



College Ready in Mathematics and Physics Partnership

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Project Description

The University of Arkansas received a five-year, \$7,000,000 grant from the National Science Foundation to design and implement the College Ready in Mathematics and Physics Partnership. Other core partners are 38 school districts in Arkansas and Oklahoma, and the University of Arkansas - Fort Smith. The project began January 1, 2009.

The mission of the College Ready in Mathematics and Physics Partnership is to enhance mathematics and physics learning for all students in its partner districts and teacher-preparation programs in partner institutions, closing achievement gaps, and preparing students for success in mathematics, science, and teaching careers. This will be achieved by building learning communities of 7-12 teachers and college faculty that foster and nurture smooth access to, productive disposition toward, and preparation for success in college.

College Ready envisions a system that supports and sustains delivery of high-quality 7-16 mathematics and physics education to all students in its targeted region of thirty-eight school districts in Arkansas and Oklahoma.

The overall goal is to smooth and support the successful transition of students from high school to college and to facilitate students' progress in attaining baccalaureate degrees.

Ultimately, College Ready will impact student outcomes through decreases in college remediation rates in mathematics, increases in student proficiency scores on state assessments, increased numbers of students enrolling in Advanced Placement (AP) mathematics and physics courses and receiving scores of 3 or better on AP exams, and increased graduation and college-going rates. In addition, the two core partner universities will build stronger and more productive teacher education programs in mathematics and physics.

College Ready will achieve these goals through a series of interconnected activities including vertical alignment of high school and college expectations, intensive content-driven workshops, articulation conferences, university course revisions, the creation of professional learning communities, and the opportunity for teachers to earn advanced degrees and endorsements.

Teachers participating in a mathematics or physics master teacher program receive:

- Three-year course of professional development.
- Stipends of \$1,500 per 45-hour structured summer institute.
- Additional support for workshops during the academic year.
- Travel and housing costs covered for the institutes.
- Six hours of meaningful technology professional development per year.

Additionally, teachers can receive credit toward masters degrees in physics or mathematics, and preparation toward National Board Certification.

Professional development opportunities offered each year include:

- AP Calculus, AB or BC, workshops
- AP Statistics workshops
- AP Physics, B or C, workshops (available as part of the physics master teacher series)
- Mathematics Master Teacher Series
- Physics Master Teacher Series
- Quantitative Literacy workshops
- Vertical Teams workshops

A workshop similar to Preparing Mathematicians to Educate Teachers (PMET) for college faculty will be offered twice over the five year period.

Supporting Partners

American Physical Society – American Association of Physics Teachers – College Board
Center for Mathematics and Science Education – Mathematical Association of America
Maplesoft – Northwest Arkansas Community College

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Examples of Success Indicators

Goal 1: Increase student learning opportunities and levels of achievement by promoting enrollment and successful completion of greater numbers of students in upper-level mathematics and physics courses, especially those that prepare students for success in college.

Outcome	Benchmark	Objective	Activity
Increased mathematics and physics learning for all 7-12 students, leading both to improvements in overall performance and elimination of gaps among subgroups of students.	<p><i>Five-year Benchmark:</i></p> <p>Each participating school will exceed the performance target in mathematics and physics set by its respective state; disaggregated data for all student subgroups will demonstrate equitable achievement for each subgroup. State-specific benchmarks are as follows:</p> <p>Both Arkansas and Oklahoma:</p> <ul style="list-style-type: none"> • Decrease college remediation rate by 10 percentage points. • Increase the percentage of scores of 3 or better in AP calculus, statistics and physics in the Partnership schools to at least the national average. • Increase the mean mathematics ACT score in partner districts by 1 point, approximately 5%. • Increase the college-going rate. <p>Arkansas:</p> <ul style="list-style-type: none"> • Increase the mean score on the multi-state Algebra II end-of-course examination to at least the mean score for all states. • Increase the percent proficient in geometry and algebra I by 10 percentage points. <p>Oklahoma:</p> <ul style="list-style-type: none"> • Increase the percent proficient on end-of-program tests by 10 percentage points. 	<p>1.1 Align mathematics and physics course content and pedagogical practices in middle and high schools so that all students are on a path toward college readiness in mathematics and physics.</p> <p>1.2 Align school and college mathematics and physics course content and pedagogical practices to promote smooth transition from school to college.</p> <p>1.3 Increase the offering of and student success in college preparatory courses in mathematics and physics.</p> <p>1.4 Professional learning communities of school and college faculty understand, support, and sustain the alignments of school and college mathematics and physics course content and pedagogical practices.</p> <p>1.5 School and college administrators support and encourage work of professional learning communities.</p> <p>1.6 Align mathematics and physics course content with the state standards or frameworks.</p>	<p>Develop curricula and principles for CR workshops</p> <p>Sorting Out</p> <p>Conduct AP workshops</p> <p>Conduct Master Teacher Workshops</p> <p>Conduct Articulation Conference</p> <p>Conduct Administrator Workshop</p> <p>Alignment documents completed and posted for workshop activities</p>

