DELIBERATE PRACTICE FOR THE PURPOSE OF PSYCHOMOTOR SKILL ACQUISITION: NURSING STUDENTS AND THE MOTIVATIONAL CONSTRAINT

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Deliberate practice, a constituent of Ericsson’s theory of expertise, has been identified as a central concept in effective simulation learning. Deliberate practice is compatible with simulation frameworks already being suggested for use in nursing education. It is unknown if nursing students can successfully negotiate the constraints of deliberate practice.

This study aimed to evaluate converging notions; deliberate practice in a simulated context for the purpose of psychomotor skill acquisition and nursing students’ ability to successfully negotiate the motivational constraint of deliberate practice. By comparing two groups of nursing students with academic-related differences it was possible to make inferences regarding the appropriateness of deliberate practice as an effective teaching and learning method in the domain of nursing education.

This study examined the difference between two groups of students; a traditional BS cohort, and MEPN cohort as it relates to a skill test score after exposure to an educational intervention utilizing deliberate practice. Additionally the relationship of academic motivation with participant’s pre-objective and post-objective skill test scores were of interest.

A mixed methods approach was utilized. The quantitative portion of the study included a between subjects factorial design with two predictor variables, deliberate practice and program of study with random assignment to the treatment group. The qualitative portion of the study was based on open ended-interviewing about the participants’ academic motivation.

No statistically significant relationship was observed between students’ academic motivation and their results on a skill test. A statistically significant relationship was found between the mean skill test score of the intervention and comparison group; on average
nursing students who were exposed to a deliberate practice intervention achieved a passing score (minimal competence) on a follow-up skill test, while those in the comparison group did not.
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Chapter 1. Introduction

Chapter 1 presents the background, problem statement, research questions and study aims, and conceptually defines the key variables and elements in the study.

Background

The flexibility permitted by simulation has made it attractive to institutions as a supplement to real-world clinical experience (Murray, Grant, Howarth, & Leigh, 2008; Rosseter, 2011). Resource constraints by academic institutions, fiscal reforms and societal pressures have promoted a safety-conscious-litigation-avoiding culture where simulation provides a means of risk free applied practice (Health care at the crossroads: Strategies for improving the medical liability system and preventing patient injury, 2005).

Effective use of simulation is dependent on a complete understanding of the concepts employed for educational interventions. Deliberate practice, a constituent of Ericsson’s theory of expertise, has been identified as a central concept in effective simulation learning (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005).

Deliberate practice has been successfully integrated into the educational domain for the purpose of psychomotor skill acquisition using simulation. Additionally Ericsson’s theoretical framework shares elements and is compatible with simulation frameworks already being suggested for use in nursing education (Jeffries, 2006).

Ericsson’s framework assumes three constraints: motivational, effort, and resource. The motivational constraint has been underscored by the claim of Ericsson, Krampe, and Tesch-Romer (1993) and later by Hyllegard and Yamamoto (2005, 2007) that deliberate practice is not inherently enjoyable and requires that individuals need to be “engaged in the activity and
motivated to improve performance before they begin deliberate practice” (Ericsson et al., 1993, p. 371). Similarly, motivation is important for the successful negotiation of nursing curriculums, especially within an accelerated timeframe such as those seen in graduate-entry nursing programs. This study included students enrolled in a Master’s Entry Program in Nursing (MEPN), as well as a students enrolled in a traditional Bachelor’s of Science (BS) degree granting program. This study examined these two groups of nursing students with documented differences in motivational orientations in order to make inferences regarding the appropriateness of deliberate practice as an effective teaching and learning method in the domain of nursing education.

Problem Statement

There are few studies evaluating deliberate practice in the domain of nursing education, and none specifically addressing the constraints of Ericsson’s theoretical framework. It is unknown if nursing students can successfully negotiate the constraints of deliberate practice. Explicit to this study is the motivational constraint.

Purpose of the Study, Research Questions and Aims

The overall purpose of this study is to explore the experience of deliberate practice among nursing students. More specifically, the research questions guiding this investigation are:

1. How does program of study impact pre-objective skill test scores?

   **Specific aim 1.** To determine if there is a difference in mean pre-objective skill test scores (PRE-OSTS) between two independent groups (POS: MEPN, BS).

2. How does deliberate practice and program of study impact objective skill test scores?
Specific aim 2. To determine if the dependent variable Δ-objective skill test score, a gain score (Δ-OSTS), varies according to the independent variables deliberate practice (DP: +DP, -DP), and program of study (POS: MEPN, BS).

3. How does motivation impact pre-objective skill test scores?

Specific aim 3. To determine if there is a relationship between the self-determination index (SDI) and pre-objective skill test score (PRE-OSTS).

4. How does motivation impact post-objective skill test scores?

Specific aim 4. To determine if there is a relationship between self-determination index (SDI) and post-objective skill test score (POST-OSTS).

5. Is there a difference in academic motivation between two different programs of study?

Specific aim 5. To determine if there is a difference between the mean self-determination index (SDI) for the two programs of study (POS: MEPN, BS) categories.

6. What is the experience of nursing students as it relates to their academic motivation?

Specific aim 6. To investigate and describe the qualitatively different ways in which nursing students experience academic motivation.

Conceptual Definitions

For the purpose of this study the following variables and key elements are conceptually defined as follows:

Academic motivation. Academic motivation is a student’s desire related to academic subjects (DiPerna & Elliott, 1999), as measured by a student’s answers to questions based on the tenets of self-determination theory.
**Constraints.** Constraints are the specific conditions required for the emergence of expertise (Ericsson, Krampe, & Tesch-Römer, 1993), conditions for optimal learning and improvement of performance (Bower & Hilgard, 1981).

**Deliberate practice (DP).** Deliberate practice is personalized and structured training, which involves identifying weaknesses or areas of improvement and practicing until those areas are strengthened (Lie, 2011), a regimen of effortful activities designed to optimize improvement (Ericsson, Krampe, & Tesch-Römer, 1993).

**Experience.** Experience is the process of doing and seeing things, and/or having things happen to you, the knowledge derived from direct observation of or participation in events or activities, the fact or state of having been affected by or gained knowledge through direct observation or participation, “the conscious events that make up an individual life” (Experience, n.d.).

**Motivation.** Motivation is the condition of being eager to act or work, a force or influence that causes someone to do something, a stimulus (Motivation, n.d.), the “why” of behavior, and the perceived reasons for engaging in that behavior (Vallerand et al., 1992).

**Objective skill test score (OSTS).** An objective skill test score is a score derived through an objective evaluation of an individual’s performance of a discrete and focused skill dedicated to a single learning objective using a validated means of scoring.

**Practice.** Practice is to do or perform often, customarily, or habitually, to perform or work at repeatedly and/or routinely (Practice, n.d.).

**Program of study (POS).** Program of study is a curricular pathway leading to a degree.
**Self-determination.** Self-determination is a free choice of one’s own acts or states without external compulsion (Self-determination, n.d.). “[An interest in learning, valuing education, and confidence in one’s own capacities and attributes]…manifested by being intrinsically motivated and internalizing the values and regulatory process, resulting in high-quality learning and understanding as well as enhanced personal growth and adjustment” (Deci, Vallerand, Pelletier, & Ryan 1991, p. 325).

**Simulation.** Simulation is “a technique...to replace...real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion” (Gaba & Raemer, 2007).
Chapter 2. Review of Literature

Chapter 2 reviews the development and details of deliberate practice. This chapter also summarizes findings from previous research and identifies opportunities for introducing new knowledge related to nursing students and deliberate practice.

A literature search was carried out on the topic of deliberate practice. Deliberate practice is a component of Ericsson’s theory of expertise, therefore this theory in addition to adjacent theories on expertise and high ability were included in the exploration. Web of Knowledge, CINAHL, PsychInfo, and Google Scholar were searched using the keywords and phrases, deliberate practice, theory of expertise, and nursing. Because the purpose of this proposal includes describing the historical progression of the topic no bounds on dates were applied to the search criteria. From these searches, 793 references were identified (Web of Knowledge n=131, CINAHL n=11, PsychInfo n=100, and Google Scholar n=551). The references were exported to Mendeley where duplicates were culled leaving 462 articles for further investigation. Titles and abstracts of each article were scanned for relevance to the topic. Several books known to be relevant to the topic were included in the review. Reference lists of germane articles were reviewed for additional resources to be incorporated into the final review (N=61).

Determinants of Deliberate Practice

In 1869 Sir Francis Galton published *Hereditary Genius: An Inquiry into its Laws and Consequences* (Galton, 1869) describing his position that excellence is inherited from an individual’s ancestors. Galton described these individuals as eminent. He argued that eminence was a predestined consequence of inherited natural ability. There is little question that Galton’s
ideas were influenced by his life in Colonial Britain and the work of his half-cousin Charles Darwin’s *The Origin of Species* published a decade earlier in 1859. In a time of few alternative hypotheses Galton’s ideas became strongly rooted in Western culture. In the general population, higher levels of ultimate performance are still often attributed to the possession of talent, an inborn quality that allows an individual to excel in one or more domains (Ericsson et al., 1993).

In 1946, more than seven decades after the publication of Galton’s inquiry on the origins of eminence, Adriann de Groot wrote *Het Denken van den Shacker* (The Thinking of the Chess Player) which would be translated into English in 1965 as *Thought and Choice in Chess* (De Groot, 1965, 1978). De Groot’s work outlined the means by which chess players achieve high levels of skill; a systematic analysis of recordable phenomena to describe the process of mastery. This exposition lay in sharp contrast to Galton’s earlier work on innate ability and was a bellwether for research on expertise and high ability.

De Groot’s research suggested that chess experts rely on pattern-based retrieval from memory and supported earlier evidence of the effect of repeated exposure and practice on memory by psychologists such as William Foster (1911) and Alberta Banner [Turner] (1932, 1935). De Groot’s Contemporary and Nobel Laureate Herbert Simon, a pioneer in artificial intelligence and heuristics used chess as a model environment in which to study human decision-making and learning. In 1964 Simon published a paper with his colleague Newell, describing “the process that expert chess players use in discovering checkmating combinations” (Simon & Newell, 1964), in which they cite de Groot’s *Thought and Choice in Chess* in its pre-English-publication form.
Simon continued to use chess to explore the components of expert decision making in a paper titled *Skill in Chess* (Simon & Chase, 1973). In it Simon and Chase described chess as psychology’s Drosophila; as psychology’s “standard task [environment] around which knowledge and understanding can cumulate” (Simon & Chase, 1973, p. 394). Chess makes a favorable platform for the study of excellence for several reasons; “...it is a complex game requiring many years of practice to attain high levels...the existence of an international rating scale allows researchers to know the level of expertise of their participants with precision...the existence of archival data of chess players’ ratings make it possible to track their level of expertise throughout their careers” (Campitelli & Gobet, 2008, p. 447).

In 1972 Chase and Simon published *The Mind’s Eye in Chess* (Chase, 1972) in which they outline their theory of expertise. In it they proposed that the ability to perform pattern-based retrieval in “any skilled activity” (p. 279) was a consequence of acquiring vast amounts of knowledge subsequent to many years of involvement in a domain. Work in the following decade by Chi, Glaser, and Reese (1982) described how experts in a domain were better than novices at retrieving and organizing knowledge for the purpose of completing physics problems. Voss (1983) as cited by Ericsson et al. (1993) detailed how expertise was specific to the domain in which it was acquired.

At about the same time Ericsson was entering the discussion on exceptional performance with a focus on human memory (Ericsson, 1985; Ericsson & Chase, 1982; Ericsson & Polson, 1988). Within a few years Ericsson’s focus shifted from memory to a general theory of expertise (Ericsson & Smith, 1991). In 1993 Ericsson (Ericsson et al., 1993) published his first work outlining a proposed “theoretical framework that explains expert performance in terms of
acquired characteristics resulting from extended deliberate practice and that limits the role of innate (inherited) characteristics to general levels of activity and emotionality” (p. 363).

**Related Research**

In the following decades Ericsson and others have applied the concept of deliberate practice to several domains to explain the significance of its components to exceptional performance. Below are several examples of research in the nursing domain associated with deliberate practice and the expert performance approach framework.

In 2007 Ericsson, Whyte, & Ward published work in *Advances in Nursing Education*. There the authors review research on expertise development in nursing within the Expert-Performance Approach framework. The review details the difficulties of describing expertise in nursing. The authors describe the decades-long pursuit of reproducibly superior performance and the failures of using “socially recognized” experts” (p. E59). An empirical finding highlighted in the review describes “an interesting exception” (p. E66), in which a graduate student, Henderson-Everhaus, “measured the accuracy of vascular assessment in the detection of peripheral arterial disease by 76 nurses…” over 5 levels of experience, *novice, advanced beginner, competent, proficient, and expert*. The only difference between the proficient and expert nurses was that the expert nurses had undergone additional training and certification. Upon assessment with a validated criterion standard the expert nurses “showed a clearly superior performance”. The specialty nursing certification included “extended supervised training with feedback of the type that would be considered deliberate practice” (E66).

The following year Haag-Heitman (2008) citing that “the role of deliberate practice…[has] not been empirically studied in nursing” (p. 204), published a study examining
nurses’ perceptions of personal and environmental influences on attainment of expert performance, which identified deliberate practice as an important concept. In this exploratory enterprise the author allowed study subjects to describe their level of achievement as told through narratives relating to their practice. The author’s analysis used a five-stage novice to expert framework to organize the themes discovered in the accounts of the subjects’ experiences. In addition to themes such as Influential and self-confident, and Innovative (risk taking), Influence of first managers, and Impact of childhood influences (social models and mentors) Haag-Heitman identified Lifelong self-directed focus, and Positive and engaged demeanor (Deliberate Practice). The interviews revealed that nurses who identified themselves as expert also described themselves as engaged, open, and lifelong experiential learners.

In 2010 Hauber, Cormier, and Whyte used Ericsson and Smith’s (1991) Expert-Performance Approach (EPA) framework, which includes deliberate practice as mediator within the context of high-fidelity simulation to explore the relationship between common measures of knowledge and performance-related variables. The authors’ primary focus was performance and evaluation in a highly complex domain, and a highly complex task that represented actual practice. Study participants reproduced the task in a controlled simulation laboratory to facilitate the comparison of individual performance. The results inferred that knowledge related measures such as course grades were not consistent predictors of performance on the complex task. Ericsson has stressed that representative tasks should be presented and applied in small units, whereas Hauber et al. devised a complex task to use during their investigation. As the authors clarify in their discussion of the results the Fundamentals course is focused on
mastery of procedural skill. The results of Hauber et al. highlight the need for careful design and selection of representative tasks.

In 2011 Oermann, Kardong-Edgren, and Odom-Maryon and others (Oermann, Kardong-Edgren, & Odom-Maryon, 2011; Oermann, Kardong-Edgren, Odom-Maryon, et al., 2011) detailed the effects of using deliberate practice to teach cardiopulmonary resuscitation to nursing students. The primary focus of this randomized trial was on the longitudinal effects of practice on psychomotor skills; practice in which the “learners are guided to improve some aspect of performance...on a well-defined skill, receive immediate feedback...[while performing] the same tasks repeatedly” (p. 451) The results showed that there was no significant difference between the treatment and control at 3-months, however at 6 months (after additional practice) there was a statistically significant difference in the participants measured ventilation volumes and depth of compressions while simulating CPR. CPR is a skill taught across multiple domains and to the lay public. While nurses need to perform competently during high-risk, low-frequency events, the representative tasks of nursing should be nursing-specific, and include as many elements of the work of nurses as possible. Other investigations into the effect of deliberate practice on learning associated with psychomotor skills could not be found.

