Proposal: PRAC Assessment Grant

Assessing Computer Science Majors Using the Capstone Experience

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Project Title: "Assessing Computer Science Majors Using the Capstone Experience"

Project Dates: Project to commence in Fall 2007 and continuing through Fall 2008, with results to be delivered by December, 2008.

Project Checklist

__X_   Statement of support from the department chair or school dean by e-mail to lhouser@iupui.edu - as a separate file not included in the proposal.

_X__   Simple budget : A detailed budget is not necessary. Nevertheless, please include a brief paragraph/details indicating how you intend to spend the grant money.

__*__   IRB (Institutional Review Board) approval attachment by email or hard copy to lhouser@iupui.edu or (Linda Houser, ES 3155, IUPUI) or project director statement that IRB representatives have been consulted and all requirements have been fulfilled sent to same. **Disbursement of funds will be contingent on receipt of approval by the Institutional Review Board, if human subjects review is necessary.**

*Please note that IRB approval documents were submitted via e-mail on 9/19/07 by Joshua Morrison. Once approval (if granted) is received, we'll be sure to forward Dr. Houser the appropriate information.

ABSTRACT

The Department of Computer & Information Science has moved forward in recent years to define a set of student learning outcomes (SLOs) that all undergraduate BS majors should attain prior to graduation. Other work currently underway in the Department deals with "mapping" these SLOs to specific course content, as understood through a content analysis of course syllabi.

This project seeks to extend the past and ongoing work through the utilization of an assessment instrument for Junior and Senior students completing CSCI 495, Explorations in Computing. This course serves as the capstone for the major, and normally includes a software project experience intended to require integration of previous knowledge and skills attained in Computer Science major coursework.

We propose utilization of the ETS Major Field Test (MFT) in Computer Science to help determine the extent to which undergraduate majors are meeting the stated academic SLOs of the BS program. Data resulting from the student completion of the MFT will be analyzed, and these results will be used to suggest, and implement, changes in the undergraduate curriculum to address any gaps in SLO attainment. We also propose using a focus group method to ascertain, once the MFT results are available, the reasons that students performed as they did on the examination. Thus, we hope to get a "what they know" and "why they know it" perspective on the issue of SLO attainment in Computer Science.

PURPOSE

The purpose of this project is to determine the extent to which upper division students in the Computer Science BS program are attaining the student learning outcomes expected of the department's faculty. Work on defining student learning outcomes (SLOs) has been completed, and these SLOs have been "mapped" to curriculum content. Assessment methods for determining competence in each SLO has also been proposed (see Assessment of Teaching & Learning document, attached). In addition, the faculty have reviewed information from the MFT, including the content areas and depth addressed, and have determined that these accurately reflect the intentions of the undergraduate curriculum. Therefore, we believe that student performance, as measured by the MFT, will yield information helpful to the understanding of student SLO completion.

Through this grant, we expect to learn not only the extent to which students are understanding and applying their domain knowledge, but also determine where "gaps" may exist in student preparation.

INTENDED OUTCOMES

There are several intended outcomes of this project. First and foremost, we want to understand where any knowledge gaps occur in the BS curriculum. A knowledge gap would occur when student performance on a certain area of the MFT is deemed to be inadequate. Once these gaps, if any, are identified, we will develop and propose alterations (both to individual courses and to the curriculum as a whole) to address these gaps. Second, we want to foster ongoing, and perhaps difficult, conversations about the nature of our curriculum and the SLOs we wish to advance in students. Last, we hope to expand the buy-in and investment of time and energy among all faculty in the department in order to begin the creation of a culture of assessment in our department.

ASSESSMENT METHODS

Multiple measures will be used to ascertain the attainment of the department's stated undergraduate SLOs. The Major Field Test (MFT) in Computer Science, produced by the Educational Testing Service, will be used to measure domain knowledge in academic SLO s. This test is an objective instrument intended to deliver a total score and subscores on various content areas in the discipline. It is in this way that we intend to gain quantitative data on the performance of students. The MFT is to be administered near the end of the term, and will be required of all CSCI 495 students. To help ensure student motivation, the instructor of CSCI 495 has agreed to assign a nominal amount of course credit for completion of the examination. The result of the exam will not be used to determine a course grade, and a certain score will not be required in order to attain a satisfactory grade in the course.

We propose the use of focus groups for CSCI 495, as well. The project associate will convene all CSCI 495 students for 1-1.5 hours to ask a series of open-ended questions about domain knowledge in computer science. A graduate student assistant will be utilized to assist the facilitator in documenting the comments of students, and confidentiality will be assured. Results of the focus group will result in an *n* of 1 for reporting purposes. Participants may be identified for demographic purposes. As CSCI 495 enrolls normally between 5-15 students per term, it is likely that all students can participate in 1 or 2 sessions. The focus group is intended to be an indirect measure of student learning, and more qualitative in nature. The focus group protocol is attached to this proposal.

