	29.2	6	15.4	13	20.6	
Race							0.301
American	0	0	0	0	0	0	
Indian							
Asian	1	4.2	3	7.7	4	6.3	
Black	2	8.3	6	15.4	8	12.7	
White	14	50	24	61.5	38	60.3	
Other	0	0.0	5	12.8	5	7.9	
No answer	11	45.8	1	2.6	12	19	
Previous Degree							0.745
High School	14	58.3	25	64.1	39	61.9	

Associate	2	8.3	8	20.5	10	15.9	
Baccalaureate	2	8.3	5	12.8	7	11.1	
No answer	6	25	1	2.6	7	11.1	
Employment Status							0.140
FT Non-HC	0	0	3	7.7	3	4.8	
PT Non-HC	6	25	12	30.7	18	28.6	
FT HC	4	16.7	3	7.7	7	11.1	
PT HC	6	25	7	17.9	13	20.6	
Unemployed	2	8.3	13	33.3	15	23.8	
No answer	6	25	1	2.6	7	11.1	

Note: Full-Time Non-Health Care (FT Non-HC); Part-Time Non-Health Care (PT Non-HC); Full-Time Health Care (FT HC); Part-Time Health Care (PT HC)

[a] Fisher's exact test was performed due to small sample size

Table 2.3

Module Exam Means by Group

Group		Score	
	n	M	SD
Intervention	39	78.75	7.29
Control	24	74.79	6.62
Difference		3.96	

Table 2.4

Regression Statistics of Demographic Characteristics for Cognitive Performance Scores

Demographic			
	Coefficient	*t*	*p*
Age	-0.136	-0.418	0.68
Gender	0.147	1.183	0.529
Race	-0.337	-1.535	0.139
Ethnicity	0.001	0.002	0.998
Degree Held	0.114	0.391	0.70
Employed in Health Care	0.281	1.183	0.25
Unemployed/Student	0.48	0.194	0.848
English Language Accommodation	-0.194	-0.818	0.422

Table 2.5

Regression Coefficients of Predictors of Cognitive Performance

Variable	***B***	***SE***	***95% CI***		***p***
			UL	***LL***	
Constant	68.082	3.558	60.942	75.22	<.001
Group	5.57	2.033	1.49	9.649	.008
ELAS[a]	-.272	.515	-1.306	.762	.60
Group and ELAS[a]	.181	.29	-.40	.762	.535

[a]English language acculturation scale

Table 2.6

Mixed ANOVA for Course Engagement

Variable	Control (n = 12)		Intervention (n = 22)		ANOVA				
	M	*SD*	*M*	*SD*	Effect	*F* ratio	*df*	*p*	η^2
SCEQ									
Interaction					G x T	0.671	1,32	.419	.021
Pretest	82.17	23.641	96.14	12.338					
Posttest	81.33	13.034	90.50	11.915					
Difference	-0.84		5.64						
Time					T	1.217	1,32	.278	.037
Error							32		

Note: N = 34. SCEQ =Student Course Engagement Questionnaire; G = Group (Control/Intervention); T = Time of testing (Pretest/Posttest; ANOVA = analysis of variance)

Table 2.7

Regression Statistics of Demographic Characteristics for Posttest SCEQ

Demographic			
	Coefficient	*t*	*p*
Age	-0.141	-0.380	0.710
Gender	-0.136	-0.505	0.622
Race	0.230	1.021	0.326
Ethnicity	-0.402	-1.597	0.134
Employed in Health Care	0.751	2.861	0.013
Unemployed/Student	0.311	1.141	0.274
English Language Accommodation	0.231	1.031	0.329

Chapter 3

Effect of Gaming on Undergraduate Nursing Student Metamotivational State in an Undergraduate Pharmacology Course

Nurse educators have been faced with many different challenges over time including the COVID-19 pandemic that forced educators to find and use innovative teaching strategies rather than traditional lectures to prepare nursing students. There has also been a curricular shift from a focus on specific disease processes to conceptual-based presentation of cognitive performance and skills that promote clinical judgment (Della Ratta, 2015). One way to achieve this new approach is through the use of a flipped classroom and active teaching strategies, such as gaming. An individual's metamotivational state influences whether they are motivated and accomplish movement towards achievement of a goal through self-regulation or whether they are present-oriented and playful (Apter, 2001). As nurse educators increase the use of new teaching strategies, such as gaming, understanding metamotivational states promotes an evidence-based approach to provide a classroom that supports the necessary metamotivational state for goal achievement. This study used reversal theory to examine behaviors in the nursing classroom with and without gaming through exploration of the means-and-ends domain. This study aimed to evaluate the effect of student metamotivational state on course engagement and cognitive performance by determining if students were in telic (serious-minded) or paratelic (playfulness) states in the classroom.

Metamotivational State

Traditionally, classroom teaching has been delivered through a lecture format, which is consistent with inducing telic states. In telic states, people are focused on accomplishing a goal; they are future oriented and attempt to avoid high arousal to accomplish their goal. In paratelic

states, people are fun oriented; they are present oriented, rather than future oriented, and prefer high arousal. Unlike lectures, gaming is a teaching strategy that can invoke the paratelic state. Cramer and Lafreiniere (2015) tracked metamotivational states and engagement levels of undergraduate students in a social psychology course during traditional lecture and found that engagement decreased as students moved from a telic to a paratelic state. These results suggest the need for an interactive activity to maintain high levels of engagement that satisfy students' paratelic needs.

Gaming

One popular game being used at various levels of education is *Kahoot!*. This game-based platform was developed as an alternative to expensive clicker technology and a way to increase engagement and motivation (Wang, 2015). Since its public launch in 2012, *Kahoot!* has increased both in popularity and the number of game formats available for educators. The various formats allow educators to customize this specific teaching strategy to specific learner characteristics along with subject matter for the course. Use of *Kahoot!* in nursing education has demonstrated positive outcomes on cognitive performance and classroom dynamics (Castro et al., 2019; Hampton et al., 2019; Kinder & Kurz, 2018; Wang et al., 2018).

Course Engagement

Student engagement in the classroom, along with course materials, has been identified as an important influence on learning outcomes and student success. With the shift in student population characteristics, including decreased attention span and need for excitement, nurse educators had to find ways to engage students in the classroom using technology such as games. There is limited evidence in nursing education regarding the use of *Kahoot!* in the classroom; perhaps one of the reasons is the generational gap between nurse educators and their students.

Hampton et al. (2019) found games to be engaging by 44.1% of nursing students surveyed, noting that only 21% of those surveyed had not experienced gaming in the nursing classroom.

Cognitive Performance

Cognitive performance in nursing pharmacology provides a foundation for the nurse's role in medication administration. Pharmacology courses in the undergraduate nursing curriculum typically consist of didactic teaching along with the psychomotor component being taught in clinical courses. This can lead to a disconnect in the learning process for nursing students. Past research has investigated low-technology and software-based games in the pharmacology classroom and found positive student outcomes (Bays & Herrmann, 1997; Kinder & Kurz, 2018; Raines, 2019).

English Language Acculturation

Students with English as an additional language have demonstrated difficulty in both their academic and clinical performance during nursing education (Salamonson et al., 2013). One critical part of the acculturation process is language acquisition, leading nurse educators to search for ways to promote academic success in students from this population. The nursing profession is challenging due to having terms and concepts that differ between cultures and require nurse educators to demonstrate cultural competence (Sailsman, 2021). Students can improve their English ability through acculturation and exposure, using English in the classroom with classmates and faculty. Students with low English language acculturation scores have demonstrated lower mean subject grades than their peers (Salamonson et al., 2008). As nurse educators move towards the use of active teaching strategies, there is a need to be cognizant of students with low English acculturation skills and ensure their academic success.

Theoretical Framework

Two theoretical frameworks guided this study on gaming as a teaching strategy in the classroom. Adult Learning Theory (Knowles, 1972) and Reversal Theory (Apter, 2001) served as the foundation for gaming as a teaching strategy in undergraduate nursing education.

Adult Learning Theory

Adult Learning Theory was developed when educators realized that there was a difference between learners based on age. Knowles et. al. (2005) proposed that adults differ from younger learners in four major areas. Adults are self-directed in their learning as they are ready to learn and wish to advance their roles. They use problem-based learning and value cognitive performance that can be readily applied to their role. Adults are also able to draw from both personal and work-related past experiences. Evidence supports that adults learn best when they are active participants in an environment that is collaborative and supportive (Harmon & Thompson, 2015; Kinder & Kurz, 2018). Gaming is used in the classroom as an active teaching strategy to promote cognitive performance gain and application. Serving as a "game show host," the nurse educator can facilitate the learning process while providing a supportive and collaborative environment (Kinder & Kurz, 2018).

Reversal Theory

Reversal Theory addresses the organization of the conscious experience and applies to numerous phenomena, including classroom climate (Apter, 2001; Lewis, 2015). The theory posits that human beings reverse between opposing metamotivational states. General characteristics of reversal theory include the following: (a) personality is inherently inconsistent, (b) people are characterized as experiencing patterns of metamotivational states over time that are changeable, and (c) self-contradictions exist explaining irrational and paradoxical behavior. The theory consists of four domains of experience, each with two opposite ways of experiencing

them that cannot exist simultaneously. The domain of means-and-ends provides the framework for classroom climate. In the means-and-ends domain, two metamotivational states exist: (a) the telic state (serious-minded) and (b) the paratelic state (playfulness) (Apter, 2001). In this study, it was hypothesized that gaming increases student engagement and will cause students to reverse into the paratelic state, using playfulness to increase engagement and learn course content.

Purpose

The purpose of this study was to investigate the effect of gaming as an active teaching strategy on metamotivational states of undergraduate nursing students enrolled in a nursing pharmacology course. The following research questions were explored: (a) what is the relationship between gaming as a teaching strategy and metamotivational states in students in an undergraduate nursing pharmacology course?, (b) Does metamotivational state interact with teaching strategy to affect course engagement such that students in paratelic states show higher engagement in the gaming condition while students in telic states will show higher engagement in the traditional didactic session?, and (c) Does metamotivational state interact with teaching strategy to affect cognitive performance such that students in paratelic states will learn relatively more than students in telic states in the gaming environment, while students in telic states will learn relatively more in the traditional didactic session?

Methods

Design

This study used a quasi-experimental two-group, repeated measures design to evaluate the relationship between the presence or absence of gaming in the classroom, along with the effect each has on undergraduate nursing students' metamotivational states. The interaction between metamotivational state and teaching strategy was also evaluated to see if there was an

effect on course engagement and cognitive performance. Students were placed in either the intervention or control group according to their registered course section. This paper consists of findings from a larger study; findings for course engagement and cognitive performance were presented in Chapter 2 of this dissertation.

Participants

A convenience sample of baccalaureate nursing students enrolled in a nursing pharmacology course at a private university located in the northeastern United States were recruited to participate in this study. Nursing pharmacology is a core course and required for all baccalaureate students to complete during their second year of the curriculum. All students enrolled in the course during Fall 2021 and Spring 2022 semesters were invited to participate in the study; however, those repeating the course were excluded as they had been previously exposed to the material.

Based on a power analysis using G-Power 3.2 to obtain a medium effect at .05 (Cohen, 1992) significance and a power of .80, each group required 64 participants, with a total number of 128 participants needed. Data collection occurred over two semesters in an attempt to reach the required numbers for statistical power.

Measures

A short demographics survey was developed by the researcher to describe the sample and compare groups (see Appendix A). The following measures were also included in the study: (a) English Language Acculturation Scale (see Appendix C), (b) Telic/Paratelic State Instrument, (c) module examination measuring pharmacology cognitive performance, and (d) Student Course Engagement Questionnaire.

