

Authors: Joseph F. Puett III, Douglas J. Wolfe, Curtis A. Carver Jr.

Title: Multi-Year Design Education for Non-MSE Majors, the West Point Experience

Paper Category: New Paradigms for Design Education

Abbreviated Abstract:

This paper presents a case study involving the teaching of design methodology to large student populations of non-Math/Science/Engineering (MSE) majors over multiple courses and years. The paper identifies and characterizes the reasons why design methodology was not initially employed by the students, identifies correcting curriculum revisions, and presents an updated approach to incorporate design methodology. This improved approach has been embraced by non-MSE majors.

Full Abstract:

The pedagogical benefits of teaching design methodologies in ABET accredited curricula are well documented; however, receiving significantly less attention are the benefits of such methods when applied to non-Math/Science/Engineering (MSE) curricula or to entire undergraduate populations over multiple courses and years. This paper reports on the results of such a curriculum recently implemented at the US Military Academy. The Military Academy requires all non-ABET majors (approximately two-thirds of the student population) to undertake two courses in information technology (IT), one during the freshman year and one during the junior year. The courses are presented at increasing levels of complexity, both focusing on problem-solving using information technology. Teaching strategies include exposing the students to the underlying physical and mathematical concepts relevant to IT, IT systems' functionality, processes for successfully employing IT, and the importance and implications of IT. Originally, design methodology was taught only during the first course with the expectation students would successfully recall and apply the methodology during the second course. The design methodology taught at the freshman level is a four-step design methodology (understand the problem, design a solution, implement the solution, test the solution) which can be effectively applied to most everyday problems, not just technical ones. During the junior IT course, cadets expand upon what they learned in their freshman course and attempt to

apply the four-step design methodology to design, build, and test different components of an information system. As course projects, the students design and build a web portal that they use throughout the semester for work submission, design a local area network, design and build a database, and design and build a three tier, web-based application using dynamic, web-based scripting languages and Microsoft Access.

For a number of reasons, the expectation that students in the second course would successfully recall and apply the design methodology presented in the first course was not met. In response, several changes were incorporated into the second course to reinforce the use of design methodology – changes which have produced substantial improvement in the quality of project products. This paper reports on this case study, identifying and characterizing the reasons why design methodology was not initially employed by the students in the second course, identifying the revisions to the second course that corrected this and reinforced earlier learning from the first course, presenting an undated paradigm of how design methodology could be successfully presented so that it is embraced by non-MSE majors, and presenting an analysis of results of the change.