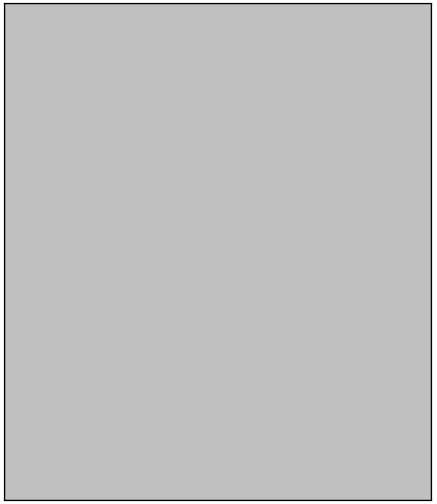
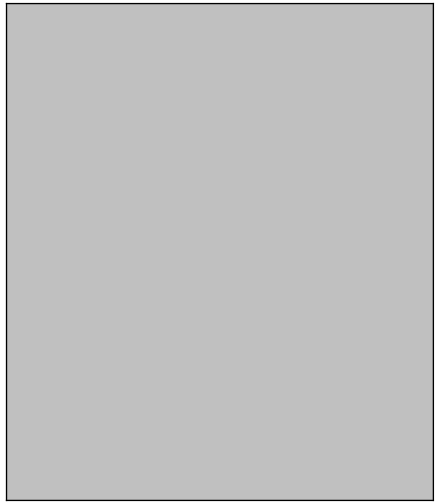
Computer Science

Institutions and Organizations seeking State Approval for programs which prepare and result in the recommendation of candidates for licensure as Educational Computing and Technology Teachers shall be required to demonstrate that they meet the following program standards. The Standards below are an adapted version of the 2001 standards of the International Society for Technology in Education (ISTE) and the National Educational Technology Standards (NETS) for Teachers for the preparation of Educational Computing and Technology Teachers.

Standard I. Programming and Algorithm Design CS endorsement candidates will demonstrate proficiency in programming that requires the use of data abstraction to solve non-trivial programming problems in multiple programming paradigms.			
Elements	Indicators	**Map to Field Experience / Map to Curriculum and Course Experiences**	**Assessment Strategies**
1.1 Laboratory-based Programming Experiences CS endorsement candidates will perform laboratory-based activities that demonstrate programming proficiency in a modern high-level programming language. A sequence of experiences is recommended to provide a connected, orderly approach to computer science during the initial study of the discipline.	Candidates and their students will: • Demonstrate knowledge of and skill regarding the syntax and semantics of a high level programming language, its control structures, and its basic data representations • Demonstrate knowledge of and skill regarding common data abstraction mechanisms (e.g., data types or classes such as stacks, trees, etc.) • Demonstrate knowledge of and skill regarding program correctness issues and practices (e.g., testing program results, test data design, loop invariants)		

