NEVADA DEPARTMENT OF EDUCATION

SUPPORT DOCUMENT

Computer Education and Technology
Half-credit graduation requirement
October 16, 2019

Nevada Department of Education

Nevada Ready!

Table of Contents

Overview:

Note to Districts

Please use this document to inform the scope and goals for your teachers. Curriculum and instructional material resources are available for the standards on the Nevada Department of Education website and the STEMHub CSforNV pages.

Purpose

Senate Bill 200, passed by the Nevada Legislature and signed into law by Governor Brian Sandoval on June 15, 2017, broadens the participation of students with regards to computer science (CS) education. It outlines certain changes in Nevada's Computer Education and Technology instruction to include computer science and computational thinking, applying credit in certain CS courses towards high school graduation, certain CS courses to fulfil requirements for Millennium Scholarship eligibility, teacher professional development (PD) requirements for computer education and technology, the appointment of a computer science subcommittee under the Governor's Advisory Council on Science, Technology, Engineering, and Mathematics (STEM) to make recommendations concerning instruction, and to provide appropriations for districts to satisfy the requirements of this bill.

Background

Members of the Nevada state legislature led by Senators Woodhouse, Denis, Ford, Spearman, Cancela, Atkinson, Cannizzaro, Gansert, Manendo, Parks, Ratti, and Segerblom, including joint sponsors Assemblymen Carlton, Frierson, and Fumo, recognized the skills gap in our current computer education and technology instruction with regards to computer science and computational thinking, and drafted this bill to strengthen the current computer technology education we have in Nevada and broaden it to include CS and computational thinking practices, and to increase the equity and diversity of instruction to all students in all districts, thereby giving them greater opportunities in their future college and career paths.

Definitions

Computer Literacy: the general use of computers and programs, such as productivity software. Examples include performing an internet search and creating a digital presentation.[1]

Educational Technology: applies computer literacy to school subjects. For example, students in an English class can use a web-based application to collaboratively create, edit, and store an essay online.[1]

Digital Citizenship: refers to the appropriate and responsible use of technology, such as choosing an appropriate password and keeping it secure.[1]

Computer Science: the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society.[2]

Computational Thinking: is a way of solving problems, designing systems, and understanding human behavior that draws on concepts fundamental to computer science… a fundamental skill for everyone, not just computer scientists.[3]

Computer Education and Technology (CET)

Senate Bill 200: Section 3.2

This section states:

> ***If the State Board prescribes a course in computer education and technology pursuant to NRS 385.114 for pupils enrolled in high school, the State Board shall adopt regulations prescribing the percentage of the instructional time for the course that must be dedicated to computer science and computational thinking, which may include, without limitation, instruction in logic, coding, robotics and cyber security.***

The provisions in Section 3 became ***effective July 1, 2018***, to allow time for districts and schools to make the necessary changes in the curriculum throughout the 2018-2019 school year. These provisions in the law became actively in place for the 2019-2020 school year.

Regulation R078-18

Regulation R078-18 was approved by the State Board on August 30, 2018. This regulation prescribes for each of the different diploma types, that the current ½ credit high school "use of computers" or "computer literacy" subject area will be renamed to Computer Education and Technology (as referenced in S.B. 200) and states that any course developed to satisfy this requirement must include AT LEAST 50% of computer science and computational thinking in addition to the current computer literacy instruction (digital citizenship, applications, and so forth).

The study of computer applications, technology, and digital citizenship is not going away. Instruction will just be enhanced to include computer science and computational thinking. Many districts are naming their course "Computer Science and Applications" to help clarify the two areas working together.

Computer Education and Technology Standards (CET)

The half-credit course required for high school graduation is sometimes taught in middle school in some districts. The standards used, however, consist of the high school set of standards (K-12 Computer Science AND K-12 Integrated Technology) with some middle school standards incorporated for continuity of subject matter. These middle school standards will essentially "drop off" of the list once continuity of instruction is rolled out completely from Kindergarten moving forward. For now, those middle school standards referenced are to bridge that knowledge gap and are NOT meant to be directed to middle school specific instruction.

