Does format matter? Engagement of first year optometry students

Interest in student engagement in higher education has increased over the last decade with the creation of the National Survey of Student Engagement (NSSE) (2007). Engagement is essential to deeper learning (Tagg, 2003). Student engagement is linked positively to desirable learning outcomes such as critical thinking and grades (Carini, Kuh, & Klein, 2006). Engaged learning is defined as a positive energy invested in one's own learning, evidenced by meaningful processing, attention to what is happening in the moment, and involvement in specific learning activities (Schreiner and Louis, 2006). Nursing students in more active learning environments demonstrated higher levels of engagement than those students in passive learning environments (Popkess, 2010). Engaged learning encompasses both psychological and behavioral aspects of student engagement and it can explain significant variation in certain aspects of student learning, interaction and satisfaction with faculty, overall satisfaction with their college experience, and finally to a smaller degree, their grades. There is a motivational component that contributes to the student's decision to engage in the learning process resulting in measurable psychological indicators of engagement (Schreiner & Louis, 2006).

Understanding and creating educational interventions to stimulate engagement in the learning process is the goal of many faculty members and institutions in higher education. The ability to transform curriculum to incorporate deep learning methods or active learning where the focus shifts from teacher centered to learner centered approaches can be a challenge. The majority of doctoral health professions programs have a basic science core with a lecture and laboratory teacher centered structure. A few optometric educators or institutions have attempted to incorporate or transform curriculum using active learning through the specific mode of problem-based learning (Scheiman & Whittaker, 1990; Whittaker & Scheiman, 1996; Rouse &

Borsting, 1990; Stefano, Dayshaw-Barker, Oleszewski, & Dell, 2001). Primarily studies have documented the use of innovative technology or other active teaching strategies into single courses or clinical tracks (Chu & Borsting, 2009) but no level of student engagement was measured in the process. Outcomes of active learning strategies within optometry should be assessed in order to determine teaching effectiveness.

The Geometric Optics course for first year students was significantly modified in 2010 by the course instructor and the investigator of the proposed study. The modifications included combining a traditional lecture component with a hybrid problem-based learning (pbl) component. The pbl component utilized small groups of eight students who met weekly to learn collaboratively while working through a clinical case. The case was focused on a diabetic patient who progressed in vision loss over time. Basic optical principles were integrated into weekly learning objectives. An online portion of the course allowed for less time in working groups and more time in independent and self-directed learning. The students were instructed in effective literature search methods and throughout the quarter, their problem solving abilities were utilized and improved upon. Weekly, students were directed to create hypotheses, review facts of the case, revise hypotheses, and distribute learning issues (areas that students had to individually research and provide to group members prior to the group meeting). The small groups summarized presentations of findings (which had been posted in depth online) at each group meeting while new case information was provided weekly. The groups utilized peer evaluation and instructor evaluation for feedback purposes. The course was limited in its effectiveness due to only one instructor guiding six groups at a time (resulting in infrequent supervision) and limited frequency of feedback.

The focus for the pbl hybrid was on understanding rather than on reaching a quick conclusion or achieving a practical result. Problems were expected to undergo transformation in the course of inquiry. So it was not expected that problems would be "solved" but that the state of collective knowledge be advanced. The goal of the learning groups was to improve theories so the group and individual focus shifted from finding answers to improving theories.

The course was assessed using a student opinion survey, survey of library usage items, engaged learning index, and self-reported improvement in critical thinking. Preliminary analysis of the outcomes survey indicated correlations between engagement, critical thinking, and student satisfaction. No comparisons were made to other courses and no control group was established. Students were also required to complete a reflection on the improvement of their problem-solving strategies. The reflections provided rich qualitative descriptions of the students' learning. An abstract describing the pilot with outcomes will be submitted for Academy 2011.

Research Framework

The *Engaged Learning Index* (ELI) is a 10-item instrument that measures malleable psychological processes leading to engagement. Understanding the malleable aspects of motivation in engagement is the key to creating educational interventions to increase engagement in the learning process.

The foundation for the ELI is based in the conceptual framework of Ryan and Deci's (2000) self-determination theory. Self-determination theory is based on the construct of intrinsic motivation as it leads to well-being. Engaged Learning is related to the "deep learning" that Biggs (2003) and Tagg (2003) have defined. Engaged Learning encompasses psychological and physical energy associated with engagement in the learning process but for this study.

Outcomes of Engaged Learning

Engaged learning as Schreiner and Louis define the term, has been linked to many college outcomes including satisfaction with faculty, retention, satisfaction with fit to the institution, satisfaction with the amount of learning achieved, and overall satisfaction with the college experience (Schreiner & Louis, 2006). The weaknesses of the Schreiner and Louis study are primarily associated with the sample being drawn from a limited number of colleges with similar institutional characteristics and the majority of respondents as Caucasian females.

The implications of the Schreiner and Louis study are two-fold. First, using the ELI to measure student engagement based on psychological and behavioral aspects is a significant contribution to the literature. Second, engaged learning can explain significant variation in certain aspects of student learning, interaction and satisfaction with faculty, overall satisfaction with their college experience, and finally to a smaller degree, their grades. These findings can significantly impact faculty understanding and planning for teaching methods which is especially relevant with recent higher education interest in deeper learning and education reform.

