Assignment 3

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Research Problem

The research problem addressed by the authors is the lack of incorporation of creative thinking and problem solving skills in current engineering education. Daly, Mosyjowski and Seifert (2014) state that "engineering students may not feel that risk taking and creative skills are a valued part of their education" (p. 418), despite the fact that creativity has been determined to be essential to engineering as a profession.

Purpose, Research Questions or Hypotheses

The purpose of this study was to investigate the current incorporation of pedagogy for students' creative skills in engineering courses. This was done through examination of "learning goals, instructional methods, and assessments focused on cognitive creative skills" (Daly, Mosyjowski, & Seifert, 2014, p. 418). The authors wished to investigate the opportunities for creative development that were present in existing course design, examining pedagogy to find out "how they fostered creativity, [and] the extent to which current course practices took advantage of known creative techniques" (Daly et al., 2014, p. 418).

Participants, Data Collection and Analysis

Daly et al. (2014) chose to utilize case study methodology to complete their research. They focused on a Midwestern public university, with case study data collected from seven engineering courses "to capture multiple places within the curriculum where creative skills may be incorporated into pedagogy" (Daly et al., 2014, p. 421). These courses were identified as having a focus on creative skills, with five of the seven openly emphasizing design. Two courses were introductory 100 and 200 level courses, three were upper-level courses, and two of the

courses involved graduate students. Having such a “range of courses allowed for the observation of creative skill pedagogy across levels of instruction” (Daly et al., 2014, p. 422).

For each course, the instructor and as many as two students were interviewed, the entire class was surveyed, and key course materials were gathered. Instructor interviews were focused on course goals associated with creativity and related instruction and assessments. Students were asked to discuss their own experiences in the courses, particularly with regards to creativity and how the creative process had been taught. The survey was completed by each class approaching the end of the semester, and was comprised of open ended questions regarding the students’ experiences with the creative process in the classroom. The authors completed seven instructor interviews, ten student interviews, and collected survey data from 240 students.

Analysis of the collected data was done by grouping the interviews, open-ended surveys, and course materials for each course. Thus, a collection was created, allowing “a more complete understanding of the goals of the course, instructional methods, and assessments” (Daley et al., 2014, p. 423). A deductive coding approach was used, with four pre-determined thematic categories: generating ideas, digging deeper into ideas, openness and courage to explore ideas, and listening to one’s inner voice. These categories were based on a framework developed by Treffinger, Young, Selby, and Shepardson (2002), and selected “on the basis of evidence that training programs focusing on cognitive skills prove successful at improving creativity” (Daley et al., 2014, p. 424). Each of these creativity indicators was assessed to determine if it was “included in all three of these course components: as a learning goal, practiced or discussed in instruction, and included in assessments” (Daley et al., 2014, p. 424).

Major Results/Findings

It was revealed that the engineering courses that were studied "focused on convergent creative skills (Digging Deeper into Ideas), evident in the desired results, learning plans, and assessment evidence for these skills" (Daley et al., 2014, p. 425). This was to be expected, as engineering curricula are "especially strong in analytical skills" (Daley et al., 2014, p. 425). One of the most prominent results highlighted that "many categories of creative skills were not addressed by any of the courses" (Daley et al., 2014, p. 427), and often course goals, desired results, assessment evidence and learning plans did not align. For example, metaphorical thinking was rarely taught or emphasized, and no courses had developed an assessment method for this skill.

There was little assessment offered for creative skills, including divergent thinking and many skills in the category of openness and courage to explore ideas (imagination, intuition, tolerance for ambiguity, etc.). Daley et al. remarked that, although instruction was often provided or learning objectives set with these skills in mind, no assessment of the skills was undertaken.

Comments

Daley et al. suggest that the clear communication of learning goals in these courses could better support and enhance students' development of creative skills. This could be an interesting area to explore, particularly in conjunction with the assessment of creativity. They propose that, in order to effectively assess it, creativity should be broken into its component skills (level of openness, depth of reflection, etc.). I am interested in exploring students' motivation to engage in creative problem solving, which Daly et al. (2014) suggest hinges on assessment, as "students may interpret a lack of assessment as an indicator of its lack of importance" (p. 434). This is certainly a phenomenon that I see in the students I work with in undergraduate engineering, and I

would be interested to see if there is an effective assessment tool to encourage students to engage more fully and "increase awareness of their personal creative process" (Daley et al., 2014, p. 437).

This study was limited in its analysis of only seven engineering courses located at one institution. The sample that the authors collected may not be reflective of pedagogy in other courses at the same institution, let alone of creativity education in engineering at other universities. However, this study does provide a good baseline for analysis of creativity education in engineering pedagogy, and allows broad generalizations to be drawn for further investigation in other contexts.

References

Daly, S. R., Mosyjowski, E. A., & Seifert, C. M. (2014). Teaching creativity in engineering courses. *Journal of Engineering Education*, *103*(3), 417-449.

Treffinger, D., Young, G., Shelby, E., & Shepardson, C. (2002). *Assessing creativity: A guide for educators.* Storrs, CT: National Research Center on the Gifted and Talented.