PIEDMONT
PIEDMONT HIGH SCHOOL
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Proposal for a New Course

Course Title: AP Computer Science Principles
Department: Computer Science
Grade Level: 10 - 12 Grades
Proposed date of implementation: 2016 - 17

Origin of Request

Teacher: Nathan Mattix
Department: Computer Science
School: Piedmont High School
Date: March 16, 2016

Course Description: (Please write a brief course description)

AP Computer Science Principles is a year-long class that introduces students to the central ideas of computer science, inviting students to develop the computational thinking vital *for success across multiple disciplines*. The course is unique in its focus on fostering students to be creative and encouraging students to apply creative processes when developing computational artifacts. Students design and implement innovative solutions using an iterative process similar to what artists, writers, computer scientists, and engineers use to bring ideas to life.

This course highlights the relevance of computer science by emphasizing the vital impact advances in computing have on people and society. By focusing the course beyond the study of machines and systems, students also have the opportunity to investigate the innovations in other fields that computing has made possible and examine the ethical implications of new computing technologies.

In partnership with the National Science Foundation, the AP Program collaborated with secondary and postsecondary educators and members of computer science educational professional organizations to develop the AP Computer Science Principles curriculum framework.

The AP Computer Science Principles course is designed to be equivalent to a first- semester introductory college computing course. In this course, students will develop computational thinking skills vital for success across all disciplines, such as using computational tools to analyze and study data and working with large data sets to analyze, visualize, and draw conclusions from trends. The course is unique in its focus on fostering student creativity. Students are encouraged to apply creative processes when developing computational artifacts and to think creatively while using computer software and

other technology to explore questions that interest them. They will also develop effective communication and collaboration skills, working individually and collaboratively to solve problems, and discussing and writing about the importance of these problems and the impacts to their community, society, and the world.

The AP College Board does not specify a programming language or dictate a particular curriculum to cover the CS Principles framework. Several courses have been developed and pilot tested that incorporate the College Board's AP Computer Science Principles Curriculum Framework (.pdf/1.42MB). Teachers have the flexibility to choose a programming language(s) that is most appropriate for their students to use in the classroom. Piedmont will be using the Mobile CSP curriculum developed in this process. The Mobile CSP curriculum satisfies the Computer Science Principles Framework using a project-based learning approach, and taps into an innovative and exciting filed in mobile app development.

Students will apply their programming skills and knowledge of internet architecture by using the "App Inventor" programming language, developed by MIT and Google, on the Android Operating systems-based phones or tablets.

The course covers the 7 Big Ideas and 6 Computational Thinking Practices outlined in the Framework. During the course, students complete two collaborative programming projects and an individual research and writing project on the impact of a recent, computing innovation that appeals to the student. These projects conform to the College Board's two performance tasks on programming and impact. The CS Principles AP course will use these performance tasks, in addition to a written exam, as a primary means for a student to demonstrate what they've learned.

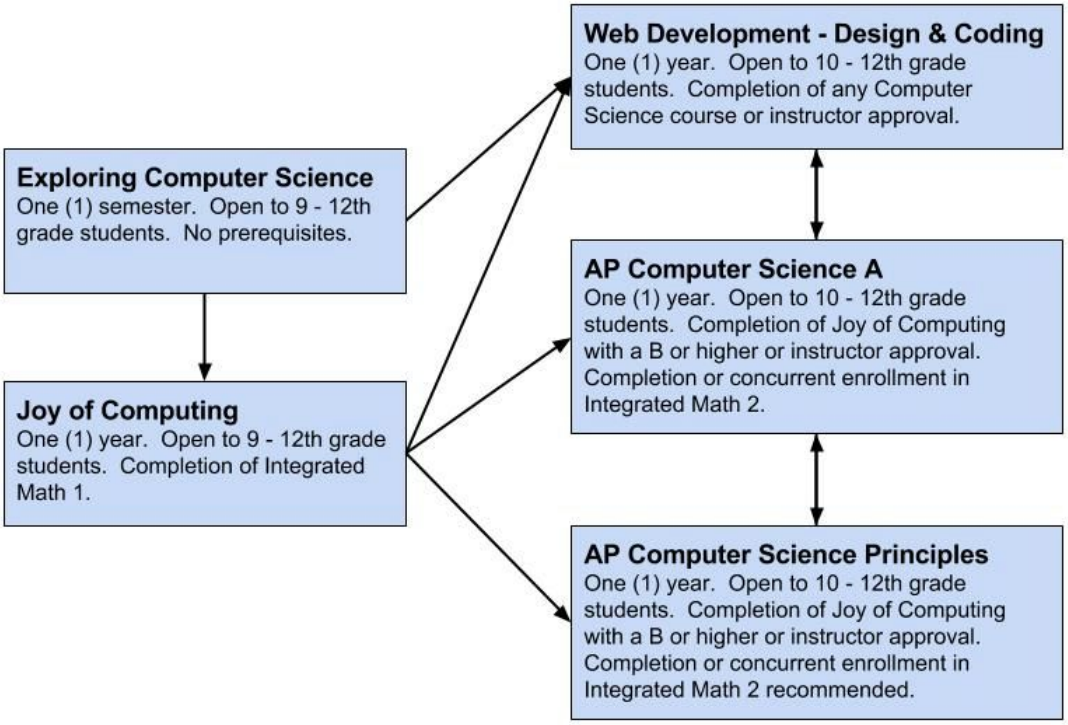
Resources:

