4 REVISION OF PROJECT DESCRIPTION

OVERVIEW
This revision of our project description for proposal 0127452, *Next Generation Laboratories in Computer Science Education*, describes the set of goals and action items we have taken from the original three-year plan in order to re-define this as a one-year CCLI proof-of-concept project. (For the sake of brevity, we will refer to pages in the *original proposal* submitted to NSF in June 2001.)

Our goals for the project are to re-examine models for laboratory components in early computer science courses, based on the master/apprentice paradigm described in the original proposal (pages 7-8). We will use these results as a first step in meeting several of our objectives discussed on page 2 of the original proposal, including reduced development cost of new laboratory components, reduced operational cost for a course’s lab component, and for refining and updating aspects of our existing lab courses. We will apply and evaluate our approaches by focusing on two of our existing lab-based courses, CS101 and CS201, our first two software courses.

Proposed Activities:
On page 10 of our original proposal, we divided our proposed activities into three high-level tasks. For our revised plan, we propose to carry out most of the activities *Refining Methods and Technologies* (described on pages 10-12). In particular we will use the master/apprentice model to evaluate our lab experiences in just two of our courses, CS101 and CS201. We will do this in the context of an evaluation of our teaching goals for those classes. Given that our work will be completed in one year instead of three, we will apply our results to refine and improve a smaller number of laboratory components in these courses that we originally intended. Our work will thus prototype and assess these approaches in a manner that will allow us to evaluate their worth before applying them to all laboratories for the two courses or to additional existing courses or new courses.

As part of these activities, we will examine the potential for removing activities from closed
laboratories where we have determined that the activity can be carried out effectively without the concurrency and collocation of a closed laboratory. We will explore a small number of methods for using electronic communication (as described in the original proposal on page 11).

Our work in this one year will also allow us to do some limited work relating to our second high-level task, Processes for Developing New Laboratory Courses, though this work will focus on processes for developing components for an existing laboratory-based course instead of a full set of laboratories for a new course. We will prepare a first draft of the Laboratory Curriculum Component Development Guide (LCCDG), focusing primarily on aspects of altering or improving existing, traditional closed-laboratory activities for CS1 and CS2 style courses (rather than developing complete new laboratory components for a course).

Since one of the two courses we will focus on is CS201, where student teams do presentations in some closed laboratory sessions, we will re-examine the role of the studio laboratory technique and how it might used more often or more effectively in this course. As part of this focus, we will create a first version of the Studio Laboratory Development Guide (SLDG).

Thus our new plan will not include any of the activities of the third high-level task in the original proposal (New Innovations for Closed Laboratories, pages 12-14). It will focus primarily on those activities described for the first high-level task, and will apply these on a more limited basis than originally proposed for some set of components of CS101 and CS201, thus achieving the “prototype goals” for this proof-of-concept project. We will also address some of the activities in the second high-level task by creating first versions of the two guides described above, but we will not apply any of our methods to new courses, nor will we seek new test sites for our approaches during this one-year project.

**Outline of Work**

A revision of the outline of work presented in the original proposal follows. We have listed activities carried over from the original document using the same symbolic identifier (e.g. “RM1”) as in the original proposal. Note that many of these are reduced in scope, and changes indicating this are shown in bold font below. Several new activities are indicated with identifiers like “PR-X”.
Note that the application of the results of the first high-level to the courses CS101 and CS201 are listed in the second high-level task, as they were in the original proposal, though we intend to use them as proofs of concepts for activities RM1-RM5.

**RM—Refining Methods and Technologies (High-level Task 1)**

RM1: Analyze the need for laboratory components in a curriculum in terms of our master/apprentice model and the needs for collaborative learning. (*Knight, Horton; Semester 1*)

RM2: Review teaching goals (e.g. Angelo and Cross’ TGI) for CS1 and CS2 courses in general and for the University of Virginia’s CS101 and CS201 in particular. (*Horton; Semester 1*)

RM3: Review current closed laboratory contents for CS101 and CS201 in light of results from RM1 and RM2. (*Horton, Anderson, Milner: Semesters 1 and 2*)

RM4: Assess alternative educational delivery mechanisms that do not require closed-laboratory environment. Assess technologies that support effective delivery outside of a closed laboratory. (*Horton, Anderson, Milner: Semesters 1 & 2*)

RM5: Determine development and operational cost for new laboratory techniques. (*All; Semesters 2 and 3*)

