Meeting Report

Framing
Science, technology, engineering, and mathematics (STEM) fields are receiving increasing attention. President Obama has called for better training of all students in STEM fields to ameliorate the economic issues the nations currently faces and to position the United States as a world leader in technological advancements. To support STEM education President Obama has created the Advanced Research Projects Agency – Education (ARPA-ED), the goal of which is to advance educational technology and increase demand. In parallel, Congress has renewed the America COMPETES law, which requires that NSF fund educational efforts from all directorates (disciplines and division of undergraduate education), including promoting undergraduate research. Current events coincide with a six-year trend of increasingly greater demands for validation of the effectiveness of science education innovations. Much of the burden of assessment and the opportunity to innovate science pedagogy falls on the shoulders of higher education STEM faculty. How can we leverage the higher levels of interest and accountability being demanded to actually improve student learning?

The first meeting of the SoCal PKAL Regional Network explored how our existing toolboxes of assessments can be used to improve teaching and promote learning. We also elucidated the challenges being faced by our institutions in Southern California and how a regional network of STEM faculty could be empowered to face these challenges.

Plenary Session: What Works: Teaching, Technology and Assessment
Three short presentations were given on different methods of assessment that can be used to improve teaching and learning. Christine Broussard, University of La Verne, presented the low tech tools of pre- and post-course surveys, reflection essays¹ and focus group interviews. The reflection essay (see Appendix A), borrowed from the Social Sciences, asks students to write about four things a ‘keeper’, a ‘query’, an ‘aha’, and ‘so what’. The free writing exercise serves two functions, to get the students to reflect on their experiences in the course/laboratory (metacognition) and to inform the instructors of what works and what needs modification for future iterations of the course (formative assessment).

Sara Johnson, Cal State Fullerton, shared department level evaluation of student learning outcomes (SLOs), guided student reflections, and the use of eportfolios and matrices to promote student metacognition and provide feedback to instructors. Department assessments require evidence of achievement of SLOs, which can be provided by guided student reflections and eportfolios. Guided student reflections ask students to describe the ‘who, what, when, and/or how’, to interpret and synthesize (reflect), and to apply what they have learned to new situations. The eportfolio matrix combined problem sets, real-word applications, and student reflections to promote higher order learning (higher levels of Bloom’s taxonomy). Collection of student work was facilitated by programs such as Epsilen which allow students to upload their own work and retrieve the matrix materials even after they have graduated.

Bryan Penprase, Pomona College, demonstrated the use of personal response systems (e.g. clickers). He discussed the flow of a sample lecture and had participants answer questions using the system. Key elements of successful use of the system were the ability of students to remain anonymous, the frequency of questions, and the design of the questions themselves. The in-class response approach works best when the questions are designed with higher order thinking in mind, although pure recall questions can be used effectively in some situations.

Following the presentations, participants were asked to work at their tables to share their own favorite/most effective assessment tools. See Appendix B, Participant Responses.

Discussion: Southern California PKAL Network Goals and Strategies

1. What challenges are facing your institutions?
Financial issues were common to all institutions present. Fiscal challenges have had broad impacts on the ability of STEM faculty to be effective. Some of the most pressing issues were increase class sizes, increased faculty workload, and increased need for remediation of incoming students. Many institutions have handled the financial crisis by lowering admission standards and admitting students who are not prepared academically for a college experience. The need for remedial classes, coupled with larger class sizes, increases the workload and decreases the morale of STEM faculty. Some participants mentioned bimodal distribution of performance in classes and the conundrum of how to promote learning to such a diverse group. Other challenges were generating buy-in from other STEM faculty to work toward or even care about program level assessment and success, increased reliance on adjunct faculty, increased student interest in more applied/practical majors, increased need to tie local work of assessment to national trends (accountability) and the need to close the loop of assessment and course improvement.
2. How can a network of cross-disciplinary, cross-institutional faculty and leaders help?

Participants felt the most pressing need the SoCal PKAL Regional Network could fill is faculty development of both full time and part-time STEM faculty. The topics of interest were assessment resources and training, the ‘craft of teaching’, sharing local expertise, and collaboration across institutions (especially including community colleges). The group also felt that SoCal PKAL could provide networking opportunities for local needs like sharing and validating assessment tools, remediation strategies, articulation strategies, and planning effective learning spaces (perhaps by visiting ‘new’ science buildings or effectively renovated learning spaces). Participants called on each other to think nationally and globally. SoCal PKAL could establish a website of resources for assessment, edit a journal of ‘Next generation’ teaching strategies, leverage local resources to create transformative science pedagogy projects with national benefit (NSF RCN grant), tackle global issues by transcending disciplinary boundaries.

3. What will success look like? Participants were encouraged to give thought to this question as fodder for future network initiatives.

Next Steps: The Second SoCal PKAL Network Gathering

Bryan Penprase of Pomona College will host the next meeting of the SoCal PKAL Network on October 1, 2011. Susan Elrod will host a teleconference (date TBD) to discuss topics and logistics of the next meeting. Participants were interested in having at least part of the October meeting focus on the relationship between 2 year and four year institutions.

Closing: A ‘Keeper’

Lastly, participants were asked to identify a ‘keeper’ from the meeting, one main idea or theme to take home from the meeting and start using next week. With that in mind, Susan Elrod asked the group to write down and follow through with one thing participants will do next week. She suggested taking your favorite administrator (e.g. Department chair, Dean) to lunch and telling them about the SoCal PKAL Regional Network gathering could be a first step.
Write a Reaction Paper*. A reaction paper gives you the opportunity to discuss your experience and thoughts about the class and lab projects. The paper should cover both your experience in class and the laboratory. Take 10 or 15 minutes. When you are done we will discuss everyone’s responses as a group. {I will type up a report based on your papers and our discussion. The report will be submitted to Dr. Broussard after semester grades have been submitted on December 28th. Your honesty and constructive thoughts are greatly appreciated.}

*Reaction Paper Guidelines, based in part on Christensen, 2000

Your paper should consist of the following parts:

1 "Keeper" = 1 main idea or theme from the semester that is worth remembering
1 "Query" = 1 problem you had, question for the instructor, or criticism of the course (class and/or lab)
1 "Aha!" = specific point that made you stop and think, or have an unexpected realization
1 "So What?" = an evaluation of the significance or impact of this course on your future/career plans.

Note that significance is not the same as a summary – you need to explain why this experience was important, not simply summarize what you did.

Separate your responses with a subtitle for each category (“Keeper,” “Query,” etc.).
Appendix B

SoCal PKAL Assessment Tools

1. Student course evaluations – given mid- and post-course (exit interview)
2. Student reflections (web-based or other)
3. Informal interviews
4. Pre- and post-mortem on exam material (exam reviews before and debriefing after)
5. Journals, reflective essays (in class or outside of class)
6. Blogs, discussion boards, direct interactions/interviews/discussions
7. Action papers, world view papers
8. Group work, peer assessment
9. Senior capstone/project – oral presentation, written product
10. SLAG/FLAG assessments of content understanding/retention (direct) and student perception (indirect) of learning.
11. Pre- and post-course concept testing
12. Rubrics for assessment (given to students in advance); AAC&U VALUE rubrics available online
13. Concept maps (Webspiration)
14. Concept inventories (physics – FORCE, biology – Biological Concepts Inventory/BCI)
15. 1-, 3-minute paper.
16. Daily quizzes
17. Web-based reading questions (just in time teaching, JITT)