

Abstract

This dissertation discusses the design, development, deployment and testing of two versions of educational interactive multimedia software entitled Motor Workshop. Both versions of the software are focused on teaching mechanical engineering undergraduates about the fundamentals of direct-current (DC) motor physics and selection. The motivation to develop materials on motors arose because they are a common engineering design element, and yet their coverage in engineering curricula is often cursory or tangential. Standard mechanical systems texts do not cover this topic, and comprehensive motor texts are typically too detailed and lengthy to be suitable for mechanical designers. Further, it was hoped that a multimedia presentation would allow for inclusion of information that is difficult to convey in a conventional text format.

The two versions of Motor Workshop software cover the same basic materials on motors, but differ in the level of interactivity between the students and the software. Here, the *level of interactivity* refers to the particular role of the computer in the interaction between the user and the software. In one version, the students navigate through information that is organized by topic, reading text, and viewing embedded video clips; this is referred to as “low-level interactivity” courseware because the computer simply presents the content. In the other version, the students are given a task to accomplish – they must design a small motor-driven ‘virtual’ vehicle that competes against computer-generated opponents. The interaction is guided by the software which offers advice from ‘experts’ and provides contextual information; we refer to this as “high-level interactivity” software because the computer is actively participating in the interaction. The software was used in two sets of experiments, where students using the low-level interactivity software served as the ‘control group,’ and students using the highly interactive software were the ‘treatment group.’ Data, including pre- and post- performance tests, questionnaire responses, learning style characterizations, activity tracking logs and videotapes were collected for analysis. Statistical and observational research methods were applied to the various data to test the hypothesis that the level of interactivity effects the

learning situation, with higher levels of interactivity being more effective for learning.

The results show that both the low-level and high-level interactive versions of the software were effective in promoting learning about the subject of motors. The focus of learning varied between users of the two versions, however. The low-level version was more effective for teaching concepts and terminology, while the high-level version seemed to be more effective for teaching engineering applications.