Mobile Computing in App Inventor, by Prof. Dave Wolber
http://mobile-csp.org/

Teaching Mobile CS principles, Teacher and other Resources
https://ram8647.appspot.com/teach_mobileCSP/preview
https://ram8647.appspot.com/mobileCSP/resources

Advanced Placement Computer Science Principles
http://apcsprinciples.org/

Computer Science
Course Sequence Options



1. Needs Statement/Needs Assessment

What need will this course fulfill?
AP Computer Science Principles is designed to broaden participation and develop computational thinking across multiple disciplines. Whether it is 3-D animation, engineering, music, app development, medicine, visual design, robotics, or political analysis, computer science is the engine that powers the technology, productivity, and innovation that drive the world. Computer science experience has become an imperative for today's students and the workforce of tomorrow.

The AP Program designed AP Computer Science Principles with the goal of creating leaders in computer science fields and attracting and engaging those who are traditionally underrepresented with essential computing tools and multidisciplinary opportunities.

How was this need determined?
PUSD recognizes the need for a course that broadens participation and builds computational thinking across disciplines. The course will also prepare students who might not be Computer Science majors yet could use these skills in a variety of future endeavors.

In the 2013 – 2014 school year, the computer department went through a yearlong review that included teachers, administrators, parents, and students. The need for higher standards and more computer class offerings came out of these discussions. The *Mobile Applications Development* class was part of the recommendation of this group. This has broad support from all stakeholders.

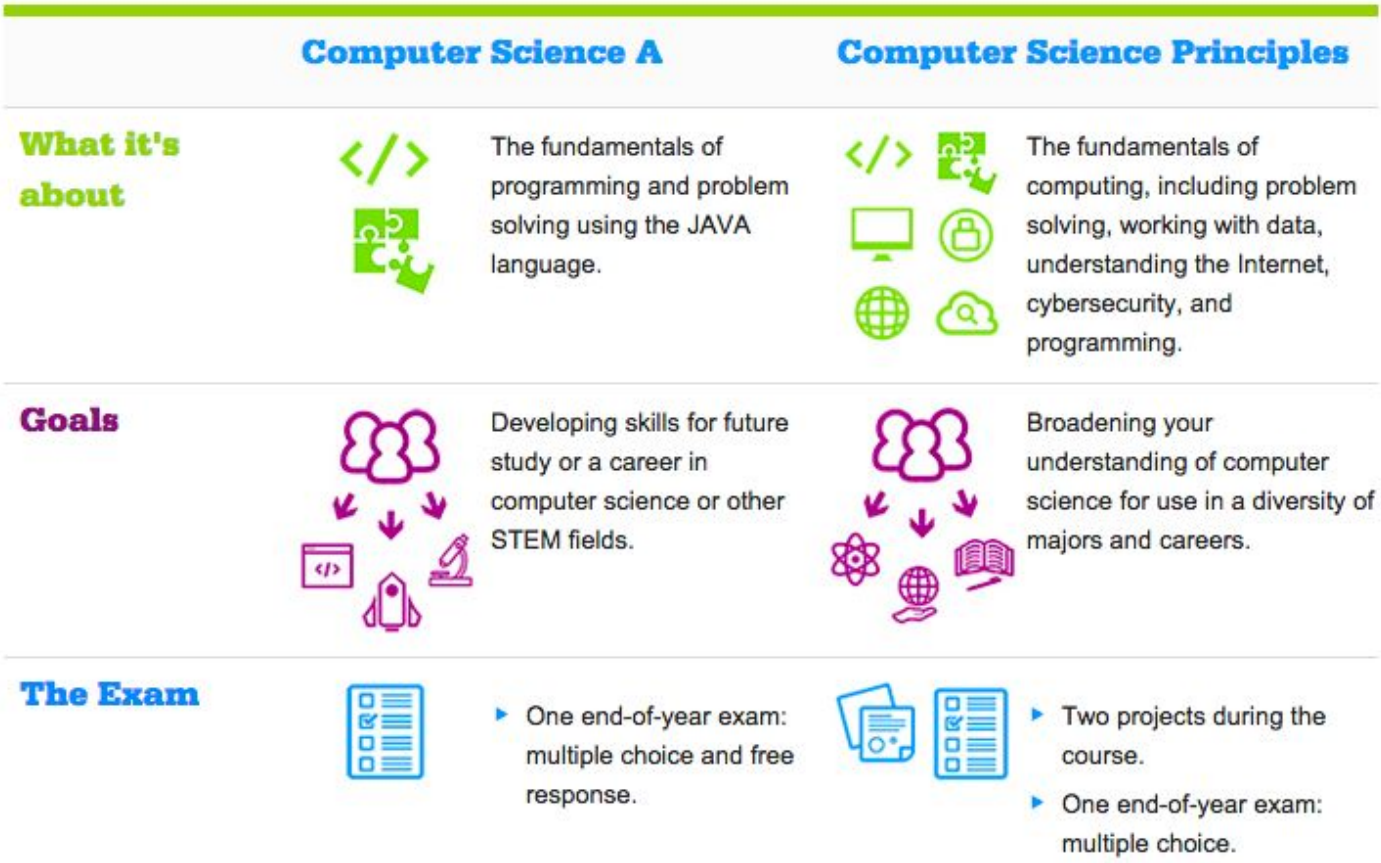
As part of the process of approving the CSTA Standards and subsequent discussions, it was agreed that having a variety of "Topics in Computer Science" courses, would offer the most options to PHS students and engage the underrepresented students in the computer science fields. A Mobile Applications Development course was suggested by CSTA as a possible first course in a series.

