OFFICE OF CHIEF OF RESEARCH AND DEVELOPMENT
Summary of State Board of Education Agenda Items
Consent Agenda
January 19, 2017

OFFICE OF EDUCATOR LICENSURE

E.   Office of Secondary Education Advanced Placement (AP) endorsement codes

Background Information: On November 4, 2016, the Commission on Teacher and Administrator Education, Certification, and Licensure and Development approved the following Advanced Placement (AP) endorsement codes as recommended by the Office of Secondary Education:

646   AP Computer Science Principles
647   AP Seminar
648   AP Research

Recommendation: Approval

Back-up material attached

AP® COMPUTER SCIENCE PRINCIPLES
BEGINNING 2016–17 ACADEMIC YEAR

About the Advanced Placement Program® (AP®)

The Advanced Placement Program® enables willing and academically prepared students to pursue college-level studies — with the opportunity to earn college credit, advanced placement, or both — while still in high school. AP Exams are given each year in May. Students who earn a qualifying score on an AP Exam are typically eligible, in college, to receive credit, placement into advanced courses, or both. Every aspect of AP course and exam development is the result of collaboration between AP teachers and college faculty. They work together to develop AP courses and exams, set scoring standards, and score the exams. College faculty review every AP teacher's course syllabus.

AP Computer Science Program

There are two computer science offerings, and students can take either course in any order. The AP Computer Science A course and exam continues to focus on computing skills related to programming in Java. The new AP Computer Science Principles course will complement AP Computer Science A as it aims to broaden participation in the study of computer science. The courses underscore the importance of communicating solutions appropriately and in ways that are relevant to current societal needs. AP Computer Science courses can help address traditional issues of equity, access, and broadening participation in computing while providing a strong and engaging introduction to fundamental areas of the discipline.

AP Computer Science Principles Course Overview

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 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.

RECOMMENDED PREREQUISITES

It is recommended that a student in the AP Computer Science Principles course should have successfully completed a first year high school algebra course with a strong foundation on basic linear functions and composition of functions, and problem solving strategies that require multiple approaches and collaborative efforts. In addition, students should be able to use a Cartesian (x, y) coordinate system to represents points in a plane. It is important that students and their advisers understand that any significant computer science course builds upon a foundation of mathematical and computational reasoning that will be applied throughout the study of the course.

Computer Language

Different from AP Computer Science A which is taught in Java, the AP Computer Science Principles course does not have a designated programming language. Teachers select the programming language(s) that is most appropriate for their students.

AP Computer Science Principles Course Content

The following are the major areas of study, or big ideas which are foundational to studying computer science:

- Creativity: Computing is a creative activity. Creativity and computing are prominent forces in innovation; the innovations enabled by computing have had and will continue to have far-reaching impact.

- Abstraction: Abstraction reduces information and detail to facilitate focus on relevant concepts. It is a process, a strategy, and the result of reducing detail to focus on concepts relevant to understanding and solving problems.

- Data and Information: Data and information facilitate the creation of knowledge. Computing enables and empowers new methods of information processing, driving monumental change across many disciplines — from art to business to science.

- Algorithms: Algorithms are used to develop and express solutions to computational problems. Algorithms realized in software have affected the world in profound and lasting ways.

- Programming: Programming enables problem solving, human expression, and creation of knowledge. Programming and the creation of software has changed our lives. Programming results in the creation of software, and it facilitates the creation of computational artifacts, including music, images, and visualizations.

- The Internet: The Internet pervades modern computing. The Internet and the systems built on it have had a profound impact on society. Computer networks support communication and collaboration.

- Global Impact: Computing has global impact. Our methods for communicating, collaborating, problem solving, and doing business have changed and are changing due to innovations enabled by computing.

Computational Thinking Practices

The course also incorporates computational thinking practices that set clear expectations of what students will do in the course:

- Connecting Computing – Students learn to draw connections between different computing concepts.

- Creating computational artifacts – Students engage in the creative aspects of computing by designing and developing interesting computational artifacts as well as by applying computing techniques to creatively solve problems.

- Abstracting – Students use abstraction to develop models and simulations of natural and artificial phenomena, use them to make predictions about the world, and analyze their efficacy and validity.

- Analyzing problems and artifacts – Students design and produce solutions, models, and artifacts, and they evaluate and analyze their own computational work as well as the computational work others have produced.

- Communicating – Students describe computation and the impact of technology and computation, explain and justify the design and appropriateness of their computational choices, and analyze and describe both computational artifacts and the results or behaviors of those artifacts.

