

EXPERIENTIAL LEARNING
MODEL FOR TECHNICIAN
EDUCATION
YEAR 3 FINAL EVALUATION
REPORT

NSF-ATE PROJECT DUE # 0302894

By Louise Yarnall
Yukie Toyama
Bowye Gong

SRI INTERNATIONAL

EXPERIENTIAL LEARNING MODEL FOR TECHNICIAN EDUCATION YEAR 3 FINAL EVALUATION REPORT

EXECUTIVE SUMMARY

Since 2003, Foothill-DeAnza Community College District has been engaged in producing and pilot-testing scenario-based tasks as a new form of technical instruction at community colleges. Scenario-based tasks are Web-based, ill-structured problems set in realistic professional contexts that require critical analysis, synthesis, production of professional deliverables, and generation of professional recommendations. This effort has been supported by an Advanced Technological Education (ATE) grant from the National Science Foundation's Division of Undergraduate Education (DUE # 0302894). The objectives of the grant were to develop new course materials, disseminate them, test their success for student learning, study their feasibility of implementation, and examine their effectiveness for moving a greater number of students into professional ranks. Before the ATE grant was issued, the scenario-based curriculum (Schank, 1997) was used primarily in graduate-level university courses.

SRI International's (SRI's) evaluation of the resulting Experiential Learning Model program has extended over the past 3 years. This final report reviews some of the key findings from earlier evaluations and provides the latest findings. Over the 3 years of the grant, SRI has examined the experiences of 78 community college students who have participated in the scenario-based courses and evaluated the experiences of 7 community college instructors, all of whom have used between 2 and 6 different scenario-based tasks in their courses. The key objectives of the evaluation have been twofold: (1) to provide formative feedback to the Experiential Learning Center (ELC) about how to adapt the scenario-based curriculum for community college instructors and students; and (2) to develop a replicable and easy-to-implement assessment model for measuring student learning.

The Experiential Learning Model program has evolved from seeking to mirror the original, university-based scenario-based curriculum, which immerses students in repeated real-world experiences with minimal instructor guidance, to a more structured approach that provides additional instructor guidance and streamlines the time demands on community college students. Because feedback in the first 2 years of the program revealed that both instructors and students wanted more time per task, the tasks per course were reduced from six to about three. Feedback also indicated that both instructors and students preferred that the tasks be introduced with brief lectures and followed by longer reflective discussions that illuminated the standards of quality student performance. Students also called for more consistent forms of assessment of, and feedback about, their performance. In sum, the initial 2 years of evaluation indicated that the original scenario-based model was too unstructured for the schedules and needs of community college instructors and students.

The intent of the Experiential Learning Model was consistently embraced by the great majority of instructors and students during these 3 pilot years. Both instructors and students appreciated the student-directed and "real world" quality of the scenario-based tasks. In fact, community college students repeatedly expressed a desire to have greater

opportunity to engage in real-time, hands-on simulations of hacker attacks than the pilot Enterprise Security course provided. Students also repeatedly reported that they appreciated being immersed in a problem-solving situation that exposed them to specific tools and Web-based resources for solving these problems. Students reported that they learned a great deal from their teammates, who often brought a wide range of professional and educational experience to the scenario-based tasks. Instructors also noted that the caliber of students' in-class questions was superior to those usually posed in traditional classes. In scenario-based tasks, student questions seemed to be more focused on understanding and solving a problem. To sum up, the curriculum model proved to have a notable capacity for leveraging students' relevant prior knowledge and focusing that knowledge in a sustained and enriched way on classroom learning activities—both hallmarks of a high-quality reform curriculum.

Specific challenges concerning implementation were identified in the first 2 years of the evaluation. Instructors and students remarked that although students seemed to work harder than usual in this curriculum—often discussing tasks outside of class—problems arose when individual students failed to contribute adequately to team efforts or lacked sufficient social skills. Instructors also noted that they felt challenged to handle student team dynamics and find a consistent way of conducting assessment and providing feedback.

Over the course of the evaluation, instructors' approaches to assessing student learning evolved. In the beginning, the instructors implementing the Experiential Learning Model sought to match the “soft focus” assessment approach of the original, university-based scenario-based model by critiquing student presentations and conducting one-time 360-degree evaluations by teammates and the instructor/boss. Unfortunately, students expressed frustration with the lack of consistency and clarity of the instructors' verbal feedback on student presentations, and instructors said they lacked sufficient time to implement the 360-degree evaluation. These issues led to the perception that there had been insufficient reflection on the major “lessons learned” from each scenario-based task—a critical element of consolidating learning in any form of simulation-based instruction (Naidu, Ip, & Linser, 2000). Contrary to the original university-based model, the new Experiential Learning Model for community colleges called for greater integration of focused evaluative, instructor-led discussions, and possibly written assessments to help instructors understand students' baseline and developing professional skills and technical knowledge. This final evaluation report presents the results of a pilot test co-designed with instructors of selected learning assessment items and of student self-report items on professional skills.

