

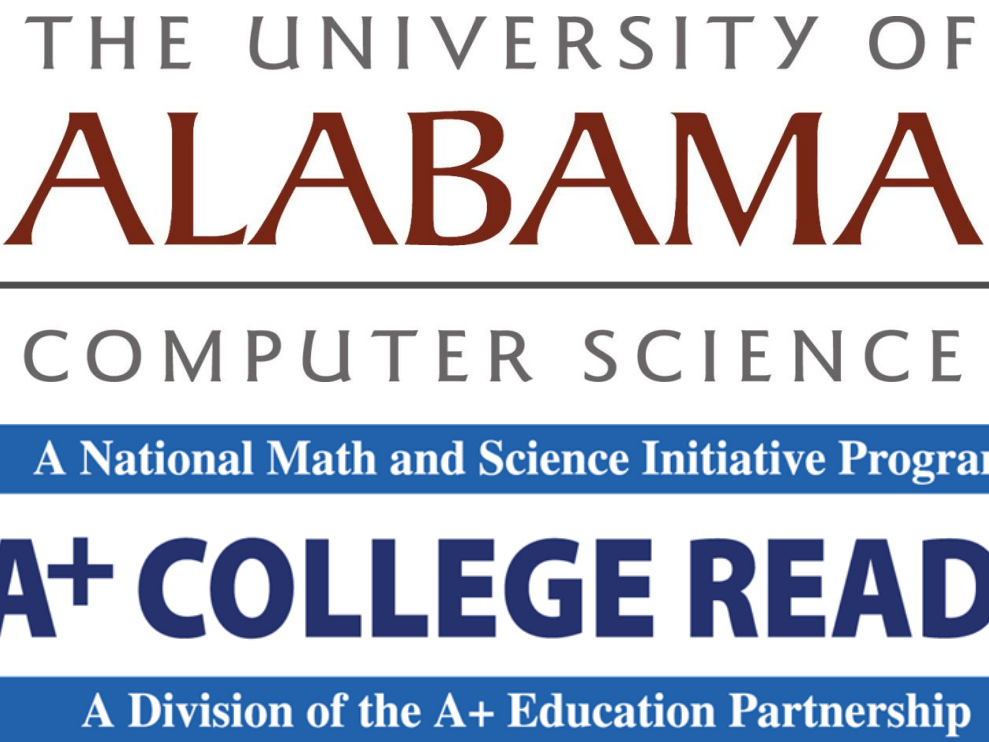
A Model for Statewide Deployment of CS Principles Courses

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PROJECT SUMMARY

This CS 10K project is centered on teacher preparation for CS Principles and will develop the knowledge base and needed infrastructure for wide-scale deployment across a state with historically low participation in the current Java-based AP CS exam. The project will adopt a successful AP professional development model created by the National Math and Science Initiative (NMSI) that will be refined to the unique challenges of K-12 CS Education (e.g., broadening participation and teacher preparation). The project will provide year-long professional development among cohorts of peer teachers who will collaborate on shared experiences both in-person and through an existing distance learning network. The project has the full support of the Alabama State Department of Education to provide needed resources and statewide advocacy of the project goals. The project also has the support of NMSI, whose nationwide adoption would assist with the general scalability and sustainability issues that often hamper CS Education efforts.

The proposed research has the potential for **broad impact** by leveraging the network of existing high schools covered by A+ College Ready (A+CR), which is the Alabama NMSI affiliate. Through partnership with A+CR, the project has the potential to train 50 teachers and 1,350 students during the project duration (yr1:150+yr2:450+yr3:750); an additional 20 schools will be trained after project completion, with a nationwide opportunity for adoption by 320 NMSI schools in 6 states. Through formative and summative assessment by Haynie Research and Evaluation, the project will offer **intellectual merit** by providing insights into a model that supports scalability and sustainability of teacher professional development for the CS Principles course.

