

Exploring Computer Science Objectives Alignment with Texas Essential Knowledge and Skills Fundamentals of Computer Science

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The Exploring Computer Science (ECS) course and curriculum was developed under the auspices of the National Science Foundation (NSF). This course was designed as an introductory course to the discipline of Computer Science. The focus of this course is on the primary concepts of computing, fundamental computational practices, and developing problem solving skills using basic programming. This course was originally developed in the Los Angeles Unified School District. The course has been revised and is in its fifth revision. Upon close evaluation, the ECS course matches well with the Texas Essential Knowledge and Skills (TEKS) course Fundamentals of Computer Science (FCS) found in Chapter 126, Subchapter C, High School, Technology Application Courses. The following is a crosswalk alignment between these two courses.

In this crosswalk, ECS objectives are aligned with TEKS standards. For a curriculum to be implemented in the State of Texas it must have a 100% alignment with the TEKS. The ECS course does align with 100% of the FCS TEKS objectives. However, the ECS scope and sequence does assign different weights to objectives and some FCS TEKS standards are not substantially covered. If the ECS course is adopted, as a curriculum in Texas, it is recommended that these weak areas be supplemented. With appropriate supplementary activities, ECS is an excellent curriculum for meeting the TEKS objectives of FCS.

To help identify which FCS TEKS objectives would benefit from supplemental resources, each ECS objective-FCS standard match is assigned an alignment strength that identifies the completeness and depth that ECS covers the intended outcome of the FCS TEKS. There are four ratings using in this alignment; strong, moderate, weak, and very weak. Ratings of strong and moderate indicate that there is a complete match between the ECS objective and the FCS TEKS objective. A weak rating indicates that the FCS TEKS objective is covered but that supplemental material and instruction is recommended. The final rating of very weak indicates that the ECS course barely covers the FCS TEKS objective. An alignment rating of very weak suggests that additional resources should be utilized to supplement the mastery of this TEKS objective.

Strong	Exhaustive and Rich Alignment
Moderate	Complete Alignment
Weak	Acceptable Alignment with supplemental resources suggested
Very Weak	Acceptable Alignment with additional resources recommended

Table1: Legend for strength of ECS objective-FCS standard match

Crosswalk Mapping ECS Objectives to FCS TEKS

ECS Objectives	Alignment Strength	FCS TEKS
1. Computer and the internet		
1.1. Hardware components	<i>Strong</i>	6.A. demonstrate knowledge of the basic computer components, including a central processing unit (CPU), storage, and input/output devices
	<i>Very Weak</i>	6.D. demonstrate knowledge and understanding of basic network connectivity
1.2. Software components	<i>Strong</i>	6.C. demonstrate knowledge and appropriate use of different operating systems
1.3. Interaction components	<i>Strong</i>	1.G. design creative and effective user interfaces
	<i>Weak</i>	4.B. find, download, and insert scripting code into web pages to enhance interactivity
1.4. Selection of appropriate components	<i>Weak</i>	6.B. use operating system tools, including appropriate file management
	<i>Very Weak</i>	4.A. demonstrate the ability to insert applets into web pages
1.5. Search engine fundamentals	<i>Strong</i>	3.A. construct appropriate search strategies
1.6. Collaborative tools	<i>Very Weak</i>	6.E. describe, compare, and contrast the differences between an application and an operating system
1.7. Evaluating websites	<i>Very Weak</i>	1.F. use the Internet to create and publish solutions
1.8. Security on the internet	<i>n/a</i>	<i>no applicable TEKS standard</i>
2. Models of intelligent behavior		
2.1. What is intelligence?	<i>n/a</i>	<i>no applicable TEKS standard</i>
2.2. Computers vs. humans	<i>n/a</i>	<i>no applicable TEKS standard</i>
3. Algorithms and abstraction		
3.1. Understanding the problem	<i>Strong</i>	4.D. read and define a problem's description, purpose, and goals
3.2. Exploring problems: problem solving heuristics and strategies.	<i>Strong</i>	1.D. create algorithms for the solution of various problems
3.3. Design creation and representation	<i>Strong</i>	4.I. demonstrate an understanding of and use sequence within a programmed story, game, or animation
3.4. Problem data	<i>Strong</i>	4.L. create an interactive story or animation
3.5. Solution accuracy	<i>Strong</i>	4.N. test program solutions by investigation valid and invalid data

3.6. Design re-evaluation and refinement	<i>n/a</i>	<i>no applicable TEKS standard</i>
3.7. Decompose the complex	<i>n/a</i>	<i>no applicable TEKS standard</i>
3.8. Communicate results	<i>n/a</i>	<i>no applicable TEKS standard</i>
3.9. Algorithm efficiency	<i>n/a</i>	<i>no applicable TEKS standard</i>
3.10. Computational intensive problems	<i>Weak</i>	4.K. demonstrate an understanding of and use iteration within a programmed story, game, or animation
3.11. Unsolvable problem for a computer	<i>n/a</i>	<i>no applicable TEKS standard</i>
3.12. Computationally hard problem	<i>n/a</i>	<i>no applicable TEKS standard</i>

