North Dakota Computer Science and Cybersecurity Standards

Kindergarten through Twelfth Grade

2019

NORTH DAKOTA DEPARTMENT OF
PUBLIC INSTRUCTION

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Superintendent's Forward

These new North Dakota computer science and cybersecurity learning standards come at an especially appropriate time in our state's history. Technology is omnipresent in every occupation, in every profession, in almost everything we do. These standards give our educators, school administrators, and parents the information they need about what our students should know and be able to do about computer science and cybersecurity from kindergarten through high school. A large majority of parents want their children to learn computer science, and it has become foundational knowledge in K-12 education. Today's students must have a basic understanding of how the internet works, how to use and test an algorithm, how to create an app, and how to develop computational thinking. It is this computational thinking that allows students to look at problems differently, and to develop problem-solving skills that can be applied to any situation. These standards will assist our North Dakota students to be good digital citizens, to be more aware of potential cyber dangers and threats, and to be better prepared to protect their digital identity. It will increase their awareness of the importance of cybersecurity in their school and workplace. We are proud to be national trailblazers in presenting these standards. We believe we are the first state in the nation to offer academic content standards for computer science and cybersecurity in grades K-12. Even our youngest students in elementary school must have a basic understanding of computer science, just as they are taught to read, write, and do mathematics. The North Dakota Constitution recognizes the importance of public education in nurturing prosperity, happiness, and a "high degree of intelligence, patriotism, integrity and morality." Statewide academic content standards help us to reach these noble objectives. These new computer science and cybersecurity standards give us the tools to provide equitable educational opportunity statewide. While these North Dakota standards represent a statewide reference point for teaching computer science and cybersecurity content in classrooms, local school districts are encouraged to use the standards as a guide for developing their own local, customized curriculum. This publication is the result of months of conscientious work by 18 North Dakota computer science and cybersecurity educators from our K-12 schools and university system, as well as industry experts. They agreed to devote the many hours needed to write these new standards. The work on these new standards began in September 2018 and continued until February 2019. The writing committee's draft was made available for public comment, which generated useful opinions from teachers, administrators, parents, and the community. A panel of business and community leaders, and representatives of the public provided another layer of review. No one is better qualified to prepare our North Dakota computer science and cybersecurity standards than our North Dakota educators. This document is an exemplar of the best in North Dakota education – North Dakota teachers, writing statewide standards in an open, transparent, and diligent manner. Each member of the writing team deserves our thanks for their extensive research, analysis, and deliberations. Thanks to their work, these standards are ready to be used in our classrooms across the state.

Kirsten Baesler

Superintendent of Public Instruction

February 2019

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Introduction

Purpose/Mission
The North Dakota Computer Science and Cybersecurity Content Standards provide a rigorous and content appropriate framework for instruction to increase student achievement.

Vision
The North Dakota Computer Science and Cybersecurity Content Standards provide all students with a quality K–12 equal-opportunity education in computer science and cybersecurity. The Computer Science and Cybersecurity Content Standards will be fundamental in the achievement of 21st Century Skills.

Computer Science and Cybersecurity Content Standards Development Process
The development of the Computer Science and Cybersecurity Content Standards for North Dakota was a multi-phase process. State Superintendent of Public Instruction Kirsten Baesler established a statewide committee through an application process that included teachers, administrators, and higher education faculty. Over three multi-day sessions, the committee developed a new set of standards. The committee began by reviewing state and national standards. Drawing from the information gained from those documents, the committee drafted the initial North Dakota Computer Science and Cybersecurity Content Standards. Input from two rounds of public comments; one review by a content standard review committee representing business interests, parents, and the public; and a review by content experts was used to inform the development of the new standards. The committee began their work in September of 2018 and completed the development of the new standards in February of 2019.

Inclusion of Cybersecurity Standards

Cybersecurity is engrained throughout the North Dakota Computer Science and Cybersecurity Standards. Cybersecurity is defined as a set of techniques used to protect the integrity of networks, programs, and data from attack, damage, or unauthorized access. Specifically, the standards that are seen throughout the Computer Science and Cybersecurity Standards fall into the CIA triad model of cybersecurity. The CIA triad is a set of guiding principles for learning, understanding, implementing, and policy making for cybersecurity. The cybersecurity standards were written with the CIA triad in mind. Cybersecurity standards are noted in the standards document with a CYSEC indicator.

The goal of the cybersecurity standards is to ensure that all North Dakota graduates are educated in the foundational principles of cybersecurity. By educating students in cybersecurity, we will develop citizensof North Dakota that are prepared to live in an increasingly digital and technology-driven society.

