# 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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# University of Cincinnati

**308** Programs of study in **14** Colleges

**41,970** Total Enrollment

Research Extensive

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.

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# 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

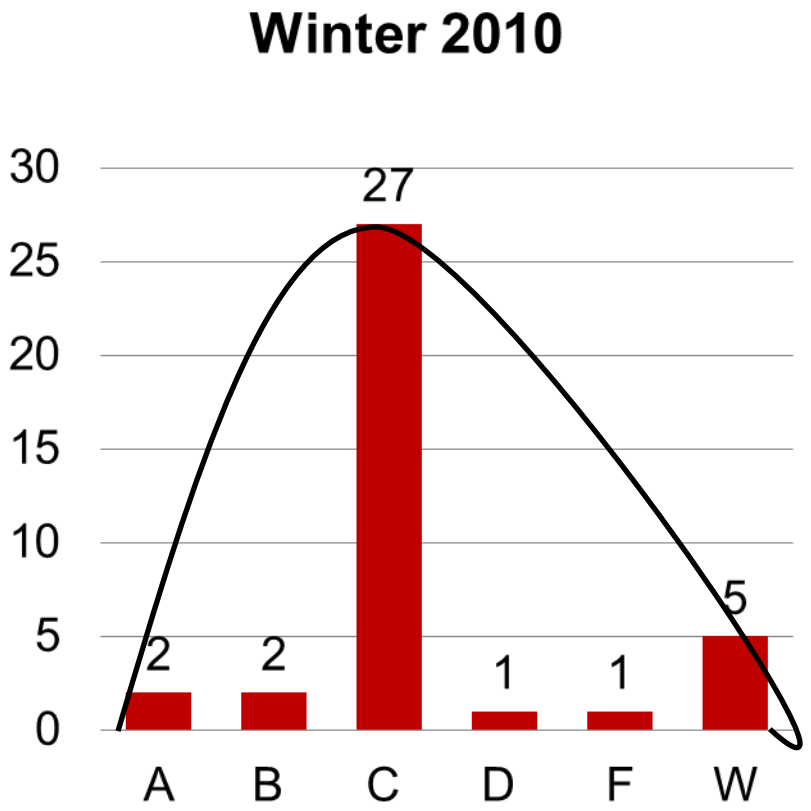
2009- First cohort of CAHS "Trig ready" students enrolled in the Physics course series

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

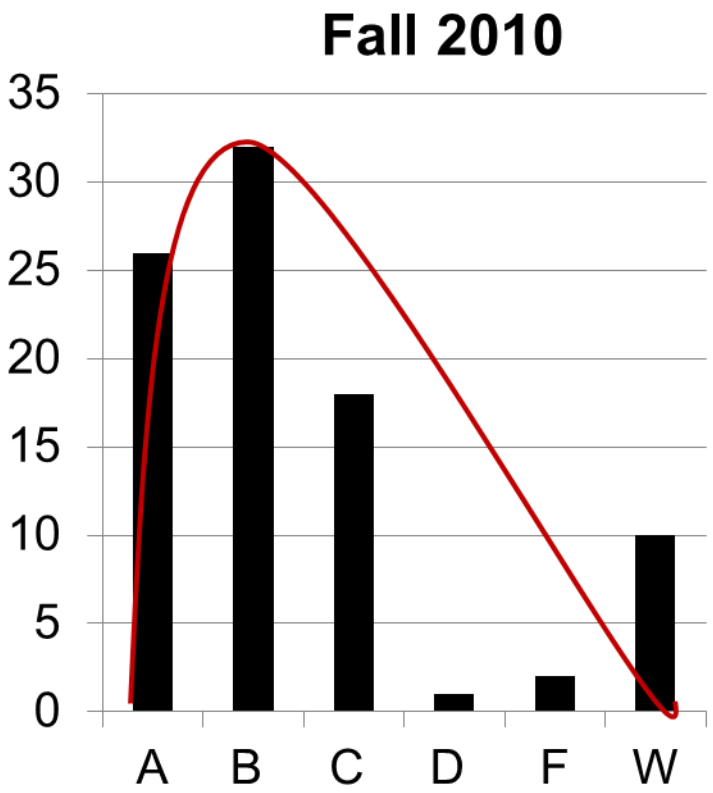
2010 (fall)- CAHS students' DFW Rates drop by over 50% (~37% to 16%)