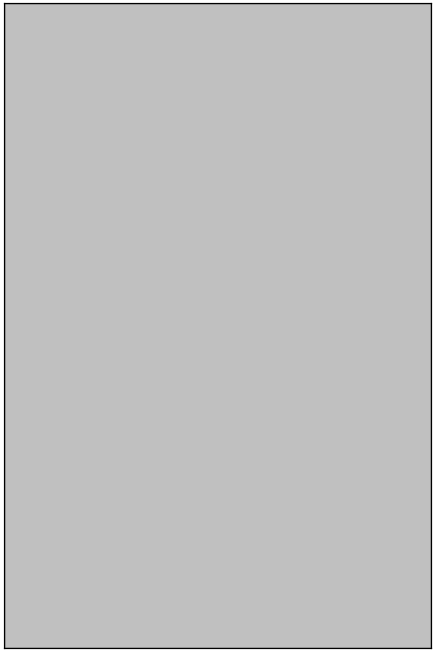
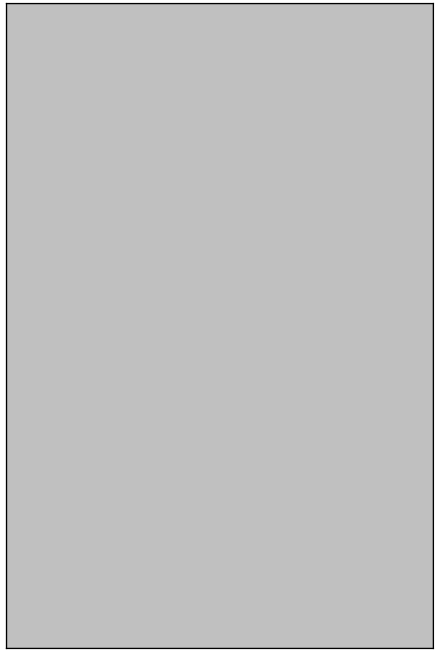
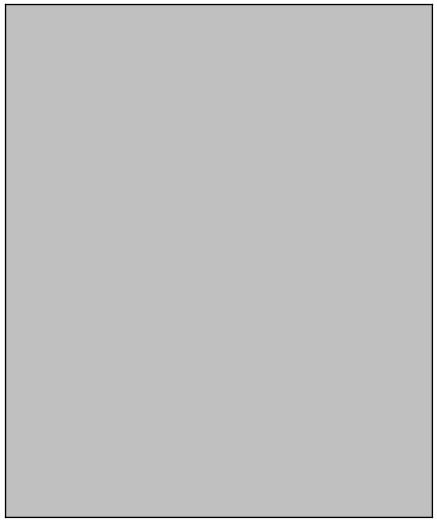
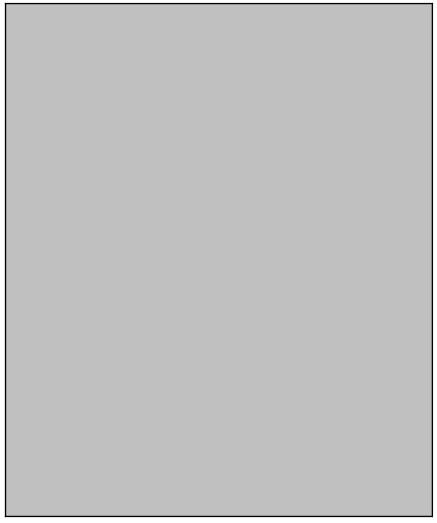
	• Design, implement, and test programs of sufficient complexity to demonstrate knowledge and skills		
1.2 Multiple Paradigms. CS endorsement candidates will demonstrate an understanding of and flexibility with differing approaches/paradigms in programming (e.g., imperative, functional, object-oriented), The endorsement candidates and their students will:	Candidates and their students will: Design, implement, and test programs in languages from two different programming paradigms in a manner appropriate to each paradigm		

Standard 2. Computer Systems--Components, Organization, and Operation			
Description	Indicators	**Map to Field Experience / Map to Curriculum and Course Experiences**	**Assessment Strategies**
CS endorsement candidates will demonstrate in-depth knowledge of how computer systems work individually and collectively.	The candidates and their students will: • Effectively use a variety of computing environments (e.g., single- and multi-user systems and various operating systems) • Describe the operation of a computer system-CPU & instruction cycle, peripherals, operating system, network components, and applications-indicating their purposes and interactions among them		

Standard 3. Data Representation and Information Organization			
Description	**Indicators**	**Map to Field Experience / Map to Curriculum and Course Experiences**	**Assessment Strategies**
CS endorsement candidates will demonstrate an understanding of data and information representation and organization at a variety of levels--machine level representation (for program correctness); data structures (for program implementation); problem representation (for solution design); files and databases (for general applications); and interactions among systems and people (for overall system design and effectiveness).	Candidates and their students will: • Describe how data is represented at the machine level (e.g., character, boolean, integer, floating point) • Identify and provide usage examples of the various data structures and files provided by a programming language (e.g., objects, various collections, files) • Describe the elements (people, hardware, software, etc.) and their interactions within information systems (database systems, the Web, etc.)		