Goal 3: Improve in-service mathematics and physics teachers' knowledge of both content and pedagogy by expanding availability of and teacher participation in a professional development program organized around content-focused inquiry-based courses.

Outcome	Benchmark	Objective	Activity
Increased enrollment and successful completion of students in advanced mathematics and physics courses, including elimination of differences in course-taking/completion patterns by subgroups of students.	<p><i>Five-year Benchmarks:</i></p> <p>Increase the participation in AP Calculus AB & BC, AP Statistics, and AP Physics.</p> <p>Eliminate participation gaps in AP Calculus AB & BC, AP Statistics, and AP Physics for sub-groups of students.</p> <p>Increase the number of students taking four years of high school mathematics.</p> <p>Increase the number of students taking a year of high school physics</p>	<p>3.1 Conform professional development offerings to the needs of partner district teachers.</p> <p>3.2 Develop common principles of high quality content, pedagogical practices, and theory of learning to be used in all College Ready workshops.</p> <p>3.3 Conduct all workshops according to common principles of high quality content, pedagogical practices, and theory of learning.</p> <p>3.4 Build structure that can continue the professional development beyond the five years of NSF funding of College Ready.</p>	<p>Develop curricula and principles for CR workshops.</p> <p>Survey partner district teachers and determine PD needs.</p> <p>Written principles of pedagogy and learning theory.</p> <p>Conduct formative assessments, summarize survey results, conduct reflective exercises.</p> <p>Lay foundation for development of learning communities through master teacher workshops and administrator workshops.</p>

Goal 4: Institutionalize mathematics and physics program improvements by building and utilizing professional learning communities among teachers

Outcome	Benchmark	Objective	Activity
Increased numbers of highly qualified 7-12 mathematics and physics teachers delivering high-quality instruction in a well-aligned and supported program.	<p><i>Five-year Benchmark:</i></p> <p>Achieve the following gains from pre- and post-testing of Master Teacher Workshop participants:</p> <ul style="list-style-type: none"> • 20 scale-score points (scale score range is 130-200) on the Educational Testing Service's Major Field Test in Mathematics for the mathematics teachers. • In physics, particular assessments used will vary by content, but statistically significant gains in content and confidence in areas treated in the workshops. <p>Increase by 10 percent the number of partner district teachers with master's degrees in mathematics or physics teaching.</p> <p>Have 50 percent of the partner districts 7-12 mathematics and science teachers complete at least one College Ready workshop.</p> <p>Have 50 percent of the partner district 7-12 mathematics and science teachers actively involved in a professional learning community.</p> <p>Revise the MA in secondary mathematics at UAF so that it is attractive and accessible to in-service teachers.</p>	<p>4.1 Build learning communities within schools and districts around master teachers.</p> <p>4.2 Build vertical learning communities in schools based on the vertical teams workshops.</p> <p>4.3 Build learning communities of school and college faculty around the PMET-like workshops.</p> <p>4.4 Build administrator support of learning communities through administrator workshops and evidence based on student performance data.</p> <p>4.5 Build cross-disciplinary learning communities, across mathematics, physics, and other science classes with a physics strand.</p>	<p>Lay foundation for professional learning community development within schools and districts around master teachers. Include PLC components in all College Ready workshops to support these efforts.</p> <p>Build foundation with vertical teams workshops in years 2-5.</p> <p>Begins in year 2.</p> <p>Conduct workshop and collect formative evaluation.</p> <p>Scheduled for year 3. Foundational work in year one with the QL workshop and will be continued in the PMET-like and QL workshops in year two.</p>

Three of the six College Ready goals are highlighted on this poster. Each goal has 4-6 outcomes. One example outcome is shown for each.