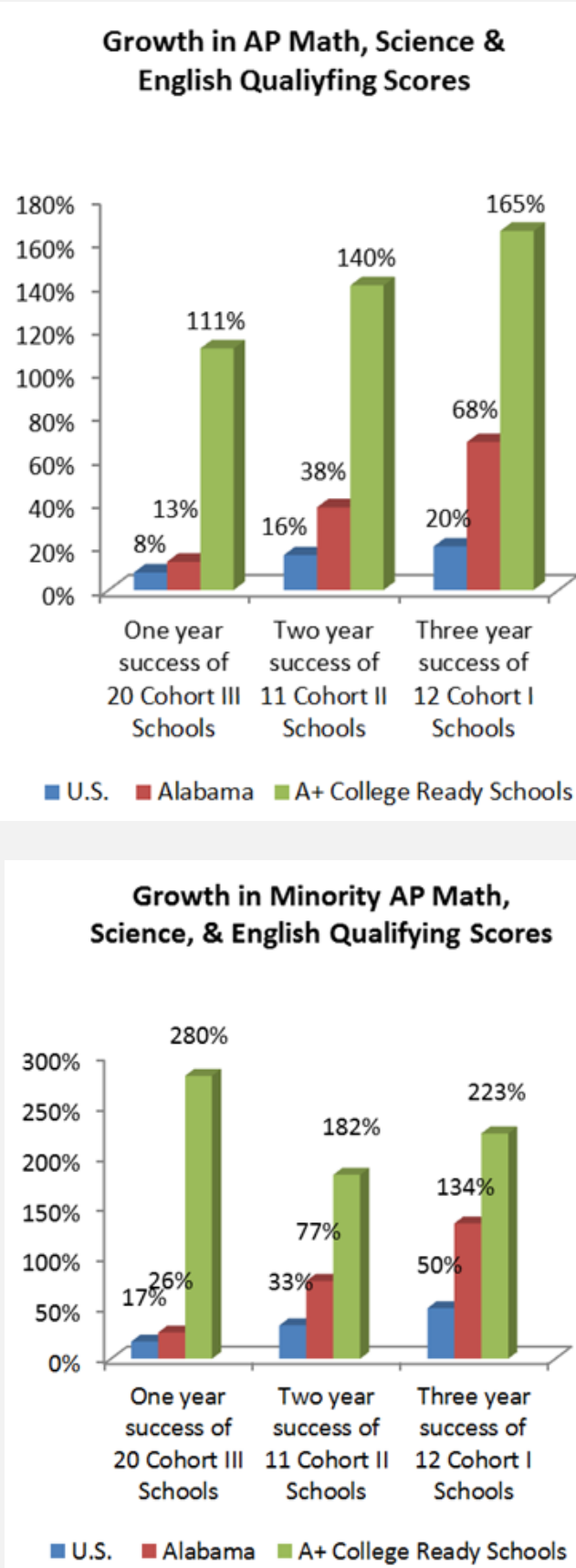
MOTIVATION AND PROJECT GOALS

Motivation and Background

- Alabama participation in CS AP traditionally low (<50 students per year over past 5 years)
- Yet, clusters of national tech leadership (Huntsville #4 in USA per capita in STEM workers)
- Successful AP Training and Incentive Program across Alabama high schools, as implemented by A+ College Ready as part of the National Math and Science Initiative (see figures to right):
Alabama's success in improving AP math, science and English scores from 2008-2011 for both all students and minority students leads the nation (% increase in qualifying scores).
- University of Alabama participation as an NSF/College Board CS Principles Pilot Site (Pilot II and II); sharing of results with southeast teachers through Google CS4HS support

Project Goals and Scope

- Train 50 high school teachers through extended Professional Development (beyond 1-week APSI) over a three-year period, while introducing 1,350 students to CS Principles content
- Sustainability and scalability through leverage and continued adoption of A+ College Ready
- Broadening participation through open access to AP courses using the NMSI model
- Dissemination of curricular materials and results of evaluation assessments to support PD



ACTIVITIES AND IMPLEMENTATION DETAILS

The project is driven by the following core activities: 1) Master Teacher mentoring and vertical teaming using face-to-face and online collaboration; 2) Open enrollment to increase diversity of participation; 3) Rigorous course content for year-long professional development; 4) Student mentoring through weekend skills development; 5) Incentives for teachers and students.

- Year 1: Ten Teacher Leaders with CS AP experience assist in developing CS Principles curricula resources and Piloting a course
- Years 2 and 3: Twenty teachers each year collaborate with assigned Teacher Leaders for year-round professional development and mentoring while introducing a new Pilot
- Undergraduate students in both CS and Education pre-service teachers, and a CS PhD student, assist PIs in training and curricular development resources

