

Virginia Board of Education Agenda Item



Agenda Item: E

Date: February 28, 2013

Title	Final Review of Proposed Revisions to the <i>Computer Technology Standards of Learning</i>		
Presenter	Mr. Lan Neugent, Assistant Superintendent for Technology, Career & Adult Education		
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Purpose of Presentation:

Action required by state or federal law or regulation.

Previous Review or Action:

Previous review and action. Specify date and action taken below:

Date: April 25-26, 2012

Action: Approval of Timetable for the Review and Approval of the Revised *Computer Technology Standards of Learning*

Date: November 29, 2012

Action: First Review of the Revised *Computer Technology Standards of Learning*

Action Requested:

Final Review: Action requested at this meeting.

Alignment with Board of Education Goals: Please indicate (X) all that apply:

	Goal 1: Accountability for Student Learning
X	Goal 2: Rigorous Standards to Promote College and Career Readiness
	Goal 3: Expanded Opportunities to Learn
	Goal 4: Nurturing Young Learners
	Goal 5: Highly Qualified and Effective Educators
	Goal 6: Sound Policies for Student Success
	Goal 7: Safe and Secure Schools
	Other Priority or Initiative. Specify:

Background Information and Statutory Authority:

Goal 2: The Board of Education’s 2012-2017 Comprehensive Plan calls for a review of all Standards of Learning (SOL) on a regular schedule.

The *Code of Virginia* also requires a review of Virginia’s Standards of Learning every seven years.

Code of Virginia, Section 22.1-253.13:1 By October 1, 2000, the Board of Education shall establish a regular schedule, in a manner it deems appropriate, for the review, and revision as may be necessary, of the Standards of Learning in all subject areas. Such review of each subject area shall occur at least once every seven years. Nothing in this section shall be construed to prohibit the Board from conducting such review and revision on a more frequent basis.

The *Computer Technology Standards of Learning* were adopted by the Board of Education on June 22, 2005. The current standards may be viewed online at http://www.doe.virginia.gov/testing/sol/standards_docs/computer_technology/index.shtml.

On April 26, 2012, the Board of Education waived first review and approved the timetable for reviewing the current standards. Upon approval of the timetable, the following actions occurred:

- Public comment on the 2005 *Computer Technology Standards of Learning* was announced via Superintendent's Memo #118-12 and received during May 2012 through a Web-based comment form.
- On May 15, 2012, the Virginia Educational Technology Advisory Committee (VETAC) met to develop a framework for the revised standards based on current research, best practices, and a review of national and international standards. VETAC advises the Virginia Board of Education through the Superintendent of Public Instruction on educational technology matters and is comprised of members from 40 organizations representing schools, professional organizations, and the business community across the Commonwealth. VETAC members were appointed to subcommittees to draft the specific standards within each of the strands.
- From May 29 through June 7, the subcommittees met via WebEx and telephone conference. Each subcommittee focused on one area of the proposed standards' structure and developed a draft of the proposed standards within the strand.
- During July 2012, the Department's draft document reflecting the combined work of all subcommittees was posted on the Department of Education's Web site for additional comment. Constituents were notified through VETAC representatives and by direct communication with division technology directors, instructional technology resource teachers, library media specialists, and business technology councils representing all areas of the Commonwealth.
- On August 7, 2012, the VETAC executive committee met via WebEx and telephone conference to review the comments and recommend revisions based on the feedback.
- During October 2012, additional revisions were incorporated and the draft document was disseminated to a group of classroom teachers for a final review of the Department's internal draft.
- In November 2012, the Office of Educational Technology incorporated the revisions and prepared the document for the Board's first review.
- On November 29, 2012, the Board accepted the revised *Computer Technology Standards of Learning* for first review.
- During December 2012, the Office of Educational Technology solicited public comment and incorporated additional feedback as appropriate in the revised document. The public comments are presented in Attachment A.

Summary of Important Issues:

A wide variety of constituents have been consulted regarding the revisions to the 2005 *Computer*

Technology Standards of Learning. The various concerns and priorities of those constituents have been incorporated whenever possible within the proposed draft of the *Computer Technology Standards of Learning*. The revised standards are presented in Attachment B.

Because there is no specific SOL test for these standards, it was recommended that the standards support the content area Standards of Learning as well as other key efforts including the *Educational Technology Plan for Virginia: 2010-15*, the Internet safety initiative, college and career readiness, and character education programs.

Public comment was carefully considered and suggestions were incorporated into the draft standards as appropriate. Several comments focused on the need for additional guidelines that address specific grade level benchmarks. Several people commented that Virginia should adopt the International Society for Technology in Education (ISTE) standards since there are significant resources currently aligned to those standards. In the second round of public comment, several readers interpreted the *Computer Technology Standards of Learning* as standards for computer science and declared that the proposed standards did not adequately address this field of study. A few comments focused specifically on the standards, providing suggested changes in wording. Much of the feedback was positive and indicated that the standards were an excellent “next step” for the integration of technology into educational practice. A third round of revisions incorporated additional specificity at each grade band.

The final public comment period in December 2012 provided additional feedback on the proposed revisions. One overarching issue that has become apparent through multiple levels of review is that the role of the *Computer Technology Standards of Learning* in supporting technology integration needs to be clarified, as several suggestions focused on the need for a new course and concern about a new SOL test. The following suggestions, along with that of the Board regarding a direct mention of cyberbullying, have been included in the revised draft (Attachment B) and are underlined:

- The words in K-2.6-B are vague and need to focus on K-2 skills.
- With regard to 3-5.1-A, students in grades 3-5 need keyboarding.
- 3-5.2-A should include editing a digital photo.
- 6-8.14-C uses redundant wording.
- 9-12.15-C should ask students to manage the learning goals for online courses, rather than just complete the course.
- 9-12.16-A could include a design/programming item.
- Each of the grade bands should have an item that specifically addresses age-appropriate knowledge for handling cyberbullying situations. The following were added or amended: K-2.3-D, 3-5.3-B, 6-8.3-B, and 9-12.5-B.

Impact on Fiscal and Human Resources:

The Department of Education administers the state standards review process and the implementation of those standards, once approved by the Board. The agency’s existing resources can absorb this responsibility at this time.

Timetable for Further Review/Action:

Upon approval of the final revisions to the *Computer Technology Standards of Learning*, the Department of Education will post the revised standards on the Department’s Web site and inform constituents through a variety of channels including a Superintendent’s Memo and the VETAC membership.

Superintendent's Recommendation:

The Superintendent of Public Instruction recommends that the Board of Education approve the attached revisions to the *Computer Technology Standards of Learning*.