More recently Liou, Chang, Tsai, and Cheng (2013) describe the results of a deliberate practice program on students’ perception of clinical competence. The study was a pre-test post-test design, which did not have a control or comparison group. The results described a positive relationship between amount of additional practice and experience by students and their post-test scores (increased Clinical Competence Questionnaire score).
Ericsson’s Theory of Expertise

Ericsson and his colleagues organized the conditions for optimal learning and improvement of performance into a theoretical framework. The central idea of which is “…that expert performance is the result of an extended process of skill acquisition mediated by large, but not excessive daily amounts of deliberate practice” (Ericsson et al., 1993, p. 387). Ericsson and his colleagues “explain [how] differential levels of performance” are a “function of deliberate practice...an individual’s prolonged efforts to improve performance while negotiating motivational and external constraints...a regimen of effortful activities designed to optimize improvement” (p. 363).

External Constraints

The framework assumes three constraints: resource, effort, and motivation. The notion of constraints underscores that expert individuals do not simply arise – conversely they develop over time in specific conditions or when specific conditions have been provided for.

Resource. The first constraint, the resource constraint encompasses the physical and fiscal means contributed by the individual, family, or institution to facilitate deliberate practice. Bloom (1985) details the resources committed toward an individual who has been identified as having potential in a domain. Including the expense of providing facilities for practice, transportation, meetings with mentors or coaches, and participating in competitions.

Effort. The second constraint, the effort constraint describes the limits of the human brain to accommodate new information (Ericsson et al., 1993). The authors describe the constraint on effort as the “duration of effective daily practice that can be sustained for long periods [as] limited”...and that...“practice [should occur] at a constant level from day to day
[and] the daily periods of deliberate practice should be of limited duration with rest periods in between” (p. 372). Ericsson et al. refers to work by Schneider and Shiffrin (1977), which describes the limits of human attention and suggests that practice be limited to 1 hour three to five days a week and practice beyond two hours is detrimental to the process.

**Motivation.** Third, the motivational constraint has been emphasized by Ericsson et al. (1993) and later by Hyllegard and Yamamoto (2005, 2007) who contended that deliberate practice is not necessarily enjoyable and requires that individuals need to be “engaged in the activity and motivated to improve performance before they begin deliberate practice” (Ericsson et al., 1993, p. 371). In this way the desire to improve dominates the unpleasant duty of practice.

Vallerand et al. (1992) describe motivation as “[o]ne of the most important psychological concepts in education (p. 1004). Motivation is often described as originating from either “outside” or “inside” the learner. Motivation originating from outside the learner is appropriately termed *extrinsic motivation*, and conversely motivation originating from inside the learner - *intrinsic motivation*. Extrinsically motivated behaviors refer to activities that are undertaken in order to achieve an outcome, often for a reward such as money, *triumph* over an opponent, or social status. Intrinsically motivated behaviors suggest that the individual is driven to engage in the behavior simply because they enjoy the task, are also interested in *mastery*, and often in the absence of external reward or acknowledgement.

In developing a scale to measure (academic) motivation, Vallerand et al. describe three types of motivation (intrinsic, extrinsic, and amotivation). Vallerand’s academic motivation scale is based on Deci and Ryan’s (1985) Self-Determination Theory, which shares conceptions
with Ericsson’s Theory of Expertise such as the sustained effort to persist in a task. Deci and Ryan’s self-determination theory conceptualizes motivation on a continuum such that intrinsic and amotivation are on either end, and extrinsic motivation is in the middle (Komarraju, Karau, & Schmeck, 2009).

**Motivation and nursing students.** Motivation is important for the successful negotiation of any nursing curriculum. In addition to different demographics, academic-related differences between standard (baccalaureate program – BS) and graduate-entry nursing programs (master’s entry program – MEPN) have been documented (Everett, Salamonson, Trajkovski, & Fernandez, 2013; Salamonson, Everett, Koch, Wilson, & Davidson, 2009; Seldomridge & DiBartolo, 2005). Students in non-traditional pathways (second-degree, accelerated-degree, and graduate-entry nursing degree pathways) have acquired academic skills and coping mechanisms in their previous educational experiences. These students are described as “able to better and more confidently negotiate course requirements within the accelerated timeframe” (Neill, 2010 as cited in Neill 2011, p. 53) in addition to reaching “maturity levels [which] allow them to negotiate the demands of personal life whilst studying” (Neill, 2012, p. 92). In addition “[a]dmission standards for accelerated programs are high...[i]dentifying students who will flourish in [these programs] is a priority for administrators” (American Association of Colleges of Nursing, 2014, Fast-Track Nursing Education, para. 2). In essence, there is a selection bias in the admissions process; students who never adapt to the demands of university academics would not be seeking out or applying to programs which require completion of a previous degree. It could be conjectured that students in graduate-entry nursing programs “arrive” better equipped to endure a simulation curriculum
that employs a method such as deliberate practice.

**Extended Involvement**

Many researchers are in agreement that Ericsson’s work supports the requirement of an extended period of time within a domain to achieve expert levels of performance. It is generally agreed that a minimum of 10 years of experience in a domain (Gustin, 1985; Hayes, 1989; Keller, 1958; Simon & Chase, 1973) which incorporates deliberate practice is necessary in order to reach expert levels of performance (Ericsson & Lehmann, 1996). In many publications Ericsson details why time alone is not sufficient to produce expertise and describes the moderating effect of deliberate practice and its specific components in producing expert performance (Ericsson, 2004b; Ericsson & Charness, 1994).

In the domain of nursing the expert is often identified as the individual with the most experience; however, there is considerable evidence that length of professional experience alone is not a sufficient indicator of expertise or even competence (Choudhry, Fletcher, & Soumerai, 2005; Cowan, Norman, & Coopamah, 2005).

**Representative Tasks**

In the study of expertise in domains such as chess, sports, and music, researchers use an investigative approach founded on the measurement and analysis of reproducible superior performance on representative tasks (Ericsson, Whyte, & Ward, 2007) which “replaces the search for socially recognized experts...with a search for consistently superior performance in everyday life” (Ericsson, Whyte, et al., 2007, p. e59).

“The first step of the expert-performance approach involves establishing representative tasks that define the essence of the domain” (Ericsson, 2004a, p. S74). In *Toward a General*
Theory of Expertise, Ericsson and Smith (1991) recognize de Groot as having been the originator of deriving reproducible phenomena (De Groot, 1978) for the purpose of “capturing reproducibly superior performance” (Ericsson, Roring, & Nandagopal, 2007, p. 9). Ericsson and Smith argue that in order to scientifically engage and analyze expert performance the design of standardized representative tasks of a domain must be completed. “Performers must be presented with the same set of situations to objectively evaluate their response” (Ericsson, 2007, p. 10). In 2007 Ericsson, Whyte, et al. published work in Advances in Nursing Education that reviewed the research on expertise development in nursing. The authors detail the challenges of “...identifying phenomena for which stable individual differences in nursing performance...” (p. 65) might be observed. The authors concluded that the work of identifying the representative tasks of nursing remains a challenge.

Empirically-derived-nursing-specific measures (nursing sensitive indicators - NSI) exist as suitable representative tasks that could be integrated into deliberate practice in simulated contexts. NSI developed as an outgrowth of taxonomy for and classification of the work of nurses, and the development of outcome measures useful for research and quality assurance (Maas, Johnson, & Moorhead, 1996; Savitz, Jones, & Bernard, 2005). New indicators undergo an extensive assessment process to ensure they reflect the structure, process and outcomes of nursing care ("Nursing Sensitive Indicators," 2014). A database of NSI known as the National Database of Nursing Quality Indicators (NDNQI) is maintained and continually updated by The National Quality Forum (NQF) in conjunction with the American Nurses Association (ANA) and other private organizations whose missions include improving the quality of American healthcare (Montalvo, 2007; National Quality Forum, 2014).
This study used the NSI central line bundle compliance (evidence-based standards for the daily care and maintenance of central venous catheters). NSI are currently being measured by institutions, creating the possibility of following learners into their practice setting for evaluation and research without requiring the creation of new means of measuring patient outcomes related to nursing care or placing additional measurement burdens on institutions.

**Deliberate Practice and Simulation**

Deliberate practice begins to be mentioned in the context of simulation less than a decade after Ericsson’s formative work on the acquisition of expert performance. In 1999, authors Issenberg et al. and Kneebone, among others began to regularly appear in the literature supporting the use of deliberate practice as a concept, learning method, and leading element of skill acquisition. Issenberg et al. (1999), employs the phrase level of acceptable mastery to define the goal of deliberate practice of medical students using simulators for the purpose of skills training. The authors describe a need for “new methods of instruction...[which can]...be used repeatedly with fidelity and reproducibility” (p. 862) making them a particularly good fit with Ericsson’s theoretical framework. Later, Issenberg et al. (2005), would assert that when used effectively (with deliberate practice) simulation was an asset to the medical education armamentarium.

**Principles of deliberate practice.** Deliberate practice has multiple principles that describe the steps in the process that is the concept. These constituents have been identified, applied, and analyzed in the educational sciences. Additionally the constituents of deliberate practice neatly intersect with the capabilities of a simulation environment. In (2005) Issenberg et al. identify the principles:
...the acquisition of expertise... is governed by a simple set of principles. These principles concern the learner’s engagement in deliberate practice [which] involves (a) repetitive performance of intended cognitive or psychomotor skills in a focused domain, coupled with (b) rigorous skills assessment, that provides learners with (c) specific, informative feedback, that results in increasingly (d) better skills performance, in a controlled setting. (p. 13)

**Definition of simulation.** For the purpose of this study, the definition of simulation proposed by McGaghie (1999) was considered. Simulation is defined as:

...a person, device, or set of conditions which attempts to present [education and evaluation] problems authentically. The student or trainee is required to respond to problems as he or she would under natural circumstance. Frequently the trainee receives performance feedback as if he or she were in the real situation...simulations can take many forms. For example they can be static, as in an anatomical model...can be automated, using advanced computer technology. Some are individual; prompting solitary performance...simulations can be playful or deadly serious. In personnel evaluation settings they can be used for high-stakes, low-stakes, or no-stakes decisions. (p. 63s)

**Deliberate practice and simulation.** McGaghie (2008) described the constituents of deliberate practice in the context of simulation outlined as a process for teaching psychomotor skills to medical students:

(1) highly motivated learners with good concentration who address (2) well defined learning objectives or tasks at an (3) appropriate level of difficulty with (4) focused,
repetitive practice that yields (5) rigorous, reliable measurements that provide (6) informative feedback from educational sources that promote (7) monitoring, error correction, and more deliberate practice (8) evaluation and performance that may reach a mastery standard where learning time may vary but expected minimal outcomes are identical and allows (9) advancement to the next task or [educational] unit. (p. 995).

Ericsson’s theory of expertise, operationalized in the framework of the expert performance approach, describes the conceptualization of the modifiability of body and mind in the acquisition of expert and elite performance in a domain. Perhaps inspired by the conversations taking place in the early information age, Ericsson, his contemporaries, and colleagues (Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Smith, 1991) succeeded in elucidating the necessary elements to produce an optimal learning environment while envisioning humans as informational processing systems. Ericsson and Smith (1991) clarified the use of representative tasks for the purpose of evaluation; analyzing reproducibly superior performance. Deliberate practice is a central concept of the theory of expertise and mediator of expert performance levels.

Following the direction of other domains in healthcare education, sound scientific inquiry into the use of deliberate practice in the context of simulation practice in nursing education needs to occur. For the most part, simulation has been employed as a means of facilitating team training, and not recognized for its usefulness to increase competence related to the individual skill set required of individual professionals.
Chapter 3. Methodology

Chapter 3 will explain the research design, data collection tools and their development. This chapter will also provide operational definitions for the independent and dependent variables and key elements in the study, provide an outline of the study procedures, as well as discuss the protection of human subjects.

Purpose

The purpose of this study is to examine the difference between two groups of students; a traditional BS cohort, and a master’s entry program in nursing (MEPN) cohort in their prelicensure year as it relates to the participants’ mean pre-objective- and post-objective skill test score after exposure to an educational intervention utilizing deliberate practice. Additionally the relationship of academic motivation, represented by participants’ Self-Determination Index (SDI), pre-objective (PRE-OSTS), post-objective skill test scores (POST-OSTS), and program of study (POS) were of interest.

Specific aim 1. The first specific aim of this study was to determine if there is a difference in mean pre-objective skill test scores (PRE-OSTS) between two independent groups (POS: MEPN, BS).

Specific aim 2. The second specific aim of this study was to determine if the dependent variable Δ-objective skill test score (Δ-OSTS) varies according to the independent variables deliberate practice (DP), and program of study (POS) when the variables have multiple levels (+DP, -DP and MEPN, BS respectively).
Specific aim 3. The third specific aim of this study was to determine if there is a relationship between the self-determination index (SDI) and pre-objective skill test score (PRE-OSTS).

Specific aim 4. The fourth specific aim of this study was to determine if there is a relationship between self-determination index (SDI) and post-objective skill test score (POST-OSTS).

Specific aim 5. The fifth specific aim of this study was to determine if there is a statistically significant difference between the mean Self-Determination Index (SDI) for the two POS categories.

Specific aim 6. The sixth specific aim of this study was to investigate and describe the qualitatively different ways in which nursing students experience academic motivation.

Research Design

A mixed methods approach was utilized. The quantitative portion of the study included experimental elements: between subjects factorial design with two predictor variables, deliberate practice (DP) and program of study (POS), each with two levels (+DP, -DP and MEPN, BS respectively) with random assignment to the treatment group (see Table 1 Between Subjects factorial Design and Figure 1 Flow of Participants in Study). The qualitative portion of the study was based on open ended-interviewing about the participants practice and motivation.
Sample

Subjects were recruited from a population of students enrolled in a traditional Bachelor’s of Science (BS) in Nursing program and Master’s Entry Program in Nursing (MEPN) at a large university in the Pacific. After recruitment the participants were randomly assigned to intervention and non-intervention groups. All participants were invited to participate in focused interviews about motivation and practice.

Participants Selection

**Inclusion and exclusion criteria.** Subjects must be enrolled in a traditional baccalaureate or master’s entry nursing programs at the university where the study took place. There were no additional exclusions to participation.

Operational Definitions

**Independent variables.** Independent variables defined for the purpose of this study include: deliberate practice (DP), program of study (POS), and Self-determination index (SDI). SDI also served as dependent variable for some portions of data analysis.
**Deliberate practice.** The independent variable *deliberate practice* (DP) is categorical and has two levels: deliberate practice (+DP), no deliberate practice (-DP). Deliberate practice is defined as a regimen of effortful activities designed to optimize improvement (Ericsson et al., 1993) with the goal of skill acquisition.

**Program of study.** The independent variable *program of study* (POS) is also categorical with two levels: (BS) individuals enrolled in a Bachelor’s of Science in Nursing program, and (MEPN) individuals enrolled in a Master’s Entry Program in Nursing (MEPN).

