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#10-230 Development of Active-Learning Units in Nuclear Engineering

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Active learning engages students in activities that could enhances their ability to analyze, synthesize, and evaluate the material being learned. The students participate in doing things instead of just listening. Evidence-based studies have shown that active learning increases student performance in Science, Technology, Engineering, and Mathematics (STEM) courses. The goal of this project is to develop active-learning units to enhance students learning and technical skills to improve their preparation for success in pursuing STEM graduate programs and careers in nuclear engineering. Three modes of active learning that are of interest include: problem-solving, lab-based hands-on activities, and simulation. This paper focuses on the development of problem-solving interactive units aimed at mastering fundamental principles and concepts, and better understanding of how equations translate and apply to real-life engineering situations. It also enhances the understanding of how different parameters in an equation interact with each other (such as dependency relationships). The practicality is in understanding how different components of an engineering systems function together to accomplish the goals for which they are designed. The design approach to each problem-solving unit starts with a brief review of the fundamental concepts, and identification of key parameters. Students participates in determining independent and dependent variables, constant parameters, and equations/formulas associated with the problem. The steps in each unit include understanding the problem, identification of the equations/formulas needed to solve the problem, listing the knowns and the unknowns, solving the problem, testing/checking the solutions/answers, and write down any difficulties encountered. Part of the post-activity evaluation include identifying any difficulties encountered, how were they resolved, and any lessons learned. The problem units presented in this paper are in the areas of neutron interactions, cross-sections, and attenuation.

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