Title: Increasing Students’ Metacognitive Assessment via University-wide Dissemination of Question Manager

CAC Priorities: “other innovative proposals with student involvement”

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Colleges: LAS.

Signatures:

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During introductory courses students complete many assignments which are graded with perhaps some feedback sent to the student. The student focus is mainly on receiving the grade and where they lost points on that specific assignment. Students rarely receive or think of the larger picture of the feedback; whether they are struggling with tasks that require use of a particular skill e.g. calculus, or the use of a particular statistical technique. This self-assessment of broader, metacognitive skills is critical for a student’s intellectual growth – if a student evaluates the areas where they are not doing so well, they can redirect their effort towards improving that particular type of skill.

This metacognitive assessment is delivered by a tool called Question Manager (QM) which we developed in the Physics and Astronomy Department using a LASCAC grant. QM provides a metacognitive skill profile to each student as they submit assignments in WebCT during a semester. The goal of this proposal is to increase the number of students receiving this metacognitive assessment by dissemination of this tool to other instructors in different departments. We plan to do this by developing training material for use in CELT’s training sessions, web-documentation, as well as providing a broader range of input/output options. Instructors also gain a very powerful database to store, categorize, and search for questions to use in their courses, which will make it easier for instructors to manage the assignments they give their students. This project is a joint project between the Physics and Astronomy Department, CELT and ITS.

QM is a web-application written in php with a mysql database of questions. From any web-browser an instructor can search for questions in the database, choose those that suit his/her needs, add these to a “shopping cart”, then upload the cart to their WebCT course. Each question has several “skill” fields associated with it that categorize what types of skills are required to solve that question. In the physics database, the skills include “setup”, “multiple concepts”, “calculus”, and “geometry”. The titles for these skills can be changed for different disciplines. Each question is assigned a level for each of these skills: 0 not used, 1 = low-level needed to solve the problem, to 2 = a high-level needed. As students complete their on-line assignments, their profile would change depending on which questions they got right or wrong. If a student got a question right that involved a particular skill, then this would increase their current skill level in that category. If they got the question wrong, that would decrease their current skill level.

A screenshot of a skill profile is shown below. This will be sent to the student after completion of the assignment and also be available for the instructor. The skill profile is currently being beta-tested, and we will be sending the first profiles to students enrolled in Phys 222 just before Spring Break 2006. We should have first student feedback on the skill profile later in the semester.
For instructors, QM provides a very powerful database to store and search for questions on particular topics, course level, and difficulty level. Questions are stored in an industry standard XML format (IMS Question Test Interoperability) so that the questions written by instructors (using Respondus) can be stored, as well as those written by a third party (depending on copyright). The questions are exported to WebCT, and could be exported to other course management tools. Using an industry-standard format for the questions protects the investment instructors make to write the questions, as well as decoupling instructors from being tied to a particular textbook publisher’s database of questions.

To increase the use of QM, we will use CAC funds to:

a. Fund an undergrad in technical writing to develop a training module for the use of QM, as well as developing web-documentation. The training would be made available to instructors as one of CELT’s training courses. This person would also help instructors who want assistance learning how to use QM.

b. Fund an undergraduate programming student to increase the range of input/output options, e.g. an instructor may want to print questions to a pdf file. Input is currently only via Respondus, but we will extend this so instructors can use existing questions they have in other formats, e.g. csv files.

c. Fund an undergraduate student programming student to modify QM so it functions with new versions of WebCT planned for academic year 06/07

CELT/ITS’ role will be to assist in technical issues and to help with the dissemination. CELT/ITS will also examine this as a pilot project to determine if this tool should be supported campus-wide.

How many students would be affected by this proposal depends on how many instructors adopt QM. If there are two to three early adopters for the first year from large courses, then this could impact 1000 new students. In the Physics Department an additional 1000 students/semester will be receiving skill profiles by Fall 06.
Table 1. Full Itemized Budget

(Costs for the Entire Project)

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>Number</th>
<th>Unit cost</th>
<th>Total Cost by Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Central Pool</td>
</tr>
<tr>
<td>Undergraduate technical writer (a)</td>
<td>300 hrs</td>
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<td>$2550</td>
</tr>
<tr>
<td>Undergraduate software development (c)</td>
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<tr>
<td>Total</td>
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<td></td>
<td>$6630</td>
</tr>
</tbody>
</table>

Notes

a) Responsibilities include developing the training modules, documentation, helping to run the training course, and being available to assist faculty with adoption. Training would be before Fall and Spring semesters.

b) CELT will promote the use of the tool to other interested faculty or departments. These costs will be covered by CELT.

c) Most probably two students. Responsibilities include developing broader range of input/output options, ensuring QM works with new version of WebCT, and extending the use of skill profile to calculated questions.
Table 2. Minimum Feasible Itemized Budget

(Costs for minimum feasible part of the project are the same as the full project, with the exception of not extending the skill profile to calculated questions)

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>Number</th>
<th>Unit cost</th>
<th>Total Cost by Funding Source</th>
<th>Central Pool</th>
<th>Other (Specify)</th>
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