English Language Acculturation Scale

The English Language Acculturation Scale (ELAS) was developed by Salmonson et al. (2008) as a way to measure the linguistic aspect of acculturation. The ELAS is comprised of five questions with five response options: 1 = *Only non-English language(s)*, 2 = *More non-English than English*, 3 = *Both non-English and English equally*, 4 = *More English than non-English*, and 5 = *Only English*. Values assigned to the responses range from 1 to 5 (low to high). Scores are calculated by adding up each value to give an overall score with a range from 5 to 25. Scores are divided into three groups: (a) low: 5-13, (b) medium: 14-18, and (c) high: 19-25. (see Appendix C). Cronbach's alpha was .89 when reliability and validity were established with a sample of 273 first-year nursing students in Australia (Salamonson et al., 2008). English as a second language has been correlated with academic performance through the use of the ELAS: students with lower ELAS scores had lower mean subject grades (Salamonson et al., 2008; Salamonson et al., 2013). In this study, the Cronbach's alpha was .98.

Telic/Paratelic State Instrument

This study measured nursing students' metamotivational states while in the classroom by using the Telic/Paratelic State Instrument (T/PSI) developed by O'Connell and Calhoun (2001). The T/PSI is a 12-item scale comprised of two subscales: (a) 7-item Serious Minded/Playful Subscale and (b) 5-item Arousal-Seeking/Arousal Avoidance Subscale (see Appendix F). Each item has a pair of opposite words requiring responses of 1 = *happy* to 6 = *sad,* indicating how students felt in the classroom. Scores are summed with higher scores (>40) indicating a paratelic (playful) state and lower scores (< 41) reflecting the telic (serious-minded) state. Cronbach's alpha for the total scale was .89. The scale reliability and validity were established with a sample of 512 adults (O'Connell & Calhoun, 2001). Grewal and Lafreniere, (2003) used the T/PSI with

undergraduate college students to investigate coping with academic failure and found a Cronbach's alpha of .82 for the total scale.

For this study, the T/PSI was recoded using the median score of the pretest as the cutoff, < = 42 representing students in the telic state and > = 42 represented students in the paratelic state. This was done based on an initial analysis of the T/PSI indicating that the majority of the students were in a paratelic state at all measurements in both groups. Using the new cutoff scores allowed an analysis more representative of the student sample as Generation Z is noted to have different characteristics than the sample used when the instrument was developed. The Cronbach's alpha for the T/PSI in this study ranged from .647 (pretest) to .918 (time 3 measurement) indicating that this cutoff was reliable and valid for the sample.

Pharmacology Cognitive Performance

The cognitive performance exam consists of 75 faculty-developed questions that are used as a module exam and have been reviewed by content experts (see Appendix D). The module exam consisted of 25 multiple-choice questions from each of three topics: (a) cardiovascular drugs, (b) hematologic drugs, and (c) respiratory drugs. Item analysis included calculation of Kuder-Richardson Formula 20 (KR-20) for internal consistency, *p* values for item difficulty, and point bi-serial (PBI) values for item discrimination. The KR-20 was .65 for the examination, indicating good reliability for a nursing examination that covers multiple concepts and topics (McGahee & Ball, 2009).

Student Course Engagement Questionnaire

Student course engagement was measured with the Student Course Engagement Questionnaire (SCEQ), which was developed to evaluate engagement in college-age students (Handelsman et al., 2005). The original 27-item SCEQ was revised to 25 items on the final

version through factor analysis (see Appendix E). Handelsman et al. (2005) noted that four factors accounted for 42.69% of the variance: (a) skills engagement, (b) emotional engagement, (c) participation/interaction engagement, and (d) performance engagement. Reliability of the factors was reported with Cronbach's alphas ranging from .76 to .82. The instrument is a Likert-type scale with response options ranging from 1 = *less like me* to 5 = *more like me.* The instrument is scored by obtaining a total score along with a score for each subscale. Higher scores indicate higher levels of student engagement. The SCEQ was previously evaluated for validity in higher education settings by enlisting 40 undergraduates with various majors and course enrollment. Several regression analyses were performed to evaluate the role that engagement plays in class grades and revealed that the student engagement factor explained 26% to 30% of the variance in course grades, illustrating construct validity of the scale (Handelsman et al., 2005). The Cronbach's alpha for the SCEQ in this study ranged from .928 (posttest) to .949 (pretest).

Procedure

Permission to use the T/PSI and SCEQ was obtained. Institutional Review Board (IRB) approval was granted by both Teachers College and the study site. Second semester nursing students enrolled in the course during Fall 2021 were informed about the study both verbally and in writing during the first class of the semester. Students enrolled in the course during Spring 2022 semester were informed in writing via email starting the first week of classes until the start of the intervention. Students signed an electronic consent form if they agreed to participate in the study. The informed consent was posted as a file on the learning management system for easy review by students. Those who chose to opt out of the study still received the teaching strategy assigned to their section of pharmacology. Due to low study enrollment, an incentive was added.

Students in the Spring 2022 semester who consented to participate and completed all surveys were given a $10 gift card. Students who were assigned to the control group were able to participate in the *Kahoot!* activities for the second half of the semester after completion of the study.

Intervention Group Experience

The teaching strategy used by all faculty in the study site's undergraduate pharmacology course is a flipped classroom model. In this model, students receive instruction, in the form of a recorded lecture, prior to coming to the classroom. Faculty then use active teaching strategies to facilitate learning in the classroom. To control the use of a flipped classroom, the study period was during the second module of the semester. This approach allowed students to adjust to the teaching strategy, as many nursing faculty in other courses still use traditional lecture. Participants completed an initial survey consisting of demographics, ELAS, SCEQ and T/PSI on the last day of course content for the first module before starting the intervention *Kahoot!*. They were then presented with the intervention of gaming, *Kahoot!*, over the next three class periods. Each *Kahoot!* was in the "lecture and learn" style that is a mixture of questions and slides to clarify difficult topics. This version of *Kahoot!* includes music, timed questions, and a leader board, which gives students an entertaining gaming session. Students were either able to play as an individual player or observe the game session. Each session of *Kahoot!* lasted 1 hour of the 3-hour class period. Students were surveyed after the completion of the *Kahoot!* gaming session during the intervention period. The *Kahoot!* intervention was used during the last hour of the class time and at the end of the class period the students were asked by the professor to complete the survey they received via email. The wording of the instructions asked the students to think about how they were feeling during the last few minutes before completing the survey. Students

were also granted access to the *Kahoot!* in individual game play mode after class, which they could use as a strategy to study for the exam. Participants completed the module exam during their scheduled class time. The posttest SCEQ was emailed to students for completion after they finished the examination. Figure 3.1 presents a representation of the procedure steps for the Intervention Group.

Control Group Experience

Students in the control group received the same flipped classroom instructional method without the gaming intervention. Active teaching strategies for this group included group discussion and case studies. The pre and posttest surveys were completed during the same time period as the intervention group. Figure 3.2 presents a representation of the procedure steps for the Control Group.

Data Analysis

Data analysis was completed using IBM SPSS Statistics version 28.0 software. Group differences on demographic variables were analyzed using (a) Mann-Whitney U (age), (b) chi-square test of homogeneity (ethnicity), and (c) Fisher's exact test (race, previous degree, and employment status). Chi-square test of homogeneity was used to analyze metamotivational state between groups for each measurement time. The relationship of gaming and metamotivational states on posttest classroom engagement was explored through a two-way ANOVA with gaming (intervention or control group) and metamotivational state during the class (telic or paratelic) as the independent variables and testing for an interaction. If the interaction was significant, then a separate analysis was carried out to investigate the simple main effects. A linear regression analysis was used to determine if the interaction between metamotivational state and teaching strategy affects cognitive performance.

Results

A total of 146 students enrolled in the undergraduate nursing pharmacology course over two semesters (37 in Fall of 2021 and 109 in Spring 2022). A total of 63 students consented to participate in the study (43.3% participation rate): (a) the intervention group had 39 students and (b) the control group had 24 students. The number of responses fluctuated for each assessment (see Table 3.1).

Demographic Characteristics

Participant ages ranged from 19 to 40 years (M = 22.24; SD = 4.432) and the sample was predominantly female (79.4%). The sample included students representing diverse backgrounds: Asian (6.3%), Black (12.7%), White (60.3%), and other (7.9%). This diversity is representative of the school of nursing in which the study was conducted. Students enrolled in the study have various levels of previous education with the majority directly out of high school (61.9%). Study participants had various levels of employment status at the time of this study. Table 3.2 shows the demographic variables. There were no statistically significant differences between the control and intervention groups in any demographic variables examined.

Metamotivational State

Chi-square analysis of the metamotivational state between the control and intervention group prior to the start of the gaming sessions revealed that four participants (30.77%) in the control group were in a paratelic state compared to 23 (60.53%) in the intervention group. These frequencies were not statistically significantly different $X^2(1, N = 51) = 3.443$, $p = .06$. Chi-square analyses showed no statistically significant differences in metamotivational state between the control and intervention group at any of the measurement points during the intervention period. Tables 3.3-3.6 show the results of these analyses.

Metamotivational State and Course Engagement

A two-way ANOVA revealed there was a statistically significant interaction between gaming and metamotivational state, $F(1,30) = 4.603$, $p = .041$. Simple main effects were calculated indicating that there were statistically significant differences between subjects in the paratelic and telic state in the intervention group, $t(18) = -3.06$, $p = .007$, with students in the paratelic state having higher course engagement. There was no significant difference in course engagement between telic and paratelic state of the control group $t(8) = 0.37$, $p = .71$. Figure 3.3 presents these results. Table 3.7 presents the descriptive statistics for the ANOVA analysis. Table 3.8 presents the results of the ANOVA analysis.

Metamotivational State and Cognitive Performance

A linear regression analysis with interaction variable was conducted to determine if metamotivational state interacted with group to affect cognitive performance. The overall regression model was not statistically significant, $F(3,38) = 2.427$, $p = .08$, $R^2 = 0.161$, indicating that metamotivational state was not a predictor of cognitive performance. Table 3.9 presents the descriptive statistics for the regression analysis. Table 3.10 presents the results of the regression analysis.

Discussion

There was no difference in metamotivational state between the groups with and without gaming indicating that despite *Kahoot!* being an interactive educational gaming activity, students exposed to gaming in the classroom did not have an increased rate of paratelic states. The individual game style of *Kahoot!* may have played a role in students remaining in the telic state as they were able to gain points with accuracy and speed in answer. Students expressed their dislike for the flipped classroom in faculty evaluations and requested traditional lecture format.

The lack of exposure to this newer modality of teaching may have increased the students' telic state as they wanted to have a more serious way of learning. This finding aligns with the Adult Learning Theory proposition of self-regulation while learning.

There was a statistically significant interaction between metamotivational state and course engagement. Students in the intervention group exposed to gaming had an increase in course engagement compared to those in the same group who were in the telic state. The opposite was found in the control group with those who were in the telic state reporting decreased course engagement. However, metamotivational state did not statistically significantly predict cognitive performance. The metamotivational states noted in the groups were subjectively confirmed by the behaviors of students within their classrooms. Students in the gaming group were more interactive with both faculty and classmates. These findings support previous recommendations for nurse educators to use gaming in the classroom as an active strategy while noting the subjective engagement behaviors and adjusting accordingly to maximize their metamotivational state to reach students with various learning styles (Cramer and LaFreniere, 2015),

Limitations

Several limitations exist in this study. Use of a convenience sample might limit the generalizability of the findings to other populations. Randomization of the study participants was not possible due to the students being allowed to register for their preferred section of the course. However, the demographic survey analysis results indicated homogeneity between groups. Due to the COVID-19 pandemic causing enrollment issues, participants were recruited over two semesters. Despite the extended time in recruitment, this study did not reach a sample size for adequate power, leading to a lower chance that the results obtained would be statistically

significant. During the second semester, the intervention group was taught by a different professor. This change in professor may have caused a threat to the internal validity of the study as the intervention may not have been delivered in the same manner.