- Collaborating – Students collaborate on a number of activities, including investigation of questions using data sets and in the production of computational artifacts.

AP Computer Science Principles Exam Structure

AP COMPUTER SCIENCE PRINCIPLES EXAM: 2 HOURS

Assessment Overview

This assessment comprises two parts: the end-of-course AP Exam and the through-course AP assessment.

The AP Computer Science Principles Exam will be a multiple-choice, paper and pencil exam.

The through-course assessment comprises two AP Computer Science Principles performance tasks, which require students to explore the impacts of computing and create computational artifacts through programming.

Format of Assessment

AP COMPUTER SCIENCE PRINCIPLES EXAM: 2 HOURS (60% of AP Exam score)

- Multiple Choice (single- and multiple-select) | 74 Questions | 120 minutes | 60% of assessment score
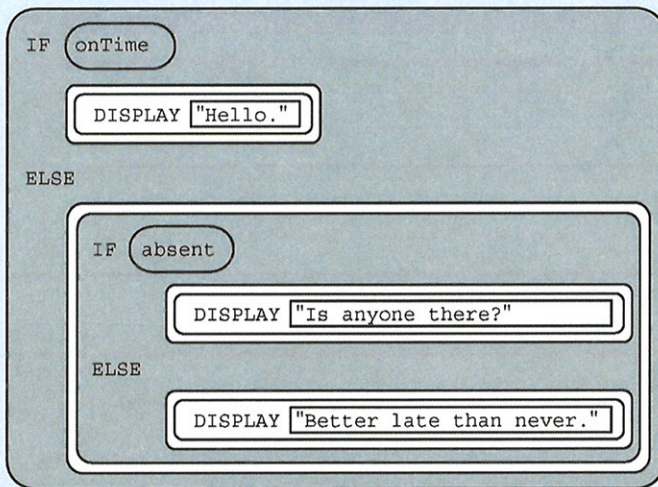
AP COMPUTER SCIENCE PRINCIPLES THROUGH-COURSE PERFORMANCE TASKS (2) (Combined 40% of AP Exam Score):

- Explore – Impact of Computing Innovations | 8 hours (classroom time) | 16% of assessment score
- Create – Application to Ideas |12 hours (classroom time) | 24% of assessment score

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AP COMPUTER SCIENCE PRINCIPLES SAMPLE EXAM QUESTIONS

Sample Multiple-Choice Question

Consider the code segment below.

```
IF (onTime)
    DISPLAY "Hello."
ELSE
    IF (absent)
        DISPLAY "Is anyone there?"
    ELSE
        DISPLAY "Better late than never."
```

If the variables onTime and absent both have the value false, what is displayed as a result of running the code segment?

(A) Is anyone there?

(B) Better late than never.

(C) Hello. Is anyone there?

(D) Hello. Better late than never.

Answer: B

Performance Task: Create – Applications from Ideas

- This performance task focuses on students developing computer programs and describing significant aspects of the program that allow it to run correctly.
  - Students have the flexibility to write programs that reflects their interests (e.g., their desire to solve a problem; program a game; or produce digital art appealing to a specific audience, etc.) This allows students to engage in the study of computer science from a creative perspective. Students will provide evidence of their knowledge of important programming concepts such as developing algorithms and using abstractions. Students are required to submit an individual program but are able to collaborate on the development of their program.

Performance Task: Explore – Impacts of Computing Innovations

- This performance task focuses on students using and applying computational analysis in the exploration of a significant computing innovation to determine and describe the impact of the innovation on people and society.
  - Students select and explore an innovation of their choosing. Then, they create a computational artifact about the innovation and describe how it works and how it used, its purpose, how it consumes and/or produces data, and the harmful and beneficial effects of the innovation on people and society.

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AP Capstone™ Program

AP Capstone™ is an innovative diploma program from the College Board that equips students with the independent research, collaborative teamwork, and communication skills that are increasingly valued by colleges. AP Capstone is built on the foundation of two AP courses — **AP Seminar** and **AP Research** — and is designed to complement and enhance the in-depth, discipline-specific study experienced in other AP courses.

In AP Seminar, students investigate real-world issues from multiple perspectives, gathering and analyzing information from various sources in order to develop credible and valid evidence-based arguments.

In AP Research, students cultivate the skills and discipline necessary to conduct independent research in order to produce and defend a scholarly academic thesis.

Students who earn scores of 3 or higher in AP Seminar and AP Research and on four additional AP Exams of their choosing will receive the AP Capstone Diploma. Students who earn scores of 3 or higher in AP Seminar and AP Research but not on four additional AP Exams will receive the AP Seminar and Research Certificate. AP Seminar may also be taken as a stand-alone option.