4. Connections between mathematics and computer science

4.1. Logic	<i>Strong</i>	4.J. demonstrate an understanding of an use conditional statements within a programmed story, game, or animation
4.2. Binary number system	<i>Strong</i>	4.C. understand binary representation of data in computer systems, perform conversions between decimal and binary systems, and count in binary number systems
4.3. Basic Sets	<i>Weak</i>	4.M. use random numbers within a programmed story, game, or, animation
4.4. Concepts of function	<i>Moderate</i>	4.H. demonstrate proficiency in the use of arithmetic operators to create mathematical expressions including addition, subtraction, multiplication, real division, integer division, and modulus division.
4.5. De. Morgan's laws	<i>n/a</i>	<i>no applicable TEKS standard</i>
4.6. Graphics	<i>n/a</i>	<i>no applicable TEKS standard</i>

5. Creating computational artifacts

5.1. Break a problem statement into specific requirements	<i>Strong</i>	1.C. create and publish interactive animations
5.2. Design a solution to a problem	<i>Strong</i>	1.B. create and publish interactive stories, games, and animations
5.3. Choose appropriate tools and techniques	<i>Weak</i>	1.E. create web pages using a mark-up language
5.4. Code a solution from a design	<i>Strong</i>	4.E. demonstrate coding proficiency in a contemporary programming language by developing solutions that create stories, games, and animations
5.5. Test a solution to identify errors	<i>Strong</i>	2.B. debug and solve problems using reference materials and effective strategies

5.6. Refine solution	<i>Moderate</i>	2.A. seek and respond to advice from peers and professionals in evaluating problem solutions
5.7. Documentation and justification	<i>Moderate</i>	2.C. publish information in a variety of ways such as print, monitor display, web pages, and video

6. Data and information

6.1. Representation and storage	<i>Strong</i>	4.F. choose, identify, and use the appropriate data type to properly represent data in a problem solution
6.2. Methods for collection and generation	<i>Strong</i>	4.G. demonstrate an understanding of and use variables within a programmed story, game, or animation
6.3. Patterns, trends, and discoveries.	<i>Strong</i>	3.B. use a variety of resources, including other subject areas, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
6.4. Evaluation	<i>Moderate</i>	6.F. compare, contrast, and appropriately use various input, processing, output, and primary/secondary storage devices
6.5. Computational models	<i>n/a</i>	<i>no applicable TEKS standard</i>
6.6. Rapid testing	<i>n/a</i>	<i>no applicable TEKS standard</i>

7. Societal impacts of computing

7.1. Fostering innovation	<i>n/a</i>	<i>no applicable TEKS standard</i>
7.2. Legal and ethical concerns	<i>n/a</i>	<i>no applicable TEKS standard</i>
7.3. Privacy and cyber security	<i>Strong</i>	5.C. investigate measures such as passwords or virus detection/prevention to protect computer systems and data basis from unauthorized use and tampering
7.4. Exploitation of information	<i>Strong</i>	5.D. demonstrate the safety risks associated with the use of social networking sties
7.5. Intellectual property	<i>Strong</i>	5.A. discuss copyright laws/issues and model ethical acquisition of digital information by citing sources using established models
7.6. Limits on information access	<i>Strong</i>	5.F. determine the reliability of information available through electronic media
7.7. Cultural influence	<i>Strong</i>	5.E. discuss the impact of computing and computing related advancements on society
7.8. Equity, access, and power	<i>Strong</i>	1.A. investigate and explore various career opportunities within computer science field and report findings through various media

7.9. Social and economic values	<i>Strong</i>	5.B. demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks, especially resources on the internet and on intranets
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Crosswalk Mapping FCS TEKS to ECS Objectives

FCS TEKS	Alignment Strength	ECS Objectives
1. Creativity and innovation		
1.A. investigate and explore various career opportunities within computer science field and report findings through various media	<i>Strong</i>	7.8. Equity, access, and power
1.B. create and publish interactive stories, games, and animations	<i>Strong</i>	5.2. Design a solution to a problem
1.C. create and publish interactive animations	<i>Strong</i>	5.1. Break a problem statement into specific requirements
1.D. create algorithms for the solution of various problems	<i>Strong</i>	3.2. Exploring problems: problem solving heuristics and strategies.
1.E. create web pages using a mark-up language	<i>Weak</i>	5.3. Choose appropriate tools and techniques
1.F. use the Internet to create and publish solutions	<i>Very Weak</i>	1.7. Evaluating websites
1.G. design creative and effective user interfaces	<i>Strong</i>	1.3. Interaction components
2. Communication and collaboration		
2.A. seek and respond to advice from peers and professionals in evaluating problem solutions	<i>Moderate</i>	5.6. Refine solution
2.B. debug and solve problems using reference materials and effective strategies	<i>Strong</i>	5.5. Test a solution to identify errors
2.C. publish information in a variety of ways such as print, monitor display, web pages, and video	<i>Moderate</i>	5.7. Documentation and justification
3. Research and information fluency		
3.A. construct appropriate search strategies	<i>Strong</i>	1.5. Search engine fundamentals
3.B. use a variety of resources, including other subject areas, together with various productivity tools to gather authentic data as a basis for individual and group programming projects	<i>Strong</i>	6.3. Patterns, trends, and discoveries.