The length of the surveys along with the number of measurement times may have caused survey fatigue, as students expressed their dislike of being exposed to research due to not having time to complete the surveys. The use of self-report instruments may have led to students not answering openly, as they may have been trying to answer in a way that is desirable to the researcher or faculty member. The researcher was limited to distributing the surveys via email, causing the inability to know exact timing of when the T/PSI was taken by the students. This could lead to false answers that were not reflective of the gaming intervention. The directions given to the students for the T/PSI made it unclear that they were to answer based on how they felt while playing *Kahoot!* or being in a non-gaming classroom. The metamotivational states obtained may, therefore, have been misrepresentative of the true state during the intervention.

Implications

This study provides a foundational evaluation of metamotivational state in an undergraduate nursing pharmacology classroom and provides evidence to support the use of gaming to promote course engagement. Further research on metamotivational state in the nursing classroom is needed to add to what is known about the use of gaming as an active teaching strategy in undergraduate nursing education. Future studies would benefit from using a larger sample and randomization. This could be accomplished through recruiting more students at the same site or conducting a multi-site study.

Conclusion

Changes in student demographics and technological advances have led nurse educators to shift from traditional lecture to active teaching strategies. Findings from this study indicate that the gaming application, *Kahoot!*, can be used in nursing classrooms without a statistically significant change in metamotivational state or impact on cognitive performance. Course engagement findings supported the hypothesis that gaming improved course engagement for those in the paratelic state much more than the telic state. Future research is needed to further evaluate students' metamotivational states in a gaming classroom and the impact it has on learning outcomes.

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Figures

Figure 3.1

Study Procedure for Intervention Group

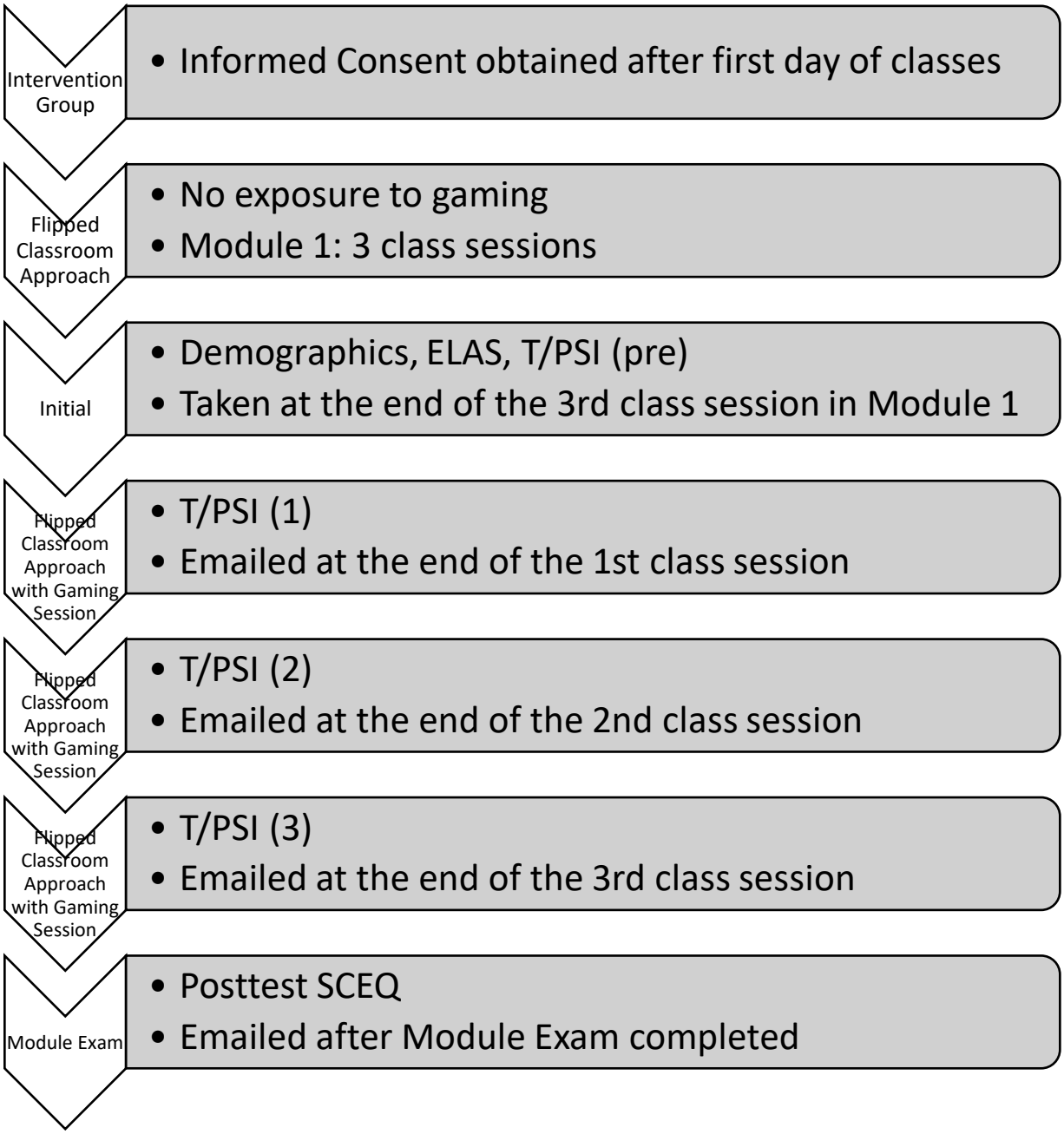


Figure 3.2

Study Procedure for Control Group

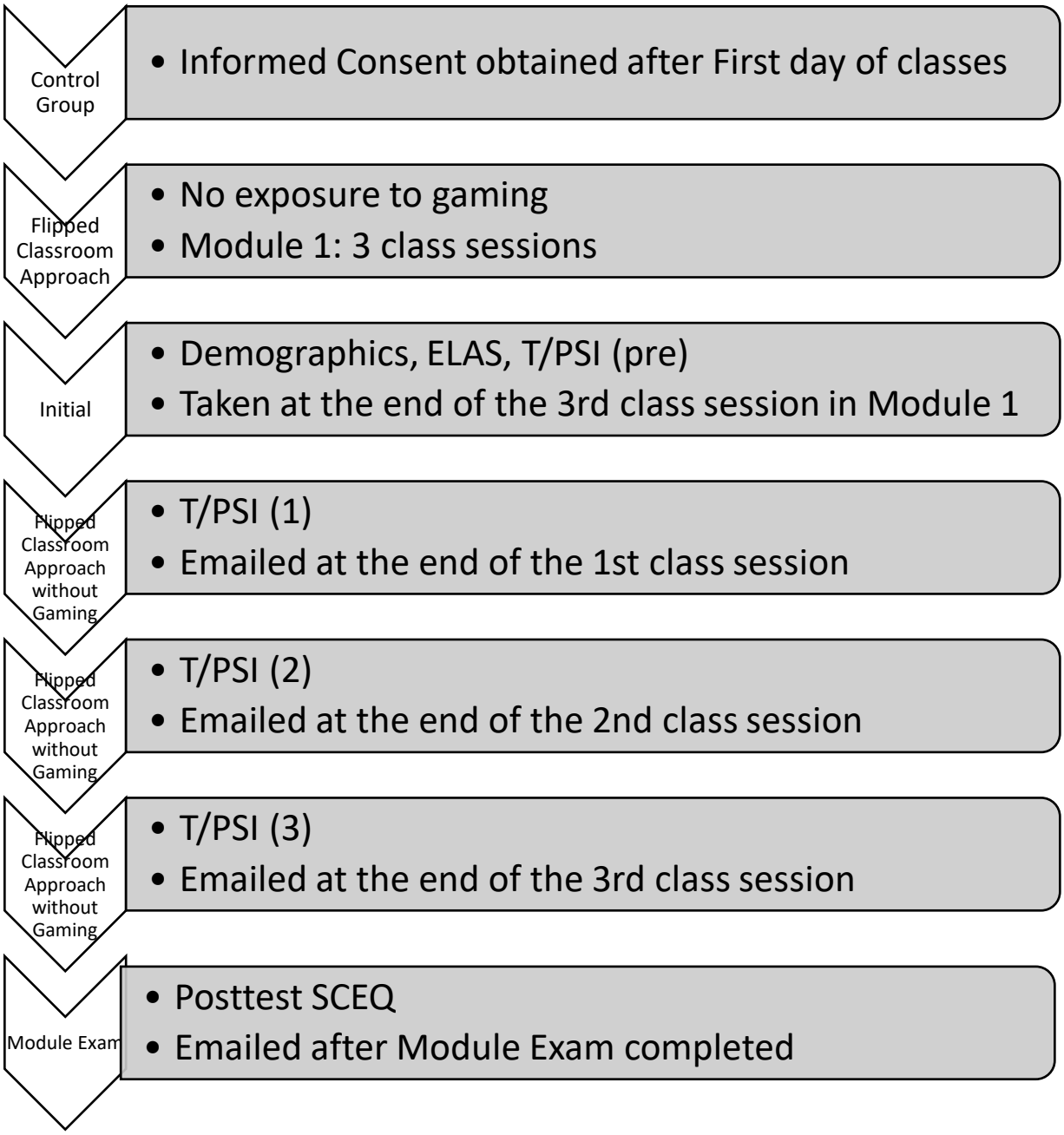
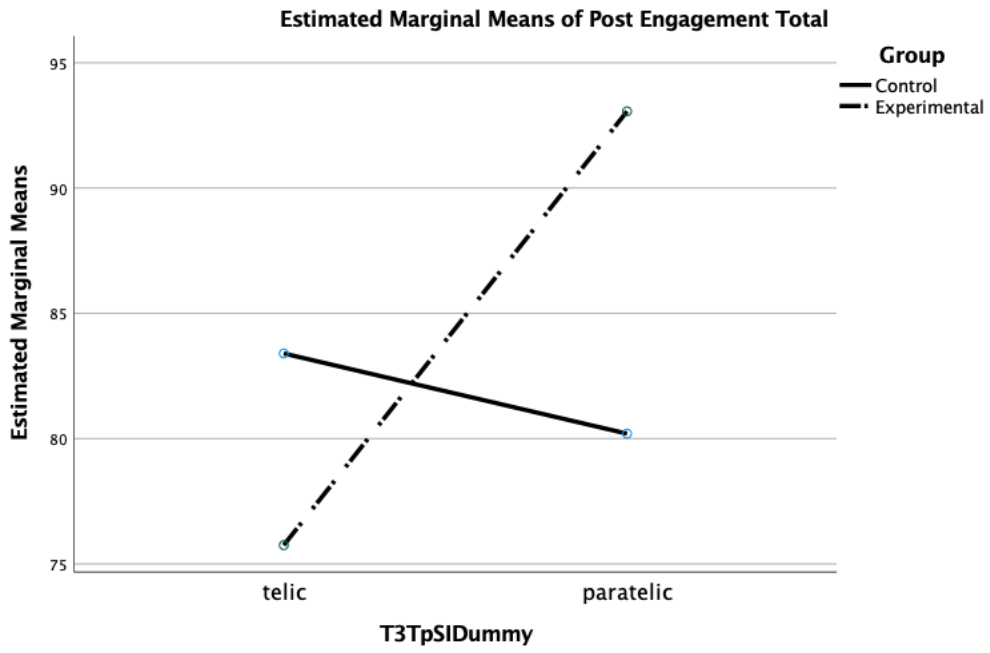