Implementation Plan Schedule (Cx represents specific cohort, where C0 are Teacher Leaders already committed to participating, and C1/C2 to be recruited from A+CR connections; PI represent PIs/Staff; S indicates student participation; E corresponds to Evaluator assessment)										
	2013			2014			2015			2016
	Spr	Sum	Fall	Spr	Sum	Fall	Spr	Sum	Fall	Spr
Teacher Leaders convene for a weekend planning session	PI, C0									
Curriculum refined (based on UA CS Principles course, and each year's K-12 course; C2 refinement in post-study)	PI, C0				PI, C1					PI, C2
Marketing of CS Principles Course at each school for student recruitment	PI, C0			PI, C0, C1			PI, C0, C1, C2			
Teachers purchase equipment for Summer training and Fall course (tablets/phones)	C0			C1						
Professional Development: Week-long APSI-like sessions (onsite at UA); summer-long reflective learning	PI, C0			PI, C0, C1			PI, C0, C1, C2			
Virtual biweekly training meetings (ACCESS); archived for those with intermittent schedule conflict	PI, C0	PI, C0	PI, C0	PI, C0, C1	PI, C0, C1	PI, C0, C1	PI, C0, C1, C2	PI, C0, C1, C2	PI, C0, C1, C2	PI, C0, C1, C2
Video recording of courses and training sessions	PI	C0	C0	PI, C0	C0, C1	C0, C1	C0, C1, C2	C0, C1, C2	C0, C1, C2	C0, C1, C2
Cohorts offer CS Principles course at their school			C0	C0		C0, C1	C0, C1	C0, C1, C2	C0, C1, C2	C0, C1, C2
PI offers CS 104 course at U. Alabama			PI			PI			PI	
Recruit new cohort from established A+CR connections				PI			PI			
Student summer camps		PI, S			PI, S			PI, S		
Student competition			PI, S		PI, S		PI, S		PI, S	PI, S
Saturday student study sessions			PI, S		PI, S		PI, S		PI, S	PI, S
Publication of results			PI				PI			PI
Evaluation: Course coverage, student learning, teacher preparation	C0, E	C0, S, E	C0, S, E	C1, E	C0, C1, S, E	C0, C1, S, E	C2, E	C0, C1, S, E	C0, C1, S, E	C0, C1, S, E

EVALUATION PLAN AND EXPECTED OUTCOMES

The goals of the project evaluation are to: (1) conduct an ongoing formative evaluation that assesses the extent to which goals are being met; (2) conduct a yearly summative evaluation that includes communicating to the NSF and other stakeholders the extent to which processes, activities, and goals are met; and (3) communicate evidence-based results with stakeholders, based on their identified informational needs.

- An extensive set of evaluation questions and associated measurement instruments will be used to assess evidence of project success (see table at right)
- Teachers will perform self-assessment of their own curricula artifacts compared to the learning objectives of CS Principles Big Ideas
- An advisory board of K-12 administrators and CS Education leaders will provide annual feedback from evaluation reports

Evaluation Plan Overview (Key questions, measures, and evidence for assessing the proposed project)		
Evaluation Questions	Measure	Evidence of Success
Teacher Professional Development and Learning Outcomes		
What is the quality of the professional development? What is the extent to which Teacher Leaders and other cohorts feel prepared to teach CS Principles materials? What is the impact of the in-service effort for participants? Do participants gain adequate content and pedagogical content knowledge? What added value is provided by virtual meetings and other resources? How well is the professional development model working? Is the project scaling to schools as expected? To what extent are the A+CR staff able to master the content to sustain the effort?	Teacher surveys (pre/post professional development); Teacher Leader and cohort interviews; Observations of virtual monthly meetings; Assessment of participant artifacts.	Teacher Leaders indicate adequate preparation for teaching (year 1) and for working with new teachers (years 2 and 3) as co-operative learners; Participants feel the preparation and continued support is adequate; Participant assignments show adequate content knowledge and pedagogical proficiency.
Course Implementation		
How are URMs recruited into the course? How engaged and motivated are students in the class? Do students persist in the class? Are students comfortable with the classroom climate? In what ways are CS Principles materials incorporated into a variety of learning contexts? What content topics and resources are used by instructors and how often? What are instructors' perceptions of the curricular materials (usability, quality, adaptability)? What is the efficacy of the state's ACCESS infrastructure to deliver professional development and shared teaching? To what extent do course implementations meet the ideals? How diverse are the course implementations?	Course syllabi; Instructor pre/post surveys; Instructor biweekly activity logs; Students post-course survey.	Course syllabi indicate alignment with Big Ideas and Learning Objectives; Cumulative activity logs indicate full content exposure with sufficient time per topic/activity; Instructors indicate material/strategies are engaging, esp. under-represented students (URMs); Students indicate enjoying class, activities, language.
Student Outcomes		
Do students' CS attitudes, interests, perceptions of relevance, confidence, self-efficacy, creativity, and content knowledge (e.g., social impacts of computing) change as a result of course participation? Does student learning increase? In what ways do students think computationally (e.g., recursively, abstractly)? Do students perceive CS as relevant? Are students interested in subsequent CS opportunities? Do students successfully pursue subsequent coursework? Do the Alabama undergrads/grad supported on the grant develop an appreciation and interest for helping to promote computer science education in K-12?	Instructor pre/post surveys; Student pre/post interest and attitude surveys; Common assessment (pre, midterm, final); Student enrollment and retention; Student grades; Exit interviews for supported students.	Survey results indicate gains in students' CS interest and attitudes, especially for URMs; Student retention is high; Student grades and common assessment results indicate successful learning of content, across and by Big Ideas and Learning Objectives; Instructors perceive adequate student learning; Alabama students continue with K-12 computer science activities after project ends.