AP Seminar Course Overview

AP Seminar is a foundational course that engages students in cross-curricular conversations that explore the complexities of academic and real-world topics and issues by analyzing divergent perspectives. Using an inquiry framework, students practice reading and analyzing articles, research studies, and foundational literary and philosophical texts; listening to and viewing speeches, broadcasts, and personal accounts; and experiencing artistic works and performances. Students learn to synthesize information from multiple sources, develop their own perspectives in research-based written essays, and design and deliver oral and visual presentations, both individually and as part of a team. Ultimately, the course aims to equip students with the power to analyze and evaluate information with accuracy and precision in order to craft and communicate evidence-based arguments.

RECOMMENDED PREREQUISITES

There are no prerequisite courses for the AP Seminar course.

AP Seminar Course Content

Students engage in conversations about complex academic and real-world issues through a variety of lenses, considering multiple points of view. Teachers have the flexibility to choose one or more appropriate themes that allow for deep interdisciplinary exploration based on:

- Concepts or issues from other AP courses
- Student interests
- Local and/or civic issues
- Academic problems or questions
- Global or international topics

Exploring different points of view and making connections across disciplines are fundamental components of the AP Seminar experience. Students consider each topic through a variety of lenses and from multiple perspectives, many of which are divergent or competing. Analyzing topics through multiple lenses aids in interdisciplinary understanding and helps students gain a rich appreciation for the complexity of important issues. Teachers should encourage students to explore a topic through several of the following lenses:

- Cultural and social
- Artistic and philosophical
- Political and historical
- Environmental
- Economic
- Scientific
- Futuristic
- Ethical

Pedagogical Framework

Throughout the program, students consider and evaluate multiple points of view to develop their own perspectives on complex issues and topics through inquiry and investigation. The AP Capstone program provides students with a framework that allows them to develop, practice, and hone their critical and creative thinking skills as they make connections between various issues and their own lives.

Students use the following framework as they explore issues and topics:

- **Q**uestion and Explore
- **U**nderstand and Analyze Arguments
- **E**valuate Multiple Perspectives
- **S**ynthesize Ideas
- **T**eam, Transform, and Transmit

AP Seminar Assessment Structure

Students are assessed with two through-course performance assessment tasks and one end-of-course exam. All three assessments are summative and will be used to calculate a final AP score (using the 1–5 scale) for AP Seminar.

Format of Assessment

Team Project and Presentation | 20% of AP Score

- Individual Research Report
- Team Multimedia Presentation and Defense

Individual Research-Based Essay and Presentation | 35% of AP Score

- Individual Written Argument
- Individual Multimedia Presentation
- Oral Defense

End-of-Course Exam (2 Hours) | 45% of AP Score

- Understanding and analyzing an argument (3 short-answer questions)
- Synthesizing information to develop an evidence-based argument (evidence-based argument essay)

Overview of Assessment Tasks

Team Project and Presentation

In this project, three to five students collaborate as a team to identify a problem or issue. Team members work together to develop a research question; they then identify approaches, perspectives, or lenses for examining the question and divide responsibilities among themselves for individual research.

Individually, students investigate their assigned approach, perspective, or lens on the issue or topic of the team research question. Each student presents his or her findings and analysis to the group in a well-written individual report that

- identifies the area of investigation and its relationship to the overall problem or issue;
- summarizes, explains, analyzes, and evaluates the main ideas and reasoning in the chosen sources;
- identifies, compares, and interprets a range of perspectives about the problem or issue; and
- cites all sources used and includes a list of works cited or bibliography.

Working collaboratively, the team considers all the research and analyses from individual team members for the purpose of proposing one or more solutions or resolutions. The team:

- collaboratively synthesizes and evaluates individual findings and perspectives to create a collective understanding of different approaches to the problem or issue;
- considers potential solutions or resolutions and conducts additional research in order to evaluate different solutions within the context of the problem; and
- proposes one or more solutions or resolutions and prepares an argument to support their proposal.

The team develops an 8–10 minute presentation that presents a convincing argument for the proposed solutions or recommendations. The team should ensure the claims made are supported by evidence and that they have considered different perspectives and the limitations and implications of their proposed solutions or recommendations. The presentation and the media used to enhance the presentation should consider audience, context, and purpose. Following the presentation, the team will defend its argument, with each student responding to a question posed by the teacher. Each team member should be prepared to answer questions about any part of the presentation.