Figure 3.3

Metamotivational State and Post SCEQ Scores by Group



Tables

Table 3.1

Number of Responses for Each Survey

Instrument	Intervention Group	Control Group Group
Consent	39	24
ELAS	38	18
Pretest SCEQ	38	18
Pretest T/PSI	38	14
Time 1 T/PSI	31	15
Time 2 T/PSI	30	17
Time 3 T/PSI	30	17
Posttest SCEQ	22	12
Cognitive performance	39	24

Table 3.2

Demographic Characteristics of Study Participants

Demographic Variable	Flipped Classroom (n=24)		Flipped Classroom plus *Kahoot!* (n=39)		Sample		*p* value[a]
	n	%	*n*	%	*n*	%	
Gender							0.123
Female	17	70.8	33	84.6	50	79.4	
Male	0	0	5	12.8	5	7.9	
No answer	7	29.2	1	2.6	8	12.6	
Ethnicity							1.0
Hispanic	1	4.2	3	7.7	4	6.3	
Non-Hispanic	16	66.7	33	84.6	49	77.8	
No answer	7	29.2	6	15.4	13	20.6	
Race							0.301
American	0	0	0	0	0	0	
Indian							
Asian	1	4.2	3	7.7	4	6.3	
Black	2	8.3	6	15.4	8	12.7	
White	14	50	24	61.5	38	60.3	
Other	0	0.0	5	12.8	5	7.9	
No answer	11	45.8	1	2.6	12	19	
Previous Degree							0.745
High School	14	58.3	25	64.1	39	61.9	

Associate	2	8.3	8	20.5	10	15.9	
Baccalaureate	2	8.3	5	12.8	7	11.1	
No answer	6	25	1	2.6	7	11.1	
Employment Status							0.140
FT Non-HC	0	0	3	7.7	3	4.8	
PT Non-HC	6	25	12	30.7	18	28.6	
FT HC	4	16.7	3	7.7	7	11.1	
PT HC	6	25	7	17.9	13	20.6	
Unemployed	2	8.3	13	33.3	15	23.8	
No answer	6	25	1	2.6	7	11.1	

Note: Full-Time Non-Health Care (FT Non-HC); Part-Time Non-Health Care (PT Non-HC); Full-Time Health Care (FT HC); Part-Time Health Care (PT HC)

[a] Fisher's exact test was performed due to small sample size

Table 3.3

Preintervention Metamotivational State Relationship with Group

	Reported Metamotivational State		
Group	Telic	Paratelic	Total
Control	9 (69.23%)	4 (30.76%)	13
Intervention	15 (39.47%)	23 (60.53%)	38

χ^2 (1) = 3.443, p = .064, Fisher's exact test (p = .1.07) non-significant results between groups.

Table 3.4

Metamotivational State Relationship with Gaming after First Session

	Reported Metamotivational State		
Group	Telic	Paratelic.	Total
Control	11 (73.3%)	4 (26.7%)	15
Intervention	15 (48.4%)	16 (51.6%)	31

χ^2 (1) = 2.504, p = .11, Fisher's exact (p = .128) indicates non-significant results between groups.

Table 3.5

Metamotivational State Relationship with Gaming after Second Session

	Reported Metamotivational State		
Group	Telic	Paratelic.	Total
Control	11 (64.7%)	6 (35.3%)	17
Intervention	18 (60%)	12 (40%)	30

χ^2 (1) = .102, p = .75, Fisher's exact (p = 1.0) indicates non-significant results between groups.

Table 3.6

Final Measurement of Metamotivational State Relationship with Gaming

	Reported Metamotivational State		
Group	Telic	Paratelic.	Total
Control	10 (71.4%)	4 (28.6%)	14
Intervention	15 (53.6%)	13 (46.4%)	28

X^2 (1) = 1.235, p = .266, Fisher's exact (p = .33) indicates non-significant results between groups.

Table 3.7

Descriptive Statistics for Posttest Course Engagement Scores by Group and Metamotivational State

Group	Metamotivational State	M	SD	N
Control	Telic	83.40	16.056	5
	Paratelic	80.20	10.733	5
	Total	81.80	12.985	10
Intervention	Telic	75.75	11.701	4
	Parateic	93.06	9.774	16
	Total	89.60	12.146	20
Total	Telic	80	11.234	9
	Paratelic	90	11.234	21
	Total	87	12.766	30

Table 3.8

2-Way ANOVA Evaluating Relationship Between Group and Posttest Course Engagement

Predictor	Sum of Squares	*df*	Mean Squared	F	*p*
Intercept	155085.011[a]	1	1550585.011	1208.809	<.001
Group	38.1134	1	38.134	.297	.590
T/PSI Time 3[b]	279.527	1	279.527	2.179	.152
GroupXT/PSI Time 3[b]	590.544	1	590.544	4.603	.041
Error	3335.688	26	128.296		

NOTE: a. R Squared = .294 (Adjusted R Squared = .213); b. Telic/Paratelic State Inventory obtained after the third gaming period for the intervention group and third class time for the control group

Table 3.9

Descriptive Statistics for Metamotivational State and Cognitive Performance Scores for Each Group

Group	Cognitive performance (Examination Scores)	M	SD	N
Control	Telic	72.3914	7.99805	7
	Paratelic	72.9614	6.00354	7
Intervention	Telic	78.7378	6.33193	9
	Parateic	79.6505	8.45192	19

Table 3.10

Regression Analysis of Metamotivational State and Cognitive Performance

Predictors			
	Coefficient	*t*	*p*
Group	0.378	1.653	.107
Metamotivational State	0.014	0.026	.979
Group x Metamotivational State	0.039	0.67	0.947

NOTE: R. Squared = .161 (adjusted R Squared = .095); Dependent Variable = Cognitive performance (Module exam after intervention period)

Chapter 4: Dissertation Summary

This dissertation study explored the effect of gaming as a teaching strategy in an undergraduate nursing pharmacology course. The following learning outcomes were measured: (a) cognitive performance of content presented in the classroom during time of intervention (module 2), (b) degree of English as a second language, (c) metamotivational state (telic/paratelic), and (d) course engagement. The quasi-experimental design allowed a comparison of those who received gaming in the classroom to those who did not. This study was guided by Adult Learning Theory (Knowles, 1972) and Reversal Theory (Apter, 2001).

A convenience sample of 63 nursing students enrolled in an undergraduate nursing pharmacology course at a private university in the northeastern United States participated in the study. The study employed a quasi-experimental, two-group design with time series measurement. Cognitive performance and course engagement findings are detailed in Chapter 2 and metamotivational state findings are detailed in Chapter 3.

Findings

The manuscript for Chapter 2 presents the use of gaming in a nursing undergraduate pharmacology course as an active teaching strategy as compared to the use of non-gaming active teaching strategies. There was a statistically significant difference in cognitive performance between groups indicating *Kahoot!* is an effective way to increase nursing cognitive performance in the classroom. Although there were no differences in groups over time regarding course engagement, this finding may suggest the use of *Kahoot!* is as effective as other teaching strategies currently being used to deliver course content in nursing education.

The manuscript for Chapter 3 presents the metamotivational states of nursing students in a nursing undergraduate pharmacology course with and without gaming as an active teaching

strategy. There was no difference in metamotivational state between those in the intervention group and those in the control group suggesting that adult learners are able to self-regulate their metamotivational state to achieve academic success. Metamotivational state did not predict cognitive performance in this study, which suggests that *Kahoot!* can be used in a classroom with diverse learners. Results showed a statistically significant interaction between group and metamotivational state indicating that participants in the control group with telic states had increased course engagement and those in the intervention group with telic states had lower course engagement. These results provide nurse educators with preliminary evidence supporting the need to be aware of subjective student behaviors while gaming in the classroom. Observing such behaviors could indicate lack of engagement and a further need for adjustments to their teaching strategies.

Implications and Future Research

This study has provided evidence that using *Kahoot!* in the undergraduate nursing classroom can be as effective as other active teaching strategies. The gaming application allows nursing faculty to provide students with a fun and exciting way to learn nursing content while providing an environment in which all types of learners can be successful. Active learning strategies, such as *Kahoot!*, are especially appropriate for Generation Z students.

This dissertation study has set the stage for future research, which could further evaluate the use of *Kahoot!* in the undergraduate nursing classroom. A variety of additional learning outcomes could be measured including cognitive performance development, competence, and clinical judgment. Because pharmacology is a requirement in all undergraduate nursing curricula, future research could include multi-site studies with larger sample sizes and increased generalizability. Nurse educators will continue to look for effective teaching modalities as

current and future students present different learning needs. Gaming is an approach that could find a home in the undergraduate nursing classroom.

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Appendix A

Institutional Review Board Approvals

TO:·Boneberg,·Anna¶

°¶

FROM:·Dr.°Julia·Hall°¶
Institutional·Review·Board°¶

°¶

DATE:·1/12/2022¶

°¶

SUBJECT:·**IRB·FULL·APPROVAL**°¶

°¶

Thank·you·for·submitting·the°materials·requested·by·the°D'Youville°IRB·regarding·your·application°that·was·previously·granted·Approval·with·Conditions.°¶

°¶

Following·a·full·review,·you·have°met·the·conditions·specified·and·your·application·entitled:°"*Assessing·the·Effectiveness·of·Gaming·as·Teaching·Strategy·in·an·Undergraduate·Nursing·Pharmacology·Course*"°has·now°been·granted°**FULL·APPROVAL**°with·respect·to·the·protection·of·human·subjects.·This·means·you·may·now·begin·your·research·unless·you·must·first·apply·to·the·IRB·at·the·institution·where·you·plan·to·conduct·the·research.°¶

°¶

You·have·approval·to·proceed·with·the·above-mentioned·study·for·one·year.·The·annual·follow-up/expiration·date·for·your·study·is°1/12/2022.°¶

°¶

The·IRB·expects·a·Study·Closure·Form·or°a·Renewal·Submission·from·the·Principal·Investigator·every·twelve·months°or·at·the·end·of·this·study,·whichever·comes·first.°After·sending·in·a·Study·Closure·Form,°the·IRB·will·log·the·research·as·closed.·The·researcher·will·then·receive·an·official·Closure·Letter·from·the·IRB.°No°changes°are·to·be°made·in·the·study's·procedures.°In·rare·instances·where·minor·changes·are·requested,·the·PI·should·send·an·explanatory·letter·on·DYC·letterhead·to·Julia·Hall·(hallj@dyc.edu)·and°irbhelp@dyc.edu.°If·you·do·not·submit·a·Study·Closure·Form·or·Renewal·Submission·of·the·study·before·the·expiration·date·noted·above,°your·study·will·be·terminated.·Any·adverse·events·or·mishaps·must·immediately·be·reported·to·the·IRB.°¶

°¶

When·your·study·is·complete,·please·notify·the·IRB·using·our·fillable°IRB·Study·Closure·Form.°You·will·then·receive·a·Closure·Letter.°**Please·refer·to·the·IRB·Manual·under°"Chapter·IV"–·IRB·Application·Guidelines"°for°further·specifics·and·the·IRB·Webpage·to·find·the·fillable·Closure·Form.**°¶

°¶

Congratulations·and·good·luck·on·your·research!°¶

°¶

kar°¶

°¶

cc:·Boneberg,·Anna·PNP-BC,·CNE¶
file°¶

¶

TO: **Anna Bonberg**

FROM: Dr. Julia Hall
Institutional Review Board

DATE: July 15, 2021

SUBJECT: **IRB FULL APPROVAL**

Thank you for submitting the necessary documentation for review of your proposed research study entitled: "Assessing the Effectiveness of Gaming as a Teaching Strategy in an Undergraduate Nursing Pharmacology Course"

Following a full review, you have been granted **FULL APPROVAL** with respect to the protection of human subjects. This means you may now begin your research unless you must first apply to the IRB at the institution where you plan to conduct the research.

You have approval to proceed with the above-mentioned study for one year. The annual follow-up/expiration date for your study is 03/30/2022.