> ***Again, this is a high school graduation requirement and the course created MUST be built upon those high school level standards and taught at that same level a student would attain in a high school level course. In addition, as a high school graduation requirement, this course must receive a letter grade (A – F) vs. a Pass/Fail no matter what grade level it is taught in.***

The subset of standards to be used specifically by districts for creating this half-credit course (Computer Science and Applications) can be found in Appendix A of this document.

This course brings together a subset of the Nevada K-12 Computer Science Standards and the entire K-12 Integrated Technology Standards (formally known as Educational Technology standards that were used in the former Digital Literacy/Computer Literacy courses) for a complete blend of skills that all students should have and know how to do in this CET subject area.

Frequently Asked Questions

There have been many questions surrounding the changes to this course requirement. This document will attempt to answer those questions.

1. What is this required course for graduation in computer education and technology being called now?
    a. Computer Education and Technology (formally called Use of Computers) is the subject area. Most districts who are developing the course are calling it Computer Science and Applications to provide clarity around the subject matter being taught.
2. What is the SCED code districts should be using to identify this graduation course in their information system?
    a. The SCED to be used for this half-credit graduation course is 10049.
3. What are the regulations pertaining to this course?
    a. NAC 389.450 and NAC 389.664
4. What is the percentage of computer science being taught in the course, versus (for example) application software?
    a. The Computer Science Subcommittee of the Governor's STEM Advisory Council made the recommendation to the State Board for 50% instructional time in computer science and computational thinking and 50% instructional time on learning the productivity tools. Digital citizenship is a component of both. These recommendations were approved by the State Board on August 30, 2018.
5. What high school standards are being used in this course?
    a. The standards that comprise this subject area are a subset of the Nevada K-12 Computer Science Standards and all of the Nevada K-12 Integrated Technology Standards (see Appendix A). A course developed can be an entire half-credit course or part of a year-long computer science course as long as these standards are covered at the appropriate level.
6. What is the content level of this course?
    a. This course is a requirement for graduation from high school; therefore the standards included are primarily high school level standards. A few middle school level K-12 Computer Science and K-12 Integrated Technology standards are included for continuity and clarity of subject matter until we bridge that knowledge gap in the coming years as the K-8 standards are being taught. Those few middle school standards referenced will eventually drop off to only include the high school standards.
7. Can this half credit class towards graduation still be taught in middle school?
    a. Yes. This high school course may still be taught in 6th, 7th, or 8th grade. If a student has taken this course in middle school, they DO NOT take it again in high school.
8. What training/license endorsement will a teacher need to teach this course?
    a. We have a document that outlines what an educator needs to have in order to teach specific computer science courses. Please click here to view that document. Basically if a teacher has been currently teaching this course, then additional training on computer science is highly recommended through RPDP or another party. If a new teacher will be teaching this course for the first time then they must get the new endorsement to teach computer technology-based applications and computational thinking. Please visit the Nevada Department of Education's Office of Educator Licensure page for more information.
9. Will this semester-long half credit class count towards the requirement in Senate Bill 200 Section 2 that states all high schools must offer a computer science course by July 1, 2022?
    a. Not as it stands, however, please see question 12.

10. Can this semester-long half credit class count in any way towards a fourth-math or third-science credit?
    a. No
11. Are there any other courses that may count as a substitution for this course, either in middle school or in high school?
    a. A course that covers the same standards as outlined in Appendix A for the Computer Science and Applications course may count towards this half-credit graduation requirement. That course MUST include all of these standards.
    b. The chosen course to count towards this half-credit graduation requirement must have the SCED code 10049 attached to it in some form, signifying it is counting towards the CET credit and for student data tracking purposes. For any questions regarding SCED codes, please contact the Data Office at the Department of Education.
12. Does the current AP Computer Science Principles course satisfy the half-credit graduation requirement?
    a. No, however:
        i. If a student takes an AP Computer Science Principles (AP CSP) course that has been enhanced to include the subset of technology standards as outlined in Appendix A, and meets all requirements of the College Board for AP coursework, then that enhanced AP CSP course WILL meet the half-credit graduation requirement.
        ii. This enhanced AP CSP course may still count towards a fourth-math or third-science credit and satisfy the Senate Bill 200 Section 2 requirement that all high schools must offer a computer science course by July 1, 2022.
        iii. If this enhanced AP CSP course is going to be used to satisfy both the half-credit graduation requirement and count as a fourth-math or third-science credit, this course will still only count for 1-credit, so the student will need to make up that half-credit towards their total graduation credit requirements through another elective half-credit course.
13. Is there a “test-out” option for this course allowed?
    a. No, not at this time.