**Self-determination index.** The independent variable self-determination index (SDI) is a composite score derived from the academic motivation scale (Academic Motivation Scale Appendix A) used with permission from the author (Vallerand et al., 1992) The scores are calculated from the mean response of each sub-scale and is designed to enumerate intrinsic-, extrinsic-, and a-motivation. The resulting score range is -18 (very little self-determination) to +18 (extreme self-determination).

**Dependent variables.** The dependent variables defined for the purpose of this study include: pre-objective skill test score (PRE-OSTS), post-objective skill test score (POST-OSTS), Δ - objective skill test score (Δ-OSTS), and self-determination index (SDI).

**Pre-objective skill test score.** The dependent variable *pre-objective skill test score* (PRE-OSTS) is a composite score from an objectively scored, validated 15-item checklist (Appendix B) of critical steps in a central venous catheter (CVC) dressing change performed prior to the intervention.

**Post-objective skill test score.** The dependent variable *post-objective skill test score* (POST-OSTS) is a composite score from an objectively scored, validated 15-item checklist
(Appendix B) of critical steps in a central venous catheter (CVC) dressing change performed after an intervention.

**Δ-objective skill test score.** The dependent variable Δ-objective skill test score (Δ-OSTS), a gain score is calculated from pre-objective and post-objective skill test scores using the formula \( D = Y_2 - Y_1 \) (Δ-OSTS = POST-OSTS – PRE-OST).

**Self-determination index.** The dependent variable self-determination index (SDI) is a composite score derived from the Academic Motivation Scale (Appendix A). The scores are calculated from the mean response of each sub-scale and are designed to enumerate intrinsic-, extrinsic-, and a-motivation. The resulting score range is -18 (very little self-determination) to +18 (extreme self-determination).

**Key elements.** The key elements defined for the purpose of this study include: academic motivation, constraints, deliberate practice, experience, motivation, and simulation.

**Academic motivation.** The Academic Motivation Scale (Vallerand et al. 1992) was used to acquire an enumerated measure (SDI) of individual participant’s academic motivation. Qualitatively the participant may describe activities that suggest or confirm the presence of academic motivation; their routines, habits, and beliefs that are evidence of a high level (or lack) of persistence and interest in academic subjects.

**Constraints.** The constraints of deliberate practice are the specific conditions required for the emergence of expertise; motivation (desire to engage in an activity or task), resource (physical and fiscal means), and effort (limits of human attention) (Ericsson, Krampe, & Tesch-Römer, 1993).

**Deliberate practice.** Deliberate practice is the process whereby highly motivated
learners address well defined learning objectives or tasks at an appropriate level of difficulty with focused, repetitive practice, with informative feedback from educational sources that promote monitoring, error correction, and more deliberate practice, that may reach a validated-mastery-standard where learning time may vary but expected minimal outcomes are identical (adapted from McGaghie, 2008).

**Experience.** The study participant will describe the activities and routines that they perceive as contributing to their academic accomplishments.

**Motivation.** The study participants will describe why they participate in the activities they perceive as contributing to their academic accomplishments.

**Objective skill test score (OSTS).** The objective skill test score is a numerical score between 0 and 15 derived through an objective evaluation of each participant’s performance of a CVC dressing change using a checklist validated using a modified Angoff method. The learning objective is “The learner was able to demonstrate a central venous catheter dressing change without error.”

**Simulation.** A stepwise demonstration replicating the procedure for changing a central venous catheter using a static manikin, with an emphasis on proper technique and error correction.

**Measures**

All data collection tools and instruments were developed by the researcher specifically for this study unless otherwise stated.

**Demographic questionnaire.** The demographic questionnaire (Demographic Questionnaire Appendix C) includes entry spaces for the participant’s, age, gender, ethnicity
and program of study. These data were used to describe the study sample during the analysis.

The POS (MEPN, BS) predictor variable was obtained from the Demographic Questionnaire.

**Central Venous Catheter (CVC) dressing change procedure checklist (15-item skill checklist).** The composite scores derived from the 15-item skill checklist comprise the outcome variables PRE-OSTS and POST-OSTS. The scores may range from 0 to 15. The checklist was based on AACN Procedure Manual for Critical Care (Wiegand, 2013) and is similar to existing Central Line Bundle checklists and protocols. CVC dressing change was chosen because of its status as a significant part of Central Line Bundle Compliance - a Nursing Sensitive Indicator, relevancy as a clinical skill, frequency that a practicing registered nurse would be required to change a CVC dressing, and feasibility of implementing the intervention with the resources available to the investigator.

A panel of ten registered nurses with acute and critical care experience reviewed the checklist. The registered nurses had a minimum of 5 years of nursing experience with six stating they had 5-10 years of experience and 3 reporting 10-15 years of experience. Their practice settings included acute medical-surgical units, post anesthesia, intensive care, and home infusion. Nine of the panel members reported direct responsibility for precepting nursing students or recently licensed registered nurses. All panel members reported having experience changing CVC dressings on their care units. Two panel members reporting changing CVC dressings weekly, 3 panel members reported changing them several times a week, 3 panel members reported changing CVC dressings once a month, and two panel members reporting changing them rarely.
The evaluation of the individual items on the objective skill test tool was carried out using a modified Angoff approach that resulted in the 15-item dichotomous (completed/not completed) checklist of critical steps of CVC dressing changes. One item was modified to include “allow to completely air-dry” as this was an omission identified by half of the panel members.

The review concluded that in the context described in the panel’s instructions, minimal competence of a nursing student or recently licensed registered nurse would be reflected by a score of 92%, i.e. completing 14 of the 15 items without error.

The steps included in the 15-item checklist are not exhaustive of the duties required of a registered nurse, seeking only to reflect the actions of the individual during a dressing change. There are several other steps including but not limited to patient identification, checking the patient’s chart for allergies or contraindications, documentation, etc. that are outside the scope of the study aims. The PRE-OSTS and POST-OSTS are comprised of the same 15-items. The reliability of the checklist has not been assessed. A subset of both the comparison and intervention group objective skill test was digitally recorded and evaluated using the 15-item checklist by the researcher and one other individual in order to establish reliability of the primary rater. In order to maintain confidentiality of the participants only their hands were visible during the digital recording.

**Self-Determination Index.** The Self-Determination Index (SDI) is a composite score derived from the Academic Motivation Scale (AMS) (Vallerand et al., 1992), based on the tenets of Self-Determination Theory. The AMS is composed of 28 items divided into 7 sub-scales. The subscales include: Intrinsic motivation - to know, toward accomplishment, to experience
stimulation: Extrinsic motivation – identified, introjected, external regulation: and Amotivation. The SDI is calculated from the mean response of each sub-scale. The scale was originally designed in French, but has since been cross-culturally validated in English. The scale has an acceptable to good internal consistency (α = .81) in published results. Additional tests of validity and reliability support the use of the AMS in the English version in educational research (Vallerand et al., 1992). Respondents are asked to indicate to what extent each question corresponded to their motivations for pursuing academic interests. The scale ranged from 1 (does not correspond at all) to 7 (corresponds exactly). The resulting score provided both predictor and outcome variables at different points in the data analysis.

**Questions for focused interview.** The questions for the focused interview addressed students’ motivation in academic settings. The content is derived from the framework of the Academic Motivation Scale, but the focused interview seeks more in-depth information on the students’ levels and types of motivation. The interview guide is shown in Appendix D.

**Methods**

**Institutional Review Board approval.** Approval to carry out research was obtained from the institutional review board human studies program at the university where the research took place. Please see *Human Studies* below for detail on protection of human subjects.

**Subject Selection and Random Assignment**

**Subject selection and consenting.** Each interested student met individually with the investigator in a private room for further explanation about the study and consenting. The room was on the same floor several doors away from other simulation activities. The researcher read the Information Sheet and Certificate of Consent aloud to each individual. In
addition the interested students were given time to review the written materials. The voluntary nature of the study was outlined in the information sheet and consent form.

**Random assignment.** Participants were randomly assigned to the intervention group (+DP) or the comparison group (-DP). Randomization was achieved by using the order in which participants volunteered which corresponded with a number from a sequence of unique random integers that had been split between the two treatments. In order to achieve a balanced design (balanced cells) a separate sequence of unique random integers was generated for each program of study (MEPN, BS) Because the sequence of unique random numbers was generated ahead of time the researcher could anticipate which group the participants would fall into facilitating preparation for the intervention.

**Intervention Protocol**

The focus of the intervention was the NQF measure Central Line Bundle Compliance (representative task), specifically the daily assessment and care of central lines. The standards described in the learning objectives correspond with the NQF measure description and are aligned with the students’ curricular benchmarks.

A 2-minute video demonstrating evidence-based practice standards and rationale for the measure was presented to the students. Next the students were familiarized with a static manikin with a central line. The students had access to the procedural video, a dressing change checklist, supplies, and the simulation facilitator. The students practiced and reviewed the video, continuing until they were able to perform the dressing change to the standards described in the learning objectives, dressing change checklist, and observed in the video. They had time to reflect on their deficiencies and how to correct them; benefiting from the success
or failure of each attempt. The individual students repeated the steps as many times as it was required for each of them to perform the dressing changes with consistent success (removal, sterile technique, BioPatch® placement etc.). Familiarity with the task was not the standard, but rather the ability to properly perform the entire dressing change consistently (repeatedly) without error.

**Data Collection**

Data collection occurred Monday through Friday during the regularly scheduled semester, and began after consent but prior to the educational intervention:

- Participants were asked to complete the demographic questionnaire (Demographic Questionnaire Appendix C).
- Participants were then asked to answer the questions in the Academic Motivation Scale (Appendix A) (Vallerand et al., 1992).
- Participants watched the 2-minute video.
- Next a baseline skill assessment was performed using the 15-item checklist (Appendix B).
- **Intervention group.** Following the video the participants assigned to the +DP group were guided through the intervention containing all the elements of deliberate practice. When the participant was able to complete all 15 items without error they were asked to complete the dressing change while being scored by the researcher using the 15-item skill checklist.
• **Non-intervention group.** Following the video the participants assigned to the -DP group were provided an opportunity to practice the CVC dressing change and have access to the same resources as the intervention group. Resources present were the video, the 15-item checklist, a summary of the procedure, and the facilitator. However the facilitator did not provide immediate, formative feedback to the participant regarding performance. After a minimum of 5 and maximum of 20 minutes the participant was asked to complete the dressing change while being scored by the researcher using the 15-item skill checklist.

• **Compensatory intervention to non-intervention group.** In order to minimize the perception that that they were “missing out”, which could result in feelings of hostility, jealousy or competitiveness, the DP intervention was offered to all students enrolled in a nursing program at the university after data collection was completed.

• Next, all participants were invited to participate in a post-intervention interview in which they were asked about their academic motivation.

• Participants were provided with a $10.00 gift card

• Completed measurement tools were stored in a locked filing cabinet in the research room.

**Sample Size**

A priori power analysis using a desired power of .8, alpha of .05, with a medium effect size was calculated for all statistical tests. G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) was used for study aim 1 and 2; It was estimated that a sample size of 128 was required to detect
the effect of interest. Tables from Cohen (1988, p. 102) were used to estimate the sample size for study aim 3 and 4; it was projected that a sample size of 85 would be required to detect the effect of interest. Tables from Cohen (1988, p. 55) were also consulted for study aim 5; it was estimated that 64 participants were needed to detect the effect of interest. All estimations assumed a two-tailed test.

Statistical Hypothesis Testing and Analysis

In this section, the specific aim, related research questions, and statistical analysis procedure are described. The two-tailed test for level of significance was used in testing the alternative hypotheses.

**Specific aim 1.** The first specific aim of this study was to determine if there was a difference in mean pre-objective skill test scores (PRE-OSTS) between two independent groups (POS: MEPN, BS).

**Research question 1.** To determine whether there were any differences between the mean Pre-OSTS of the two POS groups.

H$_0$: POS group mean PRE-OSTS are equal.

H$_a$: POS group mean PRE-OSTS are not equal.

**One-way independent ANOVA.** A one-way independent ANOVA as carried out with the independent variables POS and the dependent variable PRE-OSTS.

**Specific aim 2.** The second specific aim of this study was to determine if the dependent variable Δ-objective skill test score (Δ-OSTS) varied according to the independent variables deliberate practice (DP), and program of study (POS) when the variables had multiple levels (+DP, -DP and MEPN, BS respectively).
**Research question 2a.** Does exposure to a deliberate practice (DP) intervention have an effect on Δ-objective skill test score (Δ-OSTS)?

$H_0$: DP group mean Δ-OSTS are equal.

$H_a$: DP group mean Δ-OSTS are not equal.

**Research question 2b.** Does program of study (POS) have an effect on Δ-objective skill test score (Δ-OSTS)?

$H_0$: POS group mean Δ-OSTS are equal.

$H_a$: POS group mean Δ-OSTS are not equal.

**Research question 2c.** Is there an interaction between deliberate practice (DP) and program of study (POS) as it relates to Δ-objective skill test score (Δ-OSTS)?

$H_0$: The sum of all individual interactions equals 0.

$H_1$: The sum of all individual interactions does not equal 0.

**Two-way independent ANOVA.** A two-way independent ANOVA was carried out with the independent variables DP and POS and the dependent variable Δ-OSTS.

**Specific aim 3.** The third specific aim of this study was to determine if there was a relationship between the self-determination index (SDI) and pre-objective skill test score (PRE-OSTS).

**Research question 3.** Is there a linear relationship between self-determination index (SDI) and pre-objective skill test score (PRE-OSTS)?

$H_0$: There is no significant linear relationship between SDI and PRE-OSTS.

$H_a$: There is a significant linear relationship between SDI and PRE-OSTS.
**Linear regression.** Linear regression was used to evaluate the relationship between self-determination index (SDI), and PRE-OSTS.

**Specific aim 4.** The fourth specific aim of this study was to determine if there was a relationship between self-determination index (SDI) and post-objective skill test score (POST-OSTS).

**Research question 4.** Is there a linear relationship between self-determination index (SDI) and post-objective skill test score (POST-OSTS)?

\[ H_0: \text{There is no significant linear relationship between SDI and POST-OSTS.} \]

\[ H_a: \text{There is a significant linear relationship between SDI and POST-OSTS.} \]

**Linear regression.** Linear regression was used to evaluate the relationship between self-determination index (SDI), and POST-OSTS.

**Specific aim 5.** The fifth specific aim of this study was to determine if there was a statistically significant difference between the mean SDI for the two POS categories.

**Research question 5.** Is there a statistically significant difference between mean self-determination index (SDI) between the two levels of program of study (POS)?

\[ H_0: \text{The mean SDI for the two POS levels are equal.} \]

\[ H_a: \text{The mean SDI for the two POS levels are not equal.} \]

**Independent t-test.** An independent t-test was used to determine if there was a difference between group mean SDI for the two levels of POS (MEPN, BS).

**Specific aim 6.** The sixth specific aim of this study was to investigate and describe the qualitatively different ways in which nursing students experience motivation as it relates to academic practice, and motivation. Specific aim 6. involved thematic analysis. Key themes were
identified from transcribed interviews. Themes were evaluated on an ongoing basis in order to identify when saturation was reached.

**Protection for Human Subjects**

**Refusal and withdrawal.** When the study involves students, refusal or withdrawal has special implication, as students, even if assured that there will be no recrimination or prejudice may feel as if they cannot withdrawal. Special attention should be paid to this problem in the educational setting. A student may feel “subtle pressure to participate” (Feher Waltz, Strickland, & Lenz, 2010, p. 405) even if they have been expressly informed of their rights and obligations associated with the research. The educational context may possibly be more complex than other settings in this regard. In the community the researcher and the subject essentially part ways, whereas in the educational setting the student/subject must maintain a relationship with the institution (and possibly the researcher) in order to fulfill educational requirements.