The IRB expects a Study Closure Form or a Renewal Submission from the Principal Investigator every twelve months or at the end of this study, whichever comes first. After sending in a Study Closure Form, the IRB will log the research as closed. The researcher will then receive an official Closure Letter from the IRB. No changes are to be made in the study's procedures. In rare instances where minor changes are requested, the PI should send an explanatory letter on DYC letterhead to Julia Hall (hallj@dyc.edu) and irbhelp@dyc.edu. If you do not submit a Study Closure Form or Renewal Submission of the study before the expiration date noted above, your study will be terminated. Any adverse events or mishaps must immediately be reported to the IRB.

When your study is complete, please notify the IRB using our fillable IRB Study Closure Form. You will then receive a Closure Letter. **Please refer to the IRB Manual under 'Chapter IV – IRB Application Guidelines' for further specifics and the IRB Webpage to find the fillable Closure Form.**

Congratulations and good luck on your research!

kar

cc: Anna Bonberg
file

Attachments:
• Expedited Review Approved by Chair - IRB ID: 21-303.pdf

TEACHERS COLLEGE
COLUMBIA UNIVERSITY

Teachers College IRB *Expedited Approval Notificatio*

To: Anna Boneberg
From: Myra Luna Lucero Research Compliance Director
Subject: IRB Approval: 21-303 Protocol
Date: 07/05/2021

Please be informed that as of the date of this letter, the Institutional Review Board for the Protection of Human Subjects at Teachers College, Columbia University has given full approval to your study, entitled "*Assessing the Effectiveness of Gaming as a Teaching Strategy in an Undergraduate Nursing Pharmacology Course*," under **Expedited Review** on 07/05/2021: Category (7) Research on individual or group characteristics or behavior

Due to COVID-19 precautions, any studies that can be conducted online (remotely) should move forward with online procedures and forgo in-person engagement. Following guidance from New York State and Teachers College, the Institutional Review Board reviewing proposals for in-person data collection on a case-by-case basis.

The approval is effective until **07/04/2022**.

The IRB Committee must be contacted if there are any changes to the protocol during this period. **Please note:** If you are planning to continue your study, a Continuing Review report must be submitted to either close the protocol or request permission to continue for another year. Pleas submit your report by **06/20/2022** so that the IRB has time to review and approve your report if you wish to continue your study. The IRB numbe assigned to your protocol is **21-303**. Feel free to contact the IRB Office (212-678-4105 or irb@tc.edu) if you have any questions.

Please note that your Consent form bears an official IRB authorization stamp and is attached to this email. Copies of this form wit the IRB stamp must be used for your research work. Further, all research recruitment materials must include the study's IRB-approved protocol number.

As the PI of record for this protocol, you are required to:

- Use current, up-to-date IRB approved documents
- Ensure all study staff and their CITI certifications are on record with the IRB
- Notify the IRB of any changes or modifications to your study procedures
- Alert the IRB of any adverse events

You are also required to respond if the IRB communicates with you directly about any aspect of your protocol. Failure to adhere to your responsibilities as a study PI can result in action by the IRB up to and including suspension of your approval and cessation of your research.

You can retrieve a PDF copy of this approval letter from Mentor IRB.

When your study ends, please visit the IRB Mentor site. Go to the Continuing Review tab and select "terminate" from the drop-down menu.

Best wishes for your research work.

Sincerely,
Dr. Myra Luna Lucero
Research Compliance Director
IRB@tc.edu

Attachments:
- BonebergElectronicConsentREVISIONS.pdf
- Modification Approved - IRB ID: 21-303.pdf

TEACHERS COLLEGE
COLUMBIA UNIVERSITY

Teachers College IRB *Modification Approval Notification*

To: Anna Boneberg
From: Myra Luna Lucero Research Compliance Director
Subject: IRB Modification Approval: 21-303 Protocol
Date: 12/08/2021

Please be informed that as of the date of this letter, the Institutional Review Board for the Protection of Human Subjects at Teachers College, Columbia University has approved a *modification* to your study, entitled "*Assessing the Effectiveness of Gaming as a Teaching Strategy in an Undergraduate Nursing Pharmacology Course*" on 12/08/2021 for participant payment and update that the principal investigator will no longer be teaching the full course.

The approval remains effective until **07/04/2022**.

The IRB Committee must be contacted if there are any changes to the protocol during this period. **Please note:** If you are planning to continue your study, a Continuing Review report must be submitted to either close the protocol or request permission to continue for another year. Please submit your report by **06/20/2022** so that the IRB has time to review and approve your report if you wish to continue your study. The IRB number assigned to your protocol is **21-303**. Feel free to contact the IRB Office (212-678-4105 or IRB@tc.edu) if you have any questions.

Please note that your Consent form bears an official IRB authorization stamp. Copies of this form with the IRB stamp must be used for your research work. Further, all research recruitment materials must include the study's IRB-approved protocol number.

As the PI of record for this protocol, you are required to:

- Use current, up-to-date IRB approved documents
- Ensure all study staff and their CITI certifications are on record with the IRB
- Notify the IRB of any changes or modifications to your study procedures
- Alert the IRB of any adverse events

You are also required to respond if the IRB communicates with you directly about any aspect of your protocol. Failure to adhere to your responsibilities as a study PI can result in action by the IRB up to and including suspension of your approval and cessation of your research.

You can retrieve a PDF copy of this approval letter from the Mentor site.

Best wishes for your research work.

Sincerely,
Dr. Myra Luna Lucero
Research Compliance Director
IRB@tc.edu

Appendix B

Demographic Questionnaire

1) What is your age? _____

2) What is your gender?
   Female
   Male
   Prefer not to answer

3) What is your ethnicity?

   Hispanic
   Non-Hispanic
   Prefer not to answer

4) How do you characterize your race? (check all that apply)
   Asian
   Black
   American Indian/Alaskan Native
   White/Caucasian
   Other
   Prefer not to answer

5) Select your highest completed degree:
   High School
   Associates
   Baccalaureate
   Masters
   Doctoral

6) Are you currently employed?

   Full-time non-healthcare

   Part-time non-healthcare

   Full-time health related field

   Part-time health related field

   Unemployed at present/student

Appendix C

Gaming Use Survey

1) How many times did you participate in *Kahoot!* during scheduled class (in the classroom)

Participated in game 3 times

Participated in game 2 times

Participated in game 1 time

Observed game all sessions

2) How many times did you use *Kahoot!* on your own to study/review (outside of the classroom)

None

Once

Twice

Three times

> Three times

Appendix D

English Language Acculturation Scale

English Language Acculturation Scale (ELAS)

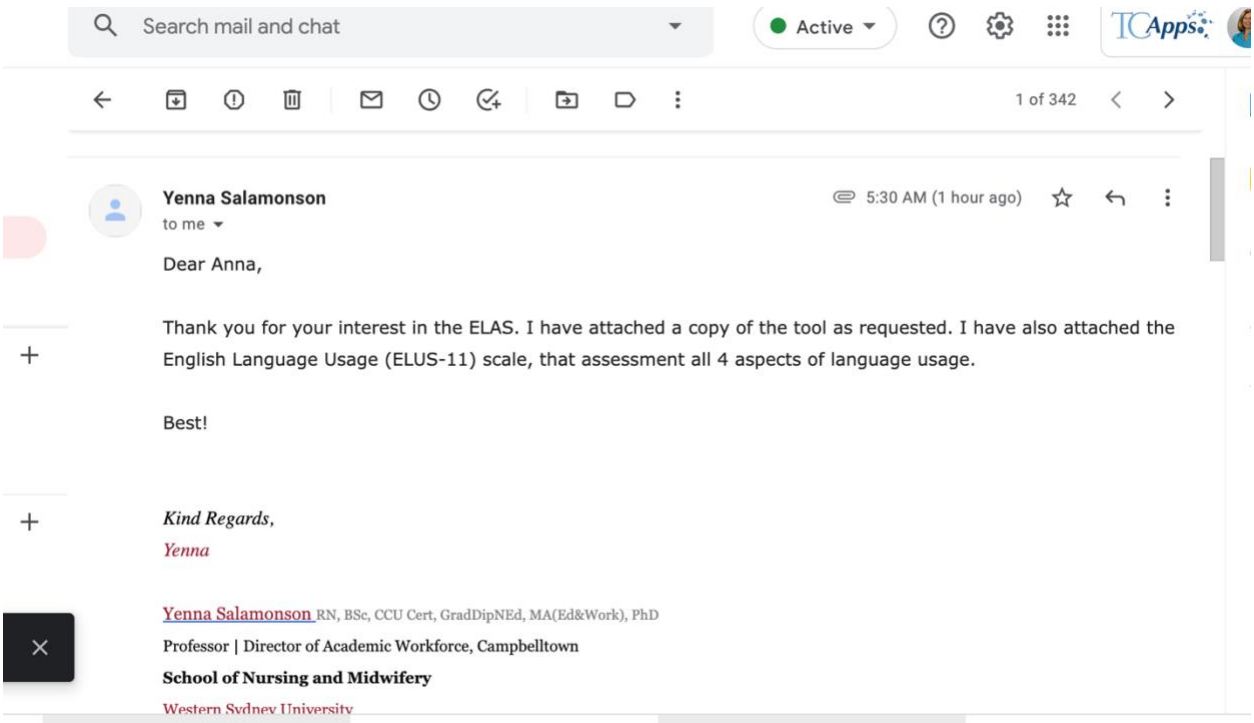
Instructions: ***Please indicate how descriptive each statement is of you by circling the number corresponding to your response.***

		Only non-English language(s)	More non-English than English	Both non-English & English equally	More English than non-English	**Only ENGLISH**
1	In general, what language(s) do you speak?	1	2	3	4	5
2	In general, what language(s) do you read?	1	2	3	4	5
3	What language(s) do you usually speak at home?	1	2	3	4	5
4	In which language(s) do you usually think?	1	2	3	4	5
5	What language(s) do you usually speak with your friends?	1	2	3	4	5

Reference:

Salamonson, Y., Everett, B., Koch, J., Andrew, S., & Davidson, P. M. (2008). English-language acculturation predicts academic performance in nursing students who speak English as a second language. *Research in Nursing & Health, 31*(1), 86-94.

Permission is granted for research and educational use of the scale. Please would you keep the lead author (Yenna Salamonson – y.salamonson@uws.edu.au) informed if you are modifying or revising this scale.


Search mail and chat
Active
1 of 342
Yenna Salamonson
to me
5:30 AM (1 hour ago)
Dear Anna,
Thank you for your interest in the ELAS. I have attached a copy of the tool as requested. I have also attached the English Language Usage (ELUS-11) scale, that assessment all 4 aspects of language usage.
Best!
Kind Regards,
Yenna
Yenna Salamonson RN, BSc, CCU Cert, GradDipNEd, MA(Ed&Work), PhD
Professor | Director of Academic Workforce, Campbelltown
School of Nursing and Midwifery
Western Sydney University

Appendix E

Pharmacology Cognitive Performance Exam and Blueprint

NUR 285 Exam 2 A

1. A client is receiving losartan. What would be important for the nurse to teach the client to avoid?

A. Grapefruit juice

B. Milk

C. Apple juice

D. Yogurt

2. When a combination of drugs needs to be incorporated into the drug plan for a client with hypertension, what type of diuretic is typically used to treat hypertension initially?

A. Thiazide

B. Loop

C. Potassium sparing

D. All three types are used equally

3. The nursing instructor is talking about clients who take an angiotensin II receptor blocker for hypertension. In teaching a female client who has been given a prescription for an ARB, what would the instructor tell the students it would be the MOST important for the nurse to include?

A. "Remember to eat with your medicine"

B. "Increase your exercise to at least 3 times per week"

C. "Use two forms of contraceptives"

D. "Make sure to keep your weight stable"

4. A client is started on captopril. The client should be instructed that what is a common adverse effect of ACE inhibitor therapy?