**Public Comment Period after First Review
Computer Technology Standards of Learning**

- Would need each school to have a tech TEACHER to teach these computer SOLs due to classroom teachers heavy load of teaching core curriculum SOLs
- I understand the need for technology standards due to the way we live and the fast pace of technology in our everyday lives. However, I am concerned about the implementation of these standards. I am a classroom teacher, and it has become my responsibility to teach these standards on top of the four core subjects. The amount of time needed to teach these standards is growing, and the list of technology standards I am required to teach is growing. However, there is no additional time to teach them. I try to include them in lessons when it is practical, and I do utilize a lot of technology. But, teachers are stretched too thin with too little planning time already, and now I have to plan for this? Please consider the students' and teachers' needs for technology teacher to teach these lessons. Thank you.
- Asking classroom teachers to add yet another requirement for them to teach is a little much....don't you think?? How about hiring a computer teacher for elementary and middle schools for a six or nine week period to teach computer skills----it could be done as an activity class AND while you are at it how about throwing in Foreign Language as a requirement-----by the way I am NOT a classroom teacher.
- At the elementary level, especially in grades K-2, students are just learning to read and write. They are also being asked to be proficient with a keyboard, which is a time-consuming process. There is not enough instructional time in the day to master all of these objectives without students having a technology class and teacher on a daily or weekly basis.
- I appreciate the detail included in the draft. I do have a few concerns. Some divisions do not have the technology available to implement the SOL properly. My other concern is some teachers do not have the knowledge of some of the technology they will be required to use. I hope that the divisions will have proper training available.
- I have no issues with the contents of this document. These are reasonable expectations that in the course of learning students will use technology to achieve their learning goals. My objection is that these standards sit outside of the core curriculums when they are the inherent tools of those curriculums. Therefore, I ask who is responsible for the teaching of these standards when still all alone like this? The content area teacher can avoid all and any use of technology and innovative tools because these standards are not their standards. There should NOT BE SEPARATE STANDARDS JUST FOR TECHNOLOGY SKILLS. They should be embedded in all curriculum standards and tested within those curriculums.

- I think the standards are wonderful, however, will school districts increase budgets so that a technology teacher will be added to work with these specific standards. Classroom teachers have enough on their plates with the CORE SOLs. Having them be responsible for all of this as well is putting an extra responsibility on our teachers.
- Augusta County Acceptable Use does not allow students to post ANY information about themselves on the Internet. How, then, are they to communicate with other cultures?
- As a middle school teacher, I am concerned with the SOL C/T 6-8.2 under Basic Operations and Concepts. The SOL Part B to Identify and use available technologies to complete specific tasks..Use content-specific tools, software, and simulations to complete projects. I do not have access to graphing calculators or science simulations in my classroom therefore I feel that this requirement needs to be adjusted or deleted. Many middle school teachers do not have access to those tools and it should be a requirement in science classrooms and not CTE classrooms. It is also impossible to cover that requirement when my classes only meet for 9 weeks.
- It would be helpful to include keyboarding skills, at what level they should be taught and when they should be mastered. The draft SOL mention word processing, are we assuming keyboarding is being taught?
- Please take a look at the standards for grades 3-5. It will be very difficult for third graders to be able to grasp some of the concepts, let alone complete them. Where does teaching them to type come into play in any of this? Can we please focus on typing somewhere? After all, they must learn how to do so for their fifth grade writing test. The children in my district only have computer class twice a week. It will be extremely challenging to cover this much material with proper understanding with such little time allowed.
- ALL students in grades 4 - 11 need extensive practice with typing and keyboarding since they are required to type their direct-writing SOL short paper.
- I really wish you could break it down per grade level, not lump 3 in one, like the core SOLs.
- I have several questions in regards to 9-12 group:
 - 1) Is the State going to add the Area of Endorsement of ICT, since the area of Computer Science degree, nor do the endorsement classes apply to what you have listed in the objectives.
 - 2) Are school divisions going to have to create a new course that will now be required to cover the 16 strands? I know at the HS level we have several computer courses but not a single one covers all 16 areas.

- 3) Since you have titled them as being SOL's, I am guessing there will be an actual exam to follow the standards. With that in mind, my question is: Since so many of the strands are written as "apply" which creates projects, how is this going to be in a multiple choice test?
 - 4) 4) C/T 9-12.16 I have an difficult time with since I know many children are not artistic nor musically inclined...you have them create original music, I feel this needs to be changed to "add music"
 - 5) In the area of research and using it, can a strand be added to state they have to demonstrate the use of proper citing either using MLA/APA style formatting?
 - 6) What Freshman class will be required to start taking an online course for graduation?
 - 7) What Freshman class will be taking this new technology SOL exam?
- Comments:
 - 1) Where are objectives relating identification/knowledge of computer specifics: hard drives, CPUs, and memory?
 - 2) Students need to know how to use some specifics of Microsoft Office to help them with job opportunities.
 - 3) Why are you including modeling and simulation when very few schools can afford the software and/or have a qualified teacher to teach it?
 - 4) There is a huge problem with plagiarism and copyright infringement due to computers and the Internet. Digital copyright laws should be included: can only use 10% of a song, video clip or movie in a presentation, etc.
 - C/T 3-5.2--I would add to 'capture a digital image' something about transferring it to the computer and saving it...this is the crux of a digital picture...maybe add editing as well.
 - Two items I would highly recommend adding. The first item at all levels would be protecting personal privacy, in social settings in particular. I realize this falls under the internet safety umbrella but it is such a huge concern that it merits special attention. The second item at the HS level is building and protecting reputation, or personal branding, a significant initiative for any student as part of any future endeavor.
 - Comments:
 - 1) C/T 9-12.1 - there is no mention of design skills or "programming." All students need experience in learning how to use technology to design - either through traditional computer science activities, or through a new generation of drag-and-drop programming environments (Squeak, Scratch, Game Salad).
 - 2) C/T 9-12.2 - "use models and simulations" will keep interactive textbook and digital content providers happy. Why not add a third section encouraging students to design/create simulations and models themselves?
 - 3) C/T 9-12.3 First paragraph should also include "programming." These standards are far too heavy on creating documents and presentations and graphics. Communications are only one of many twenty-first century skills.

- 4) C/T 9-12.15 C. Complete an online course? This is already a "requirement" next year in Virginia. How about we write this in the context of a student? Instead of "complete an online course" we say "Manage goals for learning in virtual (online) learning environments." The biggest challenge for online learning now in light of the current offerings of learning systems is motivation and students managing their time and efforts.
- 5) C/T 9-12.16 A. was a great place again to insert design/programming. I realize these are not "STEM" standards, but we could write "A" like this: "Use creative software, digital tools, and programming environments to convey existing ideas in new and effective ways."
- 6) And a bullet for B, an example could be, "Write an original software program."