Some goals of the standards will ensure that students:
- Use the Internet safely
- Are good digital citizens
- Use basic safety and security concepts
- Secure and protect their digital identity
- Protect their digital data and technology using best practices
- Have awareness of potential threats around them
- Recognize attacks that are happening
- React appropriately to an attack/breach
- Develop systems and processes with security in mind
- Understand the role cybersecurity plays in the workplace
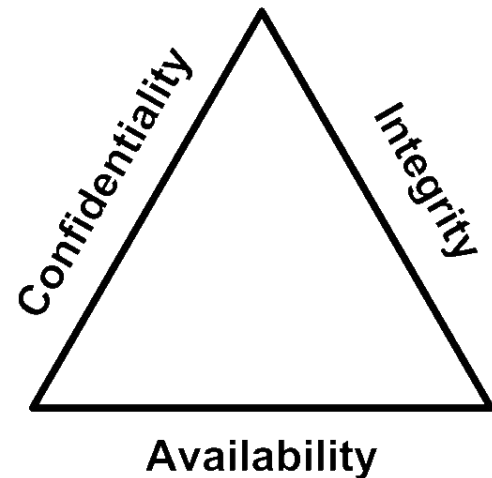
CIA is defined as:

- **Confidentiality**- Ensuring that data is accessible only to its intended parties. Data should not be accessed or read without authorization.
- **Integrity**- Data should not be modified or compromised in any way. It assumes that data remains in its intended state and can only be edited by authorized parties.
- **Availability**- Keep data and resources available for authorized use, especially during emergencies or disasters. Systems need to be available for use and free from errors and conflicts.

Standards' Intentions of Use

The application of these standards will provide a consistent and shared responsibility for student growth and achievement across curriculum.

How to Read This Document

The standards are comprised of five main sections: K-2, 3-5, 6-8, 9-12 general, and 9-12 extension. These standards are developed with the understanding that the first four sections are for all K-12 students. The extension standards are for select specialized classes in high school. The overarching topics across all levels are Technology Systems, Computational Thinking, Information Literacy, Computing in Society, and Digital Citizenship.

	Kindergarten	1st Grade	2nd Grade
Networks & Internet Networks link computers and devices locally and around the world allowing people to access and communicate information.			
Technology Systems	**K.NI.1** Recognize that computing devices can be connected together.	**1.NI.1** Recognize that connecting computing devices allows information sharing.	**2.NI.1** Explain that connecting computing devices allows information sharing.
Hardware & Software Devices, hardware, and software work together as a system to accomplish tasks.			
	K.HS.1 Follow directions to use computing devices to perform a variety of appropriate tasks.	**1.HS.1** Use appropriate terminology to identify common computing devices and components. **1.HS.2** With guidance, use a computing device to perform a variety of tasks. **1.HS.3** Recognize users have different technology needs.	**2.HS.1** Identify the components and basic functions of a computer system. **2.HS.2** Independently use a computing device to perform a variety of tasks. **2.HS.3** Recognize users have different technology needs and preferences.
Troubleshooting Strategies for solving technology system problems			
	K.T.1 Understand technology systems might not work as expected.	**1.T.1** Understand technology systems might not work as expected and with guidance use appropriate terminology to describe a problem.	**2.T.1** Understand technology systems might not work as expected and independently use appropriate terminology to describe a problem.

Labels (callouts): Concept, Sub-Concept, Code (grade, strand, number), Standard

Individual grade-specific standards can be identified by their grade, strand, and number, so that 3.HS.1, for example, stands for grade 3, Hardware & Software, standard 1.

In reading this document, the terms 'continued growth' and 'with guidance' are used.

- **Continued growth** indicates a repeating standard that will advance based on the complexity of the examples and problems students encounter as they move through the grades; the prior grade level standard needs continued attention.
- **With guidance** indicates students may work with the whole class, be prompted by an adult, work with one or more peers, or with other supports as needed.

Organizations and Key Documents Referenced

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North Dakota Information Technology Education Content Standards. (2015).

North Dakota Library and Technology Content Standards. (2012).

Oklahoma Academic Standard for Computer Science. (2018).

Virginia's CTE Resource Center: 2018/2019 Cybersecurity Fundamentals Competency-Based Task/Competency List. (2018).

Virginia's CTE Resource Center: Career Clusters. (2018).

Kindergarten-Second Grade

	Kindergarten	1st Grade	2nd Grade
Technology Systems	**Networks & Internet** Networks link computers and devices locally and around the world allowing people to access and communicate information.		
	K.NI.1 Recognize that computing devices can be connected.	**1.NI.1** Recognize that connecting computing devices allows information sharing.	**2.NI.1** Explain that connecting computing devices allows information sharing.
	Hardware & Software Devices, hardware, and software work together as a system to accomplish tasks.		
	K.HS.1 Follow directions to use computing devices to perform a variety of appropriate tasks.	**1.HS.1** Use appropriate terminology to identify common computing devices and components. **1.HS.2** With guidance, use a computing device to perform a variety of tasks. **1.HS.3** Recognize users have different technology needs.	**2.HS.1** Identify the components and basic functions of a computer system. **2.HS.2** Independently use a computing device to perform a variety of tasks. **2.HS.3** Recognize users have different technology needs and preferences.
	Troubleshooting Strategies for solving technology system problems.		
	K.T.1 Understand technology systems might not work as expected.	**1.T.1** Understand technology systems might not work as expected and with guidance, use appropriate terminology to describe a problem.	**2.T.1** Understand technology systems might not work as expected and independently use appropriate terminology to describe a problem.
	Kindergarten	1st Grade	2nd Grade
Computational Thinking	**Problem Solving & Algorithms** Strategies for understanding and solving problems.		
	K.PSA.1 With guidance, determine if a program works. **K.PSA.2** Use trial and error in attempt to solve a problem.	**1.PSA.1** Solve a problem through trial and error using given materials/resources. **1.PSA.2** Follow a set of instructions (algorithms) to complete a task. **1.PSA.3** Define debug.	**2.PSA.1** Use problem solving steps: understanding the task, considering various strategies, isolate and debug. **2.PSA.2** Break a task into smaller steps to identify patterns or solve the problem. **2.PSA.3** Define algorithms.