Appendix A

Required Computer Science and Integrated Technology Standards

The required computer science and integrated technology standards that must be included in any course that counts for the half-credit graduation requirement in the Computer Education and Technology subject area are listed in this Appendix by concept and sub-concept or by focus area. There are 32 standards in each subject (computer science and integrated technology). Instructors are encouraged to use multiple standards at one time when designing their lesson plans, as they complement each other.

Computer Science

CONCEPT: Algorithms and Programming

Algorithms:
9-12.AP.A.1 – Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.

(For subject-matter context: 6-8.AP.A.1- Use flowcharts and/or pseudocode to address complex problems as algorithms.)

Variables:
(For subject-matter context: 6-8.AP.V.1 - Create clearly named variables that represent different data types and perform operations on their values.)

Control:
9-12.AP.C.1 - Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.
9-12.AP.C.2 –Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.

(For subject-matter context: 6-8.AP.C.1 - Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.)

Modularity:
9-12.AP.M.1 - Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

(For subject-matter context: 6-8.AP.M.2 -Create procedures with parameters to organize code and make it easier to reuse.)

Program Development:
9-12.AP.PD.2 - Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.
9-12.AP.PD.4 - Design and develop computational artifacts working in team roles using collaborative tools.

(For subject-matter context:
6-8.AP.PD.2 - Incorporate existing code, media, and libraries into original programs, and give attribution.
6-8.AP.PD.4 - Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.)

CONCEPT: Computing Systems

Devices:
9-12.CS.D.1 - Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.

(For subject-matter context: 6-8.CS.D.1- Recommend improvements to the design of computing devices based on an analysis of how users interact with the devices, noting that advantages may have disadvantages and unintended consequences.)

Hardware/Software:
9-12.CS.HS.1 - Compare levels of abstraction and interactions between application software, system software, and hardware layers.

(For subject-matter context: 6-8.CS.HS.1- Design and evaluate projects that combine hardware and software components to collect and exchange data.)

Troubleshooting:
9-12.CS.T.1 - Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.

CONCEPT: Data and Analysis

Storage:
9-12.DA.S.1 - Translate between different bit representations of real-world phenomena, such as characters, numbers, and images (e.g., convert hexadecimal colors to decimal percentages, ASCII/Unicode representation).
9-12.DA.S.2 - Evaluate the tradeoffs in how data elements are organized and where data is stored.

Collection/Visualization/Transformation:
9-12.DA.CVT.1 - Create interactive data visualizations or alternative representations using software tools to help others better understand real-world phenomena.

(For subject-matter context: 6-8.DA.CVT.1 – Collect data using computational tools and transform the data to make it more meaningful and useful.)

Inference/Models: none

CONCEPT: Impacts of Computing

Culture:
9-12.IC.C.1 - Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
9-12.IC.C.2 - Test and refine computational artifacts to reduce bias and equity deficits.

(For subject-matter context:
6-8.IC.C.1 - Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.
6-8.IC.C.2 - Discuss and evaluate issues of bias and accessibility in the design of existing technologies.)

Social Interactions:
9-12.IC.SI.1 - Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.

Safety, Law, and Ethics:
9-12.IC.SLE.2 - Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.
9-12.IC.SLE.3 - Evaluate the social and economic implications of privacy in the context of safety, law, or ethics.

(For subject-matter context: 6-8.IC.SLE.1 –Identify risks associated with sharing information digitally (e.g., phishing, identity theft, hacking).

CONCEPT: Networks and the Internet

Network/Communication/Organization:
9-12.NI.NCO.1 - Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.

