Multiple Interventions for STEM Success - The Case of Physics in the College of Allied Health Sciences (or, “It Takes a Village”)

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CAHS is part of the University of Cincinnati Academic Health Center with the College of Medicine, the College of Pharmacy and the College of Nursing.
College of Allied Health Students in Physics

- Approximately 230-250 CAHS students take the General Physics 1 and 2 Algebra/Trigonometry based courses as prerequisites for their major at UC each academic year.

- CAHS students represent ~ 20 to 25% of the enrollment in this course series annually

- Prior to Fall 2010 the 10 year DFW rate for allied health students in this course series was 37%

- In Fall 2010 the DFW rate in General Physics for allied health students was less than 16%

HOW DID THIS HAPPEN?
Multiple Interventions
Focused around CAHS Majors’ Math Readiness

2006- Initiated discussions with the Physics department head and undergraduate course director about CAHS student performance to develop an intervention plan to improve our student outcomes.

2007- Added a Trigonometry requirement in the HLSC major and reordered all CAHS program curricula to ensure no first year students were enrolled in the Physic course series.

2007- Established an early warning process, CAHS advisors were notified by the physics undergraduate course director after the first midterm about students whose grade was at a D or F.

2009- First cohort of CAHS “Trig ready” students enrolled in the Physics course series.

2010 (summer/fall)- ALEKS was initiated, along with Just in Time Teaching strategies in General Physics 1 and 2 by undergraduate course director Dr. Leigh Smith.

2010 (fall)- CAHS students’ DFW Rates drop by over 50% (~37% to 16%)

2011 (winter) CAHS student performance in Physics 2 is better in aggregate than the performance of all students enrolled in the course that term!
CAHS Student Outcomes in General Physics 1 *pre-intervention*

Winter 2010

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CAHS Student Outcomes General
Physics 1 & 2 post intervention

DFW Rate dropped by over 50% this term
Student Outcomes General Physics 2

- All UC Students
- CAHS Students
Math remediation using ALEKS

• ALEKS is an artificial intelligence learning engine which covers most math up through pre-calculus (algebra, geometry, trigonometry, vectors,…)

• Students begin with a 30 question adaptive evaluation of their math knowledge

• Then the work begins…..*all self-directed by the student.*
ALEKS Use in Physics

• Extra credit offered as an incentive for students
• Trig and Algebra review before the first lecture
• Initial test is used to determine what topics need to be reviewed
• Explanations and practice problems allow for improvement in the areas of weakness
Just in Time Teaching (JiTT)

• Quizzes would be posted before the first lecture of the week to force students to take a look at the information prior to class.

• Accompanying each quiz would be an explanation with the work written out

• By the time lecture arrived a curiosity built to further understand the problems because I had seen them before
Personal Response System

Group Work

Practice Problems
• In class problems to assess students’ understanding
• Immediate practice to enforce the material learned

Group Work
• The large lecture was split up into groups to work on PRS questions together
• This gave the opportunity for students to build off of each other’s strengths
• This led to study groups outside of class as well
How does this all help the students?

• Students strengthen math skills before class even starts

• Students are introduced to all material prior to lecture each week

• Questions during class keep students interested and builds study groups
Key Question: How do we institutionalize what we have learned?