	Kindergarten	1st Grade	2nd Grade
Computational Thinking		**1.PSA.4** Identify and practice debugging strategies including 'Go back to when it worked'.	
	Data Creation & Analysis Data can be collected, used, and presented with computing devices or digital tools.		
	K.DCA.1 With guidance, draw conclusions and make predictions based on picture graphs or patterns with or without a computing device.	**1.DCA.1** With guidance, identify and interpret data from a chart or graph to make a prediction with or without a computing device.	**2.DCA.1** With guidance, construct and interpret data and present it in a chart or graph to make a prediction with or without a computing device.
	Development & Design Design processes to create new, useful, and imaginative solutions to problems.		
	K.DD.1 With guidance, create programs to follow a sequence.	**1.DD.1** With guidance, create programs to accomplish tasks that includes sequencing or looping.	**2.DD.1** Independently or collaboratively create programs to accomplish tasks that include sequencing or looping.

	Kindergarten	1st Grade	2nd Grade
Information Literacy	**Access** Effective search strategies can locate information for intellectual or creative pursuits.		
	K.A.1 With guidance, use a keyword search with a teacher selected online resource.	**1.A.1** Use a keyword search with a teacher-selected online resource.	**2.A.1** Continued growth.
	Evaluate Information sources can be evaluated for accuracy, currency, appropriateness, and purpose.		
	K.E.1 Name various information sources.	**1.E.1** With guidance, evaluate information for research purposes.	**2.E.1** With guidance, determine whether the purpose of content is to inform or to influence actions.
	Create It is important to both consume and produce information to be digitally literate.		
	K.C.1 With guidance, create a digital product.	**1.C.1** Independently or with guidance, create a digital product.	**2.C.1** Independently or collaboratively, create a digital product.

Information Literacy	Kindergarten	1st Grade	2nd Grade
Intellectual Property Respect for the rights and obligations of using and sharing intellectual property.			
	K.IP.1 Discuss that creative works have owners (copyright). **K.IP.2** Understand that credit should be given to the creator of creative work.	**1.IP.1** Understand that creative works have owners. **1.IP.2** With guidance, give credit to the creator of a creative work.	**2.IP.1** Understand that students own their creative works. **2.IP.2** Continued growth

Computing in Society	Kindergarten	1st Grade	2nd Grade
Impacts of Computing Past, present, and possible future impact of technology on society.			
	K.IC.1 List different ways in which technologies are used in daily life.	**1.IC.1** Identify how technologies are used in and out of school.	**2.IC.1** Identify how technologies are used in the workforce.
Social Interactions Technology facilitates collaboration with others.			
	K.SI.1 With guidance, use technology to share thinking with teachers or adults.	**1.SI.1** With guidance, use technology to share thinking with peers.	**2.SI.1** With guidance, use technology to communicate with others outside of the classroom.

Digital Citizenship	Kindergarten	1st Grade	2nd Grade
Safety & Ethics There are both positive and negative impacts in social and ethical behaviors for using technology.			
	K.SE.1 With guidance, use technology in safe and correct ways. (CYSEC) **K.SE.2** With guidance, use authentication methods to access technology. (CYSEC)	**1.SE.1** Identify how to use technology in safe and correct ways. (CYSEC) **1.SE.2** Understand the differences between a username and authentication methods and independently use them to access technology. (CYSEC)	**2.SE.1** Explain how to use technology in safe and correct ways. (CYSEC) **2.SE.2** Identify strategies for protecting authentication methods. (CYSEC) **2.SE.3** Recognize the risks of interacting online with others. (CYSEC)
Responsible Use Respect and dignity in virtual communities.			
	K.RU.1 Discuss positive and negative behaviors when using electronic communication. (CYSEC)	**1.RU.1** Identify positive and negative behaviors when using electronic communication. (CYSEC)	**2.RU.1** Explain positive and negative behaviors when using electronic communication. (CYSEC)

Digital Citizenship	K.RU.2 With guidance, identify appropriate manners while participating in an online community. K.RU.4 Comply with Acceptable Use Policies.	1.RU.2 Discuss reporting inappropriate electronic content. (CYSEC) 1.RU.4 Comply with Acceptable Use Policies.	2.RU.2 Know and identify how to report concerns regarding online content and behaviors. (CYSEC) 2.RU.3 Develop a code of conduct, explain, and practice appropriate behavior and responsibilities while participating in an online community. 2.RU.4 Comply with Acceptable Use Policies.
	Digital Identity Responsibilities and opportunities of living, learning, and working in an interconnected digital world.		
	No standards at this level.	1.DI.1 Recognize that you have a digital identity.	2.DI.1 Define digital identity.