DATA ANALYSIS

The Educational Testing Service (ETS) provides scoring services for the MFT, and we will be utilizing the results of the sub-scores as one of the sources of data. The MFT results are at a coarse-grain level, meaning that their results do not necessarily provide information that would lead to course improvements and educational/pedagogical innovations. Thus, we propose to employ a graduate student to assist in a fine-grain assessment of the results. We believe that through this fine-grained analysis, we can "map" student performance in MFT content areas to specific courses and content therein. This process will also help determine if student performance can be understood as a result of a "gap" in the curriculum. If there is poor performance on an area in the MFT and there are no courses or course content that examine and engage that topic, only the fine-grained analysis will tell us where such content could be places and in what course(s) it may belong. Only through a more detailed level analysis will we be able to determine with any certainty where these curriculum "holes" exist.

Data generated from the focus group will be transcribed, and content analysis will be used to identify main themes or patterns that may emerge. This will assist us in determining what content areas in the curriculum are emphasized and learned, and what areas tend to "stick" less well. Of course, no identifying details will be used in the transcription of the participant comments.

Once both the MFT and focus group data is analyzed, both data sets will be compared. It may be that the results point to similar or divergent conclusions. Either case will be instructive, and will inform the next steps taken by the department. The results will be summarized and catalogued for future comparisons with other CSCI 495 classes.

EVALUATION AND DISSEMINATION OF THE RESULTS

The project director and project associate hope to publish their results in an educational research or other appropriate journal. Results will also be shared internally to department and school colleagues, particularly those in leadership roles as they relate to undergraduate education. If appropriate, project results or selections will be publicized on the department's web page.

USE OF FINDINGS FOR IMPROVEMENT

It is hoped that the findings will support the conclusion that there are no significant gaps in student attainment of faculty-approved SLOs for BS students. More likely, however, is that deficiencies will become apparent upon receipt of MFT and focus group results.

The project director and associate will use the findings to inform meaningful discussions among the undergraduate curriculum committee regarding potential changes to the BS curriculum and/or specific courses within the curriculum. Upon approval at the committee level, proposed changes will be presented to the faculty at large for a formal vote on their acceptance. If accepted, the undergraduate curriculum committee and the project associate would be responsible for completing the appropriate administrative processes to implement the approved changes.

We hope to continue the use of the MFT and focus groups with all CSCI 495 classes. If continued, we could then complete "post-post" comparisons, to determine if curricular improvements or other factors changed the results in MFT performance. With the resulting data, (MFT and focus group results), it is expected that suggested changes to the curriculum will face less resistance and improvement to the undergraduate experience will progress rapidly.

BUDGET

- Major Field Test Exam Booklets: 30 x $26.00/each = $780
- Postage and Supplies for Mailing: 30 booklets x $1.00 = $30
- Hospitality (for Focus Groups): 30 people x $5/person = $150
- Graduate Student Assistance (1 student): $10/hour x 12 hours/week x 12 weeks = $1440

  - Total: $780+$30+$150+$1440 = $2400.00

FOCUS GROUP PROTOCOL

Participants in CSCI 495 will be invited to participate in a focus group or groups (depending on class size). Session(s) will occur during regularly scheduled class time, in order to avoid potential time conflicts. Invitation will come in the form of e-mail from Project Director and Associate.

At the focus group meeting(s), students will be asked to complete informed consent documents indicating their agreement to take part in the project. Project Director and Associate will explain the informed consent process and the ability of participants to decline participation at any time without penalty.

The Project Associate will introduce the recorder and explain the intention of the focus group, viz. to gather the thoughts and perspectives of the group on issues related to their undergraduate experience at IUPUI and, in particular, in the Computer Science BS program.

The Project Associate will ask each member of the group to introduce themselves. Once this is complete, a discussion of major themes in the Computer Science BS program will begin.

The format of the focus group will be semi-structured, with a set list of questions that are intended to garner open-ended responses. The questions to be used follow:

A. Looking back on your educational experiences in the Department of Computer & Information Science, what experiences were most helpful to you in learning computer science?

B. What factors were most helpful in assisting you in the learning process?

C. Are there concepts or topics that you would have liked to have seen in the curriculum? If so, what are they, and why?

D. You just completed the Major Field Test recently for Computer Science. What were your impressions of the test?

E. Do you feel that the curriculum prepared you for the exam? In what ways?

F. In what areas of computer science do you feel the strongest? Weakest?

G. What other insights would you like to share about the BS curriculum?