6.002ex Assessment/Evaluation Fact Sheet
Report Title: "Evaluation Report: 6.002ex, Experimental Version of *Circuits & Electronics*"

Introduction and Purpose of the Study

In spring 2003, 6.002ex, an experimental version of 6.002 *Circuits & Electronics*, was offered for the first time. Like 6.002, 6.002ex covered basic electrical engineering concepts for analyzing and designing electrical and electronic circuits and systems. But it replaced traditional recitations with twice-weekly, small-group tutorials in which groups of six to eight students worked closely with tutors – MIT engineering alumni working in local industry – to explore five case studies addressing practical applications of the fundamental concepts of electronic circuits.

Professors Hal Abelson and Gerald Sussman, 6.002ex's creators, designed 6.002ex to:

- Provide students with a practical, intuitive grasp of engineering systems grounded in real-world problems
- Help students participate effectively in engineering design and problem-solving groups
- Focus beyond problem sets, rewarding students not just for their math skills, but for the thought they put into the subject
- Enable students to take charge of their own learning

The purpose of the evaluation was twofold: (1) to provide the d'Arbeloff Fund for Excellence in Education a report on the outcomes of 6.002ex and what was learned from it, and (2) to give Professors Abelson and Sussman feedback on 6.002ex's design, content and implementation that would help improve the subject and provide input for setting future direction.

Specifically, the evaluation shed light on:

- The overall feasibility of the 6.002ex design
- The feasibility of key components of that design, e.g., the use of the case method and the use of outside tutors
- Where the design and its execution succeeded and where it did not
- The nature of the *students*' experience of 6.002ex, e.g., levels of satisfaction, likes and dislikes, and their perceptions of its impact on them personally
- The nature of the *tutors*' experience of 6.002ex, e.g., the extent to which they found it rewarding/ fulfilling; satisfaction with the design, cases, training and support; and their perceptions of its suitability for and impact on the students
- Improvements to be made in future offerings of 6.002ex, e.g., specific recommendations for improvements in design and implementation

Methodology

This evaluation combined qualitative methods (i.e., observation of tutorials and tutor meetings and interviews with tutors, other staff and student volunteers) and quantitative methods (i.e., a survey administered to all 6.002ex students).

Summary of Findings

Findings were presented in two volumes. Volume 1 addressed 6.002ex's success and impact,[1] while Volume 2 focused on the subject's design and implementation.

Success and Impact

The overall conclusion of Volume 1 was that the 6.002ex experiment was very successful. The analysis of the student survey raised no "red flags" about 6.002ex's long-term probability of success.

For example, most students liked 6.002ex, gave it high marks for meeting its objectives, were satisfied with their learning, perceived a boost in their own confidence as a result of the class and felt that they would have a long-term advantage over students in the traditional 6.002. Most were also positive about the use of tutors. 6.002ex can also expect very strong "word of mouth" endorsement. Meanwhile, most of the professional engineers enjoyed being tutors, benefitted from it, would volunteer again if asked and would recommend it to other engineers. They also gave the case method and use of tutors high marks, generally endorsed the design and content and felt the students learned effectively.

Design and Implementation

Volume 2, which concluded that 6.002ex could be even more successful in the future if lessons from the first offering were applied, cited data and provided observations in twelve operational areas: 6.002ex's overall design, the tutorials, collaboration among students, labs, quizzes, lectures, assignments, grading, student support, tutor training and support, and scaling.

Recommendations

Volume 1 recommended that 6.002ex be continued. Volume 2 offered short-term operational recommendations in areas such as the design of the subject and the tutorials; tutor recruitment, training and management; expectations-setting with the students; the addition of recitations; student help and subject evaluation. It also offered longer-term strategic ideas on communication, tutor incentives, tutor recruitment and selection strategies, tutor training and subject infrastructure.

Next Steps

Based in part on the results of the evaluation, Professors Abelson and Sussman will create a revised version of 6.002ex to be offered in the future. The evaluation effort will likely continue to examine the success of subsequent iterations of 6.002ex and their immediate and longer-term impact on students' learning.

[1] 6.002ex was evaluated on its own merits during this initial evaluation, rather than in comparison with the traditional 6.002. Comparisons between the two versions were addressed only where students expressed opinions of their differences.