A. Sedation

B. Persistent cough

C. Tachycardia

D. Rash

5. A client has been prescribed Losartan (Cozaar) for their hypertension. What should client teaching for this drug include?

A. Take the medication with food to decrease GI distress

B. Limit fluid intake to decrease urinary output

C. Take the drug on an empty stomach to limit absorption

D. Take the drug early in the day to prevent sleepiness

6. A client does not want to take medication to treat existing hypertension if it can be avoided. The client asks the nurse whether any other options are available. What health behavior changes should the nurse recommend?

A. "Eliminate all salt from your diet."

B. "Increase exercise and try to lose weight"

C. "Reduce your overall intake of fluids."

D. "Increase protein in your diet"

7. The nurse provides drug teaching to the client prescribed captopril. What statement made by the client does the nurse interpret to mean teaching has been effective?

A. "I will monitor the effectiveness by watching for any symptoms of hypertension."

B. "I will call my doctor if I bruise easily or become extremely tired."

C. "I'll take the drug in the morning so that I don't have to go to the bathroom often at night."

D. “I will increase my intake of foods high in potassium, such as bananas.”

8. A client presents to the Emergency Department (ED) with rales, wheezing, and blood-tinged sputum. The nurse suspects that the client is in congestive heart failure (CHF). What would the nurse suspect the client is experiencing?

A .Cardiomyopathy

B. Cardiomegaly

C. Valvular heart disease

D. Pulmonary edema

9. A male client has been admitted with digitalis toxicity. He has been taking the same dose for more than 20 years. His family is asking how common this problem is and how he developed a toxic level while taking the usual dose. The nurse's **best** explanation would be:

A. Toxicity can occur even on low-dose therapy due to various factors including advanced age

B. Toxicity is usually due to incorrect prescription strength

C. The client must have been taking the wrong dose

D. The client probably has severe renal impairment

10. The nurse admits a client to the constant care unit with a digoxin level of 11 ng/mL and a serum potassium level of 5.2 mEq/L. Digoxin immune Fab is administered. The next day, the client's digoxin level remains elevated at 5 ng/mL. What action does the nurse anticipate?

A. Administer digoxin immune Fab again.

B. Administer a reduced dosage of digoxin.

C. Continue to monitor the client's digoxin level daily.

D. Administer a loading dose of digoxin.

11. Prior to administering digoxin (Lanoxin), the nurse evaluates the adult client. The nurse should withhold digoxin (Lanoxin) and notify the health care provider if which of the following is noted?

A. respiratory rate falls below 14.

B. history reveals liver failure.

C. pulse is 54 beats per minute.

D. blood pressure is 90/65 mm Hg.

12. A client has been prescribed both digoxin and furosemide. The nurse should monitor the client for development of what adverse effect?

A. Hyperkalemia

B. Hyperglycemia

C. Tachycardia

D. Digoxin toxicity

13. A nurse is administering digoxin to a client. Which of the following should be recognized as a therapeutic range for digoxin?

A. 3 to 4 ng/mL.

B. 0.5 to 2 ng/mL.

C. 0.1 to 0.9 ng/mL.

D. 2 to 3 ng/mL.

14. A client should be instructed to take sublingual NTG how often if he experiences chest pain?

A. Every 1 minute times 3

B. Every 2 minutes times 5

C. Every 5 minutes times 3

D. Every 10 minutes times 5

15. The client has been started on nitroglycerin ointment for angina. The nurse identifies that the nitroglycerin ointment has been effective if the client reports which of the following?

A. minimal episodes of angina.

B. that he gets a headache each time the ointment is applied.

C. no episodes of angina since ointment was initiated.

D. dizziness after each application.

16. To relieve angina pectoris symptoms, the nurse administers nitroglycerin sublingual to the client. Which is an action of nitroglycerin?

A. Decreases myocardial oxygen consumption

B. Causes venous constriction

C. Decreases collateral circulation in the heart

D. Causes arterial constriction

17. In which client would the use of a beta-blocker most likely be contraindicated?

A. A client with angina pectoris who is trying to become pregnant

B. A client who takes a bisphosphonate for osteoporosis and who has angina

C. A client with angina who recently completed a course of moxifloxacin for pneumonia

D. A client who has angina and diabetes-related retinopathy

18. The nurse is caring for an older adult client who has just been prescribed metoprolol 75 mg PO b.i.d. What nursing diagnosis should the nurse **prioritize** in this client's immediate care?

A, acute pain

B. risk for falls

C. ineffective airway clearance

D. deficient knowledge regarding drug therapy

19. A client who has asthma and takes metoprolol should be observed for which adverse reaction?

A. Bronchospasm

B. Hypoglycemia

C. Pleural effusion

D. Pneumonia

20. What will the nurse tell a client is considered a contraindication to the administration of hydrochlorothiazide?

A. Allergy to sulfa drugs

B. Allergy to codeine

C. BP 160/96

D. Blood glucose level of 140 mg/dL

21. The nurse is caring for a client in the Emergency Department (ED) who is in pulmonary edema. The client is treated with furosemide (Lasix). What should the nurse monitor?

A. Liver function tests

B. Bone narrow function

C. Calcium levels

D. Potassium levels

22. A client is unconscious and experiencing increasing intracranial pressure. What type of diuretic will the client **most** likely be prescribed?

A. loop diuretic

B. potassium-sparing diuretic

C. thiazide diuretic

D. osmotic diuretic

23. A male client has been ordered furosemide for hypertension. Which statement by the client indicates successful education?

A. "I will weigh myself daily."

B. "I will take the medication when my blood pressure is elevated."

C. "I do not need to increase my potassium intake with this medication."

D. "I may experience breast enlargement."

24. A 91-year-old client is being discharged on the diuretic spironolactone. What is the major adverse effect of this type of medication?

A. Hypokalemia

B. Hyperkalemia

C. Gastric irritation

D. Hypertension

25. A nurse is writing a plan of care for a client who is taking a diuretic. What would be an appropriate nursing diagnosis for this client?

A. Impaired urinary elimination

B. Monitor the client response to the drug

C. Imbalanced nutrition: More than body requirements

D. Risk for fluid volume overload

26. The most common adverse effects of atorvastatin include:

A. nausea, flatulence, and constipation.

B. increased appetite and blood pressure.

C. fatigue and mental disorientation.

D. hiccups, sinus congestion, and dizziness.

27. A 10-year-old with normal BMI is brought into the clinic for an annual check-up and is diagnosed with hypercholesterolemia. What type of hypercholesterolemia is **most** often seen in children?

A. Gender specific

B. Diet

C. Familial or Genetic Connection

D. Sedentary lifestyle

28. A nurse is caring for a client receiving cholestyramine to improve his blood lipid profile at a home care setting. What adverse reactions to cholestyramine should the nurse monitor in the client?

A. Rash

B. Vertigo

C. Constipation

D. Cholelithiasis

29. A client with coronary artery disease has been prescribed atorvastatin. When reviewing this client's more recent laboratory values, what finding should the nurse attribute to adverse effects of this medication?

A. Decreased hemoglobin and hematocrit

B. Increased neutrophil levels

C. Decreased serum potassium levels

D. Increased liver enzyme levels

30. A client who has been prescribed atorvastatin (Lipitor) comes to the clinic with acute muscle pain not associated with exercise or injury, which indicates potential rhabdomyolysis. The nurse knows that the use of atorvastatin with which products places the client at risk for rhabdomyolysis?

A. Over-the-counter (OTC) drug use

B. Use of ginseng

C. Grapefruit juice consumption

D. Use of saw palmetto

31. What nonpharmacologic measures should the nurse include when educating a client about the management of metabolic syndrome?

A. Begin to increase intake of plant-sourced protein.

B. Begin a regular walking program.

C. Ensure adequate sleep on a regular basis.

D. Conserve energy by limiting physical activity.

Apply/management of care

32. The nurse is caring for a 35-year-old woman taking atorvastatin to lower serum lipid levels. When teaching this client about her medications, what priority teaching point will the nurse include in the teaching plan?

A. Need for frequent ophthalmic examinations

B. Information about a cholesterol-lowering diet

C. Use of barrier contraceptives

D .Calling her health care provider with any respiratory symptoms

33. A client is going home on cholestyramine. Client teaching should state that their other medication(s) should be administered at which of the following times?

A. with other medications.

B. 1 hour before cholestyramine

C. 1 hour after cholestyramine.

D. on an empty stomach.

34. The nurse is providing care for a client who has been prescribed cholestyramine for the treatment of hyperlipidemia. During the client's latest clinic visit, the client states, "It seems like I bruise from the lightest little bumps or scrapes." What is the nurse's best action?

A. Reassure the client that this is an expected adverse effect of the medication

B. Teach the client safety measures so that the risk for injury is reduced

C. Inform the care provider so laboratory testing can be performed

D. Tell the client to stop taking the medication until the next appointment with the care provider

35. A client is to receive enoxaparin to prevent deep vein thrombosis with an elective hip surgery. The nurse would expect this drug to be administered by which route?

A. Subcutaneous

B. Oral

C. Intramuscular

D. Intravenous

36. A client is admitted to the hospital with deep vein thrombosis. Heparin 10,000 units is administered Sub-Q. Which drug should always be available in the pharmacy if the client begins to bleed?

A. Antithrombin (Thrombate III)

B. Desirudin (Iprivask)

C. Protamine sulfate

D. Vitamin K

37. Prior to beginning anticoagulant therapy the nurse will question a female client about her history of which of the following?

A. asthma .

B. peptic ulcers.

C. urinary tract infection.

D. weight.

38. A nurse is preparing to discharge a client who has been prescribed warfarin. While assessing the client's knowledge of the drug, what statement should the nurse address?

A. "I take vitamin C when I feel like I'm getting a cold."

B. "I take aspirin to help with the pain of my arthritis."

C. “I aim to walk 2 miles a day.”

D. “I will make sure to not eat a lot of green leafy vegetables.”

39. A client is being administered heparin IV and has been started on warfarin. The client asks the nurse why she is taking both medications. What is the nurse's **most** accurate response?

A. “After a certain period of time, you must start warfarin and heparin together.”

B. “You will need both warfarin and heparin for several days.”

C. “Warfarin takes 3–5 days to develop anticoagulant effects, and you still need heparin.”

D. “Warfarin cannot be given without heparin due to the amount of clotting you need.”

40. The pharmacology instructor is discussing heparin with the students. How would the instructor explain the action of heparin?

A. Stimulates production of certain clotting factors

B. Promotes the inactivation of clotting factors

C. Enhances the blood flow in peripheral vessels

D. Dissolves new clots when they are made

41. The nurse determines that teaching about warfarin is successful when the client makes what statement?

A. “If I miss a dose, I will take 2 pills the next day.”

B. “I will check with my health care provider before taking any herbal supplements.”

C. “I will minimize my physical activity so I don’t start bleeding.”

D. “I will make sure to get my annual flu vaccine this fall.”

42. A nurse will use extreme caution when administering heparin to which client?

A. A 56-year-old male who smokes and drinks alcohol occasionally

B. A 22-year-old female with urticaria

C. A 38-year-old male with ulcerative colitis

D. A 54-year-old female with accelerated heart rate

43. A nurse is caring for a client on warfarin (Coumadin). The nurse will monitor what laboratory test to help evaluate therapeutic effects of the drug?

A. Platelet Count (PLT)

B. Complete blood count (CBC)

C. international normalized ratio (INR)

D. Prothrombin time (PT) and activated partial thromboplastin time (APTT)

44. A nurse is caring for a client receiving warfarin drug therapy. The client informs the nurse that he is also taking chamomile, which is an herbal remedy. The nurse would alert the client to which adverse effects?

