

article:1242**Self-directed Learning Readiness Among Engineering Undergraduate Students**

The work described in our paper, "Self-directed Learning Readiness Among Engineering Undergraduates," was motivated by a need to assess ABET Criteria 3, Outcome i, "a recognition of the need for, and an ability to engage in life-long learning." Our initial research question was broad – "how well are we preparing our students for lifelong learning?" However, a review of the literature led us to focus our research on self-directed learning. The book, *Self-direction for Lifelong Learning*, by Candy[1] was particularly useful in providing a comprehensive view of self-directed learning, approaches to assess it, and instructional methods to enhance it. Based on Candy's book and other literature, we decided to address two research questions: (1) What is the trend in readiness for self-directed learning across the years of undergraduate study and (2) What is the effect of problem-based learning (PBL) in engineering on readiness for self-directed learning?

Our research methodology was based on an existing instrument, the Self-directed Learning Readiness Scale (SDLRS), developed in 1977, that contains items on attitudes and skills required for successful self-directed learning.[2] The instrument is widely used and considered to have acceptable validity and reliability[3] We used cross-sectional studies to address our first research question. The total number of students in the sample for the cross-sectional was 330, spanning five years of undergraduate study. The sample was designed to be nearly gender balanced because we wanted to analyze the data for possible differences between female and male students. The second research question was investigated using a pre-test/post-test methodology in a new problem-based learning (PBL) course sequence implemented in our Industrial and Manufacturing Engineering Program. Analysis of the data from the two sets of studies was via typical statistical methods including ANOVA, pair-wise comparison, and regression analysis.

The cross-sectional study determined that a statistically significant increasing trend of SDLRS scores existed across the years of study. However, regression analysis revealed that the trend was very weak, accounting for less than 2% of the variance in the data. Furthermore, the students' grade point average was also found to be a very weak predictor, accounting for less than 4% of the variance in scores. Therefore, it appears that the current experiences of engineering students in our programs are not having a strong effect on their readiness for self-directed learning. The pre-test/post-test of the PBL approach on SDLRS scores found a statistically significant increase in average SDLRS scores confirming the positive effect of PBL reported for students in other fields of study. Interestingly, however, investigations of changes in individual scores revealed that two students suffered statistically significant decreases in SDLRS scores. Our interpretation of this result, supported by the work of Grow,[4] is that these

students were frustrated by the openness of the learning environment, which negatively affected their attitude toward this type of learning, and led to the reduced SDLRS scores.

The research questions and findings from our studies are of importance to any accredited engineering or engineering technology program in the US since all of them must address the ABET outcome related to lifelong learning as part of their accreditation process. The results point to a need to consider how we can include more opportunities for our students to engage in self-directed learning activities during their undergraduate studies. They also indicate a need to be mindful of the responses of individual students when they are challenged to be more-self-directed and to provide appropriate support so that they can be successful at this critical type of lifelong learning.

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[1] Candy, P., *Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice*. San Francisco: Jossey-Bass, 1991

[2] Guglielmino, L , *Development of Self-Directed Learning Readiness Scale*, (Doctoral Dissertation), University of Georgia, 1977

[3] *Commissioned Reviews of 250 Psychological Tests*, Maltby. J., Lewis, C., and Hill, A., Editors, Edwin Mellen Press, Wales, U.K., 2000.

[4] Grow, G. O., "Teaching Learners to be Self-directed," *Adult Education Quarterly*, Vol. 41, No. 3, pp. 125-149, 1991

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