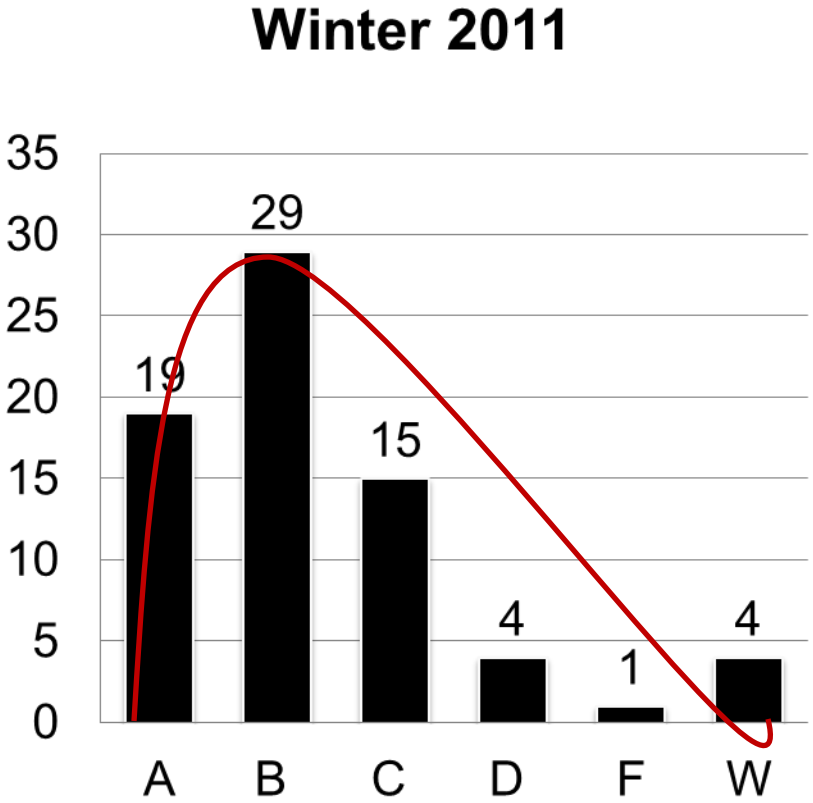
2011 (winter) CAHS student performance in Physics 2 is better in aggregate than the performance of all students enrolled in the course that term!

# CAHS Student Outcomes in General Physics 1 *pre-intervention*



# CAHS Student Outcomes General Physics 1 & 2 *post intervention*




DFW Rate dropped by over 50% this term

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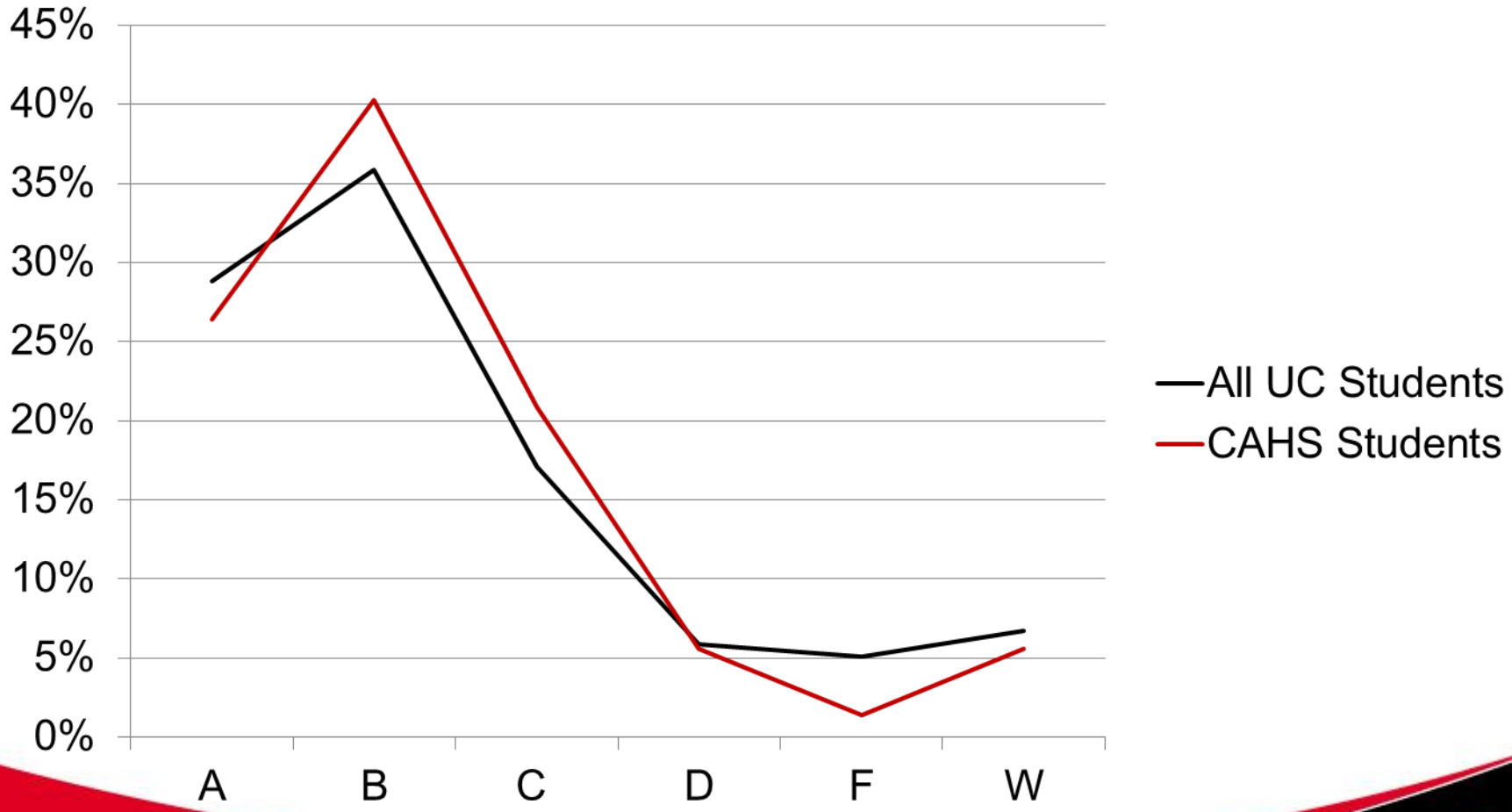
# Student Outcomes General Physics 2



# 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?