CURE Survey Report of PKAL Courses, 2014-15

Methodology

Enrollments and Survey Response Rates
229 students enrolled in Computer Science 111 and PKAL sections of Engineering 100 and 110 were invited to take pre- and post-course surveys about their course experiences as well as previous experiences with science and programming, attitudes about science, and post-graduate plans. The survey instrument included HHMI CURE questions as well as Smith-specific questions.

- Pre-Test Response Rate: 59.4%
- Post-Test Response Rate: 44.1%

Enrollment Demographics
- Under-Represented Minorities: 10.5% of PKAL (15% of total Smith enrollment)
- Asian-American: 16.2% of PKAL (13% of total Smith enrollment)
- White/Other: 47.2% of PKAL (60% of total Smith enrollment)
- International: 26.2% of PKAL (13% of total Smith enrollment)

Results

Programming
- 20% of PKAL respondents reported having out-of-school programming experiences, and having friends (female = 48%, male =57%) who spend time programming
- On a scale of 1 = Very Unlikely – 5 = Definitely: “I am considering a career where programming might be needed in my job,” received a mean Post-test score of 3.81; “I am considering a career in computer programming,” remained level Pre- to Post-test at 2.71
- Gaming: Most common gaming platform is smartphone or tablet (40.6%); most common types of games are Strategy (56.6%), Word games (46.3%), and Adventure (43.4%)
- Attitudes (using mean score on a scale of 1 = Strongly Disagree to 5 = Strongly Agree):
  o Pre/Post scores on “Programming is a problem-solving tool” were about 4.35
  o “Taking a programming class is intimidating” decreased slightly from 2.95 to 2.89
  o “Programming is a creative activity” increased from 4.07 to 4.21
  o “I understand the value of a computation approach outside of CS” scored 4.15 (CSC 111 and EGN 100 students only, N = 78)
  o “I think programming is a good skill to have, even outside science careers” scored 4.32

Scientific Experiences and Plans
- Professionalization: 29.4% had taken other research-based lab courses; 20.6% had applied to summer research programs; 17.6% had presented on data they had generated at a conference or meeting
  o The largest Pre/Post difference in plans for future scientific experience was an increase from 2.9 to 3.16 on “I plan to apply for a science- or mathematics-focused fellowship as an undergrad”
  o “I plan to pursue a career in a STEM-related field” scored highly: Pre (4.00), Post (4.06)
- 63.9% of Pre- and 45.7% of Post-Test respondents plan to pursue an advanced science degree
• **Attitudes about Science**: Pre to Post, attitudes scores did not change drastically; the highest scoring Post items were:
  - “If I forget the facts, I’ll still be able to use the thinking skills I learned in science,” (4.38)
  - “I get personal satisfaction when I solve a sci. problem by figuring it out myself,” (4.38)
  - “Explaining science ideas to others has helped me understand the ideas better,” (4.26)

**The Course**

- “Interest in the subject matter” was a “Very important” reason in taking course for 78.5%
- “I need it for employment after college” — 83.8% felt this was “Moderately” or “Very” important
- “(Plan) to take what I learn and apply it in other contexts”— Pre 4.5, Post 4.24 (5 = Strongly Agree)
- “(Expect) to get a high grade in this course”— Pre 4.39 dropped to 3.93 on the Post-test
- “This course was a good way of learning the subject matter” scored 4.35 on the Post-test
- **Tutors and Faculty Office Hours** were utilized less than expectations reported on the Pre-test, with majority selecting “none” or “once or twice” on the Post. Time spent on **Homework** was about as predicted; 76% selected 3-6 hours or 6-9 hours per week
- **Course Elements**: the largest ability gains, between Pre and Post scores, were in the items “Computer Modeling,” “A project entirely of student design,” “A lab or project where no one knows the outcome,” and “Write a research proposal”
- **Course Benefits**: Highest scoring items include “Becoming part of a learning community,” (3.53); “Learning to work independently,” (3.52); “Understanding how scientists work on real problems,” (3.45)

**Notes**

**Instrument**
The original CURE instrument includes questions related to lab techniques; some of these items do not apply and could be removed to shorten the survey.

**Implementation**
These survey results indicate that students enroll in PKAL gateway courses already equipped with interest in the subject matter, belief in their ability to earn a high grade, and intent to use new skills and content in other contexts and in post-college careers. Further, they believe programming is a creative activity and is a good problem-solving tool—this suggests that enrolled students are a self-selecting group. Outreach about CS and Engineering should thus be focused towards the wider Smith community; who are the students who haven’t been exposed to out-of-school CS programming or friends who code, and don’t yet know about the wide applications of CS skills and applications.