Thank you for the opportunity to provide a comment.

- Comments:
 - 1) Nowhere in the document is there a reference to "social media". It's understandable NOT to use brand names such as Facebook or Twitter, but "social media" is an important term and genre and should be taught.
 - 2) Students should understand the implications of behavior on social media at all levels. Elem.3-5 should have some mention to age appropriate participation in social media
 - 3) No mention of the word predator, phishing, hack, hoax?
 - 4) Only ONE mention of the word privacy?
 - 5) No mention of the word cell phone or use of the term "digital devices" in the context of hand held or personal devices and the myriad of issues surrounding them from privacy to social media to bullying.
- Comments:
 - 1) 6-8.3: I'm not clear as to how this would be demonstrated within a school in an adequate way. The "and avoiding high-risk activities" would also be difficult to demonstrate unless some form of assessment is specifically developed. I would rather see this completed naturally by a student but not be assessed on it.
 - 2) 6-8.5: "positive activities for personal and community well-being"- This part is a little vague. How is this supposed to be implemented exactly? I'm not sure how the community well-being part could be implemented.
 - 3) 6-8.13.B: This may not be possible depending on the technology infrastructure of the district. Some districts block outside communications for students/teachers.
 - 4) 6-8.14: B/C: Both of these seem to already be covered in A. I'm really not sure why they need to be listed again.
 - 5) Grades K-2.4: "reflect on alternate strategies that might lead to greater successes in future projects."

- It's not realistic that the majority students 8 yrs old or younger are able to "reflect" to determine better ways to search/research. At this point they are just learning how to narrow down the information on the page to get what's needed.
- K-2.5- What exactly does "communicate how a decision was made based on assistance from a technology tool" mean? This skill is very vague
- Please weave in graphic representation into the Spreadsheet expectations in this SOL: C/T 3-5.2. Students at these grades are asked to interpret data from a chart or graph much more often than to actually create a spreadsheet.
- Comments:
 - 1) Please define high risk activities in the following SOL: C/T 3-5.3. If this is social media or second life / virtual worlds / online gaming, say what that set of behaviors is.
 - 2) Please give guidance on what is "best practices" in the following SOL: C/T 3-5.6.
- With regard to simulations, we are finding that few teachers are doing what is asked for in this SOL at the 3-5 level (C/T 3-5.9). We have Gizmos, and teachers are not using the subscriptions well. Please give guidance as to grade level appropriate types of simulations.
- Hire an English teacher and rewrite the whole thing. Use half as many words for half as many SOLs, and write them in English.
- If the state of Virginia put the resources into the actual teaching of the material that it puts into the testing of the material, this world would be a better place.
- Testing of the material only measures how much the teacher teaches, not how much the learner learns. Anyone can memorize the material long enough to pass an SOL in most classes. Math and writing seem to be the only ones that require a student to "know" the material. In addition, math and writing seem to be the only two subjects that require a student to have previous knowledge.
- I feel the vocabulary is too hard for many to understand. I think it needs to be simplified a bit and examples given.
- Thank you for reviewing these standards! I am a teacher currently writing my MAT thesis on "Goodbye Computers, Hello STEM: The New Face of Technology in Schools" and these new standards definitely support the idea of learning through computers and solving real world problems, instead of identifying a "mouse" when most kids today are using iPads anyway. Keep up the good work moving in a more progressive direction!

- Not related to the process of learning, but to having a skill in the workplace. Good for Business Education, or Technology Education class, not for English or social studies or math or science class or world language or art classes or even physical education classes where technology is now a regular tool for learning.
 - 1) Simply not integrated into the core classroom
 - 2) Too wordy
 - 3) Limited to computer technology
 - 4) Doesn't include emerging technologies we can't imagine
 - 5) Doesn't connect to teacher skills in general
 - 6) You should be using ISTE NET-S and NET-T and NET-A

- Please feel free to contact me if you need this in a document form instead. These were suggested replacements by our ITRTs:
 - 1) K-2, Basic Operations and Concepts
 - a. C/T K-2.1 The student will demonstrate knowledge of the nature and operation of technology systems.
 - i. Use technology to demonstrate the ability to perform a variety of tasks; among them turning on and off a computer, starting and closing programs, saving work, creating folders, using pull-down menus, closing windows, dragging objects, and responding to commands, use copy, paste, insert, minimize & maximize.
 - ii. Insert and resize a picture into a document
 - b. C/T K-2.2 The student will demonstrate proficiency in the use of technology.
 - i. Demonstrate the use of mouse, touch pad, keyboard, printer, multimedia devices, and earphones.
 - ii. Use multimedia resources such as interactive books and software with graphical interfaces.
 - iii. Demonstrate the ability to use the Internet including the back button, search engines
 - 2) K-2, Social and Ethical Issues
 - a. C/T K-2.3 The student will practice responsible use of technology systems, information, and software.
 - i. Know the school's rules for using computers.
 - ii. Know and understand safety rules for using the Internet, including rules for social media.
 - iii. Understand the importance of protecting personal information or passwords.
 - iv. Understand the basic principles of the ownership of ideas.
 - b. C/T K-2.4 The student will use technology responsibly.
 - i. Demonstrate respect for the rights of others while using computers.
 - ii. Understand the responsible use of equipment and resources.

- iii. Understand the concept of being a good digital citizen to use technology in an appropriate and responsible way.

3) 3-5, Basic Operations and Concepts

- a. C/T 3-5.1 The student will demonstrate knowledge of the nature and operation of technology systems.
 - i. Discuss common uses of computers in their daily life and the advantages and disadvantages those uses provide.
 - ii. Communicate about basic technology components with appropriate terminology.
 - iii. Identify and explain the strategies used for the safe and efficient use of computers (e.g., passwords, virus protection software, spam filters, popup blockers).
- b. C/T 3-5.2 The student will demonstrate proficiency in the use of technology.
 - i. Use skills and procedures needed to operate various technologies such as scanners, digital cameras and hand-held computers. Demonstrate basic skills and procedures to operate various technologies while using available hardware and applications (e.g. log into a computer, connect/disconnect peripherals, and upload files from peripherals).
 - ii. Identify basic software applications such as word processing, databases, spreadsheets and multimedia.
 - a) Word processing
 - Use menu/tool bar functions in a word processing program (i.e., font size/style, line spacing, and margins) to format, edit, and print a document.
 - Copy and paste text and images within a document, as well as from one document to another.
 - Proofread and edit writing using appropriate resources (e.g. dictionary, spell-checker, grammar resources).
 - b) Database
 - Define the term 'database' and provide examples from everyday life (e.g. library catalogues, electronic encyclopedia).
 - Define terms related to databases, such as 'record,' 'field,' and 'search.'
 - Complete simple searches of existing database (e.g., online library catalog, electronic encyclopedia).
 - c) Spreadsheets
 - Demonstrate an understanding of the spreadsheet as a tool to record, organize, and graph information.
 - Identify and explain terms and concepts related to spreadsheets (i.e. cell, column, row, values, labels, chart, and graph).
 - Enter/edit data in spreadsheets and perform calculations using simple formulas (+, -, *, /) observing the changes that occur.