The design minimized resource demands on the students. Ideally there should be no difference in the demands placed on students in an intervention than already exist for regular attendance in school related activities.

**Possible negative consequences.**

- *Physical* – minimal and no greater than students are already exposed to while traveling to and from, and being in the simulation environment.

- *Psychological* – minimal potential for emotional distress. What does exist is from the experience of being observed in the simulation setting. However potentially less secondary to fewer observers in the deliberate practice setting.
• **Social** – minimal risk. The educational intervention was available to all nursing students to minimize perception by students that they were “missing out” potentially stirring feelings of hostility, jealousy or competitiveness. Peer pressure to *participate or not participate* may also be present in a population of students.

**Possible positive consequences.**

• Reinforcement of psychomotor skill necessary for professional nursing and acquisition of new information.

• Knowledge that they are contributing to the body of knowledge related to best practice in nursing education, opportunity to contribute to a worthwhile undertaking.

• Benefits to society because of potential for improving nursing education and subsequently healthcare delivery.

Under the researcher’s estimation the risk was neutral and the benefit to participating outweighed the risk. The risks were the same as those currently being experienced by the nursing students. There was potentially less risk of emotional distress than students currently encounter in the simulation curriculum where they are observed simultaneously by as many as 10 peers, instructors, and simulation technicians. The established required health and safety policies were followed within the simulation laboratory setting for this project (see Appendix E for UH Translational Health Science Simulation Center Regulations).

**Risk to the researcher.** The risk associated with the proposed study was equal to that experienced at any other time in the process of traveling to and from campus, and working in the simulation lab. The potential risk was extremely minimal as the proposed protocols were followed and the policies associated with subjects’ rights were respected and adhered to.
Protecting against or minimizing potential risk to human subjects. The researcher did not hold a teaching position or other position of authority within the institution during the study period. The researcher did not discuss any student’s participation with their clinical faculty. The information sheet provided to the student during the consent process emphasized that there was no connection between this study and their course/clinical evaluation or grade.

Comprehension of the informed consent by potential participants. No personally identifying information was on data collection tools. The Informed Consent and Information Sheet (Appendix F) and Certificate of Consent (Appendix G) were adapted from publically available templates provided by the National Institutes of Health, and followed the consent guidelines of the institution where the research took place. The informed consent was designed to be easily read and understood. Written at the 8th grade reading level, an awareness of the admission profile and requirements for the students under study was considered during the development of the consent form and procedure. The population under consideration (undergrad and graduate entry nursing students in the Pacific) should have a reasonable grasp of the English language. Students for whom English is not their first language, are required to have established English proficiency by taking the English Language Institute Placement Test (ELIPT) on admission to the nursing program and have reached Level 2: ELI Placement or Exemption. Additionally students who gain admission into the school of nursing must have achieved a minimum passing score on the National League for Nursing Pre-Entrance Examination or Test of Essential Academic Skills V. During the consent process the participants were given time in a low-pressure setting to read the consent forms and other information related to the study and provided an opportunity to ask questions.
Participants were explicitly instructed that they have the right to refuse or withdraw from the study at any time. If the intervention is anticipated or perceived to have a beneficial effect, students may feel compelled to continue in the study if only to receive the benefit, therefore the educational intervention was offered outside of the study to those who wished to participate without being evaluated or included in the data collection.

**Participant privacy.** Complete privacy could not be assured. However there was no collection of sensitive information. Additionally the privacy concerns were the same as for any student enrolled in a nursing program at the university where the study took place. The Confidentiality Agreement (Appendix E) signed by the students attending regularly scheduled simulation at the simulation center includes language regarding the confidentiality of activities. These same rules applied to the researcher and students during research related activities. Express permission to utilize laboratory space was obtained (Appendix H).

**Emotional or psychological harm.** The intervention included the practice of a psychomotor skill. The risk of emotional distress was small. It is generally agreed that simulation and debriefing should occur in an emotionally safe environment; the activities of this study were designed with this in mind.

**Participant confidentiality-anonymity.** No personal identifying information was gathered from participants. No name badges were visible during digital video recordings. It may be known among the student cohort that they have participated in a study. The details of the demographics form, PRE-OSTS, POST-OSTS, SDI, text and recordings from the focused interview and any field observation notes remained confidential. All completed consents, forms, digital recordings, and field notes were kept in a secured locking file-box.
Chapter 4. Results and Findings

Chapter 4 describes the sample, reviews the reliability of the instruments, describes the statistical hypothesis tests utilized during the analysis and their associated assumptions, details the procedures, provides the results of the quantitative analysis, and the findings from the qualitative analysis.

Sample Characteristics

A total of 36 students participated in the study (N = 36). The sample consisted of BS (n = 26) and MEPN (n = 10) students. All 36 students were enrolled full-time in the Spring semester of their respective programs (Table 2).

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<td></td>
<td>26</td>
<td>72</td>
</tr>
<tr>
<td>MEPN</td>
<td>1</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>

Univariate analysis was used to describe the characteristics of the sample. Percentages describing the sample were rounded to the nearest whole percent. The descriptive data were derived from the Demographic Questionnaire (Appendix C). The total number of participants recruited for this study was lower than the number identified as necessary to achieve the desired statistical power. This is especially problematic for the factorial ANOVA (Specific aim 2) where in addition to a smaller than desired sample, the data was unbalanced.
Demographics. Study participants ranged in age from 20 to 38 years with a mean of 25.20 years (SD = 4.14). Participants mean age between the intervention and comparison group were not statistically significantly different (Table 3).

Table 3
Participant Mean Age by POS and Intervention Group

<table>
<thead>
<tr>
<th>POS</th>
<th>+DP</th>
<th>-DP</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>25.69 (±5.42)</td>
<td>24.07 (±3.64)</td>
<td>.381</td>
</tr>
<tr>
<td>MEPN</td>
<td>26.40 (±2.88)</td>
<td>25.60 (±2.61)</td>
<td>.658</td>
</tr>
</tbody>
</table>

Thirty-four (94%) students identified themselves as Female, 2 students (6%) identified themselves as male. For a breakdown of gender by program of study and intervention group see Table 4. The sample consisted of, in order of frequency, Multi-ethnic 10(28%), Caucasian 8(22%), Chinese 5(14%), Japanese 5(14%), Filipino 4(11%), Korean 3(8%), Hispanic 1(3%).

Table 4
Participant Gender by POS and Intervention Group

<table>
<thead>
<tr>
<th>POS</th>
<th>Gender</th>
<th>+DP (%)</th>
<th>-DP (%)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Female</td>
<td>13 (36)</td>
<td>12 (33)</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>0 (0)</td>
<td>1 (3)</td>
<td>3</td>
</tr>
<tr>
<td>MEPN</td>
<td>Female</td>
<td>4 (11)</td>
<td>5 (14)</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>1 (3)</td>
<td>0 (0)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18 (50)</td>
<td>18 (50)</td>
<td>100</td>
</tr>
</tbody>
</table>

Experience with CVC dressing change. One student reported having prior experience with a CVC dressing change approximately 5 years prior to the study.

Instrumentation

Cronbach’s α. The internal consistency of the underlying sub structs in the AMS were assessed using Cronbach’s α coefficient. The AMS returned adequate internal consistency with
subscales ranging from 0.61 to 0.89 (Table 5). This is consistent with findings by Vallerand et al. (1992).

Table 5

<table>
<thead>
<tr>
<th>Cronbach’s Alpha Coefficients for Subscale Items of the AMS</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation - to know</td>
<td>0.76</td>
</tr>
<tr>
<td>Intrinsic motivation - toward accomplishment</td>
<td>0.83</td>
</tr>
<tr>
<td>Intrinsic motivation - to experience stimulation</td>
<td>0.82</td>
</tr>
<tr>
<td>Extrinsic motivation - identified</td>
<td>0.70</td>
</tr>
<tr>
<td>Extrinsic motivation - introjected</td>
<td>0.89</td>
</tr>
<tr>
<td>Extrinsic motivation - external regulation</td>
<td>0.78</td>
</tr>
<tr>
<td>Amotivation</td>
<td>0.61</td>
</tr>
</tbody>
</table>

**The 15-item checklist. Interrater Reliability.** Interrater reliability was considered using a two-way mixed, absolute agreement single-measures intraclass correlation coefficient (ICC) to assess the degree to which the two raters provided agreement in their ratings across study participants when scoring their performance using the 15-item checklist. The resulting ICC was in the excellent range, ICC=0.81 (Cicchetti 1994) suggesting that the 15-item checklist was scored similarly across raters. An ICC of this level suggests that the independent raters introduced a minimal amount of measurement error, and consequently statistical power for the subsequent analysis was not substantially reduced.

**Assumptions of Parametric Data**

For all parametric data, i.e., based on the normal distribution, used in this analysis the assumptions considered were, normality, homogeneity of variance, and independence of observations. When required particulars of each assumption, or additional assumptions unique to each statistical test were considered and will be discussed in more detail along side the corresponding statistical test.
**Normality.** Normality is grounded on the assumption that the value of interest will demonstrate a parametric - bell-curve - distribution function. Normality is a principal assumption when analyzing parametric data, assessing data for normality is therefore a precondition for most statistical tests. There are multiple tests of normality available both numerical and graphical, e.g., Shapiro-Wilk’s Test of Normality and Q-Q plots respectively.

**Homogeneity of variance.** The assumption that treatment variances are equal, i.e., the spread of scores (or data points) around the mean for each treatment are roughly equal. Tests for homogeneity of variance include Bartlett’s, Levene’s, and Brown-Forsythe Test. Each having strengths and weaknesses with Levene’s often considered the most robust of the three tests secondary to its lack of sensitivity to a data sets departure from normality.

**Independence of observations.** The assumption that data points gathered from separate study participants are independent; the behavior of one participant does not influence the behavior of another. Independence of observations is usually a consequence of study design. For linear regression the Durbin-Watson test was used to assess for serial correlation, i.e. correlation between the errors of adjacent observations.

**Absence of significant outliers.** Outliers, or unusual scores with extremely small or large values when compared to other scores in the data set may have a large effect on the mean and standard deviation for the group they represent. This is particularly harmful in a small sample size where each datum exerts a larger influence on the mean and standard deviation.

**Quantitative Statistical Tests**

**One-way independent ANOVA.** The one-way independent ANOVA is used to establish whether there are statistically significant differences between the population means of two or
more unrelated groups; for example, when the effect of different treatments on similar samples of students is of interest.

**Assumptions.** There are six assumptions for the one-way ANOVA including, 1) one dependent variable that is measured at the continuous level, 2) one independent variable that consists of two or more categorical independent groups, 3) normality, 4) independence of observations, 5) no significant outliers in the groups of your independent variable in terms of the dependent variable, 6) homogeneity of variances.

**Two-way independent ANOVA.** A two-way ANOVA compares the mean difference between groups that are split on two independent variables. As an example, for the purposes of this study the investigator wanted to know if a gain score (dependent variable) varies according to the independent variables, DP and POS when the factors being evaluated have multiple levels, DP: deliberate practice, and no deliberate practice, and POS from two separate programs of study: traditional bachelor’s degree students, and a graduate entry program. The two-way ANOVA can tell a researcher whether any of the factors (sometimes referred to as the *focal variable* and the *moderator variable*) had an effect on the dependent variable.

**Assumptions.** There are 6 assumptions for the two-way ANOVA, 1) one dependent variable that is measured at the continuous level, 2) two independent variables where each independent variable consists of two or more categorical independent groups, 3) independence of observations, which means that there is no relationship between the observations in each group of the independent variable or between the groups themselves, 4) There should be no significant outliers in any cell of the design, 5) the dependent variable (residuals) should be approximately normally distributed for each cell of the design, 6) the variance of the dependent
variable (residuals) should be equal in each cell of the design, that is the data should exhibit homogeneity of variance.

**Linear Regression.** Simple linear regression is used to explore the linear relationship between an outcome variable and a predictor variable. Specifically regression analysis describes how the value of the dependent variable changes when the independent variable varies. The criteria for variables used in a simple linear regression are a predictor and outcome variable that are both continuous. The resulting model may be used to predict new values for outcome variables.

**Assumptions.** The assumptions for linear regression include 1) linearity, 2) normality, 3) independence of observations, 4) absence of outliers, 5) heteroscedasticity, 6) and normality of residuals.

**Independent t-test.** The independent t-test is used to test for the difference between two means. Frequently, as is the case in this study, the predictor variable is an experimental condition and a comparison group with one (continuous) outcome variable.

**Assumptions.** The independent t-test requires, 1) one dependent variable measured at the continuous or ordinal level, 2) one independent variable with two categorical independent groups, 3) independence of observations, 4) no significant outliers in the two groups of your independent variable as it relates to the dependent variable, 5) the dependent variable should be approximately normally distributed in each group of the independent variable, 6) homogeneity of variances.

**Effect Size**
Effect size is described by Cohen (1992, p. 156) as “the degree to which the $H_0$ is believed to be false”, or “the magnitude of the difference between groups” (Sullivan & Feinn, 2012, p. 279) and directs our perception regarding the magnitude of the phenomenon we are investigating. “Calculated indices of effect size are useful when the measurements have no intrinsic meaning” (Sullivan & Feinn, 2012, p. 279). Effect sizes assist in interpreting the results of a statistical test in practical, applied terms. Different statistical tests approach the calculation of an effect size using different coefficients, each using the standard deviation to transform the absolute difference into standard deviation units (Sullivan & Feinn, 2012) (Table 6 provided the guide for reporting indices and interpreting their values).

**One-way ANOVA.** Effect size in one-way ANOVA describes how much variance in the dependent variable is a result of the independent variable. Effect size is calculated after conducting an appropriate statistical test for significance; in the case of ANOVA, the $F$ test. Effect size for a one-way ANOVA is reported using the $\eta^2$ (eta squared).

**Two-way ANOVA.** Effect size in factorial ANOVA is also reported using $\eta^2$ for any of the independent variables. However the variance is further broken down by the experiment ($SS_M$) and that which cannot be explained ($SS_e$) (error variance). The $SS_M$ is comprised of the variance for both experimental conditions (both IVs), and also by the variance explained by the interaction of the two IVs ($SS_{AB}$). For the interaction effect size $SS_{int}$ (sums of squares for the interaction) is alternatively used in the numerator.

**Linear regression.** $r$ is the multiple correlation coefficient, which describes the strength of the linear relationship between the dependent variable and independent variable if one exists. $r^2$ is the *coefficient of determination*, i.e. the *percent variance* of the dependent variable...
that is predicted from the independent variable, and has a range of 0 – 1. The closer the value is to 1 (100%) the better the independent variables are at predicting the outcome.

**Independent t-test.** For the independent-samples t-test the effect size is reported using Cohen’s r or Cohen’s d, calculated by dividing the mean difference between the groups by the pooled standard deviation, and then finding the square root, Cohen’s d (Cohen, 1998).