Cybersecurity:
9-12.NI.C.1 - Give examples to illustrate how sensitive data can be affected by malware and other attacks.

(For subject-matter context: 6-8.NI.C.1 – Explain how physical and digital security measures protect electronic information.)

Computer Science & Computational Thinking Overall Topics Covered

TOPIC	TOPIC	TOPIC	TOPIC	TOPIC	TOPIC
flowcharts	creating prototypes	giving attribution	using libraries	collaborating and project management	working in teams to develop an artifact
creating variables	designing programs with loops and conditionals	justifying the selection of control structures	designing artifacts to address a societal issue	using procedures with parameters	exchanging data
abstraction within system software/ hardware layers	recommending improvements to a device based on user analysis	how to identify and fix errors,	where data is stored	collect and visualize data	discuss bias and accessibility
test artifacts to reduce bias	evaluate ways people use computing	identify risks with identity theft/hacking	evaluate privacy concerns	explain security measures needed to protect data	describe relationship between routers and switches

Integrated Technology

FOCUS AREA: Empowered Learner

9-12.EL.A.1 – *Actively assimilate and revise personal and career goals, select and manage current and emerging technologies to achieve them, and reflect on their successes and areas of improvement in working toward their goals.*
9-12.EL.B.1 - *Consistently engage in online social networks as a means to access and promote lifelong learning in collaboration with global peers.*
9-12.EL.C.1 – *Regularly revise their work habits and attitudes based on feedback from others and from functionalities embedded in digital tools to improve their learning process, and they select or creatively use technologies to share their learning in ways that are useful to others.*
9-12.EL.D.1 - *Successfully use a variety of existing technologies to develop criteria and identify new digital tools and resources from emerging technologies to accomplish a defined task with fluency and ease.*

FOCUS AREA: Digital Citizen

9-12.DC.A.1 - *Analyze their digital identities and reputations within school policy to consider social media's impact on society, including demonstrating an understanding of how digital actions may have positive or negative implications for their future.*
9-12.DC.B.1 - *Demonstrate and advocate for positive, safe, legal, and ethical habits when using technology and when interacting with others online.*
9-12.DC.B.2 - *Distinguish potential dangers while online (e.g., malicious actors, phishing, impersonation) to prevent, detect, and combat cybersecurity threats while practicing safe and secure techniques, tactics, and practices recognizing cybersecurity is everyone's responsibility.*
9-12.DC.C.1 - *Advocate and demonstrate a respect for intellectual property with both print and digital media—including copyright, permission and fair use—by creating a variety of media products that include appropriate citation and attribution elements.*
9-12.DC.D.1 - *Demonstrate an understanding of what personal data is and how to keep it private and secure, including the awareness of terms such as encryption, HTTPS, password strength, cookies, phishing, and computer viruses; understand the limitations of data management and how data-collection technologies work.*

FOCUS AREA: Knowledge Constructor

9-12.KC.A.1 - *Plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.*
9-12.KC.B.1 - *Evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources in the school and career setting.*
9-12.KC.C.1 - *Curate information from digital resources, including online databases and catalogs, for research using a variety of tools and methods to create collections of artifacts that support their learning and career goals.*
9-12.KC.D.1 - *Explore real-world issues and problems through inquiry and analysis, develop ideas, actively create solutions for them, and evaluate and revise through the use of digital tools.*

FOCUS AREA: Innovative Designer

9-12.ID.A.1 **-** *Engage in a design process and employ it to inquire and analyze, generate ideas, create innovative products or solve authentic problems, and evaluate the process to revise if needed.*
9-12.ID.B.1 - *Creatively use digital tools to support a design process and expand their understanding to identify constraints, trade-offs, and to weigh risks.*

9-12.ID.C.1 - *Engage in a cyclical design process to inquire and analyze, develop ideas, test, and revise prototypes, presenting finished products and best practices learned during the development.*
9-12.ID.D.1 - *Demonstrate an ability to persevere and handle greater ambiguity as they work to solve open-ended problems.*