Using survey-based measurement methods for the first time, the Year 3 evaluation also yielded additional findings about student and instructor perspectives on the course and student learning outcomes. The highlights of these findings follow:

Student Course Perspectives

- *What were the most helpful aspects of the scenario-based tasks?* Most students rated all the course components of the scenario-based curriculum as “helpful” or “highly helpful” in preparing them for work. They identified hands-on activities and the instructors as particularly helpful. Their focus on instructors' roles differed from previous years and was perhaps a sign that professional development efforts were progressing around this new curriculum.

- *What were the most useful impacts of the scenario-based course?* More than 75% of students identified the most useful impacts as new skills and knowledge, and more than half said that the course was preparing them to work in the field.
- *How could the scenario-based course be improved?* Students had different perspectives on the two scenario-based courses, Enterprise Security and the new Basic Programming. Overall, students found the Enterprise Security course to be concise and easy to follow; some suggested including more hands-on, real-time experience. Students in the Beginning Programming course appeared to embrace the class if they had had some experience with programming, but programming novices found the class somewhat overwhelming, and suggested greater background on the history and philosophy of programming, as well as more time to work on tasks.
- *What type of background experience was most helpful for succeeding in a scenario-based course?* More than half of students reported that feeling “comfortable” with course content was a “major support” to succeeding.
- *Did students feel they had more opportunity to learn actively?* About half the students reported the scenario-based course offered them somewhat more opportunity to engage actively in learning activities than more traditional community college courses.

Instructor Course Perspectives

- *What was different about teaching with the scenario-based materials?* All instructors reported the primary difference was their ability to make course content more relevant to the real world. They also reported their role was more that of a “coach or advisor” than was the case in traditional courses.
- *How did increased experience with scenario-based materials affect teaching?* Preliminary indications were that as instructors gained experience with the materials their ability to tailor instruction to student needs and lead student reflection about learning increased. By way of contrast, novice instructors found it difficult to “get their bearings” on how active or passive they should be as they guided student-centered activities.
- *What was different about student performance with the scenario-based materials?* Instructors perceived that students had more opportunity to conduct independent research, seek help from classmates, coordinate group work, and work together outside of class. They also perceived that students held each other more accountable for their work. They somewhat agreed that the materials provided students a greater opportunity to gain a “deeper understanding” of content.
- *What was the same about student performance with scenario-based materials?* Consistent with past evaluations, instructors perceived that students needed as much help in refining the quality of their work and in working independently in this curriculum as in any other.
- *What were the challenges for students with these materials?* Instructors expressed concern about the capacity of nonnative English speakers to participate in

the course. Students who discussed this problem agreed language barriers made presentations challenging.

- *What were the challenges for instructors with these materials?* Instructors identified several factors as key student challenges: students' capacity to work on teams, students' initial course expectations, the amount of time students had for course work, and students' comfort with, and skill in, making presentations. They also identified several instructor factors: monitoring team dynamics, providing guidance or advice just-in-time, coordinating different course activities and making them coherent, coping with student resistance to this instructional approach, and assessing student progress.
- *Would they recommend the materials to other instructors?* All instructors responding to the survey said they would recommend that other community college instructors use the scenario-based tasks in their courses.

Learning Outcomes

- *Did item refinement lead to more instructionally sensitive measures of technical content learning?* The item development process yielded three new items for three of the most popular Enterprise Security scenario-based tasks, and four new items for the four new Beginning Programming scenario-based tasks. All seven items demonstrated instructional sensitivity to the technical content.
- *Did the professional skills items demonstrate alignment with scenario-based tasks?* Both Enterprise Security and Beginning Programming professional skills items aligned with the task content and were relevant to students' past work experience. Statistical tests conducted on the DeAnza and Foothill data revealed students' self-ratings of their prior knowledge were positively correlated with their overall performance on the technical content pretest items. Corroborating students' self-ratings of their past experiences with professional skills with their short-answer descriptions of those experiences provided strong evidence that their self-ratings were accurate.
- *Did students increase in technical content knowledge?* The results indicated that students did learn, with percentage learning gains ranging from 9 percentage points to 83 percentage points per item from precourse test to postcourse test.
- *Did all students report they had an opportunity to learn professional skills?* In both Enterprise Security and Beginning Programming courses students reported moderate to high levels of opportunity to practice a range of teamwork, research, and presentation skills. Corroborating students' self-ratings of their descriptions of their course experience learning these skills showed strong results for research skills, but weaker relations between self-ratings and descriptions of their teamwork and presentation experiences. These results underscored the importance of interpreting even deeply critical student comments as evidence of possibly "high" opportunity to learn about teamwork.
- *What suggestions did students make for improving professional skills support?* Students wanted greater structure and accountability for their individual research and

teamwork, with less emphasis on presentations in the Enterprise Security course.