Third-Fifth Grade

	3rd Grade	4th Grade	5th Grade
Technology Systems	**Networks & Internet** Networks link computers and devices locally and around the world allowing people to access and communicate information.		
	3.NI.1 Recognize that information is sent and received over physical or wireless paths.	**4.NI.1** Recognize that computing devices can be connected in a variety of ways to share information.	**5.NI.1** Understand that information is sent and received across physical or wireless paths.
	Hardware & Software Devices, hardware, and software work together as a system to accomplish tasks.		
	3.HS.1 Identify the components and the basic functions of a computer system including peripherals and external storage features. **3.HS.2** Independently use a computing device to perform a variety of tasks. **3.HS.3** Recognize users have different technology needs and preferences.	**4.HS.1** Explain the difference between hardware and software. **4.HS.2** Continued growth. **4.HS.3** Continued growth.	**5.HS.1** Compare and contrast physical and virtual systems. **5.HS.2** Continued growth. **5.HS.3** Continued growth.
	Troubleshooting Strategies for solving technology system problems.		
	3.T.1 With guidance, apply basic troubleshooting strategies.	**4.T.1** Continued growth.	**5.T.1** Continued growth.
	3rd Grade	4th Grade	5th Grade
Computational Thinking	**Problem Solving & Algorithms** Strategies for understanding and solving problems.		
	3.PSA.1 Solve a task by breaking it into smaller pieces. **3.PSA.2** Debug a program that includes sequencing.	**4.PSA.1** Decompose (break down) a large task into smaller, manageable subtasks. **4.PSA.2** Debug a program that includes sequencing or loops. **4.PSA.3** Identify multiple solutions to a task.	**5.PSA.1** Create a sequence of instructions from a previous decomposed task. **5.PSA.2** Debug a program that includes sequencing, loops, or conditionals. **5.PSA.3** Work collaboratively to explore multiple solutions to a task.

Computational Thinking	**Data Creation & Analysis** Data can be collected, used, and presented with computing devices or digital tools.		
	3.DCA.1 Collect and organize data in various visual formats.	**4.DCA.1** Organize and present collected data visually to highlight comparisons.	**5.DCA.1** Organize, and present collected data to highlight comparisons and support a claim.
	Development & Design Design processes to create new, useful, and imaginative solutions to problems.		
	3.DD.1 Independently or collaboratively create programs that use sequencing and looping. **3.DD.2** Convert an algorithm into code.	**4.DD.1** Independently and collaboratively create programs that use sequencing, loops, and conditionals.	**5.DD.1** Continued growth. **5.DD.2** Create solutions to problems using a design method.

	3rd Grade	4th Grade	5th Grade
Information Literacy	**Access** Effective search strategies can locate information for intellectual or creative pursuits.		
	3.A.1 Use basic search strategies with teacher-selected online sources.	**4.A.1** Use multiple teacher-selected online resources to locate information.	**5.A.1** Refine your keyword search to improve your results.
	Evaluate Information sources can be evaluated for accuracy, currency, appropriateness, and purpose.		
	3.E.1 With guidance, compare and contrast resources based on content and the author's purpose.	**4.E.1** With guidance, use a strategy to evaluate information for research purposes.	**5.E.1** Continued growth.
	Create It is important to both consume and produce information to be digitally literate.		
	3.C.1 Independently or collaboratively, create a digital product.	**4.C.1** Continued growth.	**5.C.1** Independently or collaboratively, create a digital product using two or more tools.
	Intellectual Property Respect for the rights and obligations of using and sharing intellectual property.		
	3.IP.1 Define copyright. **3.IP.2** With guidance, identify the elements of a citation. **3.IP.3** Explain piracy and plagiarism.	**4.IP.1** Demonstrate an understanding of copyright and fair use. **4.IP.2** With guidance, create a citation. **4.IP.3** With guidance, use strategies to avoid piracy and plagiarism.	**5.IP.1** With guidance, demonstrate an understanding of ethical issues in copyright and fair use. **5.IP.2** Continued growth. **5.IP.3** Continued growth.

	3rd Grade	4th Grade	5th Grade
Computing in Society			
	Impacts of Computing Past, present, and possible future impact of technology on society.		
	3.IC.1 Identify technologies that have changed the world.	**4.IC.1** Give examples of technologies that influence society today.	**5.IC.1** Explain how technologies can change the future.
	Social Interactions Technology facilitates collaboration with others.		
	3.SI.1 Recognize that there are various collaborative technologies. **3.SI.2** With guidance, use collaborative technology to seek out diverse perspectives.	**4.SI.1** With guidance, use collaborative technology to interpret diverse perspectives.	**5.SI.1** With guidance, use collaborative technology to compare and contrast diverse perspectives.