Table 6
*Effect Size Reporting Indices*

<table>
<thead>
<tr>
<th>Statistical test</th>
<th>Index</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-way ANOVA</td>
<td>$\eta^2$</td>
<td>small 0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium 0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>large 0.8</td>
</tr>
<tr>
<td>Two-way ANOVA</td>
<td>$\eta^2 / SS_{INT}$</td>
<td>small 0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium 0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>large 0.8</td>
</tr>
<tr>
<td>Linear Regression</td>
<td>$r^2$</td>
<td>small 0.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium 0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>large 0.64</td>
</tr>
<tr>
<td>t-test</td>
<td>$d$</td>
<td>small 0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium 0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>large 0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>very large 1.3</td>
</tr>
</tbody>
</table>

*Adapted from Sullivan & Feinn, 2012 – Common Effect Size Indices*

**Qualitative Analysis**

**Thematic analysis.** Thematic Analysis was used to carry out the qualitative portion of this study. The interview questions addressed the study participants’ motivation in academic settings. The conceptual basis of the interview was derived from the framework of the Academic Motivation Scale and Self-Determination Theory, but the focused interview sought more in-depth information on the participants’ levels and orientation in academic tasks. The interview guide is shown in Appendix D.

**Results**
Data were collected on 33 days over a 7-week period. Data were reviewed for erroneous entries using Excel VBA (=sheet1!A1=sheet2!A1). All statistical hypothesis testing was performed on IBM SPSS 22 software referencing Laerd Statistics SPSS Tutorials and Statistical guides (Lund & Lund, 2015). For each statistical test the upper limit on the probability of erroneously rejecting $H_0$ was set at 5% ($p<.05$), with 95% confidence intervals.

**Research Question 1**

**Research question 1.** How does program of study impact pre-objective skill test scores?

**Specific aim 1.** The first specific aim of this study was to determine if there is a difference in mean pre-objective skill test scores (PRE-OSTS) between two independent groups (POS: MEPN, BS).

**Research question 1 null hypothesis.** $H_0$: POS group mean PRE-OSTS are equal.

**Research question 1 alternative hypothesis.** $H_0$: POS group mean PRE-OSTS are not equal.

**Research question 1 one-way independent ANOVA.** A one-way independent ANOVA was computed with the independent variables POS and the dependent variable PRE-OSTS to determine if the PRE-OSTS was different between the two programs of study.

**Research question 1 results.** There were no outliers, as assessed by boxplot. PRE-OSTS score was not normally distributed, as assessed by Shapiro-Wilk's test ($p = .049$, $p = .025$ for BS and MEPN respectively). In addition the assumption of homogeneity of variances was violated, as assessed by Levene's test of homogeneity of variances ($p = .121$). The mean calculated total pre-objective skill test score (PRE-OSTS) differed from the BS ($n = 26$, $M = 11.9$, $SD = 2.08$), to MEPN ($n = 10$, $M = 10.8$, $SD = .79$) (Table 7) group.
The difference was not statistically significant between the different programs of study (MEPN, BS) groups, $F(1, 34) = 2.528, p = .121$, partial $\eta^2 = .069$. Therefore the null hypothesis was not rejected.

**Research Question 2**

**Research question 2.** How does deliberate practice and program of study impact objective skill test scores?

**Specific aim 2.** The second specific aim of this study was to determine if the dependent variable $\Delta$-objective skill test score ($\Delta$-OSTS), a gain score, varied according to the independent variables deliberate practice (DP), and program of study (POS) when the variables had multiple levels (+DP, -DP and MEPN, BS respectively). Owing to the nature of factorial ANOVAs, 3 separate research questions with corresponding null and alternative hypothesis were analyzed.

**Research question 2a.** Does exposure to a deliberate practice (DP) intervention have an effect on $\Delta$-objective skill test score ($\Delta$-OSTS)?

**Research question 2a null hypothesis.** $H_0$: DP group mean $\Delta$-OSTS are equal.

**Research question 2a alternative hypothesis.** $H_a$: DP group mean $\Delta$-OSTS are not equal.

**Research question 2b.** Does program of study (POS) have an effect on $\Delta$-objective skill test score ($\Delta$-OSTS)?

**Research question 2b null hypothesis.** $H_0$: POS group mean $\Delta$-OSTS are equal.
**Research question 2b alternative hypothesis.** $H_a$: POS group mean $\Delta$-OSTS are not equal.

**Research question c.** Is there an interaction between DP and POS as it relates to $\Delta$-OSTS?

**Research question 2c null hypothesis.** $H_0$: The sum of all individual interactions equals 0. **Research question 2c alternative hypothesis.** $H_a$: The sum of all interactions does not equal 0.

**Research question 2 Two-way independent ANOVA.** Answering Research question 2a-c. relied on data gathered using randomly assigned groups (+DP/-DP), program of study (MEPN/BS), and $\Delta$-OSTS, calculated from pre-objective and post-objective skill test scores using the formula $D = Y_2 - Y_1$ ($\Delta$-OSTS = POST-OSTS – PRE-OST).

**Research question 2a results.** The variables were at the required level of measurement to run a factorial ANOVA, meeting assumptions 1, and 2. Assumption 3 was also met, as by design there is no relationship between the observations in each group, or between groups. Additionally there were no significant outliers in any cell of the design as assessed by inspection of a boxplot. The assumption of normality was violated, as assessed by Shapiro-Wilk's test for the cell MEPN/-DP ($p = .006$). The data were adjusted with a Bonferroni correction, and reassessed for normal distribution. Factorial ANOVAs by design should have equal cell sizes. This study did not have equal cell sizes (Table 8). This will be addressed further at the end of the section on Research question 2 - two-way ANOVA.
Table 8
*Between Subjects Factorial Design – Cell Sizes*

<table>
<thead>
<tr>
<th>Program of Study (IV₂)</th>
<th>Deliberate Practice (IV₁)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>+DP ( n = 13 )</td>
</tr>
<tr>
<td></td>
<td>-DP ( n = 13 )</td>
</tr>
<tr>
<td>MEPN</td>
<td>+DP ( n = 5 )</td>
</tr>
<tr>
<td></td>
<td>-DP ( n = 5 )</td>
</tr>
</tbody>
</table>

*Interaction effect.* There was not a statistically significant interaction effect between POS and DP for gain score, \( F(1, 32) = .137, p = .713 \), partial \( \eta^2 = .004 \). Therefore the null hypothesis was not rejected (Table 9).

*The simple main effect of deliberate practice (DP).* In accordance with Field (2009) the simple main effect for differences in mean gain score between the intervention and comparison group within each program of study are reported here.

There is not a statistically significant difference in mean gain score between BS students in the intervention (+DP) and comparison group (-DP), \( F(1,32) = 1.85, p = .183 \), partial \( \eta^2 = .055 \). There is not a statistically significant difference in mean gain score between MEPN students in the intervention (+DP) and comparison group (-DP), \( F(1,32) = 1.64, p = .210 \), partial \( \eta^2 = .049 \). We fail to reject the null hypothesis. Therefore the null hypothesis is not rejected.

*The simple main effect of program of study (POS).* In accordance with Field (2009) the simple main effect for differences in mean gain score between the two programs of study (MEPN, BS) within each intervention group are reported.

There was not a statistically significant difference in mean gain score between the group +DP as it relates to BS students and MEPN students, \( F(1,32) = 2.45, p = .126 \), partial \( \eta^2 = .072 \).
There was not a statistically significant difference in mean gain score between the group -DP as it relates to BS students and MEPN students, F(1,32) = 1.10, p = .302, partial η² = .033.

Therefore the null hypothesis is not rejected.

### Table 9
**Results – Between Subjects Factorial ANOVA Δ-OSTS by IV₁ DP and IV₂ POS**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP</td>
<td>1</td>
<td>9.75</td>
<td>9.75</td>
<td>3.26</td>
<td>.040</td>
<td>.092</td>
</tr>
<tr>
<td>POS</td>
<td>1</td>
<td>10.27</td>
<td>10.27</td>
<td>3.44</td>
<td>.037</td>
<td>.097</td>
</tr>
<tr>
<td>POS*DP</td>
<td>1</td>
<td>0.41</td>
<td>0.41</td>
<td>0.137</td>
<td>.357</td>
<td>.004</td>
</tr>
</tbody>
</table>

**Unequal cell sizes.** The two-way ANOVA compared weighted means; the means of the two cells for IV₁ and then the means of the two cells for IV₂. These are very different when the cell sizes are unequal. One solution was to run separate t-tests for each IV. This provided “incomplete” information but provided insight into the data. It is not be possible to makes inferences about an interaction effect, i.e., if there is an advantage to being both a MEPN student and participating in the deliberate practice intervention.

**Research Question 3**

**Research question 3.** How does motivation impact pre-objective skill test scores?

**Specific aim 3.** The third specific aim of this study was to determine if there is a relationship between the self-determination index (SDI) and pre-objective skill test score (PRE-OSTS)

**Research question 3 null hypothesis.** H₀: There is no significant linear relationship between SDI and PRE-OSTS.
Research question 3 alternative hypothesis. $H_3$: There is a significant linear relationship between SDI and PRE-OSTS.

Research question 3 simple linear regression. Linear regression was used to evaluate the relationship between self-determination index (SDI), and PRE-OSTS.

Research question 3 results. The assumption of linearity was addressed before running the regression. This was achieved by visual inspection of a scatterplot of the dependent variable plotted against the independent variable. The resulting scatterplot did not present an obvious linear relationship.

An attempt was made to transform the non-linear relationship to a linear one. The data were transformed with the least aggressive method; squaring the dependent variable (calculated PRE-OSTS score). Independence of observations was tested for using the Durbin-Watson test statistic $(d = 2.37)$, indicating that there is no autocorrelation between residuals. There were no outliers in the cases, as evidenced by the absence of a Casewise Diagnostics table in the output.

Variance of the errors was constant across the observations, residuals appeared to be approximately normally distributed; this was supported through visual inspection of a p-p plot.

A linear regression established that there was not a statistically significantly linear relationship between the two variables, $F(1, 34) = .745, p = .394$ and that SDI accounted for less than 1% (Adjusted R Square = -.007) of the explained variability in PRE-OSTS (Table 10). Therefore the null hypothesis was not rejected.
Table 10
Results - Bivariate Linear Regression on IV SDI and DV PRE-OSTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
<th>Adjusted $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.27</td>
<td>.853</td>
<td>14.38</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>SDI</td>
<td>-0.098</td>
<td>.114</td>
<td>-0.863</td>
<td>.394</td>
<td>-.007</td>
</tr>
</tbody>
</table>

Research Question 4

Research question 4. How does motivation impact post-objective skill test scores?

Specific aim 4. The fourth specific aim of this study was to determine if there is a relationship between self-determination index (SDI) and post-objective skill test score (POST-OSTS).

Research question 4 null hypothesis. $H_0$: There is no significant linear relationship between SDI and POST-OSTS.

Research question 4 alternative hypothesis. $H_a$: There is a significant linear relationship between SDI and POST-OSTS.

Research question 4 simple linear regression. Linear regression was used to evaluate the relationship between self-determination index (SDI), and POST-OSTS.

Research question 4 results. The assumption of linearity was addressed before running the regression. The resulting scatterplot presented a linear relationship. This was assessed by visual inspection of a scatterplot of the dependent variable plotted against the independent variable. No transformations were performed. Independence of observations was tested for using the Durbin-Watson test statistic ($d = 2.15$), indicating that there is no autocorrelation between residuals.
There was one outlying case, evidenced by the presence of a Casewise Diagnostics table in the output. The case and data point were identified on the original document and found to be correct. The regression was run with and without the case to assess the impact of this outlying case. Variance of the errors was constant across the observations and residuals appear to be approximately normally distributed. This was also supported through visual inspection of a p-p plot.

**Results with outlier retained.** SDI could not statistically significantly predict POST-OSTS, \( F(1, 34) = 1.145, p = .292 \) and SDI accounted for less than 1% (Adjusted R Square = -.004) of the explained variability in POST-OSTS.

**Results with outlier omitted.** SDI could not statistically significantly predict POST-OSTS, \( F(1, 34) = 2.498, p = .124 \) and SDI accounted for less than 5% (Adjusted R Square = -.042) of the explained variability in POST-OSTS.

See Table 11 for comparison of results. Regardless of the inclusion or omission of the outlier, the lack of a statistically significant result demonstrated that the null hypothesis was not rejected.
Table 11  
*Comparison of Results - Bivariate Linear Regression on IV SDI and DV POST-OSTS*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
<th>Adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>β</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>14.57</td>
<td>.344</td>
<td>42.31</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>SDI</td>
<td>-0.049</td>
<td>.046</td>
<td>-.180</td>
<td>-1.07</td>
<td>.292</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
<th>Adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>β</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>14.73</td>
<td>.300</td>
<td>49.12</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>SDI</td>
<td>-0.063</td>
<td>.040</td>
<td>-.265</td>
<td>-1.58</td>
<td>.124</td>
</tr>
</tbody>
</table>

**Research Question 5**

**Research question 5.** Is there a statistically significant difference between mean self-determination index (SDI) between the two levels of program of study (POS)?

**Specific aim 5.** The fifth specific aim of this study was to determine if there was a statistically significant difference between the mean SDI for the two POS categories.

**Research question 5 null hypothesis.** H₀: The mean SDI for the two POS levels are equal.

**Research question 5 alternative hypothesis.** H₁: The mean SDI for the two POS levels are not equal.

**Research question 5 independent t-test.** To determine if there is a difference between the mean self-determination index (SDI) for the two programs of study (POS) categories an independent t-test was used.

**Research question 5 results.** The data were examined in preparation for analysis. The appropriateness of the variables was confirmed. There was one case with an outlying data point as assessed by inspection of a boxplot. It was established that the outlier was not the result of a
data entry error, and was a genuinely unusual data point. It was decided that the analysis would be run with the outlier and again with the outlier adjusted to near the next closest value to determine if it would have a measurable effect on the significance of the test statistic (see Table 12 for comparison of results).

**Results with outlier retained.** SDI score was not normally distributed for BS group, as assessed by Shapiro-Wilk’s test ($p = .027$). However it was normally distributed for the MEPN group. It was decided to run the test regardless of this violation, as the independent samples t-test is considered robust to violations of normality. Levene’s test for equality of variances ($p = .675$) indicates that the variability in the two conditions is not significantly different.

Subsequently the interpretation was based on *equal variances assumed*.

The BS group mean SDI was 0.133, 95% CI [-2.01 to 2.28] higher than MEPN mean SDI. The difference was not statistically significant between the two groups, $t(.34) = .126, p = .901, d = 0.045$. Subsequent to the non-statistically significant result the null hypothesis was not rejected.

**Results with outlier adjusted.** Inspection of a boxplot confirmed that the outlying value had been adjusted. SDI score was not normally distributed for BS group, as assessed by Shapiro-Wilk’s test ($p = .027$). The data were normally distributed for the MEPN group ($p = .610$). It was decided to run the test regardless of this violation, as the independent samples t-test is considered robust to violations of normality.

Levene’s test for equality of variances ($p = .111$) indicated that the variability in the two conditions was not significantly different. Subsequently the row *equal variances assumed* was used to interpret the output.
The BS mean SDI was 0.34131, 95% CI [-2.28 to 1.60] was lower than MEPN mean SDI.

However the difference was a not statistically significant between the two groups, $t(34) = |-.34|, p = .723, d = -0.142$. Similarly, the null hypothesis was not rejected.