4. Critical thinking, problem solving, and decision making

4.A. demonstrate the ability to insert applets into web pages	<i>Very Weak</i>	1.4. Selection of appropriate components
4.B. find, download, and insert scripting code into web pages to enhance interactivity	<i>Weak</i>	1.3. Interaction components
4.C. understand binary representation of data in computer systems, perform conversions between decimal and binary systems, and count in binary number systems	<i>Strong</i>	4.2. Binary number system
4.D. read and define a problem's description, purpose, and goals	<i>Strong</i>	3.1. Understanding the problem
4.E. demonstrate coding proficiency in a contemporary programming language by developing solutions that create stories, games, and animations	<i>Strong</i>	5.4. Code a solution from a design
4.F. choose, identify, and use the appropriate data type to properly represent data in a problem solution	<i>Strong</i>	6.1. Representation and storage
4.G. demonstrate an understanding of and use variables within a programmed story, game, or animation	<i>Strong</i>	6.2. Methods for collection and generation
4.H. demonstrate proficiency in the use of arithmetic operators to create mathematical expressions including addition, subtraction, multiplication, real division, integer division, and modulus division.	<i>Moderate</i>	4.4. Concepts of function
4.I. demonstrate an understanding of and use sequence within a programmed story, game, or animation	<i>Strong</i>	3.3. Design creation and representation
4.J. demonstrate an understanding of an use conditional statements within a programmed story, game, or animation	<i>Strong</i>	4.1. Logic
4.K. demonstrate an understanding of and use iteration within a programmed story, game, or animation	<i>Weak</i>	3.10. Computational intensive problems
4.L. create an interactive story or animation	<i>Strong</i>	3.4. Problem data
4.M. use random numbers within a programmed story, game, or, animation	<i>Weak</i>	4.3. Basic Sets
4.N. test program solutions by investigation valid and invalid data	<i>Strong</i>	3.5. Solution accuracy

5. Digital citizenship

5.A. discuss copyright laws/issues and model ethical acquisition of digital information by citing sources using established models	<i>Strong</i>	7.5. Intellectual property
5.B. demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks, especially resources on the internet and on intranets	<i>Strong</i>	7.9. Social and economic values
5.C. investigate measures such as passwords or virus detection/prevention to protect computer systems and data basis from unauthorized use and tampering	<i>Strong</i>	7.3. Privacy and cyber security
5.D. demonstrate the safety risks associated with the use of social networking sties	<i>Strong</i>	7.4. Exploitation of information
5.F. determine the reliability of information available through electronic media	<i>Strong</i>	7.6. Limits on information access
5.E. discuss the impact of computing and computing related advancements on society	<i>Strong</i>	7.7. Cultural influence

6. Technology operations and concepts

6.A. demonstrate knowledge of the basic computer components, including a central processing unit (CPU), storage, and input/output devices	<i>Strong</i>	1.1. Hardware components
6.B. use operating system tools, including appropriate file management	<i>Weak</i>	1.4. Selection of appropriate components
6.C. demonstrate knowledge and appropriate use of different operating systems	<i>Strong</i>	1.2. Software components
6.D. demonstrate knowledge and understanding of basic network connectivity	<i>Very Weak</i>	1.1. Hardware components
6.E. describe, compare, and contrast the differences between an application and an operating system	<i>Very Weak</i>	1.6. Collaborative tools
6.F. compare, contrast, and appropriately use various input, processing, output, and primary/secondary storage devices	<i>Moderate</i>	6.4. Evaluation

7. Enrichment

<i>no applicable TEKS standard</i>	<i>n/a</i>	1.8. Security on the internet
<i>no applicable TEKS standard</i>	<i>n/a</i>	2.1. What is intelligence?
<i>no applicable TEKS standard</i>	<i>n/a</i>	2.2. Computers vs. humans
<i>no applicable TEKS standard</i>	<i>n/a</i>	3.6. Design re-evaluation and refinement
<i>no applicable TEKS standard</i>	<i>n/a</i>	3.7. Decompose the complex
<i>no applicable TEKS standard</i>	<i>n/a</i>	3.8. Communicate results
<i>no applicable TEKS standard</i>	<i>n/a</i>	3.9. Algorithm efficiency

<i>no applicable TEKS standard</i>	<i>n/a</i>	3.11. Unsolvable problem for a computer
<i>no applicable TEKS standard</i>	<i>n/a</i>	3.12. Computationally hard problem
<i>no applicable TEKS standard</i>	<i>n/a</i>	4.5. De. Morgan's laws
<i>no applicable TEKS standard</i>	<i>n/a</i>	4.6. Graphics
<i>no applicable TEKS standard</i>	<i>n/a</i>	6.5. Computational models
<i>no applicable TEKS standard</i>	<i>n/a</i>	6.6. Rapid testing
<i>no applicable TEKS standard</i>	<i>n/a</i>	7.1. Fostering innovation
<i>no applicable TEKS standard</i>	<i>n/a</i>	7.2. Legal and ethical concerns