	3rd Grade	4th Grade	5th Grade
Digital Citizenship			
	Safety & Ethics There are both positive and negative impacts in social and ethical behaviors for using technology.		
	3.SE.1 Identify problems that relate to inappropriate use of computing devices and networks. (CYSEC) **3.SE.2** Keep authentication methods confidential and be proactive if they are compromised. (CYSEC) **3.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **3.SE.4** Identify the difference between public and private information. (CYSEC)	**4.SE.1** Identify and explain issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (CYSEC) **4.SE.2** Create secure authentication to insure privacy. (CYSEC) **4.SE.3** Continued growth. **4.SE.4** Recognize when it is safe to share private information online. (CYSEC)	**5.SE.1** Recognize that there are real-world cybersecurity problems (i.e., hacking) when interacting online. (CYSEC) **5.SE.2** Continued growth. **5.SE.3** Continued growth. **5.SE.4** Apply strategies to keep your private information safe online. (CYSEC)
	Responsible Use Respect and dignity in virtual communities.		
	3.RU.1 Identify and discuss positive and negative uses of technology and information and their impact.	**4.RU.1** Discuss basic issues related to the appropriate use of technology and information, and the consequences of inappropriate use.	**5.RU.1** Demonstrate an understanding of the appropriate use of technology and information and the consequences of inappropriate use.

Digital Citizenship	3.RU.2 Recognize similarities and differences between in-person bullying and cyberbullying. 3.RU.3 Develop a code of conduct, explain, and practice appropriate behavior and responsibilities while participating in an online community. 3.RU.4 Comply with Acceptable Use Policies.	4.RU.2 Identify strategies for dealing responsibly with cyberbullying and reporting inappropriate behavior. 4.RU.3 Continued growth. 4.RU.4 Comply with Acceptable Use Policies.	5.RU.2 Use strategies that prevent and deal responsibly with cyberbullying and inappropriate behavior. 5.RU.3 Continued growth. 5.RU.4 Comply with Acceptable Use Policies.
Digital Identity Responsibilities and opportunities of living, learning, and working in an interconnected digital world.			
	3.DI.1 Recognize the permanence of their actions in the digital world.	4.DI.1 Explain the importance of your digital identity.	5.DI.1 Continued growth.

Sixth-Eighth Grade

	6th Grade	7th Grade	8th Grade
Technology Systems	**Networks & Internet** Networks link computers and devices locally and around the world allowing people to access and communicate information.		
	6.NI.1 Explain how data is sent across networks.	**7.NI.1** Model how data is sent from one computer to another across networks.	**8.NI.1** Investigate how data is sent from one computer to another across networks.
	Hardware & Software Devices, hardware, and software work together as a system to accomplish tasks.		
	6.HS.1 Use hardware and/or software to complete a task. **6.HS.2** Use software features to accomplish a goal. **6.HS.3** Organize, store, and retrieve digital information with guidance. **6.HS.4** Identify threats to technology systems. (CYSEC) **6.HS.5** Identify security measures to protect technology systems. (CYSEC)	**7.HS.1** Compare and contrast hardware and/or software options to complete a task. **7.HS.2** Continued growth. **7.HS.3** Organize, store, and retrieve digital information with minimal guidance. **7.HS.4** Describe threats to technology systems. (CYSEC) **7.HS.5** Explain how security measures protect technology systems. (CYSEC)	**8.HS.1** Choose appropriate device/hardware/software to complete a task. **8.HS.2** Continued growth. **8.HS.3** Organize, store, and retrieve digital information efficiently. **8.HS.4** Describe ways to protect against threats to technology systems. (CYSEC) **8.HS.5** Compare, and contrast securitymeasures used to protect technology systems. (CYSEC)
	Troubleshooting Strategies for solving technology system problems.		
	6.T.1 Apply basic troubleshooting strategies.	**7.T.1** Continued growth.	**8.T.1** Continued growth.
	6th Grade	7th Grade	8th Grade
Computational Thinking	**Problem Solving & Algorithms** Strategies for understanding and solving problems.		
	6.PSA.1 Identify and test an algorithm to solve a problem. **6.PSA.2** Debug a program that includes sequencing, loops, or conditionals.	**7.PSA.1** Modify and test an algorithm to solve a problem. **7.PSA.2** Continued growth.	**8.PSA.1** Create and test an algorithm to solve a problem across disciplines. **8.PSA.2** Continued growth.

Computational Thinking			
	6.PSA.3 Compare and contrast the efficiencies of multiple solutions to a task.		
	Data Creation & Analysis Data can be collected, used, and presented with computing devices or digital tools.		
	6.DCA.1 Collect and analyze data to support a claim.	**7.DCA.1** Represent data, in more than one way, to defend your claim.	**8.DCA.1** Represent data from multiple sources to defend or refute a claim.
	Development & Design Design processes to create new, useful, and imaginative solutions to solve problems.		
	6.DD.1 Use programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.	**7.DD.1** Modify programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.	**8.DD.1** Create programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.

Information Literacy	6th Grade	7th Grade	8th Grade
	Access Effective search strategies can locate information for intellectual or creative pursuits.		
	6.A.1 Use a variety of strategies to refine and revise search results.	**7.A.1** Continued growth.	**8.A.1** Use advanced search strategies to locate information online.
	Information sources can be evaluated for accuracy, currency, appropriateness, and purpose.		
	6.E.1 Evaluate information and its sources.	**7.E.1** Independently, evaluate information and its sources using student selected processes and strategies.	**8.E.1** Continued growth.
	Create It is important to both consume and produce information to be digitally literate.		
	6.C.1 Repurpose or remix original works following fair use guidelines.	**7.C.1** Continued growth.	**8.C.1** Continued growth.
	Intellectual Property Respect for the rights and obligations of using and sharing intellectual property.		
	6.IP.1 With guidance, properly use copyrighted works, works in the creative commons, and works in the public domain.	**7.IP.1** With minimal guidance, properly use copyrighted works, works in the creative commons, and works in the public domain.	**8.IP.1** Properly use copyrighted works, works in the creative commons, and works in the public domain.