- d) Multimedia
 - Create projects that use text and various forms of graphics, audio and video to communicate ideas.
 - Use various operating system features (e.g. open more than one application/program, work with menus, and use the taskbar).
 - Select a printer, use print preview, and print a document with the appropriate page setup and orientation.
 - Demonstrate beginner keyboarding skills and proper keyboarding technique.

- 4) 3-5, Social and Ethical Issues
 - a. C/T 3-5.3 The student will demonstrate knowledge of ethical, cultural, and societal issues related to technology.
 - i. Identify how technology has changed society in areas such as communications, transportation, and the economy.
 - ii. Identify ways in which technology is used in the workplace and in society.
 - iii. Discuss ethical behaviors when using information and technology.

 - b. C/T 3-5.4 The student will practice responsible use of technology systems, information, and software.
 - i. Understand the need for the school division’s acceptable use policy.
 - ii. Explain terms related to the use of networks (e.g., username, password, network, file server).
 - iii. Discuss the rationale of fair use and copyright regulations.
 - iv. Follow rules for personal safety when using the Internet.
 - v. Identify cyber bullying and describe strategies to deal with such a situation.
 - vi. Recognize and describe the potential risks and dangers associated with various forms of online communications.

- 5) 3-5, Technology Research Tools
 - a) C/T 3-5.6 The student will use technology to locate, evaluate, and collect information from a variety of sources.
 - i. Explain and use age-appropriate online tools and resources (e.g., drill and practice, assessment, online subscriptions).
 - ii. Collect information from a variety of sources.
 - iii. Evaluate the accuracy of electronic information sources.
 - iv. Enter data into databases and spreadsheets.
 - v. Use online tools (e.g., blogs, wikis, Web 2.0, apps) to gather and share information collaboratively with other students.

- 6) 6-8, Basic Operations and Concepts
 - a. C/T 6-8.1 The student will demonstrate knowledge of the nature and operation of technology systems.
 - i. Describe how technology impacts learning.

- ii. Explore how software and hardware are developed to respond to the changing needs of technology.
 - iii. Describe compatibility issues, between various types of technology.
 - iv. Identify successful troubleshooting strategies for minor hardware and software issues (e.g., frozen screen).
- b. C/T6-8.2 The student will demonstrate proficiency in the use of technology.
- i. Understand that hardware and software have different operating systems that may affect their use.
 - ii. Use features of a computer operating system (e.g., access the size and format of files, identify the version of an application).
 - iii. Use self-help features such as online tutorials and manuals to learn to use hardware and software.
 - iv. Independently operate peripheral equipment (e.g., digital camera, iPod, iPad, eReader).
 - v. Identify and use a variety of storage media (e.g., CDs, DVDs, flash drives, school servers, online storage spaces) and provide a rationale for using a certain medium for a specific purpose.
 - vi. Demonstrate keyboarding skills between 25-30 wpm with fewer than 5 errors and proper keyboarding technique. (For students with disabilities, demonstrate alternate input techniques as appropriate).
 - vii. Identify basic software applications such as word processing, databases, spreadsheets and multimedia.
 - a) Word processing
 - Demonstrate use of intermediate features in word processing applications (e.g., tabs, indents, headers and footers, bullet and numbering, tables).
 - Create, save, open, and import a word processing document in different file formats, (e.g., RTF, HTML).
 - b) Database
 - Describe the structure and function of a database in a variety of real-world settings.
 - Create a simple database, defining field formats and adding new records.
 - Perform simple operations in a database (i.e. browse, sort, filter, search on selected criteria, delete data, enter data).
 - Plan and develop database reports to organize and display information.
 - c) Spreadsheet
 - Describe the use of spreadsheets to calculate, graph, organize and present data in a variety of real-world settings.
 - Create an original spreadsheet using formulas and functions.
 - Produce simple charts and graphs from a spreadsheet.

- Distinguish among different types of charts and graphs, and choose the most appropriate type to represent given data.
 - Apply advanced formatting features to customize tables, charts, and graphs.
- d) Multimedia
- Create a multimedia presentation using various media.
- 7) 6-8, Technology Research Tools
- a. C/T 6-8.6 The student will use technology to locate, evaluate, and collect information from a variety of sources.
- i. Use databases and spreadsheets to evaluate information.
 - ii. Use technology resources such as calculators and data collection probes for gathering information.
 - iii. Use Internet and other electronic resources to locate information in real time.
 - iv. Describe appropriate and responsible use of communication tools (e.g., blogs, wikis, Web 2.0, social media).
- b. C/T 6-8.7 The student will evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
- i. Use search strategies to retrieve information.
 - ii. Evaluate the accuracy, relevance, and appropriateness of electronic information sources.
 - iii. Analyze and explain how media and technology can be used to distort, exaggerate, and misrepresent information.
 - iv. Give examples of hardware and applications that enable people with disabilities to use technology.
- 8) 6-8, Technology Communication Tools
- a. C/T 6-8.9 The student will use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- i. Choose the appropriate tool, format, and style to communicate information.
 - ii. Identify probable types and locations of Web sites by examining their domain names, and explain that misleading domain names are sometimes created in order to deceive people (e.g., .edu, .com, .org, .gov).
 - iii. Explain and correctly use terms related to networks (e.g., LANs, WANs, servers, and routers, and Internet connectivity).
 - iv. Explain and correctly use terms related to online learning (e.g., IP address, post, thread, Intranet, discussion forum, drop box).
 - v. Independently use technology tools to create and communicate for individual and/or collaborative projects.
 - vi. Produce documents demonstrating the ability to edit, reformat, and integrate various software tools.

- vii. Identify cyber bullying and describe strategies to deal with such a situation.
- viii. Provide examples of safe and unsafe practices for sharing personal information. (e.g., e-mail, texting, Internet).