Table 12
**Comparison of t-test Results Outlier Retained/Outlier Adjusted**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean SDI</th>
<th>Mean Diff.</th>
<th>t</th>
<th>p-value</th>
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<tr>
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<td>26</td>
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<td>.133</td>
<td>.126</td>
<td>.901</td>
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<td>MEPN</td>
<td>10</td>
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<tr>
<td>Outlier adjusted</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS</td>
<td>26</td>
<td>7.02</td>
<td>-.341</td>
<td>-.358</td>
<td>.723</td>
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<tr>
<td>MEPN</td>
<td>10</td>
<td>7.36</td>
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</table>

**Additional Analysis**

**Mann-Whitney U test.** While not part of the original proposal, questions remained regarding the relationship between several variables. It was noted that the output for the two-way ANOVA contained descriptive statistics indicating that both the BS and the MEPN groups participating in the intervention had higher mean gain scores (BS/+DP: mean gain score = 2.77, MEPN/+DP: mean gain score = 4.2), as compared to the BS and MEPN group members in the comparison group (BS/-DP mean gain score = 1.85, MEPN/-DP mean gain score = 2.8). It was unknown if this had implications for POST-OSTS as it relates to DP (+DP/-DP). Specifically, did individuals who participated in the intervention utilizing deliberate practice have statistically significantly higher POST-OSTS?

Using DP (+DP/-DP) as the independent variable and POST-OSTS as the dependent variable the Mann-Whitney U test was used because the previous statistical test had shown non-normal distribution of the data. The data did not violate the assumptions of the Mann-
Whitney U test. A population pyramid was used to make a judgment regarding the distributions of POST-OSTS. Scores for both groups of the independent variable appeared to have the same distribution. The test was run and found the median POST-OSTS was statistically significantly different between the intervention group (Mdn = 15.00) and comparison group (Mdn = 14.00), \( U = 98, p = .044 \), using an exact sampling distribution for \( U \) (Dineen & Blakesley, 1973).

**Findings**

**Research Question 6**

*Research question 6.* What is the experience of nursing students as it relates to their academic motivation?

*Specific aim 6.* The sixth specific aim of this study was to investigate and describe the qualitatively different ways in which nursing students experience motivation. After the participants completed the POST-OSTS, they were given a debriefing and opportunity to ask questions about the dressing change. During the consent process participants had been asked to give separate explicit permission for audio recordings to be made during the focused (semi-structured) interviews. A total of 14 participants in the BS group agreed to have their interviews recorded, and 12 declined. Seven participants in the MEPN group agreed to have their interviews recorded, and 3 declined.

All participants were asked the same questions (Appendix D). Interviews were transcribed and key themes were identified from interview text. Themes were evaluated on an ongoing basis in order to identify when saturation was reached. Thirteen interviews with the BS cohort were used in the final analysis. The 14th interview was used to corroborate the themes that were achieved with the first 13 interviews. All seven interviews completed with the MEPN
cohort were used in the final analysis. Redundancy of themes was observed in the BS cohort; however it is believed that saturation was not reached with the MEPN cohort.

Using the existing framework of Deci & Ryan’s Self-Determination Theory, a deductive process was used to identify themes in the participants’ statements. The themes were divided into the three orientations and their subthemes by decreasing internalization: intrinsic motivation (to know, toward accomplishment, to experience stimulation), extrinsic motivation (integration, identification, introjection, external regulation), and amotivation.

Deductive inferences were drawn from descriptions given by participants after pre-determined interview prompts in order to infer the meaning of the phenomenon in question; motivation. There were discernable trends in student answers between the two cohorts. All three orientations and their subthemes were recognized in the data (Table 13).

**Intrinsic Motivation**

Themes describing *intrinsic motivation* accounted for approximately half (49.5%) of the BS students’ statements, while they accounted for nearly three-fourths (67.5%) of the MEPN students’ statements. The MEPN students describe enjoying the academic process, they spurn cramming for tests, or just getting by, they want to do well academically, and they value knowing the material more than simply “getting good grades.” Even though they often described themselves as achieving A’s, and that A’s were considered “good grades” it was not the reason for their efforts. Statements aligned with intrinsic motivation, such as doing something because it is inherently interesting or enjoyable, as reported by participants were:

**Intrinsic motivation. To know.**
“...my father had cancer, rectal cancer with metastases to the lung and then he passed away in 2012, ... when [I was] taking care of him in the hospital, I thought I want to know more, then, I can understand better” (B4). While the exposure to terminal illness may have been a stimulus, the primary external force was not knowing which motivated this participant to pursue nursing.

“I don’t leave anything until the last minute, ...I like repetition, it’s a big thing ...useless-cramming you’re not going to remember anything, it’s little by little okay lets focus on this little thing today and [I] will review it, [I] will work on, I will review like [that’s how] I learn things...” (M1).

“I do want to do well academically but at the end of the day I, I think what I care most about is that I really do learn the knowledge and not just get an A on the test, or that I just crammed it all in, that I didn’t really learn it” (M5).

“...I like understanding the body, and how it works” (M10).

**Intrinsic motivation. Toward accomplishment.**

“I always, like, intrinsically wanted to do really well...I think it like came from inside that I wanted to do it myself” (B8).

“I’m hoping I can look back on this and be cool with it and not wish I hadn’t done it or that I should have tried harder” (M2).

**Intrinsic motivation. To experience stimulation.**

“I’m kinda interested in ER, like boom fast” (B5).

“My sister is a nurse practitioner and it sounds like a challenging career” (M3).

**Extrinsic Motivation**
Themes describing *extrinsic motivation* accounted for approximately one half (46.1%) of all BS statements related to the themes under surveillance, and less than one third (30.0%) of the statements made by the MEPN students. BS students’ descriptions were more likely to portray that which motivated them as originating from outside themselves. Participants produced statements in describing doing something because it leads to a separable outcome, extrinsically motivated actions:

**Extrinsic motivation. Integration.**

“I know [nursing school is] a means to an end” (B3).

“I’m thinking too that if I want to have the ability to get promoted I’ll need to do more than an undergrad” (M2).

“I kinda just stuck out the psych thing knowing that I – well pretty sure – that I would be applying to some type of graduate program. And so here I am” (M3).

“I need to pay back loans so I have to get it done” (M3).

**Extrinsic motivation. Identification.**

“It was because of financial reasons, um, I wanted to be a marine biologist but then I did an internship with a dolphin company for a year and it was really hard for them to get jobs” (B16).

“my grandmother was very sick and passing, was on hospice, so I just realized, a lot of things that were happening at the same time, and I realized I want to put all this work into making something productive and good for people” (M9).

**Extrinsic motivation. Introjection.**

“I got one C in my life and my dad yelled at me and I will never do that again” (B4).
“...and [my parents] say they hope I enjoy it – and I do – but I wasn’t going to be allowed to lay around the house and do nothing” (B3).

“So my father was encouraging me to work. He thought I should go ahead with school, do an advanced degree since I wasn’t finding work and he has an MBA, and [he] thinks that [having an advanced degree] is the baseline” (M2).

**Amotivation.** Finally on the continuum described by Deci & Ryan (2000), is the orientation of amotivation. Amotivational statements were more common in the answers given by the BS students. This orientation is not only described in terms of apathy, but also as experiencing no enjoyment, laboriousness, or being overwhelmed. They experience feelings of incompetence and expectancies of uncontrollability”, they ask themselves “why in the world they go to school. Eventually they may stop participating in academic activities” (Vallerand et al 1992).

“After the break I was like I don’t want to, I don’t want to go back, I just wanted to go home and do nothing” (B2).

“I don’t have any time to hang out with my friends, I don’t have a social life” (B6).

“it was devastating - I thought I was a failure and I didn’t’ think I was good enough to continue nursing” (B14).

“I don’t do anything else all day except study” (M9).

**Mixed motivation.** The participants in this study did describe amotivation (as above), however it was usually coupled with a statement describing persistence and continuing to value the experience regardless of their antipathy:
“After the break I was like I don’t want to, I don’t want to go back, I just wanted to go home and do nothing, just go hang out with my family, and they were like are you sure you want to be a nurse, are you sure you don’t want to just be a phlebotomist or something and I was like NOPE, I’m going to finish nursing school, I’m going to finish” (B2).

“I don’t have any time to hang out with my friends, I mean I learn a lot, during clinical and in class from the teachers and then from other nurses and everything, so I enjoy it, but at the same time I don’t have a social life” (B6).

**Interview prompt 3.** An interesting pattern emerged around interview prompt 3, “Why do you want to get good grades in your nursing courses? What do you consider good grades?” MEPN students consistently identified good grades as “A’s” — good grades indicate if you know — therefore you should get good grades — but the grade is not the goal, knowing is the goal. MEPN students went as far as suggesting that receiving a B required the student to repeat the course. Whereas BS students frequently explained that achieving A’s in nursing school was beyond reach, and they had adjusted their expectations to “B’s” — I used to get A’s – now I’m happy with B’s, with no mention of this being indicative of mastering the material.

Statements that exemplify the MEPN students’ attitudes towards grades are:

“I’d say B+ and above – lower than that I start to feel like I’m missing some major idea, and that is just scary” (M2).

“I guess I just feel like [if you don’t get an A] maybe you should redo it, you haven’t mastered it, especially ‘cause since everything builds you should probably go back and do it again”(M7).

Statements that exemplify the BS students’ attitudes toward grades are:
“I used to get A’s before I got into nursing school and in like the science courses, but then I had to change my thinking over here, so I’ve been getting B’s” (B16).

“I used to think it was straight A’s, but nursing school it’s a little harder to get straight A’s, I’m always going to try my best but nursing school is a whole different standard” (B8).

Table 13

Statement Orientations and Their Subthemes by Decreasing Internalization

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<th>MEPN</th>
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<tr>
<td></td>
<td># of</td>
<td>%</td>
<td># of</td>
<td>%</td>
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<td># of</td>
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<td>External regulation</td>
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<td># of</td>
<td>%</td>
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<td></td>
<td>91</td>
<td>100</td>
<td>40</td>
<td>100</td>
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</table>
Chapter 5. Discussion

The purpose of this study was to examine the difference between two groups of students; a traditional baccalaureate-entry cohort (BS), and a masters-entry cohort (MEPN) as it relates to a skill test score after exposure to an educational intervention utilizing deliberate practice. Various other relationships between these factors were also considered, as well as the findings of a qualitative analysis.

There is a reasonable amount of literature that discusses the use of deliberate practice and simulation. The existing analyses are predominantly focused on the medical domain where deliberate practice has been used as a means of skill acquisition (Chee, 2013).

“Educational intervention[s]…should be introduced thoughtfully and evaluated rigorously...” (McGaghie et al., 2011, p. 1). Although deliberate practice has been integrated into the educational domain for the purpose of psychomotor skill acquisition using simulation, fundamental questions remained regarding its use in nursing education. There was no published research focusing on the characteristics of the learner, nor empirical evaluation of learning outcomes on empirically-derived-nursing-specific representative tasks after a deliberate practice intervention. The understanding of deliberate practice and its application in the context of simulation could be used to influence the development of effective simulation curricula for teaching both introductory, complex, and multidisciplinary nursing skills.

The intent of this study was to begin to analyze the various constraints of deliberate practice, primarily the extent to which the *motivational constraint* effects a student’s engagement with academic activities. The motivational constraint has been underscored by the claim of Ericsson, Krampe et al. (1993) and later by Hyllegard and Yamamoto (2005, 2007) that...
deliberate practice is not inherently enjoyable and requires that individuals need to be
“motivated to improve performance before they begin deliberate practice” (Ericsson, Krampe et al. 1993). Similarly, motivation is important for the successful negotiation of nursing curriculums, especially within an accelerated timeframe such as those seen in graduate-entry nursing programs.

According to Ericsson and Smith, in order to scientifically engage and analyze expert performance the design of standardized representative tasks of a domain must be completed. “Performers must be presented with the same set of situations to objectively evaluate their response” (Ericsson, 2007, p. 10).

“The first step of the expert-performance approach involves [identifying] representative tasks that define the essence of the domain” (Ericsson, 2004a, p. S74). Nursing sensitive indicators (NSI) are an outgrowth of the classification of the work of nurses, and the development of outcome measures useful for research and quality assurance. A database of NSI known as the National Database of Nursing Quality Indicators (NDNQI) is maintained and continually updated by The National Quality Forum (NQF) in conjunction with the American Nurses Association (ANA) and other private organizations whose missions include improving the quality of American healthcare (Montalvo, 2007; National Quality Forum, 2014). Empirically-derived-nursing-specific measures (NSI) exist as suitable representative tasks that could be integrated into deliberate practice in simulated contexts (Chee, 2014). For the purpose of this study the representative task will be based on the NQF measure Central Line Bundle Compliance, the daily assessment and care of central lines (central venous catheters).
The Centers for Medicare and Medicaid Services (CMS) set the standards for payment of public funds to both public and private healthcare facilities in the United States. The CMS imposes financial penalties on healthcare institutions that perform poorly with regard to quality indicators (Centers for Medicare and Medicaid Services, 2013) including but not limited to indicators in the NDNQI. This provides a financial incentive for healthcare providers to improve their performance related to NSI. Results of this investigation could enhance the potential of educators, employers, and other stakeholders to improve nursing skill performance.

**Discussion of Results and Findings**

**Research question 1.** Research question 1 sought to determine whether there were any differences between the mean PRE-OSTS between the two POS. Did the BS and MEPN students have significantly different mean PRE-OSTS? The analysis compared mean PRE-OSTS between BS (n = 26), and MEPN (n =10). The mean was found to be higher in the BS group (11.88) than the MEPN group (10.80), however, the analysis revealed the difference to be non-statistically significant ($p = .121$). Nearly two-thirds of the BS students were in their second or third year of their curriculum. While all of the MEPN students were in their first year. The higher mean BS group score could reflect the BS students’ increased familiarity with similar psychomotor skills, and comfort with performing tasks in front of their instructors and peers in the sim-lab.

**Research questions 2 a – c.** Research question 2a-c sought to explore the effects of DP and POS on $\Delta$-OSTS, the interaction of these two variables (DP*POS) on $\Delta$-OSTS was also of interest. Described both anecdotally and in published literature, graduate entry program nursing students demonstrate higher levels of motivation as compared to their undergraduate program peers. The factorial design of this study sought to leverage the MEPN students’ higher
levels of motivation; is there a motivational advantage that these graduate students possess, and could the effect of this phenomenon be reflected in skill test scores? Is the presence of motivation as described by Ericsson a requirement for students to successfully engage in a learning intervention using deliberate practice?

The data violated several assumptions and the study design was unbalanced. A Bonferroni correction was used to bring the data closer to a normal distribution, however the problem of unequal cell sizes remained. Bootstrapping the data to bring the relative cell sizes closer together was not performed. Running the analysis with multiple one-way ANOVA brings the risk of false positive results, and does not solve the problem of non-normality. The results still provided valuable information related to the gain score. Students who were randomly assigned into the intervention group had higher mean gain scores BS/+DP (2.77), and MEPN/+DP (4.20), than the students randomly assigned to the comparison group BS/-DP (1.85), and MEPN/-DP (2.80). Research question 1 established that there was no statistically significant difference in mean PRE-OSTS, and that on average MEPN had scored lower on the PRE-OSTS. Subsequently it was hypothesized that the intervention group possibly had statistically significant higher mean POST-OSTS.

If the non-normal distribution of the data is ignored and a one-way ANOVA used to run an analysis on the POST-OSTS between the intervention and comparison group the results demonstrate a statistically significant difference between the mean POST-OSTS of the intervention group (mean = 14.50) and comparison group (mean = 13.95) \( (p = .013) \).