FOCUS AREA: Computational Thinker

9-12.CT.A.1 - *Define complex issues, create a plan, and select appropriate technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.*
9-12.CT.B.1 - *Evaluate created or given data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.*
9-12.CT.B.2 - *Evaluate and justify the formats for reporting results to a variety of audiences.*
9-12.CT.C.1 - *Collaborate to break problems into component parts, identify key pieces, and use that information to problem-solve.*
9-12.CT.C.2 - *Use 3D design tools to create prototypes, models, and simulations to demonstrate solutions and ideas.*
9-12.CT.D.1 - *Collaborate to develop an automated process by using algorithmic thinking to develop a sequence of steps to create and test automated solutions.*

FOCUS AREA: Creative Communicator

9-12.CC.A.1 - *Use digital learning tools and resources to identify communication needs considering goals, audience, content, access to tools or devices, and timing of communication, to involve teams in diverse locales for effective communication.*
9-12.CC.B.1 - *Create an original work using multiple digital tools, including planning, research, editing, and production.*
9-12.CC.C.1 - *Create digital graphic visualizations, data driven models, and simulations to succinctly communicate complex ideas and problems; justify methods and tools used.*
9-12.CC.D.1 – *Publish or present content designed for specific audiences using online meeting tools to asynchronous and synchronous audiences.*

FOCUS AREA: Global Collaborator

9-12.GC.A.1 - *Use digital tools to interact with others to develop a richer understanding of different perspectives and cultures; publish electronic artifacts that communicate to a culturally diverse and global community.*
9-12.GC.B.1 - *Use collaborative technologies (live and recorded) to connect with global stakeholders including peers, not excluding other languages, experts, and community members, to learn about issues and problems or to gain a broader perspective; develop multiple viewpoints that may be electronically published and accessible to all audiences.*
9-12.GC.C.1 - *Learn project management roles on a team to meet goals, based on their knowledge of technology and content, as well as personal preference; goals in project, timelines and milestones, will be monitored with tools and shared globally.*
9-12.GC.D.1 - *Select and justify the effective collaborative technologies (live video conference, online forums, social media and other emerging communication methods) to investigate, develop, and publish solutions related to local and global issues.*
9-12.GC.D.2 - *Understand that digital tools such as blogs and social media can be used to crowd source, crowd fund, and mobilize a community toward a goal.*

Integrated Technology Overall Topics Covered

TOPIC	TOPIC	TOPIC	TOPIC	TOPIC	TOPIC
generating new ideas, products or processes	create original works	use models and simulations to explore complex systems	identify trends and forecasting	publish digital products	create digital text, images, sound, and video for communication
critique appropriateness of digital formats for audiences and purposes	interact electronically with culturally diverse groups	identify a problem, present a solution, evaluate the solution	justify method used to electronically interact for a goal or purpose	use digital tools to plan, organize, and critique	use digital tools to plan complex timeline, track progress, cite sources, and organize information for a research project
use advanced search techniques	use digital tools to organize and compare information	use digital resources	evaluate peers' use of resources	analyze data and critique theories and hypotheses	justify formats for reporting results to a variety of audiences
identify complex issue, develop systematic plan, present innovative solution	analyze digital planning tools	select digital tools to organize and analyze data	consider diverse perspectives to create solutions to authentic problems	intellectual and digital property rights	acceptable use of technology resources
how technology impacts post-secondary life and career	capabilities and limitations of current and emerging technologies	model digital citizenship	components of technology systems and how they interact	selecting digital tools based on efficiency and effectiveness	troubleshoot common hardware and software issues

References

1 K-12 Computer Science Framework. (2016). Retrieved from K-12 Computer Science Framework

2 Nevada Academic Content Standards for Computer Science and Integrated Technology. (2019). Retrieved from Nevada Department of Education – Computer Science.

2 Tucker, A., Deek, F., Jones, J., McCowan, D., Stephenson, C., & Verno, A. (2003). A model curriculum for K-12 computer science. *Final Report of the ACM K-12 Task Force Curriculum Committee, CSTA*.

3 Wing, J. M. (2006). Computational thinking. *Communications of the ACM, 49(3)*, 33-35.