

## 505-3-.41 COMPUTER SCIENCE PROGRAM

**(1) Purpose.** This rule states field-specific content standards for approving programs that prepare individuals to teach computer science in grades P-12 and supplements requirements in Rule 505-3-.01, [REQUIREMENTS AND STANDARDS FOR APPROVING EDUCATOR PREPARATION PROVIDERS AND EDUCATOR PREPARATION PROGRAMS](#).

### **(2) Requirements.**

(a) To receive approval, a GaPSC-approved educator preparation provider shall offer a preparation program as described in program planning forms, catalogs, and syllabi, based on the following standards adapted from standards for Computer Science Educators published in 2011 by the International Society for Technology Education (ISTE), and the Computer Science Teachers Association Interim Standards published in 2016:

Standard 1. The program shall prepare candidates who demonstrate computational thinking skills to formalize a problem and express its solution in a way that computers (human and machine) can effectively carry out as indicated by the following:

(i) The program shall prepare candidates who demonstrate knowledge of and ability for applying computational thinking skills including decomposition, abstraction, and pattern recognition in problem solving;

(ii) The program shall prepare candidates who demonstrate skills in devising algorithms for solving computational problems and checking for the correctness of the algorithms;

(iii) The program shall prepare candidates who demonstrate understanding of limitations of computing; and

(iv) The program shall prepare candidates who perform activities demonstrating applications of computational thinking skills.

Standard 2. The program shall prepare candidates who demonstrate proficiency in at least one third-generation programming language such as Java, Python, C, or C++ , as indicated by the following:

(i) The program shall prepare candidates who demonstrate knowledge of and skill regarding the syntax and semantics of a third-generation programming language, its control structures, and its data types;

(ii) The program shall prepare candidates who demonstrate knowledge of and skill regarding common abstraction mechanisms including functions, data structures, and application programming interfaces (APIs);

(iii) The program shall prepare candidates who demonstrate knowledge of and skill in implementing algorithms into robust programs and testing and debugging these programs for correctness;

(iv)The program shall prepare candidates who perform laboratory-based activities that demonstrate programming concepts proficiency in a third-generation programming language; and

(v) The program shall prepare candidates who can document a program so that others can understand its design and implementation.

Standard 3. The program shall prepare candidates who demonstrate proficiency in basic computer system components and organization as indicated by the following:

(i) The program shall prepare candidates who demonstrate knowledge of how data are represented on a computer including bits, bytes, words and binary, and both octal and hexadecimal number systems as well as conversions among them;

(ii) The program shall prepare candidates who demonstrate knowledge of main components of a computer system including CPU, OS, Memory, I/O devices, and peripherals;

(iii) The program shall prepare candidates who demonstrate knowledge of various types of storage options in a computing environment including hard drive, cloud storage, flash drives, DVDs; and

(iv) The program shall prepare candidates who demonstrate knowledge and understanding of how components of a computer system work together to produce programs and applications to solve computational problems.

Standard 4. The program shall prepare candidates who demonstrate proficiency in fundamental principles of computer networks and the Internet as indicated by the following:

(i) The program shall prepare candidates who demonstrate knowledge of network components including hardware and software;

(ii) The program shall prepare candidates who can explain how network topologies and protocols enable users, devices, and systems to communicate and collaborate with each other;

(iii) The program shall prepare candidates who can examine the factors such as bandwidth, latency, and server capability that impact network functionality;

(iv) The program shall prepare candidates who can explain the abstractions in the Internet and how the Internet functions including the assignment of IP addresses, routing, the domain name system (DNS), and the use of protocols; and

(v) The program shall prepare candidates who can explain the characteristics of the Internet and the systems built on it including redundancy, fault tolerance, hierarchy in IP addressing scheme, hierarchy in the DNS and open standards, and the influence of these characteristics on the systems.

Standard 5. The program shall prepare candidates who demonstrate proficiency in effectively and responsibly using computer applications to create digital artifacts, analyze data, model and simulate phenomena suggested by research and/or data as indicated by the following:

(i) The program shall prepare candidates who can effectively use computer applications to create digital artifacts such as audio, video, animation, presentation, and websites;

(ii) The program shall prepare candidates who can extract information from data to discover, explain, and visualize connections or trends;

(iii) The program shall prepare candidates who can create models and simulations to help formulate, test and refine hypotheses;

(iv) The program shall prepare candidates who can form a model from a hypothesis generated from research and run a simulation to collect and analyze data to test that hypothesis; and

(v) The program shall prepare candidates to use industry best practices in application development.

Standard 6. The program shall prepare candidates who demonstrate proficiency and understanding of security, privacy, and safety concerns in computer systems, networks, and applications as indicated by the following:

(i) The program shall prepare candidates who can describe main tenets of information security including confidentiality, integrity, availability, authentication, and nonrepudiation;

(ii) The program shall prepare candidates who can explain fundamental design principles;

(iii) The program shall prepare candidates who can describe types of threats and vulnerabilities to computer systems and the appropriate incident response and handling as well as imaging and backup procedures;

(iv) The program shall prepare candidates who can describe common network vulnerabilities (cyberattacks, identity theft, privacy) and their associated responses;

(v) The program shall prepare candidates who can identify safe, secure, and ethical digital behavior; use effective strategies to evaluate the quality, credibility, and validity of websites; and understand the current and future implications of careless digital decisions;

(vi) The program shall prepare candidates to educate students on their role in the prevention of cyber-bullying and to take an active role in building positive online communities; and

(vii) The program shall prepare candidates to provide students with the ability to use effective search strategies to evaluate the quality, credibility, and validity of websites.

Standard 7. The program shall prepare candidates who plan, organize, deliver, and evaluate instruction that effectively utilizes current technology for teaching computational thinking principles, computer programming and its applications as indicated in the following:

(i) The program shall prepare candidates who identify resources, strategies, activities, and manipulatives appropriate to teaching computer science including related curricular areas, professional teacher and student organizations, and careers;

(ii) The program shall prepare candidates who know how to plan and implement instruction that allows students to use computer science in problem-solving and decision-making situations;

(iii) The program shall prepare candidates who know how to plan and implement instruction using a wide range of instructional strategies for individuals and groups for a diverse student population;

(iv) The program shall prepare candidates who create and implement multiple forms of assessment and use resulting data to gauge student progress and adjust instruction accordingly;

(v) The program shall prepare candidates to prepare students for the emerging technologies and educate them to become responsible digital citizens with safe, secure, ethical and professional digital behavior; and

(vi) The program shall prepare candidates to positively impact the achievement and attainment of underrepresented populations by incorporating instructional strategies to increase their students' intentions to continue advanced studies in computer science.

Standard 8. The program shall prepare candidates who work with business and industry leaders in establishing school/business partnerships and advisory committees and operate student organizations as appropriate.

[Authority O.C.G.A. § 20-2-200](#)