Despite the MEPN group starting with lower mean PRE-OSTS, they managed to “cover more ground” than the BS students to end with higher mean POST-OSTS.
It is worth noting that during the development of the 15-item checklist it was determined that *minimal competence* of a nursing student or recently licensed registered nurse would be reflected by a score of 92%, i.e. completing a minimum of 14 of the 15 items without error. While it could not be established that student motivation levels as measured by the SDI had an effect on POST-OSTS, participating in the intervention could mean the difference between “passing” or “failing” the POST-OSTS. There does appear to be some benefit to participating in the intervention, however, it should be cautiously accepted that an effect exists as no a priori sample size was established.

**Research question 3.** Research question 3 sought to identify a linear relationship between a student’s motivation (as determined by a self determination index) and their performance on a *baseline* skill test (PRE-OSTS). The statistical analysis found no statistically significant relationship between the two variables. The study had less than half of the required participants estimated to detect the effect of interest.

**Research question 4.** Research question 4 sought to identify a linear relationship between student’s self-determination index and their performance on a *follow-up* skill test (POST-OSTS). The statistical analysis found no statistically significant relationship between the two variables.

Student performance at baseline and follow-up could not be predicted by SDI alone. The effect of student motivation may be very small, and therefore the phenomenon not identifiable in such a small sample. There may be additional explanations for failing to detect the phenomenon if one exists, i.e. untested measurement tools (sensitivity, reliability...), or poor task design (is the task too simple, too complex...).
Research question 5. Research question 5 sought to determine if there was a statistically significant difference between mean SDI between the two levels of POS. The data contained a case with an extreme value for the sample but within the allowable SDI range of -18 to +18. The statistical analysis was run with the outlier “as is” and again with the outlier adjusted. While the results were not statistically significant in either output, they still provided useful information about the sample. That is, as measured by the AMS, the sample has relatively homogenous self-determination indices.

This could have been secondary to the recruitment strategy; students who participated in the study were essentially self-selecting. Most students signed up to participate in the study after hearing about the study from faculty, staff, or seeing announcements in the student lounge.

Students arrived early to participate, often 10 or 15 minutes ahead of their scheduled time. They often e-mailed or sent the researcher a text the night before to confirm their participation and to inquire about dress-code requirements. These are the behaviors of conscientious, motivated, young adults; not necessarily representative of the entire target population.

Reciprocity is a valued cultural norm in the community where the study took place. The modest monetary reward was offered with this in mind. An attempt was made to recognize the individual participants for their contribution without being so large that it alone could have driven students to participate.
Research question 6. Research question 6 sought to explore the experience of nursing students as it relates to their academic motivation. How did the students describe the why of their behavior?

Intrinsic motivation. Intrinsically motivated behaviors suggest that the individual is driven to engage in the behavior simply because they enjoy the task, are interested in mastery, often in the absence of external reward or acknowledgement. The findings of the analysis were in agreement with what is described in the literature regarding graduate entry program nursing students. The admission standards are high, as student quality must be congruent with the demands of an accelerated graduate program. This was reflected in the descriptions they gave during the interviews. They have already successfully completed an undergraduate degree program and know they “have what it takes” to succeed academically. Whether MEPN students are by nature more intrinsically motivated, or they have cultivated it over years of academic success (or failure) is outside the scope of this study, the MEPN students expressed a love of learning, and enjoyment of academic challenge.

Extrinsic motivation. This propensity to see one’s motives as dictated by or influenced by others could not be fully accounted for by chronological maturity, the mean age of the BS students was 25 years, and the MEPN students 26 years. Regardless, the BS students more frequently described the why of their behavior as a means to an end, or the consequence of encouragement from family or community.

Amotivation. In addition to intrinsic and extrinsic motivation, a third motivational orientation is described by Deci & Ryan (1985); amotivation.
Statements such as “I don’t have any time to hang out with my friends….I don’t have a social life” (B6), “I didn’t’ think I was good enough to continue” (B14), and “after the break I was like I don’t want to, I don’t want to go back, I just wanted to go home and do nothing” (B2), exemplify expressions of amotivation, and reflect the realities of a full and challenging curriculum.

Mixed motivation. As represented through answers to interview questions, participants often described a mixed experience, with the sense of achievement (intrinsic motivation) and the need or desire to understand driving the value of the activity (extrinsic motivations). Their descriptions do not exclude the experience of learning as pleasurable and wanting to gain a sense of accomplishment: recognizing the effort required as worthwhile and thus they are willing to put forth the energy - as a means to an end (external motivation - integration). This was especially apparent when a student described amotivation. The amotivational statements were often “sandwiched” between declarations of perseverance and grit, despite the arduousness of the task.

Strengths

There are few studies evaluating deliberate practice in the domain of nursing education, and none specifically addressing the constraints of Ericsson’s theoretical framework. It is unknown if nursing students can successfully negotiate the constraints of deliberate practice. In this study the motivational constraint was analyzed. The methodology utilized in this study moves beyond the psychometrics of confidence, competence, and self-efficacy associated with nursing students and simulation, which have been discussed extensively. This study makes an
attempt to use statistical hypothesis testing to infer to what magnitude an educational intervention utilizing deliberate practice effects an outcome (skill test score).

Limitations

Sample size. The primary limitations of this study were small sample size, and unequal groups for the variable POS. This was due in part to the length of the study. A larger sample could be achieved if data were collected for 9 to 12 months. The proposal conceived of a longer study, however administrative setbacks truncated the duration of data collection.

Faculty perceptions. Faculty perception influences student behavior and participation. An unanticipated challenge of recruitment was a lack of initial “buy-in” from faculty. Faculty expressed concern that students could attribute poor performance in coursework or clinical to participation in the study, and thus a segment of the faculty were hesitant to endorse the study. Recruitment of students during their regularly scheduled simulation activities was therefore eliminated as a recruitment strategy. It is worth noting that during the data collection period, faculty who had initially dismissed the study for the aforementioned reasons, approached the investigator with comments about the positive effect participation had on their students, and subsequently began encouraging their students to attend the intervention.

Homogenous sample. The recruitment strategy contributed to a homogenous sample. It is possible that the personal drive required to volunteer for a study intervention outside of required attendance on campus is related to academic motivation, making it difficult to observe an effect. Self-referral, and referral of individuals by their friends and acquaintances with similar personal characteristics could also have contributed to the homogeneity of the sample.
Non-parametric data. Possibly as a result of a small and homogenous sample, the data set was found to violate the assumption of normality.

Study design. The study design, while convenient does not allow for the measurement of the persistence of an effect after an intervention, eliminating the ability to identify trends, or observe the effects in different settings over time. Therefore the generalizability of a pre/post differences in test scores or performance over time is limited. Quantitative misrepresentation of the concept of motivation may have occurred during measurement.

The qualitative portion of the study was approached using a deductive process. While having some idea about the phenomenon of interest is important when coming up with a research question as well as designing the interview prompts and guiding the interview, utilizing a preconceived framework to analyze the textual data may introduce bias. Additionally this was not a blind study. The researcher/evaluator knew which participants were in each of the 4 possible conditions.

Implications for Nursing Education

Currently the volume of curricular content drives the learning deadline. The results of this study indicate that deliberate practice is superior to traditional methods in achieving nursing-specific psychomotor skills, and offers support to the notion that mastery of the task should act as the threshold for moving to the next educational unit and establishment of learning deadlines.

Recommendations
**Intervention.** Design an intervention that could be done in groups – groups of 10 or more – this could facilitate cooperation of clinical facilitators. Entire clinical groups could be recruited to participate.

**Multi-site.** Form a collaborative research partnership with an individual(s) at another campus, college, or university. Invite multiple employers to participate and share their pre-post intervention quality indicator data. This would contribute to the generalizability of any results.

**Translation to practice settings.** It is recommended that this study design be adapted to a translational phase 1 and 2 study, where participants are followed into their clinical practice, and where patient care practices are evaluated. This could be facilitated with self-reported data from practitioners.

**Conclusion**

While the original research questions yielded no statistically significant results, the descriptive statistics obtained from them were of interest and led to supplemental analysis. Whether a study participant was enrolled in the BS or MEPN program at the time of the study showed no impact on pre-objective skill test scores.

The deliberate practice intervention, nor program of study (BS or MEPN) had an impact on mean gain score; there was no interaction effect between the intervention and program of study. There was no performance advantage to membership in the intervention (+DP) or comparison group (-DP), nor in enrollment in either program of study.

There was no statistically significant linear relationship between participants’ SDI and their PRE- or POST-OSTS. No predictions could be made regarding performance on a PRE- or POST-OSTS based on self-determination index.
There was no statistically significant difference between mean self-determination index between the two programs of study, BS and MEPN.

There was a statistically significant difference in mean POST-OSTS between the intervention (+DP) and comparison group (-DP). The intervention group had a mean POST-OSTS at the mastery level, while those in the comparison group did not.

Interviews with study participants resulted in rich descriptions of their academic motivation. Participants described all motivational orientations and subthemes. Students enrolled in the BS program tended to describe the *why* of their behavior as arriving from outside themselves; extrinsic motivation. Those enrolled in the MEPN program tended to describe the *why* of their actions as originating from within their person; intrinsic motivation. Amotivation was described by both groups but was often of a mixed quality, detailing how despite feeling apathetic, overwhelmed, or discouraged they remained focused on completing their respective programs.
References


(454137)


Ericsson, K., & Chase, W. (1982). Exceptional memory: Extraordinary feats of memory can he matched or surpassed by people with average memories hat have been improved by training. *American Scientist, 70*(6), 607-615.


Figure 1

Flow of Participants in Study

- Convenience sample BS Students
  - BS agree to participate
  - Consent, Demo. Ques., AMS (SDI)
    - Pre-OSTS
      - Random Assignment (N=128)
        - 50% BS (n=32)
          - 50% MEPN (n=32)
            - DP intervention (+DP)
            - Post-OSTS
              - Debriefing (all participants) and Informal Interview (subset)
        - 50% BS (n=32)
          - 50% MEPN (n=32)
            - No DP intervention (-DP)

- Convenience sample MEPN Students
  - MEPN agree to participate

Compensatory DP intervention offered at conclusion of study
Appendix A

Academic Motivation Scale

<table>
<thead>
<tr>
<th>ACADEMIC MOTIVATION SCALE (AMS-C 28)</th>
<th>COLLEGE VERSION</th>
</tr>
</thead>
</table>

WHY DO YOU GO TO COLLEGE?

Using the scale below, indicate to what extent each of the following items presently corresponds to the reasons why you go to college.

<table>
<thead>
<tr>
<th>Does not correspond at all</th>
<th>Corresponds a little</th>
<th>Corresponds moderately</th>
<th>Corresponds a lot</th>
<th>Corresponds exactly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

WHY DO YOU GO TO COLLEGE?

1. Because with only a high-school degree I would not find a high-paying job later on.  1 2 3 4 5 6 7
2. Because I experience pleasure and satisfaction while learning new things.  1 2 3 4 5 6 7
3. Because I think that a college education will help me better prepare for the career I have chosen.  1 2 3 4 5 6 7
4. For the intense feelings I experience when I am communicating my own ideas to others.  1 2 3 4 5 6 7
5. Honestly, I don't know; I really feel that I am wasting my time in school.  1 2 3 4 5 6 7
6. For the pleasure I experience while surpassing myself in my studies.  1 2 3 4 5 6 7
7. To prove to myself that I am capable of completing a college degree.  1 2 3 4 5 6 7
8. In order to obtain a more prestigious job later on.  1 2 3 4 5 6 7
9. For the pleasure I experience when I discover new things never seen before.  1 2 3 4 5 6 7
10. Because eventually it will enable me to enter the job market in a field that I like.  1 2 3 4 5 6 7
11. For the pleasure that I experience when I read interesting authors.  1 2 3 4 5 6 7
12. I once had good reasons for going to college; however, now I wonder whether I should continue.  1 2 3 4 5 6 7
13. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.  1 2 3 4 5 6 7
### Appendix A continued

#### Academic Motivation Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale (1-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Because of the fact that when I succeed in college I feel</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>important.</td>
<td></td>
</tr>
<tr>
<td>15. Because I want to have &quot;the good life&quot; later on.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>16. For the pleasure that I experience in broadening my knowledge</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>about subjects which appeal to me.</td>
<td></td>
</tr>
<tr>
<td>17. Because this will help me make a better choice regarding my</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>career orientation.</td>
<td></td>
</tr>
<tr>
<td>18. For the pleasure that I experience when I feel completely</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>absorbed by what certain authors have written.</td>
<td></td>
</tr>
<tr>
<td>19. I can't see why I go to college and frankly, I couldn't</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>care less.</td>
<td></td>
</tr>
<tr>
<td>20. For the satisfaction I feel when I am in the process of</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>accomplishing difficult academic activities.</td>
<td></td>
</tr>
<tr>
<td>21. To show myself that I am an intelligent person.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>22. In order to have a better salary later on.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>23. Because my studies allow me to continue to learn about many</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>things that interest me.</td>
<td></td>
</tr>
<tr>
<td>24. Because I believe that a few additional years of education will</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>improve my competence as a worker.</td>
<td></td>
</tr>
<tr>
<td>25. For the &quot;high&quot; feeling that I experience while reading about</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>various interesting subjects.</td>
<td></td>
</tr>
<tr>
<td>26. I don't know; I can't understand what I am doing in school.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>27. Because college allows me to experience a personal satisfaction</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>in my quest for excellence in my studies.</td>
<td></td>
</tr>
<tr>
<td>28. Because I want to show myself that I can succeed in my studies.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

---


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## Appendix B

### 15-item Checklist

#### Central Venous Catheter Dressing Change

Procedure Checklist

<table>
<thead>
<tr>
<th>Item</th>
<th>Completed</th>
<th>Not completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Put on your mask</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Prepare supplies</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Perform hand hygiene</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Put on non-sterile gloves</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Position the patient so that the CVC site is accessible</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Have the patient turn their head away from the CVC site or apply mask during the dressing change</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Remove and discard used CVC dressing</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Inspect the CVC insertion site and surrounding skin for signs and symptoms of infection, and measure the distance from the insertion site to the hub</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Remove non-sterile gloves and perform hand hygiene</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Open and prepare sterile supplies</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Apply sterile gloves</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cleanse skin, catheter, and stabilizing device with 2% Chlorhexidine using a back-and-forth friction scrub for 30 seconds and allow to air-dry</td>
<td>Chemiwipe</td>
</tr>
<tr>
<td>13</td>
<td>Apply Bio-patch</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Apply sterile occlusive dressing</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Document time and initials on dressing</td>
<td></td>
</tr>
</tbody>
</table>

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Appendix C

Demographic Questionnaire

<table>
<thead>
<tr>
<th>AGE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER:</td>
</tr>
</tbody>
</table>

**ETHNICITY:**
Which ethnic or cultural group do you most closely identify with? **Circle all that apply.** Feel free to write in ethnic subgroups or other ethno-cultural groups you identify with for example: Chinese - Han, Hispanic - Cuban, Micronesian - Chuukese, etc.
- American Indian or Alaska Native
- Black or African American
- Caucasian
- Chinese
- Filipino
- Hispanic or Latino
- Japanese
- Korean
- Melanesian
- Micronesian
- Polynesian/Hawaiian
- Other:

