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Impact of pedagogical approaches on cognitive complexity and motivation to learn: Comparing nursing and engineering undergraduate students

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ABSTRACT

Background: The changing higher education landscape is prompting nurses to rethink educational strategies. Looking beyond traditional professional boundaries may be beneficial. We compare nursing to engineering because engineering has similar accreditation outcome goals and different pedagogical approaches.
Purpose: We compare students' cognitive complexity and motivation to learn to identify opportunities to share pedagogical approaches between nursing and engineering.
Method: Cross-sectional data were collected from 1,167 freshmen through super senior students. Comparisons were made across years and between majors.
Findings: Overall nursing and engineering students advance in cognitive complexity while maintaining motivation for learning. Sophomores reported the lowest scores on many dimensions indicating that their experiences need review. The strong influence of the National Council Licensure Examination on nursing students may drive their classroom preferences. Increased intrinsic motivation, coupled with decreased extrinsic motivation, suggests that we are graduating burgeoning life-long learners equipped to maintain currency.
Discussion: The disciplines' strategies for incorporating real-world learning opportunities differ, yet the students similarly advance in cognitive complexity and maintain motivation to learn. Lessons can be exchanged across professional boundaries.

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Introduction

The higher education landscape is changing. University faculty are striving to, for example, provide learner-centered instruction (e.g., Wright, 2011), increase 4-year graduation rates (e.g., Akers & Chingos, 2013), and develop interprofessional educational opportunities (e.g., Interprofessional Education Collaborative Expert Panel, 2011). Pedagogical differences across disciplines result in a myriad of approaches to address these changes. More systematic, rigorous research is necessary to examine the effectiveness of these approaches and to develop an understanding of how they prepare

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graduates for the complex practice world they are preparing to enter. This need is particularly salient for nursing educators (Broome, Ironside, & McNelis, 2012). The looming faculty shortage and shrinking resources for clinical teaching (American Association of Colleges of Nursing [AACN], 2015b), in addition to the recent report from the National Council of the State Boards of Nursing (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014), are challenging nursing faculty to rethink the traditional clinical education model.

To address the research gap and inform nurse educators, we look beyond the clinical education paradigm of the health care professions to engineering. Engineering is a practice-oriented profession that requires critical thinking and problem solving yet uses very different educational methods for providing students with real-world learning experiences. Our research purpose was to compare nursing and engineering students' cognitive complexity and motivation to learn across their programs of study. This examination of an alternative approach for garnering practice experience may lead to an expanded portfolio of pedagogies available to nurse educators.

Nursing and engineering have many commonalities that make comparing their pedagogies relevant. They are both professional disciplines where students learn how to improve people's lives and can practice their professions with their undergraduate degrees. Moreover, the accreditation outcomes of both nursing and engineering are very similar (ABET, 2015; AACN, 2015a). For instance, in addition to possessing a broad foundational education and discipline-specific knowledge, both disciplines focus on developing (a) an ability to collect meaningful data and apply evidence to practice, (b) the skills needed to communicate and collaborate effectively with others, (c) an appreciation for the role of technology and other tools available to support practice, and (d) professional values that guide ethical practice (Gauci, Perz, Purzer, Kirkpatrick, & McComb, 2012). Finally, both professional disciplines have been challenged to better contextualize the learning experiences (Benner, Sutphen, Leonard, & Day, 2010; Committee on the Engineer of 2020 Phase II, 2005).

The two disciplines have traditionally taken different approaches, however, with respect to how accreditation outcomes are translated into the curricula and how students experience real-world learning (Gauci et al., 2012). Nursing students are exposed to direct patient care early in their curricula, with many programs beginning weekly clinical experiences supervised by faculty preceptors as early as the sophomore year. Thus, students have the opportunity to apply their knowledge in context (i.e., the environment where they will eventually practice) and observe how others in their professional communities conduct themselves in the workplace. Nursing students may also seek summer employment opportunities as interns, but these experiences are independently arranged.

Alternatively, engineering students are (a) expected to apply engineering knowledge through class projects based on real-world problems without an active link outside the classroom; (b) encouraged to seek internship and/or cooperative opportunities throughout their undergraduate years, but these experiences are typically unstructured and have no faculty oversight; and (c) required to take a senior design course where student teams undertake a real-world problem with minimal faculty oversight. Thus, the most striking tradeoff between nursing and engineering is in their distinctly different pedagogical approaches for garnering practical experience. Nursing students are exposed to consistent, structured, and supervised experiences, whereas engineering students have ad hoc immersive and simulated real-world experiences.

To better understand how these different pedagogical approaches may impact students, we focus on two constructs: cognitive complexity and motivation to learn. Cognitive complexity, conceptualized by Perry (1981), represents student intellectual development over time (Wankat & Oreovicz, 1993) and the depth with which they can synthesize disparate perspectives (Granello, 2010). As individuals' levels of cognitive complexity increase so will their use of questions, ease with uncertainty and ambiguity, ability to adjust as new information is obtained, and so forth (Granello, 2010). Motivation to learn encompasses the beliefs held by learners about their capacity for learning, the value they associate with an activity, and the degree of interest they have in the activity (Kramarski & Michalsky, 2009). Such motivation is necessary because it may be indicative of academic engagement (Estepp & Roberts, 2015; Pintrich & Zusho, 2007). These two outcomes were selected because they align with recommendations from external influences, such as accrediting bodies and experts in student-centered learning, and are impacted by the learning environment designed by faculty.

First, cognitive complexity and motivation to learn are needed for students to succeed at the professional and technical skills identified by accrediting bodies (Shuman, Besterfield-Sacre, & McGourty, 2005). Two such examples are a broad foundational education (e.g., AACN Essential I; and ABET Student Outcome h; ABET, 2015; AACN, 2015a) and work within an everchanging context that is subject to various constraints that must be identified and understood (e.g., AACN Essentials II and V and ABET Student Outcomes c, j, and i). Students need to envision broad impacts of their actions and realize the relevance of contemporary issues in their day-to-day responsibilities. This depth of thinking is captured by cognitive complexity. At the same time, they also must be motivated to engage in life-long learning to stay abreast of contextual and contemporary issues that are evolving and changing professional practice.

Second, experts in student-centered learning recommend approaches for enhancing the student educational experience that align with the way in which cognitive complexity and motivation to learn are operationalized. For instance, the framework by