Why is this need not be met by the current curriculum?
This course replaces our current semester-long Mobile Apps class. The semester-long class was intended to be a precursor into the new AP Computer Principles class. Computer Science has been rapidly expanding, and the College Board added this new class to meet the educational needs that were not currently being addressed in the existing AP class.

This new AP Computer Science Principles course is complementary to AP Computer Science A. Students can take these courses in any order or at the same time, as schedules permit. Both courses include rigorous computer science content and skills that can be built on to complete further science, technology, engineering, and mathematics (STEM) and computing studies.

In the CSP course, students will develop computational thinking skills vital for success across all disciplines, such as using computational tools to analyze and study data and working with large data sets to analyze, visualize, and draw conclusions from trends. The course is unique in its focus on fostering student creativity. Students are encouraged to apply creative processes when developing computational artifacts and to think creatively while using computer software and other technology to explore questions that interest them. They will also develop effective communication and collaboration skills, working individually and collaboratively to solve

problems, and discussing and writing about the importance of these problems and the impacts to their community, society, and the world.



https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles/create-the-future-with-ap-csp

Have you considered other alternatives to meet this need? If so, explain.
There are other approaches to the AP CSP Framework. We decided upon the Mobile Apps curriculum based upon the project-based learning, and the appeal to students. The mobile app field represents the multi-disciplinary approach with art, business, design, social work and many other disciplines working together.

We have considered a class with other advanced computer topics but decided on this class based on strong student and parent input and support by the CSTA and the current popularity of mobile devices.

What pre-requisites will there be?
This is an advanced programming class and will require one year of computer programming, *Joy of Computing*, as a prerequisite. Integrated Math 1 is also a recommended prerequisite.

Why do you think this course is the best solution in meeting the need?
Student interest, community support, and the current popularity of mobile devices were all critical variables that yielded this decision. Recently the CSTA held a meeting on high school

mobile apps classes at UC Berkeley, and it was strongly urged by local universities (USF and UC Berkeley) that high schools move in this direction.

2. Effect on Other Aspects of the School Program

Since this class is replacing a class that already exists, the effects should be minimal. Initially there probably will be a decrease in size of the current AP Computer Science A class as more students opt to take the new class. Currently, approximately 95 students have shown interest in taking the course next school year.

From what other subjects do you anticipate that students will be drawn?

So far we have seen a decrease in enrollment in our Web Design and Web Development courses, which would hopefully minimally impact the enrollment of our other current electives, such as art, music, and dance.

Will the course require specially trained teachers not now on the staff?

We are adapting the course to the curriculum implemented at USF. Professional development offered by the College Board may be necessary. In addition, professional development and curriculum are available online and free-of-cost.

3. Projected Cost

We have already purchased Android tablets and deployed these for our current Mobile Apps class. There may be additional cost if enrollment is greater than the current enrollment in the semester class. Otherwise, we already have the equipment that we need.

The textbook for the class is currently available online and free-of-cost. Printed copies of the textbook for a class set may be necessary.
http://shop.oreilly.com/product/0636920034056.do

New computers for the computer lab are needed. A solution to maintaining the needed equipment for the class needs to be developed.

4. Graduation Requirement

How does this course fulfill PHS Graduation Requirements? Is it UC Approved? Which UC Subject Requirement does it meet (a-g)?

This course will fully satisfy the PHS computers graduation requirement.

The course will be submitted to UC and College Board for approval.

5. Similar School Comparison

List any schools similar to PHS that have the particular course as one of their offerings.
Mobile CSP is being taught in over 80 schools in 14 different states across the country.
http://www.mobile-csp.org/