A. Decreased effectiveness of chamomile

B, Decreased absorption of warfarin

C. Increased risk for bleeding

D. Increased risk for hypertension

45. For what purpose would the nurse administer postoperative epoetin alfa to the client who is a Jehovah's Witness?

A. Reduce the need for allogenic blood transfusion

B. Treatment of neutropenia

C. Treatment of HIV infection

D. To prevent the need for chemotherapy

46. A client, currently prescribed epoetin alfa, has recent blood work that reveals a hemoglobin level of 12.8 g/dL. What action does this assessment finding necessitate regarding the epoetin alfa?

A. temporarily withholding administration

B. administering an unscheduled dose

C. changing the route of administration

D. requesting a change in the dosage

47. Prior to administration of an iron preparation, what should a nurse assess?

A. Red blood count

B. Hematocrit and hemoglobin

C. Aspartate transminase levels

D. Serum creatinine levels

48. A client diagnosed with iron deficiency anemia is learning about her prescribed iron supplement. Which additional information would the nurse include in the client's teaching plan?

A. "If constipation or diarrhea become severe, call your primary care provider."

B. "If darkening of the stools appears, call your primary care provider."

C. "If you get a little thirsty, call your primary care provider."

D. "If you have an increased appetite, call your primary provider."

49. When the client is taking filgrastim, what positive outcome does the nurse anticipate observing from the laboratory studies?

A. Increased platelet count

B. Improved tissue oxygenation

C. Elevated red blood cell count levels

D. Increased neutrophil count

50. The nurse is caring for a client who is prescribed filgrastim. What statement by the client would indicate successful discharge teaching?

A. “Filgrastim inhibits bacterial growth in the body”

B. “Filgrastim will decrease my blood glucose”

C. “Filgrastim will increase my platelet count and make me bruise less”

D. “Filgrastim will stimulate my white blood cells and help me fight off infection”

51. What home remedies are effective for mouth dryness and cough?

A. Administration of over-the-counter antihistamine

B. Decrease fluid intake

C. Humidification of the environment

D. Swishing the mouth with astringent mouthwash.

52. The nurse should educate clients about reading and understanding the label of OTC cold medications. Why is this statement true?

A. Many of these preparations contain the same active ingredients, and inadvertent overdose is a common problem.

B. Each product is best used for one particular symptom.

C. Some of these products do not contain any drugs.

D. Some of these products could interfere with breast-feeding.

53. A client presents at the clinic with a dry, non-productive cough. The client is diagnosed with bronchitis, and it is determined that the client needs help thinning the sputum so the cough can become productive. What does the nurse expect the health care provider will prescribe?

A. Benzonatate (Tessalon)

B. Guaifenesin (Mucinex)

C. Dextromethorphan (Benylin)

D. Hydrocodone (Hycodan)

54. An older client diagnosed with hypertension is requesting pseudoephedrine for cold symptoms. Which statement by the nurse **best** describes the effect of decongestants on blood pressure?

A. "The administration of pseudoephedrine will increase blood pressure due to vasoconstriction of blood vessels."

B. "The administration of pseudoephedrine will cause bradycardia and increase peripheral blood pressure-gastric reflux."

C. "The administration of pseudoephedrine will decrease thyroid function and increase rebound congestion."

D. "The administration of pseudoephedrine will act on the central nervous system to cause vasodilation of blood vessels."

55. A client is instructed to take diphenhydramine after an allergic reaction. Which statement by the client should the nurse be concerned about?

A. "I will still be able to have my after-dinner drink with this medication."

B. "I will eat a diet low in sodium while taking this medication."

C. "I should not drive my car after taking this medication."

D. "I should not make any big decisions while taking this medication."

56. Which preventive measure is **most** important to teach parents concerning the prevention of the common cold?

A. frequent hand washing

B. maintaining vaccinations

C. taking 1200 grams of vitamin C

D. taking *Echinacea* daily

57. A client has expressed frustration stating, “I’ve been taking an over-the-counter (OTC) decongestant for several days and it still hasn't really cured my cold.” What teaching point should the nurse convey to the client?

A. “Drugs like this can often relieve some of the symptoms of a cold, but they won't cure it.”

B. “Most people find that cold medications are essentially ineffective.”

C. “It usually takes between 8 and 10 days for a decongestant to cure affect cold symptoms.”

D. “Sometimes a decongestant can mask the effects of your cold, essentially prolonging it.”

58. A gerontology nurse has encouraged a group of caregivers who work with older adults to avoid administering diphenhydramine to their clients. The nurse's cautionary message is an acknowledgment of what possible nursing diagnosis?

A. Risk for infection related to adverse effects of antihistamines

B. Risk for falls related to sedation

C. Risk for deficient fluid volume related to diuresis

D. Risk for impaired skin integrity related to urticaria

59. A nurse is taking care of a client with a history of allergic reaction with blood transfusions. What medication should the nurse anticipate being prescribed to minimize the risk associated of a transfusion reaction?

A. diphenhydramine

B. epinephrine

C. clemastine

D. cetirizine

60. A client has been prescribed an antihistamine for the treatment of seasonal allergies. What dietary guidelines should the nurse provide to the client?

A. Avoid drinking alcohol while taking antihistamines

B. Avoid grapefruit juice until at least 48 hours after treatment is complete

C. Increase intake of foods that are high in vitamin C

D. Eat several small meals instead of three larger meals in case of GI upset

61. The nurse is educating an adult client diagnosed with rhinosinusitis with viscous clear mucous about the prescribed guaifenesin 400 mg PO every 4 hours. Which statement made by the client establishes the need for further clarification?

A. "I will ask my pharmacist before taking any over-the-counters."

B. "I will drink at least 8 ounces of water with each dose."

C. "The drug will suppress my cough so I can sleep easier."

D. "The drug is not affected by taking it with or without meals."

62. Which assessment finding should prompt the nurse to suspect that the resident is experiencing an anticholinergic effect of diphenhydramine?

A. Blurry Vision

B. tinnitis

C. wheezing

D. urticaria

63. What drug is known to be effective in treating acute bronchospasm?

A. Ipratropium bromide

B. albuterol

C. Cromolyn (Intal)

D. Ephedrine

64. A client is prescribed albuterol, 2 puffs every 6 hours. After teaching the client about the drug and its administration, the nurse determines that the teaching was successful when the client states that he will allow how much time between each puff

A. 1 minute

B. 10 seconds

C. 30 seconds

D. 5 minutes

65. The nurse is reviewing the medication of a newly-admitted client. The nurse observes the client takes sustained-release theophylline. When planning care, the nurse should address what characteristic of this client's asthma?

A. The client likely experiences several asthma exacerbations each week

B. The client likely has asthma symptoms once or twice a day

C. The client likely experiences asthma symptoms a few times each week, but not every day

D. The client was likely diagnosed with asthma several months ago

66. The parent of a 4-year-old client taking inhaled corticosteroids, states she has not been routinely administering the medication because of concern about the child not growing properly. What is the nurse's best response?

A. "When administered every other day, they will not affect growth."

B. "Inhaled steroids will not affect the growth of your child."

C. "You need to be more worried about all of the oral steroids your child routinely takes."

D. "I agree, we need to change your child's medications."

67. A client experiences wheezing related to asthma. Which medications will increase the bronchi of the lung?

A. Bronchodilators

B. Anti-inflammatory agents

C. Antihypertensive agents

D. Antineoplastic agents

68. Which teaching intervention is a **priority** for the client prescribed an albuterol inhaler experiencing shortness of breath related to the physiological constriction of airways?

A. Administer insulin to decrease hand shaking.

B. Administer ibuprofen to decrease inflammation.

C. Exercise should be limited to one time per week.

D. Stop smoking due to the bronchoconstriction.

69. Albuterol inhaler has been ordered for a teenage athlete who has exercise-induced asthma. What should the client be instructed to do?

A. Use the inhaler every day at the same time each day

B. Use the inhaler as soon as the symptoms start

C. Use the inhaler 30 to 60 minutes before exercising to ensure peak therapeutic levels when needed

D. Use the inhaler 2 to 3 hours before exercising to ensure peak effectiveness

70. The nurse caring for a 38-year-old client started on albuterol (Proventil) should advise the client that the client may experience what adverse effect?

A. Polydipsia

B. Tachycardia

C. Hypotension

D. Diarrhea

71. A client has asthma and prescribed inhaled steroids, budesonide. What should the nurse teach the client about this treatment?

A. Inhaled corticosteroids like budesonide should not be used on an emergency basis

B. Effective levels are usually reached within 72 hours of starting treatment

C. Systemic adverse effects should be expected and can be serious

D. The drug will stimulate the sympathetic nervous system

72. A nurse is providing health teaching for a 15-year-old male newly diagnosed with asthma. What statement, made by the client, indicates the client has a good understanding of the teaching regarding inhalers?

A. "I should hold my breath when administering a puff."

B. "The aerosol canister should be shaken well before using."

C. "I need to take 3 short quick breaths when I administer the inhaler."

D. "A second aerosol medication cannot be administered until 30 minutes after the first aerosol medication."

73. After completing discharge instructions for a client on montelukast, which statement indicates understanding by the client about the action of the drug?

A. "it will open my airways"

B. "it will improve the gas exchange in my alveoli"

C. "it will prevent inflammation and bronchospasm"

D. "it will prevent inflammation by blocking mast cells from releasing histamine"

74. Why are inhaled steroids used to treat asthma and COPD?

A. They act locally to decrease release of inflammatory mediators

B. They act locally to improve mobilization of edema

C. They act locally to increase histamine release

D. They act locally to decrease histamine release

75. The triage nurse in the emergency department has a 42-year-old client with asthma present for treatment. The client's respiratory rate is 40 breaths per minute. Based on this objective data, what is the correct nursing diagnosis for this client?

A. Activity intolerance

B. Risk for aspiration

C. Ineffective airway clearance

D. Ineffective breathing pattern

Examination Blueprint – based on NCLEX and Bloom's Taxonomy

Management of Care 23%	Safety and Infection Control 9%	Health Promotion and Maintenance 6%	Psychosocial Integrity 9%	Basic Care and Comfort 9%	Pharm 18%	Reduction Risk 15%	Physiological Adaptation 11%
7	5	4	1	1	28	9	16
10%	**5%**	**3%**	**9%**	**2%**	**20%**	**12%**	**20%**

HTN	7
HF	6
Angina	6
diuretics	6
Lipid-loweing	9
Blood Coag	10
anemia	6
Upper Resp	12
lower resp	13
TOTAL	**75**

Remembering	7	10%	10%
Understanding	15	20%	20%
Applying - AP	38	50%	50%
Analzing - A	11	15%	15%
Evaluating - E	4	5%	5%
Totals	**75**	**100%**	**actual exam**

Appendix F

Student Engagement Questionnaire

To what extent do the following behaviors, thoughts, and feelings describe *you, in this course.* Please rate each of them on the following scale:

5 = very characteristic of me

4 = characteristic of me

3 = moderately characteristic of me

2 = not really characteristic of me

1 = not at all characteristic of me

1. _____ Raising my hand in class
2. _____ Participating actively in small group discussions
3. _____ Asking questions when I don't understand the instructor
4. _____ Doing all the homework problems
5. _____ Coming to class every day
6. _____ Going to the professor's office hours to review assignments or tests, or to ask questions
7. _____ Thinking about the course between class meetings
8. _____ Finding ways to make the course interesting to me

9. _____ Taking good notes in class

10. _____ Looking over class notes between classes to make sure I understand the material

11. _____ Really desiring to learn the material

12. _____ Being confident that I can learn and do well in the class

13. _____ Putting forth effort

14. _____ Being organized

15. _____ Getting a good grade

16. _____ Doing well on the tests

17. _____ Staying up on the readings

18. _____ Having fun in class

19. _____ Helping fellow students

20. _____ Making sure to study on a regular basis

21. _____ Finding ways to make the course material relevant to my life

22. _____ Applying course material to my life

23. _____ Listening carefully in class

[Source: Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *Journal of Educational Research, 98,* 184-191.]