Optometry has a high retention rate with very few students dropping or failing out of the program (<10%) and so the goals of graduation are similar to other health professions in producing doctors with excellent clinical skills. Outcomes typically include GPA, national board scores and clinical performance (Denial, 2007). Few, if any, optometric studies have explored outcomes related to student satisfaction or engagement. Also, few studies within optometric education have explored the processes that lead to deeper learning and critical thinking and the relationships of various variables that leading to meaningful outcomes. In order to establish consistent outcomes in student learning, it is critical to understand student motivation and relationships to learning outcomes. Ultimately, course design and curriculum can be aimed at impacting multiple dimensions of learning including but not limited to fact recall, critical thinking skills, problem solving, enjoyment of the learning process, and the preparation for lifelong learning.

Engaged Learning in Optometry

Within healthcare professions, specifically Optometry in this study, understanding how to motivate students for deeper learning in a highly rigorous curriculum is of interest. In a pilot study of students on one college of optometry campus, a modified ELI (6 items) was used to assess the first, second, and third year students in a population study. It was found that mean scores on the ELI in optometry students were low when compared to a large sample of four year college students at a variety of campuses in the United States (Kammer, 2010a). In a second study by Kammer (2010b), engaged learning was determined to be a meaningful construct in optometry students and significant relationships with student satisfaction were determined using structural equation modeling.

The purpose of this study is to examine the engagement level of optometry students enrolled in a problem-based learning style of course integrating basic sciences in a first year optometric curriculum. The course the first of its kind at the optometric institution and the study will be conducted during its first year of implementation. The research questions for this study are: 1) Is there a difference in the engagement level of optometry students in a problem based learning format when compared to a traditional lecture style course in the first year. 2) What is the relationship between engagement, critical thinking skills, and other academic related factors in a problem based learning style course.

Instrument

Schreiner and Louis (2010) confirmed the reliability and validity of the Engaged Learning Index (ELI) as a measure of psychological and physical efforts of student engagement in deeper learning using exploratory factor analysis (2006) and then most recently using confirmatory factor analysis in 2010. One thousand seven hundred and forty seven full-time students responded to the 10-item ELI from 13 different 4-year institutions of moderate to high selectivity. A three-factor model was verified using confirmatory factor analysis (Meaningful Processing, Focused Attention, and Active Participation) with a second order construct of Engaged Learning. The three-factor model with engaged learning as a higher-order construct provided an excellent fit, with χ^2 (32)= 471.91, $p < .001$, CFI = .98, and RMSEA = .046 with 90% confidence intervals of .042 to .049 (Schreiner & Louis, 2010). Variable loading was strong with β ranges from .61 to .82.

Kammer (2010b) also demonstrated a good fit within Optometry students using confirmatory factor analysis on a version of the ELI with the two factors of Meaningful Processing and Focused Attention. The measurement model demonstrated an excellent fit to the data with χ^2 (8)= 10.80, p =.214, CFI = .993, and RMSEA = .037 with 90% confidence intervals of .000 to .088. Variable loading was strong with β ranges from .56 to .86. CMIN/DF = 1.349.

Schreiner and Louis (2010) demonstrated that engaged learning was predictive of student satisfaction with learning, satisfaction with faculty, gains in critical thinking skills, and to a lesser degree, student grades. The Meaningful Processing Scale was the most predictive of all the outcomes but was correlated most with students' satisfaction with amount of learning. Meaningful processing was associated with students' overall perception and satisfaction with college and also with the quality of their learning.

Methods

Data will be collected from students at a single private four year doctoral level optometry college. With consent, all of the first year students will be surveyed using Engaged Learning Index and demographic items. Three scales make up the Engaged Learning Index (ELI) from Schreiner and Louis (2006): Meaningful Processing, Focused Attention, and Active Participation.

The first phase of data analysis will use t-tests to compare the mean engagement scores on the ELI on the same group of students in two different courses. SPSS will be used to run the statistical analysis (the investigator owns the software)

Hierarchical multiple regression will be used for the second phase of data analysis. A series of regression equations will be conducted using outcome variables of satisfaction with learning, self-reported academic performance, satisfaction with the optometry college experience, satisfaction with the quality of interaction with faculty, and frequency of interaction with faculty outside of class. Two blocks will be used in the regression analysis, with the first block containing control variables (student characteristics and class level) and the second containing students' responses to the three ELI scales of Meaningful Processing, Focused Attention, and Participation.

Plan for Project

The intent of publication for this paper is not only to inform the optometric educators at the colleges of optometry but also graduate level health professions educators in general. The curriculum within medical fields such as dentistry, medicine, and nursing typically have curriculum with basic science core courses and clinical management courses. Students in these programs could benefit from faculty and administrators who have a better understanding of student engagement, deeper learning processes, and problem-based learning pedagogy.

The new course has been through a rigorous governance process (see proposal attached) and training for the instructors will take place during July and August, 2011. If funded, training and consulting will be provided for the instructors prior to and during the course administration to insure consistent small group facilitation. Consulting with an educational research expert from Azusa Pacific University (institution where investigator is enrolled in doctoral program in higher education) will also be requested.

Timeline

June, 2011	Apply for IRB approval at SCCO
August 21st, 2011	Start of New Course Clinical Integration of Basic Science
November 7th, 2011	End of Course, Distribute survey on last day of course
December-February 2011-12	Analyze Data, Draft Manuscript for Optometric Education

Budget

1) Federal work study student assistant at $12/hour X 50 hours = $600
2) 2 days PBL Facilitator Training for consistency with all instructors = $100/hourX12 hours = $1200
3) Consultation with Education Researcher/Statistician from Azusa Pacific University (Data Analysis phase) = $100/hour X5 = $500
4) Annual license for electronic survey system (Survey Monkey or Zoomerang) = $200

Total Requested: $2500

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