Individual Research-Based Essay and Presentation

On or about Jan. 2 of each year, the College Board will release academic, cross-curricular source material (texts) focused on a theme representing a range of perspectives from each of the following domains:

- Natural Sciences, Technology, Mathematics, Environment
- Social Sciences, Politics, Economics, Psychology
- Arts (Visual Arts, Music, Dance, Theater)
- Culture, Languages, Linguistics
- History
- Literature, Philosophy, Critical Theory/Criticism

The following will be represented in the texts: visual text and/or multimedia and quantitative data.

Students read and analyze the provided stimulus materials to identify thematic connections among the sources and possible areas for inquiry. They compose a research question prompted by their analysis of the stimulus material. They then gather additional information through research; analyze, evaluate, and select evidence; and develop a logical, well-reasoned argument of 2,000 words. The final paper must refer to and incorporate at least one of the sources provided.

Students must avoid plagiarism by acknowledging, attributing and/or citing sources throughout the paper and including a bibliography (see AP Capstone Policy on Plagiarism and Falsification or Fabrication of Information).

Students each develop a 6–8 minute presentation using appropriate media and present it to an audience of their peers. This presentation is an opportunity for students to present their conclusions by building arguments that convey their perspectives. The presentations should use the evidence to support students' own arguments and situate their perspectives in their larger contexts rather than merely summarizing student research. Finally, students defend their research process, use of evidence, and conclusion through oral responses to two questions asked by the teacher.

End-of-Course Exam

During the AP Exam administration window, students will take the AP Seminar End-of-Course Exam. The exam consists of four items (three short-answer and one essay question). The three short-answer questions assess analysis of an argument in a single source or document. The essay question assesses students' skills in synthesizing and creating an evidence-based argument.

AP® RESEARCH
BEGINNING 2015-16 ACADEMIC YEAR

AP®

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AP Research Course Overview

AP Research allows students to deeply explore an academic topic, problem, or issue of individual interest. Through this exploration, students design, plan, and conduct a year-long research based investigation to address a research question.

In the AP Research course, students further their skills acquired in the AP Seminar course by understanding research methodology; employing ethical research practices; and accessing, analyzing, and synthesizing information as they address a research question. Students explore their skill development, document their processes, and curate the artifacts of the development of their scholarly work in a portfolio. The course culminates in an academic paper of approximately 4000–5000 words (accompanied by a performance or exhibition of product where applicable) and a presentation with an oral defense.

RECOMMENDED PREREQUISITES

Students must have successfully completed the AP Seminar course.

AP Capstone Research Course Content

Although the topic of each research study will vary, the course requires students to plan and conduct a study or investigation.

The course provides opportunities (activities/assignments) for students to

- Understand principles of discipline-specific research methods (e.g., qualitative, quantitative, mixed)
- Employ appropriate disciplinary research methods to develop, manage, and conduct an in-depth study or investigation in an area of student's own interest, culminating in a 4000–5000 word paper (accompanied by an additional piece of scholarly work — where applicable — to be performed or exhibited).
- Present (using appropriate media) and defend the research design, approach, and findings to a panel.
- Document their processes and curate the artifacts of the development of their scholarly work in a portfolio.

Pedagogical Framework

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AP Research Assessment Structure

Students are assessed on the academic paper and presentation and oral defense of research. The academic paper is approximately 4,000–5,000 words, and the presentation and defense take approximately 15-20 minutes.

Assessment Overview

- Academic Paper — 75% of score
- Presentation and Oral Defense — 25% of score

Format of Assessment

- Academic Paper
  - Introduces and contextualizes the research question and initial student assumptions and/or hypotheses
  - Reviews previous work in the field to synthesize information and a range of perspectives related to the research question (e.g., Literature Review)
  - Identifies the gap in the current field of knowledge to be addressed
  - Explains and provides justification for the chosen method, process, or approach
  - Presents the findings, evidence, results, or product
  - Interprets the significance of the findings, results, or product; explores connections to original research question
  - Discusses the implications and limitations of the research or creative work
  - Reflects on the process and how this project could impact the field
  - Discusses possible next steps and/or future directions
  - Provides a complete list of sources cited and consulted in the appropriate disciplinary style
- Presentation and Oral Defense
  - All students will develop a 15–20-minute presentation (using appropriate media) and deliver it to an oral defense panel. Students may choose any appropriate format for their presentation, as long as the presentation reflects the depth of their research. Prior to the presentation, students whose academic paper was accompanied by an additional piece of scholarly work (e.g., performance, exhibit, product) will arrange for the teacher and panelists to view the scholarly work.
  - The defense will include three to four questions from a panel consisting of the AP Research teacher and two additional panel members (chosen at the discretion of the AP Research teacher).