**PR—Processes for Developing New Laboratory Courses (High-level Task 2)**

PR1: Document results of activities RM1 - RM5 as a first version of the Laboratory Curriculum Component Development Guide (LCCDG) that provides guidance on how best to organize and deliver practicum-oriented learning activities inside or outside of a closed-laboratory. (*Knight, Anderson: Semester 3*)

PR-X: Get baseline data on effective of existing methods used in CS101 and CS201 closed laboratories by analysis of past student performance, student surveys, etc. (*Anderson, Milner; Semesters 1 and 2*)

PR3: Revise a subset of the CS101 closed laboratories and assess the revisions. (*Horton, Milner: Semesters 2 and 3*)

PR5: Revise a subset of the CS201 closed laboratories and assess the revisions. (*Anderson, Milner: Semesters 2 and 3*)
**PR-Y:** Assess effectiveness of revised laboratories for CS101 and CS201 (*All: Semester 3*)

**PR11:** Document the experience with the studio presentation model for a closed-laboratory course component that we have gained. Create a **first version** of the second guide document, the *Studio Laboratory Development Guide* (SLDG), for introducing studio presentation laboratories into computing courses. (*Knight: Semester 3*)

**Budget Notes**

The revised budget meets the constraints for the proof-of-concept style project. Funds for the four faculty are allocated for use in the first semester in order to allow them to carry out the activities RM1-RM5 and plan activities for the second and third semesters. Some funds are included for a graduate research assistant (or possibly undergraduate students). A budget item for some software tools is included, as we are considering a Web-based discussion forum tool like WebBoard as a way of supporting collaboration and communication among students.

**Evaluation Plan**

Because the scope of the project has been reduced, our evaluation plan will differ from that in the original proposal. Horton will continue to have primary responsibility for project evaluation, and we will hold regular team meetings to carry out implementation evaluation at least twice a semester. At the start of the project, Horton will prepare an evaluation plan for the entire project, and get feedback on this plan from the team and also from at least one person other than the four faculty funded on the project.

Formative and summative assessment goals and procedures will be very similar to those documented in the original proposal, but obviously altered because of the transformation of the project to a proof-of-concept project. Our stakeholders will only include faculty and students at the University of Virginia, particularly those taking and teaching the two courses CS101 and CS201. Our activities in the second and third semesters will focus on making changes to the laboratory components in these courses, and before making these improvements we will gather infor-
mation that explicitly addresses the effectiveness of our current versions of the components to be altered. This baseline data will also include measures of operational costs for delivering laboratory components, including instructor and teaching assistant contact hours. These measures and our assessment of the changes we make for some CS101 and CS201 laboratory exercises will be extremely important to the success of the project, as we will compare these to determine if we meet our goals related to one of the evaluation questions documented in the original proposal (page 24):

• **Did project deliverables help create closed-laboratory components that are both effective and less resource intensive?**

As our eventual goal is to apply for a full proposal version of an EMD grant, evaluation will have a very high priority as we seek to identify effective ways of updating our laboratory courses.

In addition to these evaluations, we plan on surveying graduates of the University of Virginia and the test sites who have experienced the laboratory activities improved by project activities. If any of these students are working in industry at the end of the project, we will attempt to contact them to gather responses about their educational experiences and their impact on getting hired and performing their job duties.

**Dissemination of Results**

Our revised proposal for a one year project does not include activities with test-site universities, as the original proposal does. We do have interactions with two other universities. Horton and Knight are working faculty teaching software engineering at James Madison University, as part of the NSF Award 9981071. This work includes the use of studio labs in upper-division software engineering courses, and we will use these colleagues as reviewers and hopefully users of the SLDG document. Horton also still has contact with colleagues at his former university, Florida Atlantic University. He developed the laboratory component for the course COT3002 there (http://www.cse.fau.edu/~cot30021 -- that’s an “ell” at the end of this URL), and FAU has identical concerns about the effectiveness and operational cost of that laboratory course. Thus Horton will
keep his colleagues at FAU informed of this work in hopes they may make use of the results as
soon as possible, and we will continue to plan to include them as a test-site if we apply for subse-
quent funding for this work.

Needless to say, we will seek every opportunity to dissemination of our results as appropriate
at conferences like SIGCSE, ITiCSE, and FIE, as well as in the on-line forums of the Computer
Science Teaching Center and the ACM e-journal JERIC.