**YOUR PARENT'S EDUCATION:**
What is the highest level of education completed by your **MOTHER? Please circle one:**
- Less than high school completion
- High School Completion
- Some college
- Associate's degree
- Bachelor's degree
- Master's degree
- Doctorate or first-professional degree
- Unknown

What is the highest level of education completed by your **FATHER? Please circle one:**
- Less than high school completion
- High School Completion
- Some college
- Associate's degree
- Bachelor's degree
- Master's degree
- Doctorate or first-professional degree
- Unknown

**YOUR CURRENT ENROLLMENT:**
Which degree program and semester are you currently enrolled in? **Please circle one:**

<table>
<thead>
<tr>
<th>Bachelor's of Science in Nursing</th>
<th>Master's Entry Program in Nursing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1  Fall</td>
<td>Year 1  Fall</td>
</tr>
<tr>
<td>Year 2  Fall</td>
<td>Year 2  Fall</td>
</tr>
<tr>
<td>Year 3  Fall</td>
<td>Year 3  Fall</td>
</tr>
</tbody>
</table>

**YOUR PREVIOUS EXPERIENCE:** Before today, have you ever changed a central venous catheter (“central line” or “PICC”) dressing in simulation, dry lab, or in a real world setting? **Please circle one:**
- Yes
- No
Appendix D

Interview Guide

1. Why did you choose to go to [nursing] school?
   Prompts:
   • enjoy learning about topics covered in school (Intrinsic, To Experience Stimulation)
   • satisfaction of achieving excellence (Intrinsic, To Accomplish)
   • better prepare for my career (Extrinsic, Identified)
   • enjoy broadening my knowledge (Intrinsic, To Know)
   • help find a high-paying job (Extrinsic, External Regulation)

2. Do you care about school? Why or why not?
   Prompts:
   • couldn’t care less (Amotivation)
   • experience satisfaction when I learn about new things (Intrinsic, To Know)

3. Why do you want to get good grades in your nursing courses? What do you consider a good grade?
   Prompts:
   • show myself that I can succeed (Extrinsic, Introjected)
   • surpass myself in my accomplishments (Intrinsic, To Accomplish)
   • improve my competence as a health care provider (Extrinsic, Identified)
   • find employment (Introjected, intrinsic)
   • for the pleasure of learning (Intrinsic, To Know)

4. How important is it for you to get good grades?
   Prompts:
   • prove to myself I am capable of completing this program (Extrinsic, Introjected)
   • show myself I am intelligent (Extrinsic, Introjected)
   • feel important (Extrinsic, Introjected)
   • feel satisfied when I accomplish difficult academic activities (Intrinsic, To Accomplish)

5. How much interest do you have in learning nursing skills?
   Prompts:
   • feel this program is a waste of my time (Amotivation)
   • enjoy learning interesting things (Intrinsic, To Experience Stimulation)
   • experience pleasure when I feel completely absorbed by my course readings (Intrinsic, To Experience Stimulation)

6. How serious are you about graduation from nursing school?
   Prompts:
   • wonder whether I should continue with this program (Amotivation)
   • in order to have a job that people look up to later on (Extrinsic, External Regulation)
Appendix E

THSSC Confidentiality Agreement

Confidentiality Agreement

Involvement in the UH Translational Health Science Simulation Center may require participation in simulation scenarios, standardized patient scenarios, debriefings, discussions and other activities.

Scenarios, simulated patients, debriefings and other simulation activities are planned and structured as a safe place for learners and faculty to explore multiple components of realistic patient care through participation in simulated clinical encounters. Activities may be audio, video or digitally recorded for educational purposes. Participants may be actively involved in the scenarios or act as observers.

All activities in the Simulation Center are considered confidential, whether electronic, written, verbal, observed or overheard. Participants are expected to uphold all requirements of the Health Insurance Portability and Accountability Act (HIPAA) and any other federal or state laws requiring confidentiality.

Sharing scenario experiences with fellow learners outside of the simulation lab will be considered cheating and subject to disciplinary action. Any other inappropriate sharing, posting to social media, discussion, recording, reproducing, revealing or disclosure of simulation activity is a violation of University policy and may be grounds for disciplinary and/or legal action.

Participants are obligated to report any violations to the Simulation Center Director.

Your signature below acknowledges that you have read and fully understand the implications of this agreement, and agree to maintain the strictest confidentiality about simulation activities in which you participate. Further, you understand a violation of confidentiality is strictly prohibited and serious consequences will occur if you violate the agreement.

Print Name: _______________________________ Date: ______________

Signature: _______________________________
Appendix E continued

THSSC Confidentiality Agreement

Agreement for Audio, Video or Digital Recording Of Simulation Activities

The Simulation Center provides opportunities for integration, practice and evaluation of learner’s knowledge, interpersonal communication, and clinical skills through the use of simulation technology and activities. Participation in simulation is, therefore, critical to the successful achievement of program/course didactic and clinical objectives. Activities may include participation in simulation scenarios, simulated patient scenarios, debriefings, discussions and other activities.

I hereby grant permission to the University of Hawaii Translational Health Science Simulation Center to take digital video/audio of me during my participation in the simulation activities. I understand that the video/audio footage taken of me is the property of the UH Translational Health Science Simulation Center. Recordings may be used during the debriefing period to help participants and simulated patients reflect on the actions, activities, and interactions that occurred during the simulation experience.

The recording(s) will be stored on a secured server within the UH Translational Health Science Simulation Center, and will be permanently erased on a frequent basis. Access is restricted to Simulation Center faculty, administrators and staff when needed to fulfill a professional responsibility to the learner. University authorized individuals involved in the accreditation process, or University authorized researchers approved by the University IRB.

If I am part of an outside entity using UH Translational Health Science Simulation Center, I understand the UH Translational Health Science Simulation Center may release digital audio/video copies of simulation activities to the outside entity if requested. Those copies become the responsibility of the requestor and any additional release forms or fees will be obtained, retained and paid for by the requestor.

If a recording is going to be used by the University for any purpose other than the above, a separate written consent will be obtained and retained by the appropriate department.

By signing below, I acknowledge to having read and agree to the above statement regarding audio, video or digital recording.

Print Name: ___________________________ Date: ___________________________

Signature: _____________________________
Appendix E continued

THSSC Confidentiality Agreement

Agreement for Observers

As a leader in simulation education, the UH THSSC shares its experiences and expertise with those who may occasionally visit to observe the educational, administrative and technical aspects of simulation learning. If a simulation session is to be viewed, the participant group will be notified of observers’ presence before the simulation session.

Some simulation activities utilize simulated patients (actors coached to play patient or family roles). The actors may be from the UH Manoa Department of Theatre or from outside the UH System and will have training to be simulated patients. The training will include observation of live and prerecorded simulation sessions.

I understand that there may be individuals observing as I participate in simulation activities. By signing below, I agree to the above statements regarding observers.

Print Name: ____________________________ Date: ______________

Signature: ____________________________
Appendix E continued

THSSC Confidentiality Agreement

Agreement and Release
Use of Audio/Video Recording For Education/Training Purposes

The UH THSSC mission is to improve health outcomes by providing programs which promote and enhance safe, quality healthcare through clinical competence, teamwork, and inter-professional collaboration. The Center supports bio-behavioral and translational research to add to the body of knowledge on simulation, practice, technology, quality and safety in the workplace. The vision is to be internationally recognized as the leader in these content areas in Hawai‘i, Asia and the Pacific Basin.

To support accomplishment of the mission and vision, the THSSC is a multifunctional teaching and learning center which provides programs for learners inside and outside the school of nursing and the university system, and may include national or international programs.

I hereby grant permission to the University of Hawai‘i Translational Health Science Simulation Center for the use of my voice, photograph or video recordings (alone or within a group) to be used as part of an organized, formal, training and education program or curriculum for simulation faculty, administrators, facilitators, technicians or learners.

The recording may be transferred to a DVD and if so will be stored and destroyed following THSSC and University of Hawai‘i policies and procedures. The recording becomes the property of the THSSC and will not be uploaded to any public viewing site such as Youube.com.

- I grant permission without reservation or limitation.
- I grant permission with the understanding I will not receive compensation.

By signing below, I acknowledge I have read and understand this agreement and release regarding use of my audio, video or digital recording for education or training purposes only.

Print Name: ___________________________ Date: ________________

Signature: ___________________________
Appendix F

Informed Consent and Information Sheet

Informed Consent Form for nursing students enrolled in Bachelor of Science in Nursing (BS) or Master Entry Program in Nursing (MEPN) at the University of Hawai‘i at Mānoa School of Nursing, and who are invited to participate in research on learning in a simulated context.

Principal Investigator: Jennifer D. Chee
University of Hawai‘i School of Nursing
Learning Methods and Skill Development in a Simulated Context Research Study

This informed consent form has two parts (Part I and Part II):
- Part I: Information Sheet (to share information about the research with you)
- Part II: Certificate of Consent (for signatures if you agree to take part)

- You will be given a copy of the Information Sheet and Informed Consent Form -

Part I: Information Sheet

Introduction
I am a graduate student at the University of Hawai‘i at Mānoa School of Nursing. I am doing research on learning methods for use in a simulated context. I am going to give you information and invite you to be part of this research. If you have any questions I will take time to answer them. If you have more questions during the research activities or after you participate you may ask them of me. My contact information as well as the contact information for the Human Subjects Review Board is on this Information Sheet.

Purpose of the Research
Psychomotor skills are an important part of nursing practice. There are many things that affect how people develop motor skills. This study aims to evaluate methods for developing motor skills with nursing students.

Type of Research Intervention
This research will involve practicing how to complete a central venous catheter dressing change. I will also ask you some questions about your experience after practicing the dressing change.

Participant Selection
I am inviting all students in their first semester as a BS or MEPN student who spend time in the simulation lab to participate.

Voluntary and Anonymous Participation
Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate there is no penalty. The choice that you make will have no bearing on your evaluation at school, in any course/clinical. There is no connection between this project and your course/clinical evaluation or grade.
Appendix F continued

Informed Consent and Information Sheet

- No personal identifying information will be collected.
- You may change your mind later and stop participating even if you agreed earlier.
- You may participate in the activities of the study but decline to have data collected for analysis.

Procedures and Protocol

The research will be conducted by myself (Jennifer Chee). You will be asked to complete:

- **demographic** questionnaire
- questionnaire designed to measure academic motivation
- **baseline** skill evaluation
- educational intervention related to a routine nursing procedure
- post-intervention skill evaluation
- **answer** a few questions about your academic experience

Because it is not known if methodologies new to nursing are better than those currently in use, we need to compare the two. To do this we will place participants taking part in this research into two groups. The groups are selected by chance, as if by tossing a coin.

Participants in one group will participate in an educational intervention that is new to nursing education, while the other group will participate in an educational intervention that is similar to what is currently being done in their “skills lab”. You will not know which group you are in. The results from the two groups will then be compared.

No one else but myself will be present unless you would like someone else to be there. All data gathered is confidential, and no one else except myself will have access to the information documented during your participation. The information and data will be kept in locked file.

Recordings

Digital video recordings will be made of your hands while you complete the baseline and follow-up skills evaluation. The recordings are only for the purpose of establishing the accuracy of the scores. The recordings:

- will not show your face and there will be no identifying information connected to them.
- will not be used for purposes beyond those detailed and consented to in the informed consent form.
- will be stored on the hard drive of the digital device that is used to record them. The device will remain in the research room in a locked cabinet.
- will be destroyed at the completion of the study period.

Digital audio recordings will be made of your voice at the end of the intervention. The recordings are for the purpose of transcribing your answers to the interview questions. The recordings will not be used for purposes beyond those detailed and consented to in the informed consent form. They will be destroyed at the completion of the study period. There will no identifying information connected to them.

You may decline to have recordings made and still participate in the study.
Appendix F continued

Informed Consent and Information Sheet

Duration
Participation in this research should take from **20 to 60 minutes** for the educational intervention and post-intervention interview.

Risks
It is not anticipated that you will be at greater physical risk than you would otherwise be by attending your regularly scheduled simulation activities. You may experience mild embarrassment from being observed.

You do not have to answer any question on the demographics form or survey or take part in the educational intervention if you feel the question(s) are too personal or if participating makes you uncomfortable. You do not have to give me any reason for not responding to any question, or for refusing to take part in the intervention.

Benefits
You may benefit from participating as the intervention is designed to teach and reinforce a task that is required of professional nurses. If there is no direct benefit to you, your participation may contribute to the understanding of how best to use simulation for teaching motor skills to nursing students.

Reimbursements/Compensation
You will be provided with a $10.00 gift card as a demonstration of appreciation for taking time to participate in this project today.

Confidentiality
Participating in this research project may draw attention to you and if you participate you may be asked questions by other students. I will not be sharing information about you with anyone. Your name will not be associated with any information I gather. The information that I collect from this research project will be kept private. Any information provided by you or about you will have a number on it instead of your name. The number is used to link all study materials to a single participant. It will not be shared with or given to anyone.

Right to Refuse or Withdraw
You do not have to take part in this research if you do not wish to do so, and choosing to participate will not affect your course or clinical grades in any way. You may stop participating in the questionnaires, educational intervention, or interview at any time.

Who to Contact
If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact me (Jennifer Chee) by phone at (808) 927-3177, or by email at dressingchange@gmail.com. If you cannot obtain satisfactory answers to your questions or have comments or complaints about your treatment in this study you may contact:

The Committee on Human Studies
University of Hawaii at Manoa
2540 Maile Way
Honolulu, Hawaii 96822
(808) 956-5007
Appendix G

Certificate of Consent

Part II. Certificate of Consent

Learning Methods and Skill Development in a Simulated Context Research Study

Participant: I have been invited to participate in research about learning strategies for use in a simulated context.

<table>
<thead>
<tr>
<th>Check one option for each line:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1</td>
</tr>
<tr>
<td>Line 2</td>
</tr>
</tbody>
</table>

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant

Signature of Participant Date

Researcher: I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that they are participating in a research project that includes completing:

- demographic questionnaire
- questionnaire designed to measure academic motivation
- baseline skill evaluation
- educational intervention related to a routine nursing procedure
- post-intervention skill evaluation
- answering a few questions about your academic experience

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this consent form has been provided to the participant.

Print Name of Researcher

Signature of Researcher Date
Appendix H

Memorandum for Utilization of Laboratory Space

October 1, 2014

Jennifer Chee
PhD Student
School of Nursing and Dental Hygiene

Dear Jennifer:

This letter is written to confirm your use of the “Research Room” in the UH Translational Health Science Simulation Center (UH THSSC) for your proposed study. I understand that you will approach each student on an individual basis during their simulation lab time, and invite the student to participate. Furthermore, you will be administering the educational intervention and collecting the data.

Your dissertation proposal is indeed an exciting and timely study. The UH THSSC’s mission is to improve patient outcomes by providing effective programs which promote and enhance safe, quality healthcare through clinical competence, teamwork, trans-disciplinary collaboration and translational research. The investigation of deliberative practice methodologies and their impact on student learning will help inform our innovative approaches to teach students to provide safe, quality healthcare for the people of Hawai‘i.

Best wishes on your work. Please let me know when your Dissertation Committee and the UH IRB as formally approved the study.

Sincerely,

Lorrie Wong, RN PhD CHSE-A
Associate Professor
Director of UH THSSC

cc: Alice Tse, Dissertation Chair