INSTITUTIONAL CASE STUDIES: USING ADAPTIVE LEARNING TO IMPROVE OUTCOMES

Meg Benke, SUNY Empire State College
Martha Campbell, St Petersburg College
Jimmy Chang, St. Petersburg College
Ann Garnsey-Harter, Shoreline Community College
Dale Johnson, Arizona State University
Rahim S. Rajan, Bill & Melinda Gates Foundation

WCET, Santa Fe
At the Bill & Melinda Gates Foundation, we believe that all lives have equal value.
Our independence allows us to take risks others cannot. It allows us to find innovative solutions and track their long-term success in solving some of the world’s most challenging problems.
We cannot do it alone, so we work with partners, especially those who have deep experience in local communities.
PERSONALIZED

Students learn best when education is tailored to their individual needs, skills, and interests.

Our partners are exploring how all students—not just those who are able to attend the most elite, expensive colleges—can get the best, most personalized education at a reasonable price, using advising and digital courseware to amplify the personal element in education.

Grants include:

- Next Generation Courseware Challenge
- Integrated Planning & Advising Services (IPAS 1 & IPAS 2)
- Adaptive Learning Market Acceleration Program
- Next Generation Learning Challenges Wave I
“As an approach to creating a personalized learning experience for students, adaptive learning takes a sophisticated, data-driven, and in some cases, non-linear approach to instruction and remediation, adjusting to a learner’s interactions and demonstrated performance level and subsequently anticipating what types of content and resources learners’ need at a specific point in time to make progress...Rigorous “adaptive learning” solutions leverage various strands of academic research in areas such as intelligent tutoring systems, machine learning, knowledge space theory, memory, cognitive load theory, etc. in the development of technology-enabled delivery models.”

-Learning to Adapt: Understanding the Adaptive Learning Supplier Landscape (2013)
WHAT IS ADAPTIVE COURSEWARE?

- Mastery based learning
- Adaptive spacing
- Adaptive fading
- Error-differentiated feedback
- Metacognitive support
- Non-cognitive support
We believe that well implemented, high quality digital courseware has the potential to dramatically improve student outcomes and save institutions resources.

Potential Pedagogical Benefits*

✓ Formative Evaluation (d=.90)
✓ Acceleration (.88)
✓ Effective Feedback (.73)
✓ Meta-cognition (.69)
✓ Mastery Based Learning (.58)
✓ Concept Mapping (.57)
✓ Interactive content (.52)

15 year, 800+ meta analysis on achievement

Standard deviation is effect size where $d = 1.0$
(i.e. improvement of learning by at least 50%)

Average effect size $d=.40$

When $d$ is > .40
excellent achievement gains

*Source: John Hattie’s *Visible Learning (2008)*
A GROWING EVIDENCE BASE

- Research on mastery based learning, 1:1 tutoring, and digital tutors – **Bloom’s 2 sigma** findings (B. Bloom, 1984); recent research that argues intelligent tutors are now nearly as effective as 1:1 human tutors (K. Van Lehn, 2011).

- Randomized controlled study by **ITHAKA** conducted with six public universities w/ statistically reliable control and treatment groups, found no difference in learning between the blended and face to face groups, with **OLI** students completing approximately 25% faster.

- Previous research by **Carnegie Mellon University** of CMU students documented that students achieved the same or better learning outcomes on an independent third party assessment while completing the course 50% faster.

- **CSU Northridge** (Next Generation Learning Challenges Wave 1 winner) - a 67% increase in a hybrid, adaptive redesigned Math 103 course (with pass rates improving from 45% to 75%).

- **ITHAKA’s** July 2014 study of **blended MOOCs** in the Maryland System found that student outcomes were roughly the same in hybrid sections as in traditional face-to-face sections, including students from low-income families, under-represented minorities, first-generation college students, and those with weaker academic preparation.

- **SRI’s recent meta-analysis** of $60mm of the foundation’s own investments in courseware found an overall effect size of .37 (the equivalent of moving course pass rates from 50% to 65%) with much of the variation in outcomes and performance attributable to the variability in how courseware was implemented.
14 Grants involving 17 colleges, universities

9 Adaptive Learning Platforms

30 Courses in 12 Disciplines

44% - % Pell eligible students across cohort

Goal of +30K students enrolled (across 3 consecutive terms)
INTERIM FINDINGS FROM ALMAP – NOT FOR ATTRIBUTION

- A diverse array of implementations
  - Grantees varied in comparison conditions, design rigor, cost comparability
- 14,820 participating students and 460 instructors over two academic terms thus far
- Portfolio analysis based on quasi-experimental evaluations of student outcomes and program costs per grantee
- Thus far, greatest impacts on student outcomes and cost were in the blended implementations
- Instructor-customized courseware* involves considerable faculty effort and benefits greatly from centralized instructional design and course design
INTERIM FINDINGS FROM ALMAP – NOT FOR ATTRIBUTION

- Instructors liked progress dashboards, but raised questions about fostering frequent student usage.

- Instructors responded differently to adaptive courseware that was “off the shelf” vs. instructor-customized:
  - “Off the Shelf”: Instructors said not always consistent with course schedules or desired learning and assessment approach.
  - Instructor-created: Instructors questioned high labor required.

- Contradictory feedback from learners – sometimes not “enjoying” adaptive courseware, but most acknowledging it helped them learn.
INSTITUTIONAL CASE STUDIES: USING ADAPTIVE LEARNING TO IMPROVE OUTCOMES

- Meg Benke, Empire State College
- Martha Campbell, St. Petersburg College
- Jimmy Chang, St. Petersburg College
- Ann Garnsey-Harter, Shoreline Comm. College
- Dale Johnson, Arizona State University
- Rahim Rajan, Bill & Melinda Gates Foundation
Adaptive Learning ALMAP Courses

All Sections of Introduction to Psychology for four terms, 4-8 sections in each
Partner: Cogbooks
Online Delivery Model with Predominantly Adult Learners

Key Issues
Pushing the envelope with innovation
Students/faculty moving between two platforms
Engaging adjunct faculty effectively

Next steps
Moved to a adaptive and competency-based curriculum in a different degree area, information systems, will do full degree starting with two courses in fall 2015
Moving to greater use of open education resources in psychology advanced courses
Institutional research office doing more with analysis of predictors for success in course management system in introductory courses
Adaptive Learning ALMAP Courses
Composition 1, Intermediate Algebra
Partner: McGraw-Hill---ALEKS and ConnectSmart
Implementation began Fall 2013

Key Issues
Professional Development/Training
Faculty/Student buy-in and expectations
Institutional culture change

Next steps
Incorporation of personalized learning in Comp. 1
Expansion of F2F adaptive learning offerings in Intermediate Algebra and above
Continued tracking of student success data in above courses
Adaptive Learning ALMAP Courses
- Engl 100 Analytical Reading and Writing
- Econ 201 Micro Economics
- Partner: Cogbooks
Implementation began summer 2013, first courses offered January 2014

Key Issues
- Preparing faculty and instructional designers
- Developing course content

Next steps
- Training on latest release of Cogbooks
- Offering new course (Astronomy) fall 2015
- Hiring faculty mentor
ARIZONA STATE UNIVERSITY

- Adaptive Learning ALMAP Courses
  - College Algebra
  - Pearson MyMathLab with Knewton analytics
  - Flipped classroom model

- Key Issues
  - Systems are necessary, but not sufficient for student success
  - Data, data, data for faculty
  - Train the students – technology and pedagogy

- Next Steps
  - Apply model to other courses (biology, chemistry, etc.)
  - Faculty dashboard development