Standard 4. Social Aspects of Computing We live within a cultural environment and interact daily with other people. Computing specialists need to communicate and work with each other and with non-specialists. Specialists and non-specialists need to be cognizant of issues and risks related to computing in our society and to learn independently as new developments in technology arise. CS endorsement candidates will demonstrate skills and understanding relative to social aspects of computing that are appropriate for specialists and non-specialists.

Elements	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
4.1 - Societal Impact and Issues. In order to prepare high school graduates to make informed decisions regarding computing in their personal lives and with respect to societal laws and norms, CS endorsement candidates will demonstrate an understanding of computing and potential issues and skill at recognizing, researching, and analyzing issues to reach defensible conclusions. They will promote understandings relative to social aspects of computing among their secondary students.	Candidates and their students will: • Demonstrate awareness of social issues related to the use of computers in society and principles for making informed decisions regarding them (e.g., security, privacy, intellectual property, equitable access to technology resources, gender issues, cultural diversity, differences in learner needs, limits of computing, rapid change) • Analyze various social issues involving computing, producing defensible conclusions • Demonstrate an understanding of significant historical events relative to computing		

4.2 - Independent Learning and Communication CS endorsement candidates will demonstrate the ability to help their students learn independently about computing and communicate what has been learned to others.	Candidates will: • Conduct independent learning on specific, unfamiliar topics in general areas central to computer science and provide their students with opportunities to do the same • Produce and present reports of substantial independent learning and provide their students with opportunities to do the same		
4.3 - Collaborative Software Development. CS endorsement candidates will demonstrate knowledge and experience in collaborative software development and provide opportunities for their students to do the same. CS endorsement candidates and their students will:	Candidates will: • Participate in team software development projects that apply sound software engineering principles		

Standard 5. Planning Instruction			
Description	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
CS endorsement candidates will demonstrate an understanding of the teaching tasks and approaches and be able to apply and evaluate them with respect to the students in their computer science classes. Evidence of these capabilities should include examples of student performance resulting from this planning.	Candidates will: • Identify resources, strategies, activities, and manipulatives appropriate to teaching secondary computer science • Plan lessons/modules/courses related to each of programming process, knowledge/concepts, and issue examination • Develop assessment strategies appropriate to lesson goals and the need to provide student feedback • Perform course and lesson planning that addresses student population characteristics (e.g., academic ability, cultural experience, gender)		

Standard 6. Classroom and Field Experiences in Computer Science--Delivering Instruction			
Description	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
CS endorsement candidates will observe and participate in instructional planning and delivery in secondary computer science classrooms. Evidence should include some examples of effects on student performance.	Candidates will: • Observe and discuss the teaching of secondary computer science • Participate in the teaching of secondary computer science (lab assistant, tutoring, miniteaching, etc.) • Plan and deliver a unit of instruction		

Standard 7. Classroom & Course Management.			
Description	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
CS endorsement candidates will apply methods and skills appropriate to the management of the secondary computer science classroom. Evidence should include some examples of effects on student performance.	Candidates will: • Plan direct instruction involving simultaneous use of computing facilities by students (e.g., holding class in the lab, closed labs) • Plan instruction involving students independently using computing facilities		

Standard 8. Instructional Assessment.			
Description	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
Reflection upon one's own performance as a teacher is essential for improving that performance. Thus, teacher candidates will examine and work to improve their teaching practice. Assessing secondary student performance is essential to determining success in teaching practice, as well.	Candidates will: • Develop a personal plan for evaluating their own practice of teaching • Make use of their plan for self-evaluation in the instructional delivery activities • Develop assessment criteria and procedures to determine successful performance and analyze results to improve instructional practice.		

Standard 9. Professional Development.			
Description	Indicators	Map to Field Experience / Map to Curriculum and Course Experiences	Assessment Strategies
CS endorsement candidates must recognize and plan for ongoing professional development that will be needed to sustain themselves and their students.	Candidates will: • Discuss guidance roles and possible enrichment activities for secondary computer science students (e.g., computing career guidance, preparation for college, gender equity, cultural diversity, and extracurricular activities such as computer clubs and organized competitions) • Plan for professional growth after identifying professional computer science and computer science education societies, organizations, groups, etc. that provide professional growth opportunities and resources		

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