	6th Grade	7th Grade	8th Grade
Information Literacy	**6.IP.2** Cite a variety of sources using the appropriate format. **6.IP.3** Describe negative consequences of piracy and plagiarism.	**7.IP.2** Continued growth. **7.IP.3** Identify strategies to avoid personal works and the works of others from being pirated and plagiarized. (CYSEC)	**8.IP.2** Continued growth. **8.IP.3** Debate the risks and benefits of sharing personal works online (CYSEC)

	6th Grade	7th Grade	8th Grade
Computing in Society	**Impacts of Computing** Past, present, and possible future impact of technology on society.		
	6.IC.1 Identify the positive and negative impacts of past, present, and future technology, including bias and accessibility.	**7.IC.1** Compare and contrast the impacts of technology, including bias and accessibility.	**8.IC.1** Explore and create solutions for the negative impacts of technology, including bias and accessibility.
	Social Interactions Technology facilitates collaboration with others.		
	6.SI.1 Use collaborative technology. **6.SI.2** Identify how social interactions can impact a person's self-image.	**7.SI.1** Use collaborative technology to gather and share information. **7.SI.2** Continued growth.	**8.SI.1** Use collaborative technology to communicate information to a specific audience. **8.SI.2** Continued growth.

	6th Grade	7th Grade	8th Grade
Digital Citizenship	**Safety & Ethics** There are both positive and negative impacts in social and ethical behaviors for using technology.		
	6.SE.1 Identify steps for responding to uncomfortable situations when interacting online. (CYSEC) **6.SE.2** Identify basic methods to maintain digital privacy and security. (CYSEC) **6.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **6.SE.4** Identify threats to personal cybersecurity. (CYSEC)	**7.SE.1** Continued growth. **7.SE.2** Identify a variety of methods to maintain digital privacy and security. (CYSEC) **7.SE.3** Continued growth. 7.SE.4 Describe how to respond to threats to personal cybersecurity. (CYSEC)	**8.SE.1** Continued growth. **8.SE.2** Identify advanced methods to maintain digital privacy and security. (CYSEC) **8.SE.3** Continued growth. **8.SE.4** Discuss the consequences of identity theft. (CYSEC)

Digital Citizenship	Responsible Use Respect and dignity in virtual and physical communities.		
	6.RU.1 Identify different forms of cyberbullying. **6.RU.2** Identify strategies to stop cyberbullying. **6.RU.3** Use appropriate digital etiquette in avariety of situations. **6.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**7.RU.1** Describe different forms of cyberbullying and the effects on all parties involved. **7.RU.2** Identify strategies to prevent and stop cyberbullying. **7.RU.3** Continued growth. **7.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**8.RU.1** Continued growth. **8.RU.2** Identify strategies to prevent and stop cyberbullying. **8.RU.3** Continued growth. **8.RU.4** Understand the purpose of and comply with Acceptable Use Policies.
	Digital Identity The responsibilities and opportunities that come with living, learning, and working in an interconnected digital world.		
	6.DI.1 Describe personal online usage and determine how it affects identity on- and offline.	**7.DI.1** Evaluate how digital identity can impact a person now and in the future.	**8.DI.1** Continued growth.

Ninth-Twelfth Grade

	9th Grade	10th Grade	11th Grade	12th Grade
Technology Systems	**Networks & Internet** Networks link computers and devices locally and around the world allowing people to access and communicate information			
	9.NI.1 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). **9.NI.2** Understand the implications of accessing publicly available Internet connections. (CYSEC)	**10.NI.1** Identify and define different network connection types (e.g., Wi-Fi, mobile data,ethernet). **10.NI.2** Identify networkable devices.	**11.NI.1** Compare and contrast different network connection types (e.g., Wi-Fi, mobile data, ethernet). **11.NI.2** Understand the global impact of networkable devices.	**12.NI.1** Choose an appropriate network connection given a scenario or situation. **12.NI.2** Compare and contrast the benefits and security risks of networkable devices.
	Hardware & Software Devices, hardware, and software work together as a system to accomplish tasks.			
	9.HS.1 Compare and contrast appropriate device/hardware/software to complete a task. **9.HS.2** Define software and security patches/update. (CYSEC) **9.HS.3** Explain why a backup is necessary. (CYSEC)	**10.HS.1** Continued growth. **10.HS.2** Recognize the importance of and effectively perform software and security patches/updates. (CYSEC) **10.HS.3** Identify important data or systems that need redundancy. (CYSEC)	**11.HS.1** Continued growth. **11.HS.2** Identify and choose hardware and software to help protect a system. (CYSEC) **11.HS.3** Identify different options for redundancy (e.g., cloud storage, external, duplicate devices). (CYSEC)	**12.HS.1** Continued growth. **12.HS.2** Continued growth. **12.HS.3** Implement redundancy. (CYSEC)
	Troubleshooting Strategies for solving technology system problems.			
	9.T.1 Describe basic hardware and software problems using appropriate and accurate terminology.	**10.T.1** Follow appropriate guidelines that convey systematic troubleshooting techniques to identify and fix errors.	**11.T.1** Continued growth.	**12.T.1** Implement systematic troubleshooting strategies to identify and fix errors.