9) 9-12, Basic Operations and Concepts

- a. C/T 9-12.1 The student will demonstrate knowledge of the nature and operation of technology systems.
 - i. Discuss the inherent advantages and limitations of technology.
 - ii. Define the relationship between infrastructure, electronic resources, and connectivity.
 - iii. Identify and describe the impact of new and emerging technologies and their applications.
 - iv. Identify the platform, version, properties, function and interoperability of computing devices that compute and/or manage digital media.
 - v. Explain criteria for evaluating hardware and software appropriate for a given task (e.g. features, version, and capacity).
 - vi. Demonstrate keyboarding techniques to complete assignments efficiently and accurately.
 - vii. Describe good practices for password protection and authentication
- b. C/T 9-12.2 The student will demonstrate proficiency in the use of technology.
 - i. Identify and resolve hardware and software compatibility issues.
 - ii. Develop and communicate strategies for solving routine hardware and software problems.
 - iii. Use online help and other support to learn about features of hardware and software to assess and resolve problems.
 - iv. Explain effective backup and recovery strategies.

10) 9-12, Social and Ethical Issues

- a. C/T 9-12.3 The student will demonstrate knowledge of ethical, cultural, and societal issues related to technology.
 - i. Assess the potential of information and technology to address personal and workplace needs.
 - ii. Demonstrate knowledge of electronic crimes such as viruses, pirating, and computer hacking.
 - iii. Explore and participate in online communities, and online learning opportunities.
 - iv. Describe and use safe and appropriate practices when participating in online communities (e.g., discussion groups, blogs, social networking sites).
 - v. Explain and use practices to protect one's personal safety online (e.g., not sharing personal information with strangers, being alert for online predators, reporting suspicious activities).
 - vi. Identify cyber bullying and describe strategies to deal with such a situation.
 - vii. Identify the role that technology will play in future career opportunities.

- b. C/T 9-12.7 The student will evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
 - i. Analyze and draw conclusions about the comprehensiveness and bias of electronic information sources.
 - ii. Design and implement a variety of search strategies to retrieve electronic information.
 - iii. Explain and demonstrate effective search strategies for locating and retrieving electronic information (e.g., using syntax and Boolean logic operators).

**Computer Technology
Standards of Learning
for Virginia's Public Schools**

DRAFT

February 2013

**Board of Education
Commonwealth of Virginia**

Computer Technology Standards of Learning

Introduction

As the new century has unfolded, various studies have postulated about the likely competencies that will be needed in the workplace of tomorrow; one consistent conclusion is that technology will be integrated into every facet of business and life.

The Educational Technology Plan for Virginia: 2010-15 focuses primarily on one specific component of 21st century skills—information and communications technology (ICT) literacy. The most recognized definition for this topic was formulated in 2002 by the International ICT Literacy Panel: “ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society.”

Educational Technology Plan for Virginia: 2010-15

The Computer Technology Standards of Learning define the essential knowledge and skills necessary for students to access, manage, evaluate, use, and create information responsibly using technology and digital resources. They provide a framework for digital literacy and include the progressive development of technical knowledge and skills, intellectual skills for thinking about and using information, and skills needed for working responsibly and productively both individually and within groups. Digital literacy is not an end in itself but lays the foundation for deep and continuous learning. It focuses on using technology to learn rather than learning about technology.

To become technologically proficient, students must develop these skills through integrated activities across all K-12 content areas. These skills should be introduced and refined collaboratively by all K-12 teachers as an integral part of the learning process. Teachers can use these standards as guidelines for planning technology-based activities in which students achieve success in learning and communication—preparing them to meet the challenges of today’s knowledge-based society.

Computer Technology Standards of Learning

Grades K-2

Basic Operations and Concepts

- C/T K-2.1 Demonstrate an operational knowledge of various technologies.
- A. Use various types of technology devices to perform learning tasks.
 - Use a keyboard, mouse, touchscreen, touchpad, and other input devices to interact with a computer.
 - Use appropriate buttons, gestures, menu choices, and commands to manipulate the computer when completing learning tasks.
 - B. Communicate about technology with appropriate terminology.
 - Use basic technology vocabulary as needed.
- C/T K-2.2 Identify and use available technologies to complete specific tasks.
- A. Identify the specific uses for various types of technology and digital resources.
 - Identify the difference between hardware and software.
 - Create a text document.
 - Open and read an electronic book.
 - Create a digital image.
 - B. Use content-specific tools, software, and simulations to complete projects.
 - Use tools in various content areas as appropriate.

Social and Ethical Issues

- C/T K-2.3 Make responsible decisions—grounded in knowledge of digital safety and security best practices—that pertain to various digital communication tools and methods.
- A. Demonstrate knowledge of school policies for using computers and other technologies.
 - Be able to articulate what is allowed and what is not allowed at school when using technology.
 - B. Understand the importance of protecting personal information and passwords.
 - Communicate an understanding of the basic principles of online safety.
 - Follow procedures that protect safety and security as outlined in the division's acceptable use policy.
 - C. Understand the basic principles of the ownership of ideas.
 - Identify digital information as being produced by people—either as individuals or as part of a group or organization.
 - D. Identify and model responsible behaviors when using information and technology.
 - Identify strategies to address bullying situations involving electronic devices.

Technology Research Tools

Computer Technology Standards of Learning

- C/T K-2.4 Plan and apply strategies for gathering information, using a variety of tools and sources, and reflect on alternate strategies that might lead to greater successes in future projects.
- A. Identify information in various formats.
 - Recognize that information may be presented as printed text, electronic text, audio, video, or images.
 - B. Identify available sources of information.
 - Be able to name and use sources of information available at school and outside the school.

Thinking Skills, Problem Solving, and Decision Making

- C/T K-2.5 Practice reasoning skills when gathering and evaluating data.
- A. Recognize that technology can be used to solve problems and make informed decisions.
 - Communicate how a decision was made based on assistance from a technology tool.
 - B. Use technology tools to assist with problem solving.
 - Demonstrate how technology can be used to investigate and solve problems in various content areas.

Technology Communication Tools

- C/T K-2.6 Communicate effectively with others (e.g., peers, teachers, experts) in collaborative learning situations.
- A. Use technology tools for individual and collaborative writing, communication, and presentation activities.
 - Use word processing to practice writing skills.
 - Use common graphic and presentation tools when preparing and providing presentations.
 - B. Recognize tools useful for communication.
 - Identify how different technologies appeal to different senses.

Computer Technology Standards of Learning

Grades 3-5

Basic Operations and Concepts

- C/T 3-5.1 Demonstrate an operational knowledge of various technologies.
- A. Use various types of technology devices to perform learning tasks.
 - Use a keyboard, mouse, touchscreen, touchpad, and other input devices to interact with a computer.
 - Demonstrate the ability to perform a wide variety of basic tasks using technology, including saving, editing, printing, viewing, and graphing.
 - B. Communicate about technology with appropriate terminology.
 - Use basic technology vocabulary in daily practice.
- C/T 3-5.2 Identify and use available technologies to complete specific tasks.
- A. Identify the specific uses for various types of technology and digital resources.
 - Identify the differences among local, network, and Internet resources and tools.
 - Create, edit, and format a document with text and graphics.
 - Create and present a multimedia presentation.
 - Create and populate a spreadsheet with data.
 - Capture and edit a digital image.
 - Demonstrate the ability to choose appropriate resources when completing assignments in various content areas.
 - B. Use content-specific tools, software, and simulations to complete projects.
 - Use tools in various content areas as directed by the teacher.

