Progress report for 2010-2011 iSTEM Chancellor’s award:
Development of a Capstone Concept Assessment to measure integrated content retention in biology
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Considerable progress was made on this project, although more has been done in the first half of 2012 than was accomplished during 2010-2011, due to staffing losses and gains. In this progress report, I will give a very general overview on the project through May 2012.

Original plans for the project included the following steps:

**Step 1:** Establish a set of learning goals that are common to all 3 capstone courses in the major, and which reflect the most important concepts students should be familiar with upon completion of the major.

**Step 2:** Collect free-response answers to open-ended questions through student interviews and create distracters and correct answers from student-supplied responses.

**Step 3:** Administer pilot assessment and interview additional students.

**Step 4:** Solicit evaluations of the questions from external faculty.

**Step 5:** Repeat the student interview and external faculty evaluation process.

Step 1 was completed at the beginning of 2012. Extensive faculty interviews helped us generate learning goals that were then organized under the AAS Vision and Change broad core competency categories of Evolution, Structure and Function, Information Flow, Exchange and Storage, Pathways and Transformation of Energy and Matter, and Systems.

Step 2: On average, four question stems per category were generated for think-aloud interviews with students. A total of 20 students have been interviewed thus far: some were interviewed with open ended question stems only. The remainder of students were interviewed using completed multiple choice questions as well as some open ended question stems. We have slightly altered the type of question we will be asking from multiple choice questions with one correct answer to a multiple true/false design. Each question now has a scenario followed by four to five statements; students select true or false for each statement. We believe this approach will allow us to get a more robust picture of both the incorrect and correct students students may have about a single concept.

Step 3: several pilot assessments have been administered. The first was administered at the end of the fall 2011 semester to students taking Developmental Biology (one of the capstone courses); the second was administered to students at the beginning of our Introductory biology course (spring 2012) to ascertain the level of incoming freshmen on
such an assessment, and the third was administered at the end of the spring 2012 semester to students in Molecular Neurobiology (one of the capstone courses). The results from the first two pilots enabled us to make substantial improvements to the questions; we are still analyzing the final pilot.

Steps 4 and 5: These steps will be achieved this summer. We plan to partner with researchers at University of Washington and University of Maine to develop a suite of assessments for biology departments. This meeting is intended to set the groundwork for a TUES II NSF application in January. We will share our questions at this meeting, as well as developing a plan for getting additional feedback from faculty on questions already developed, and to pilot the assessment questions at multiple institutions.

In summary, the iSTEM Chancellor’s award enabled me to initiate work on a capstone assessment for molecular and cell biology. As a result of this work, I have been able to hire a postdoctoral fellow (using the SEI MCDB grant), and now plan to join forces with other researchers to apply for NSF funding to expand the development and use of such concept assessment.