	9th Grade	10th Grade	11th Grade	12th Grade
Computational Thinking	**Problem Solving & Algorithms** Strategies for understanding and solving problems			
	9.PSA.1 Identify, recognize, and use an algorithm to solve a complex problem across disciplines.	**10.PSA.1** Create and test an algorithm to solve a complex problem across disciplines.	**11.PSA.1** Demonstrate ways a given algorithm applies to problems across disciplines and explain the benefits and drawbacks of choices made.	**12.PSA.1** Use and adapt common algorithms to solve computational problems.
	Data Creation & Analysis Data can be collected, used, and presented with computing devices or digital tools.			
	9.DCA.1 Collect and analyze complex data.	**10.DCA.1** Represent complex data in more than one way to support a claim.	**11.DCA.1** Represent complex data in multiple ways to defend a student-generated claim.	**12.DCA.1** Represent complex data using interactive data visualizations or computational models.

	9th Grade	10th Grade	11th Grade	12th Grade
Information Literacy	**Access** Effective searches strategies can locate information for intellectual or creative pursuits.			
	9.A.1 Plan and employ effective research strategies to locate information.	**10.A.1** Curate relevant information from digital resources using a variety of tools and methods.	**11.A.1** Devise new search strategies based on information gaps and new understanding.	**12.A.1** Build knowledge by actively exploring real-world issues and problems, developing ideas and theories,and pursuing answers and solutions.
	Evaluate Information sources can be evaluated for accuracy, currency, appropriateness, and purpose.			
	9.E.1 Evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.	**10.E.1** Gather accurate, credible, and relevant sources of information, media, data, or other resources showing different perspectives.	**11.E.1** Use accurate, credible, and relevant sources of information, media, data, or other resources showing different perspectives.	**12.E.1** Explain source selection based on accuracy, perspective, credibility, and relevance of information, media, data, or other resources.

Information Literacy

Create
It is important to both consume and produce information to be digitally literate.

9th Grade	10th Grade	11th Grade	12th Grade
9.C.1 Create original works or responsibly repurpose or remix digital resources into new creations to communicate an idea.	**10.C.1** Choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.	**11.C.1** Publish or present content that customizes the message and medium for their intended audiences to communicate their idea.	**12.C.1** Exhibit perseverance, a tolerance for ambiguity, and the capacity to work with open-ended problems in the design and creation process.

Intellectual Property
Respect for the rights and obligations of using and sharing intellectual property.

9th Grade	10th Grade	11th Grade	12th Grade
9.IP.1 Properly use copyrighted works, works in the creative commons, and works in the public domain. **9.IP.2** Cite sources in a standard format to ethically reference the intellectual property of others. **9.IP.3** Engage in positive, safe, legal, and ethical behavior when using technology.	**10.IP.1** Demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. **10.IP.2** Continued growth. **10.IP.3** Continued growth.	**11.IP.1** Explain the beneficial and harmful effects that intellectual property laws can have on innovation, creativity, and collaboration. **11.IP.2** Continued growth. **11.IP.3** Evaluate the social and economic implications of piracy and plagiarism in the context of safety, law, or ethics.	**12.IP.1** Debate laws and regulations that impact the development and use of software. **12.IP.2** Continued growth. **12.IP.3** Continued growth.

Computing in Society

9th Grade	10th Grade	11th Grade	12th Grade

Impacts of Computing
Past, present, and possible future impact of technology on society.

9th Grade	10th Grade	11th Grade	12th Grade
9.IC.1 Evaluate how technology has impacted the workforce positively and negatively.	**10.IC.1** Evaluate the social, personal, and economic implications technology has on society and the economy.	**11.IC.1** Explain how computing may change cultural aspects of society.	**12.IC.1** Predict how computing may impact the workplace and personal lives.

Social Interactions
Technology facilitates collaboration with others.

9th Grade	10th Grade	11th Grade	12th Grade
9.SI.1 Identify how technology has affected our means of communication.	**10.SI.1** Evaluate the impacts of technology on social interactions.	**11.SI.1** Investigate ways to maximize the benefits and minimize the harmful effects technology can have on society.	**12.SI.1** Evaluate the impact of equity, bias, access, and influence on the availability of computing resources in a global society.