Social and Ethical Issues

- C/T 3-5.3 Make responsible decisions—grounded in knowledge of digital safety and security best practices—that pertain to various digital communication tools and methods.
- A. Demonstrate knowledge of basic practices related to online safety.
 - Use best practices for online safety as defined by the division's online safety program.
 - Demonstrate an understanding of the division's acceptable use policy and consequences for inappropriate use.
 - B. Discuss and model responsible behaviors when using information and technology.
 - Identify reasons for taking security precautions when using any technology, especially those related to the Internet.
 - Demonstrate responsible behavior, such as using strong passwords and avoiding high-risk activities.
 - Identify inappropriate or threatening interpersonal situations involving electronic devices and develop strategies to react to them safely.

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- Behave appropriately in virtual groups and be proactive in preventing bullying behavior in an environment that provides anonymity to bullies.

- C/T 3-5.4 Exhibit personal responsibility for appropriate, legal, and ethical conduct.
- A. Understand the need for laws and regulations regarding technology use.
- Model appropriate, legal, and ethical behavior in all technology use and technology-supported environments.
- B. Understand the basic principles of the ownership of ideas.
- Demonstrate a basic understanding of “fair use.”
- C/T 3-5.5 Demonstrate digital citizenship by actively participating in positive activities for personal and community well-being.
- A. Communicate respect for people when participating in group online learning activities.
- Identify ways in which online communications are different from face-to-face communications.
 - Demonstrate online etiquette when communicating with others.
- B. Explore the potential of the Internet as a means of personal learning and the respectful exchange of ideas and products.
- Participate in the creation of digital projects that involve communicating with others.

Technology Research Tools

- C/T 3-5.6 Plan and apply strategies for gathering information, using a variety of tools and sources, and reflect on alternate strategies that might lead to greater successes in future projects.
- A. Collect information from a variety of sources.
- Conduct research using various types of text- and media-based information.
- B. Apply best practices for searching digital resources.
- Apply effective search strategies that will yield targeted information.
 - Identify basic indicators that a digital source is likely to be reliable.
- C/T 3-5.7 Draw conclusions from research and relate these findings to real-world situations.
- A. Use research to support written and oral presentations.
- Apply research derived from digital resources to original work.
 - Demonstrate how to cite digital resources when developing nonfiction reports and presentations.
- B. Apply knowledge when conducting research to develop accurate and balanced reports.
- Use best practice guidelines for evaluating research results.

Thinking Skills, Problem Solving, and Decision Making

- C/T 3-5.8 Practice reasoning skills when gathering and evaluating data.

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- A. Determine when technology tools are appropriate to solve a problem and make a decision.
 - Identify technology resources and tools that can help with decision making.
- B. Demonstrate organization and persistence when completing personal and group assignments, activities, and projects.
 - Use various productivity tools that help with planning, time management, project goal setting, etc.

C/T 3-5.9 Use models and simulations to understand complex systems and processes.

- A. Understand the use of simulations in learning.
 - Enhance understanding of concepts and skills by explaining how a simulation differs from and is similar to real life.
- B. Use simulations to understand complex concepts.
 - Enhance understanding of concepts and skills by using simulations.

Technology Communication Tools

C/T 3-5.10 Communicate effectively with others (e.g., peers, teachers, experts) in collaborative learning situations.

- A. Use technology tools for individual and collaborative writing, communication, and publishing activities.
 - Produce documents and presentations that demonstrate the ability to edit, reformat, and integrate various tools and media.
- B. Participate in communications among different cultures.
 - Understand the need to place communication in the context of culture.
- C. Assume different roles (e.g., leader/follower, orator/listener) on teams in various situations.
 - Recognize that different people on a team bring different technical skills, and understand how that can influence team responsibilities.
 - Demonstrate the ability to share technology tools as needed.

C/T 3-5.11 Apply knowledge and skills to generate innovative ideas, products, processes, and solutions.

- A. Organize and display knowledge and understanding in ways that others can view, use, and assess.
 - Understand the various ways in which digital products can be shared.
- B. Use technology tools to share original work.
 - Use presentation tools to organize and present stories, poems, songs, and other original work.

Computer Technology Standards of Learning

Grades 6-8

Basic Operations and Concepts

- C/T 6-8.1 Demonstrate an operational knowledge of various technologies.
- A. Use various types of technology devices to perform learning tasks.
 - Demonstrate the ability to perform specific tasks using technology, including organizing, analyzing, and presenting data; formatting and presenting text and graphic information; and capturing and manipulating images.
 - B. Communicate about technology with appropriate terminology.
 - Use technology vocabulary in daily practice.
- C/T 6-8.2 Identify and use available technologies to complete specific tasks.
- A. Identify the specific uses for various types of technology and digital resources.
 - Select and use local, network, and Internet resources and tools.
 - Capture and edit video.
 - Explain how various careers incorporate technology.
 - B. Use content-specific tools, software, and simulations to complete projects.
 - Use tools in various content areas, such as graphing calculators, science simulations, story diagramming applications, image processing applications, and history timeline applications.

Social and Ethical Issues

- C/T 6-8.3 Make responsible decisions—grounded in knowledge of digital safety and security best practices—that pertain to various digital communication tools and methods.
- A. Demonstrate knowledge of basic practices related to online safety.
 - Use best practices for online safety as defined by the division's online safety program.
 - Apply the division's acceptable use policy to everyday situations.
 - Model appropriate, legal, and ethical behavior in all technology use and technology-supported environments.
 - B. Discuss and model responsible behaviors when using information and technology.
 - Identify reasons for taking security precautions when using any technology, especially those related to the Internet.
 - Demonstrate responsible behavior, such as using strong passwords and avoiding high-risk activities.
 - Identify differences between healthy and unhealthy virtual relationships such as bullying and practice positive responses to problems.
 - Demonstrate personal responsibility for online behavior, especially in social media settings.

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- Demonstrate awareness of the potential social, economic, and legal consequences of inappropriate online behavior.

C/T 6-8.4 Exhibit personal responsibility for appropriate, legal, and ethical conduct.

- A. Demonstrate an understanding of “fair use.”
- Apply knowledge of copyright and “fair use” when developing presentations, products, and papers.
- B. Demonstrate an understanding of current copyright laws.
- Identify copyright laws that impact student work.

C/T 6-8.5 Demonstrate digital citizenship by actively participating in positive activities for personal and community well-being.