SCEQ: STUDENT ENGAGEMENT SCORING

[Source: Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *Journal of Educational Research, 98,* 184-191.]

For the total score, simply add up the answers. For each subscale, simply add up the answers for the questions in each subscale.

SKILLS ENGAGEMENT SUBSCALE

4. _____ Doing all the homework problems
5. _____ Coming to class every day
9. _____ Taking good notes in class
10. _____ Looking over class notes between classes to make sure I understand the material
13. _____ Putting forth effort
14. _____ Being organized
17. _____ Staying up on the readings
20. _____ Making sure to study on a regular basis
23. _____ Listening carefully in class

EMOTIONAL ENGAGEMENT SUBSCALE

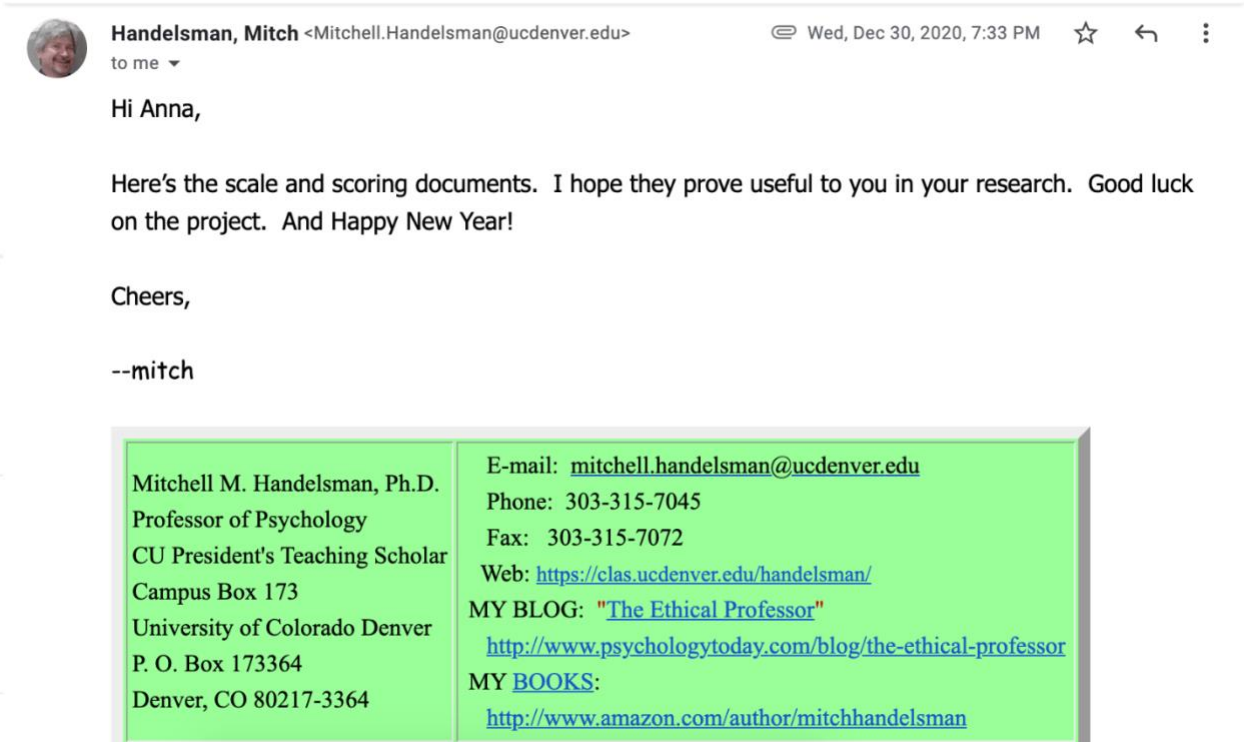
7. _____ Thinking about the course between class meetings
8. _____ Finding ways to make the course interesting to me
11. _____ Really desiring to learn the material
21. _____ Finding ways to make the course material relevant to my life
22. _____ Applying course material to my life

PARTICIPATION/INTERACTION ENGAGEMENT SUBSCALE

1. _____ Raising my hand in class
2. _____ Participating actively in small group discussions
3. _____ Asking questions when I don't understand the instructor
6. _____ Going to the professor's office hours to review assignments or tests, or to ask questions
18. _____ Having fun in class
19. _____ Helping fellow students

PERFORMANCE ENGAGEMENT SUBSCALE

12. _____ Being confident that I can learn and do well in the class
15. _____ Getting a good grade
16. _____ Doing well on the tests



Handelsman, Mitch <Mitchell.Handelsman@ucdenver.edu> Wed, Dec 30, 2020, 7:33 PM

to me

Hi Anna,

Here's the scale and scoring documents. I hope they prove useful to you in your research. Good luck on the project. And Happy New Year!

Cheers,

--mitch

Mitchell M. Handelsman, Ph.D. Professor of Psychology CU President's Teaching Scholar Campus Box 173 University of Colorado Denver P. O. Box 173364 Denver, CO 80217-3364	E-mail: mitchell.handelsman@ucdenver.edu Phone: 303-315-7045 Fax: 303-315-7072 Web: https://clas.ucdenver.edu/handelsman/ MY BLOG: "The Ethical Professor" http://www.psychologytoday.com/blog/the-ethical-professor MY BOOKS: http://www.amazon.com/author/mitchhandelsman

Appendix G

Telic/Paratelic State Instrument and Permission

Below are 12 pairs of words that are opposites. Please circle the number that is located BETWEEN each pair of words that best indicates how you were feeling in the LAST FEW MINUTES, just before you started filling out this questionnaire. For example, if the pair were

Happy 1 2 3 4 5 6 Sad

and you were definitely feeling happy, you would circle the "1." If you were definitely feeling sad, you would circle the "6." If You were feeling just a little bit sad, you would circle the "4."

1 Feeling playful 1 2 3 4 5 6 Feeling serious-minded

2 Wanting peace and quiet 1 2 3 4 5 6 Wanting adventure

3 Trying to accomplish something 1 2 3 4 5 6 Just having fun

4 Doing activity just for the fun of it 1 2 3 4 5 6 Doing activity because it may affect my future

5 Wanting to feel excitement 1 2 3 4 5 6 Wanting to feel calm

6 Wanting to be serious 1 2 3 4 5 6 Wanting to be playful

7 Concerned about the future effects of my current activity 1 2 3 4 5 6 Not concerned about the future effects of my current activity

8 Wanting to just have fun 1 2 3 4 5 6 Wanting to accomplish something

9 Wanting to feel less aroused 1 2 3 4 5 6 Wanting to feel more aroused

10	Living for the Moment	1 2 3 4 5 6	Focusing on the future
11	Feeling serious	1 2 3 4 5 6	Feeling playful
12	Feeling Adventurous	1 2 3 4 5 6	Not feeling adventurous

INSTRUCTIONS FOR SCORING THE TELIC/PARATELIC STATE INSTRUMENT (T/PSI)

1. The following items comprise the serious-minded/playful (SM/P) subscale:

   1, 3, 4, 6, 8, 10, 11

2. The following items comprise the arousal-avoidant/arousal-seeking (AA/AS) subscale:

   2, 5, 7, 9, 12

3. Recode items, 1, 4, 5, 8, 10, 12, so that a response of 1 equals a 6, a response of 2 equals a 5, a response of 3 equals a 4, a response of 4 equals a 3, a response of 5 equals a 2, and a response of 6 equals a 1.

4. Low values (1, 2, or 3) reflect the telic state. Higher values (4, 5, or 6) reflect the paratelic state.

5. Summed scores that are higher reflect the paratelic state; summed scores that are lower reflect the telic state.

   Sum over the items for each subscale:

SM/P: 1, 3, 4, 6, 8, 10, 11

AA/AS: 2, 5, 7, 9, 12

Sum over the two subscales for get a total T/PSI score.

6. Range of possible scores

SM/P: 7-42

AA/AS: 5-30

T/PSI: 12-72

7. Suggested cut scores:

SM/P: telic = <23

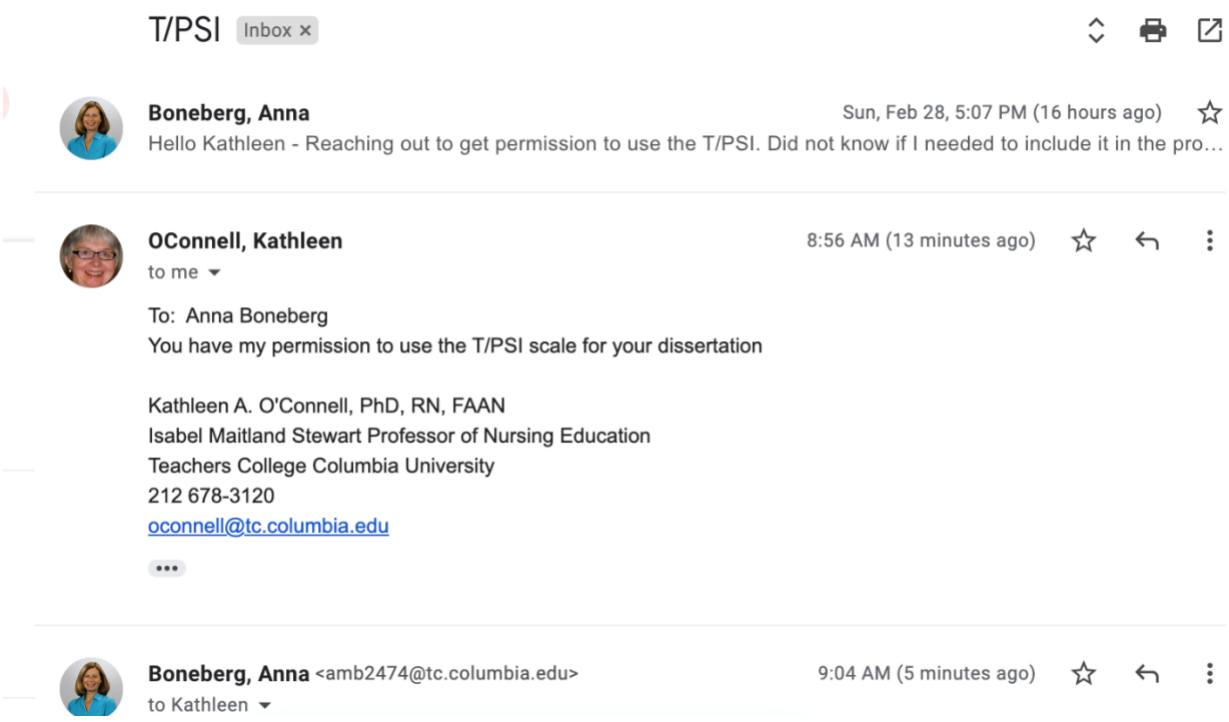
paratelic = >22

AA/AS: telic = <18

paratelic = >17

T/PSI: telic = <41

Paratelic = >40



T/PSI Inbox ×

Boneberg, Anna Sun, Feb 28, 5:07 PM (16 hours ago)
Hello Kathleen - Reaching out to get permission to use the T/PSI. Did not know if I needed to include it in the pro…

OConnell, Kathleen 8:56 AM (13 minutes ago)
to me

To: Anna Boneberg
You have my permission to use the T/PSI scale for your dissertation

Kathleen A. O'Connell, PhD, RN, FAAN
Isabel Maitland Stewart Professor of Nursing Education
Teachers College Columbia University
212 678-3120
oconnell@tc.columbia.edu

Boneberg, Anna <amb2474@tc.columbia.edu> 9:04 AM (5 minutes ago)
to Kathleen