- A. Communicate respect for people when participating in group online learning activities.
- Demonstrate online etiquette when communicating with others.
 - Demonstrate an understanding of cyberbullying and strategies for stopping a cyberbully.
- B. Explore the potential of the Internet as a means of personal learning and the respectful exchange of ideas and products.
- Participate in the creation of digital projects that involve others working together toward a common goal.
 - Demonstrate the ability to identify diverse perspectives on issues.

C/T 6-8.6 Understand the nature of information in a global society and how the characteristics of various media may influence others.

- A. Identify the various uses of media based on intent and audience.
- Investigate media messages in various contexts.
- B. Be able to construct and deconstruct media messages.
- Connect media messages to various writing techniques, logic models, and outcomes.
 - Develop communication projects using various types of media.

Technology Research Tools

C/T 6-8.7 Plan and apply strategies for gathering information, using a variety of tools and sources, and reflect on alternate strategies that might lead to greater successes in future projects.

- A. Use various technology and digital resources to collect information.
- Conduct research using various types of text- and media-based information.
 - Use various types of content-specific technology to gather data and information.
- B. Use search strategies to retrieve information.
- Apply effective search strategies that will yield targeted information.
 - Identify indicators that a digital source is likely to be reliable.

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- C/T 6-8.8 Draw conclusions from research and relate these findings to real-world situations—investigating further, if necessary.
- A. Use digital research to support written and oral presentations.
 - Apply research derived from digital resources to original work, as appropriate.
 - B. Apply knowledge when conducting research to develop accurate and balanced reports.
 - Determine when further research is needed based on original search results and first drafts.
 - Demonstrate how to cite digital resources when developing nonfiction reports and presentations.
 - Apply strategies that help avoid plagiarism when clipping and storing digital notes.
 - C. Interpret digital primary sources within historical and contemporary contexts.
 - Follow procedures to interpret various primary sources for a variety of content areas.

- C/T 6-8.9 Analyze, synthesize, and evaluate information based on source validity and the appropriateness to specific tasks.
- A. Evaluate the accuracy, relevance, and appropriateness of electronic information sources.
 - Use a variety of strategies to evaluate the accuracy of digital resources.
 - Use various digital tools, such as graphic organizers, to analyze and synthesize data for learning tasks.
 - B. Use various digital tools to organize, analyze, and synthesize data for learning tasks.
 - Use digital tools, such as graphic organizers, spreadsheets, and databases.

Thinking Skills, Problem Solving, and Decision Making

- C/T 6-8.10 Practice reasoning skills when gathering and evaluating data.
- A. Employ technology in developing strategies for solving problems.
 - Identify and use technology resources and tools that can help with problem solving.
 - Use a variety of technologies to identify and provide possible solutions to real-world problems.
 - B. Select resources that extend one's own capability to solve problems and make informed decisions.
 - Understand how certain technologies can extend human capabilities to understand complex situations.
- C/T 6-8.11 Demonstrate organization and persistence when completing personal and group assignments, activities, and projects.
- A. Use digital resources to assist with project planning.

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- Use various productivity tools that help with planning and time management.
 - B. Use digital resources to assist with project management.
 - Use productivity tools to assist in tracking and meeting goals.
- C/T 6-8.12 Use models and simulations to understand complex systems and processes.
- A. Use simulations to understand complex concepts.
 - Enhance understanding of concepts and skills by using simulations.
 - B. Use various digital resources to produce graphical representations of data.
 - Complete assignments involving data by using data graphing or imaging tools.

Technology Communication Tools

- C/T 6-8.13 Communicate effectively with others (e.g., peers, teachers, experts) in collaborative learning situations.
- A. Use technology tools for individual and collaborative writing, communication, and publishing activities.
 - Use various technology resources to develop written and media-based reports and projects, integrating technologies as appropriate.
 - Collaborate with others using digital communication tools.
 - B. Participate in communications among different cultures.
 - Understand the need to place communication in the context of culture.
 - C. Assume different roles (e.g., leader/follower, orator/listener) on teams in various situations.
 - Use technology to complete a wide variety of tasks when working in teams, depending on the individual's group role.
- C/T 6-8.14 Apply knowledge and skills to generate innovative ideas, products, processes, and solutions.
- A. Organize and display knowledge and understanding in ways that others can view, use, and assess.
 - Choose the appropriate tool, format, and style to communicate information for specific purposes.
 - Independently use technology tools to create and communicate for individual and/or collaborative projects.
 - B. Add meaning to individual and group ideas and products through creative work.
 - Use digital resources and technology to enhance original oral and written presentations.
 - C. Produce resources in a variety of formats.
 - Demonstrate the ability to determine proper formats for delivering products digitally so others may use them.

Computer Technology Standards of Learning

Grades 9-12

Basic Operations and Concepts

- C/T 9-12.1 Demonstrate an operational knowledge of various technologies.
- A. Use various types of technology devices to perform learning tasks.
 - Demonstrate the ability to perform a wide variety of complex tasks using technology, including creating and using models and simulations, developing multipage documents and multimedia presentations, capturing and manipulating video, and constructing spreadsheets that use mathematical or logical functions to manipulate and present data.
 - B. Communicate about technology with appropriate terminology.
 - Use an expansive technology vocabulary in daily practice.
- C/T 9-12.2 Identify and use available technologies to help complete specific tasks.
- A. Identify the specific uses for various types of technology and digital resources.
 - Apply knowledge of different types of technology and digital resources to routine and complex tasks.
 - B. Use content-specific tools, software, and simulations to approach projects.
 - Use specialized tools to assist with learning in various content areas.
 - Use models and simulations to learn complex concepts, solve problems, and make decisions.
- C/T 9-12.3 Demonstrate an understanding of the strengths and weaknesses of various technologies for supporting different tasks (e.g., writing, research, presentations, creating artwork, statistical analysis).
- A. Make appropriate choices when determining how to use different technologies for different purposes.
 - Demonstrate the ability to choose appropriate resources when completing assignments in various content areas.
 - Make use of self-help tutorials and manuals to troubleshoot and explore unfamiliar features in various tools.
 - B. Explore career opportunities in technology-related careers, and consider the roles technology will play in future career choices.
 - Explain how various careers incorporate technology.
 - Investigate careers that focus on inventing or developing technology.
- C/T 9-12.4 Incorporate new and emerging technologies as appropriate.
- A. Demonstrate knowledge of current advancements in information technologies.
 - Identify and describe the impact of new and emerging technologies and their applications.
 - Debate ethical issues related to new technologies.

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- B. Develop and apply strategies to evaluate new and emerging technologies as potential tools for learning.
 - Research and report on new and emerging technologies and how these impact daily life, with a focus on learning.

Social and Ethical Issues

- C/T 9-12.5 Make responsible decisions—grounded in knowledge of digital safety and security best practices—that pertain to various digital communication tools and methods.
- A. Discuss and debate appropriate legal, ethical, and responsible behaviors concerning information and technology.
 - Investigate current issues related to legal, ethical, and responsible use of various types of technology and information.
 - B. Model appropriate legal, ethical, and responsible behaviors when using information and technology.
 - Use best practices for online safety as defined by the division’s online safety program.
 - Demonstrate responsible behavior, such as using strong passwords and avoiding high-risk activities.
 - Model responsible behavior when using technology tools and software as well as various types of networks.
 - Identify personal responsibilities in virtual relationships and demonstrate an understanding of the connection to legal, ethical, and responsible behavior.
 - Identify positive and negative uses of social media and develop strategies to avoid risky or negative situations as well as how to report such situations to authorities.
- C/T 9-12.6 Exhibit personal responsibility for appropriate, legal, and ethical conduct.
- A. Demonstrate an understanding of “fair use” and copyright law.
 - Apply knowledge of “fair use” and copyright law when developing presentations, products, and papers.
 - Identify copyright laws that impact student work.
 - B. Respectfully collaborate with peers, experts, and others to contribute to an electronic community of learning.
 - Demonstrate advocacy for and a personal commitment to respectful online interaction.
 - Contribute in various ways to an online community.
 - Model respect for the privacy of others.
 - C. Demonstrate knowledge of cyber crime and cyber security issues.
 - Identify the use of digital resources and tools for illegal activity.
 - Compare and contrast various state, federal, and international policies designed to stem the illegal use of technology.

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- C/T 9-12.7 Model digital citizenship by actively participating in positive activities for personal and community well-being.
- A. Communicate respect for people when participating in group online learning activities.
- Apply knowledge about effective online communications to ensure personal communications are clear.
 - Use rules of online etiquette when communicating with others.
- B. Explore the Internet as a means of personal learning and a respectful exchange of ideas and products.
- Participate in projects that involve others digitally, working together toward a common goal.
 - Pursue individual projects using online resources.
 - Demonstrate the ability to identify diverse perspectives on issues.
- C/T 9-12.8 Understand the nature of information in a global society and how the characteristics of various media may influence others.
- A. Identify the various uses of media based on intent and audience.
- Investigate media messages in various contexts.
- B. Be able to construct and deconstruct media messages and graphical representations of data.
- Connect media messages to various writing techniques, logic models, and outcomes.
 - Develop and communicate an innovative solution to a complex problem through various types of media in collaboration with experts and peers.
- Technology Research Tools**
- C/T 9-12.9 Plan and apply strategies for gathering information, using a variety of tools and sources, and reflect on alternate strategies that might lead to greater successes in future projects.
- A. Use various technology and digital resources to collect information.
- Perform research using a variety of purposefully chosen technology and digital resources.
 - Use various types of content-specific technology to gather data and information.
- B. Design and implement a variety of advanced search strategies to retrieve electronic information.
- Develop search strategies based on prior knowledge and reflect on strategies to increase their effectiveness.
- C/T 9-12.10 Draw conclusions from research and relate these findings to real-world situations—investigating further, if necessary.
- A. Use digital research to support written and oral presentations.
- Apply research derived from digital resources to original work, as appropriate.

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- Demonstrate an understanding of copyright and plagiarism when using digital resources.
 - B. Apply knowledge when conducting research to develop accurate and balanced reports.
 - Determine when further research is needed based on original search results and first drafts.
 - C. Interpret digital primary sources for historical and contemporary events.
 - Apply knowledge to interpret digital primary sources for a variety of content areas.
- C/T 9-12.11 Analyze, synthesize, and evaluate information based on source validity and the appropriateness to specific tasks.
- A. Analyze and draw conclusions about the comprehensive nature and bias of electronic information sources.
 - Follow best practice guidelines for analyzing information from particular Web sites.
 - Evaluate information in the original context.
 - B. Evaluate the relevance of electronic information sources to a given situation.
 - Determine appropriate types of information sources for various situations.
 - Choose only relevant information when citing resources.
 - C. Use various digital tools to organize, analyze, and synthesize data for learning tasks.
 - Use digital tools, such as graphic organizers, spreadsheets, and databases.

Thinking Skills, Problem Solving, and Decision Making

- C/T 9-12.12 Practice reasoning skills when gathering and evaluating data.
- A. Employ technology in developing strategies for solving problems.
 - Regularly use technology tools to assist in authentic problem-solving activities.
 - Investigate and apply expert systems and intelligent agents in real-world situations.
 - B. Select resources that extend one's own capability to solve problems and make informed decisions.
 - Choose resources that extend one's own capabilities when solving problems.
- C/T 9-12.13 Demonstrate organization and persistence when completing personal and group assignments, activities, and projects.
- A. Use digital resources to assist with project planning.
 - Use various productivity tools that help with planning and time management.
 - B. Use digital resources to assist with project management.
 - Use productivity tools to assist in tracking and meeting goals.

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- C/T 9-12.14 Use models and simulations to understand complex systems and processes.
- A. Use simulations to understand complex concepts.
 - Enhance understanding of concepts and skills by using simulations.
 - B. Use various digital resources to produce graphical representations of data.
 - Complete assignments involving data by using data graphing or imaging tools.

Technology Communication Tools

- C/T 9-12.15 Communicate effectively with others (e.g., peers, teachers, experts) in collaborative learning situations.
- A. Use technology tools for individual and collaborative writing, communication, and publishing activities.
 - Use various technology resources to develop, revise, and assess written and media-based reports and projects, integrating technologies as appropriate.
 - Independently collaborate with others using digital communication tools.
 - Use digital communication tools to communicate with specific audiences.
 - B. Participate in communications among different cultures.
 - Contribute during a distance-based communication project that includes individuals from different cultures by leveraging the differences of those cultures to develop solutions to common issues.
 - C. Participate in online courses, social and learning networks, and virtual worlds.
 - Manage goals for learning in an online course.
 - Participate in activities that involve social and learning networks and virtual worlds.
- C/T 9-12.16 Apply knowledge and skills to generate innovative ideas, products, processes, and solutions.
- A. Use various creative software, programming environments, or digital tools to convey existing ideas in new and effective ways.
 - Use technology to develop innovative and effective solutions for assignments.
 - B. Add meaning to individual and group ideas and products through creative work.
 - Create a drawing, painting, or other visual image.
 - Create original music.
 - Produce a video.
 - C. Participate with peers and experts to assess projects.
 - Use peer networks to provide and receive assessments.
 - Use communication media to locate experts who can assess projects.