	9th Grade	10th Grade	11th Grade	12th Grade
Digital Citizenship	**Safety & Ethics** There are both positive and negative impacts in social and ethical behaviors for using technology.			
	9.SE.1 Recognize the effects sharing information online can have on others' privacy. (CYSEC) **9.SE.2** Know how to modify account settings to protect privacy and security. (CYSEC) **9.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **9.SE.4** Describe ways to prevent identity theft. (CYSEC)	**10.SE.1** Implement best practices to secure personal information. (CYSEC) **10.SE.2** Recognize the importance of monitoring your private data. (CYSEC) **10.SE.3** Manage personal data to maintain digital privacy and security and are aware of data-collection technology used to track online behaviors. (CYSEC) **10.SE.4** Identify if their private data has been altered and can react appropriately. (CYSEC)	**11.SE.1** Understand encryption and how it is used to protect data. (CYSEC) **11.SE.2** Explain the privacy concerns related to the collection and generation of data through automated processes. (CYSEC) **11.SE.3** Continued Growth **11.SE.4** Develop a plan to recover from an incident that was tied to unauthorized access. (CYSEC)	**12.SE.1** Continued growth. **12.SE.2** Illustrate how sensitive data can be affected by malware and other attacks. (CYSEC) **12.SE.3** Continued growth. **12.SE.4** Continued growth.
	Responsible Use Respect and dignity in virtual and physical communities.			
	9.RU.1 Apply cyberbullying prevention strategies. **9.RU.2** Apply safe and ethical behaviors to personal electronic communication and interaction. (CYSEC) **9.RU.3** Continued growth. **9.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**10.RU.1** Continued growth. **10.RU.2** Continued growth. **10.RU.3** Continued growth. **10.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**11.RU.1** Continued growth. **11.RU.2** Continued growth. **11.RU.3** Continued growth. **11.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**12.RU.1** Continued growth. **12.RU.2** Continued growth. **12.RU.3** Continued growth. **12.RU.4** Understand the purpose of and comply with Acceptable Use Policies.

Digital Identity			
The responsibilities and opportunities that come with living, learning, and working in an interconnected digital world.			
9.DI.1 Manage a digital identity and be aware of the permanence of actions in the digital world. (CYSEC)	**10.DI.1** Continued growth.	**11.DI.1** Continued growth.	**12.DI.1** Continued growth.

CYSEC - North Dakota Cybersecurity standard

CS Extension Standards (9-12)

9-12

Technology Systems

Network & Internet

ES.NI.1 Examine the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.

ES.NI.2 Explain how the characteristics of the Internet influence the systems developed on it.

ES.NI.3 Develop solutions to security threats. (CYSEC)

ES.NI.4 Give examples to illustrate how sensitive data can be affected by malware and other attacks. (CYSEC)

ES.NI.5 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology).

ES.NI.6 Compare ways software developers protect devices and information from unauthorized access. (CYSEC)

Hardware & Software

ES.HS.1 Categorize and describe the different functions of operating system software.

ES.HS.2 Categorize the roles of operating system software.

ES.HS.3 Demonstrate familiarity and knowledge of the programming environment.

Troubleshooting

ES.T.1 Continued growth.

9-12

Computational Thinking

Algorithms & Programming

ES.AP.1 Design algorithms to solve computational problems using a combination of original and existing algorithms.

ES.AP.2 Implement searching and sorting algorithms to solve computational problems.

ES.AP.3 Evaluate algorithms in terms of their efficiency.

ES.AP.4 Evaluate key qualities of a program through a process, such as code review, program tracing, and/or critical data testing.

ES.AP.5 Demonstrate knowledge of the different types of programming errors.

ES.AP.6 Identify and correct different types of programming errors using a systematic approach.

Variables

ES.V.1 Use data structures to represent information.

ES.V.2 Compare and contrast fundamental data structures and their uses.

Control Structures

ES.CS.1 Design computational artifacts using single and multi-way conditional statements.

ES.CS.2 Design computational artifacts using pretest and/or posttest repetitions.

ES.CS.3 Design computational artifacts using fixed and/or variable length repetitions.

ES.CS.4 Iteratively design and develop computational artifacts for practical intent, personal expression, or to address a societal issue.

ES.CS.5 Justify the selection of specific control structures by identifying tradeoffs associated with implementation, readability, and performance.

ES.CS.6 Demonstrate the flow of execution of a recursive algorithm.

Modularity

ES.M.1 Analyze a large-scale computational problem and identify generalizable patterns or problem components that can be applied to a solution.

ES.M.2 Decompose problems into smaller subproblems through systematic analysis.

ES.M.3 Construct solutions to problems using student-created components, such as procedures, modules, and/or objects.

ES.M.4 Demonstrate code reuse by creating programming solutions using libraries or APIs.

	Program Development
Computational Thinking	**ES.PD.1** Iteratively evaluate and refine a computational artifact to enhance its performance, reliability, usability, and/or accessibility.
	ES.PD.2 Document decisions made during the design process using text, graphics, presentations, and/or demonstrations in the development of complex programs.
	ES.PD.3 Develop and use a series of test cases to verify that a program performs according to its design specifications.
	ES.PD.4 Modify an existing program to add additional functionality and discuss intended and unintended implications.
	ES.PD.5 Explain security issues that might lead to compromised computer programs.
	ES.PD.6 Internally document coding structures.

	9-12
Information Literacy	**Access** Conduct basic searches to gather information from teacher provided digital sources.
	ES.A.1 Continued growth.
	Evaluate Evaluate information sources based on purpose. Recognize when the purpose of content is to inform or to influence actions.
	ES.E.1 Continued growth.
	Create Products are used to share information with others.
	ES.C.1 Evaluate the ability of models and simulations to test and support hypotheses.

	9-12
Computing in Society	**Impacts of Computing** The past, present, and possible future impact of technology on society. People use many types of technologies in their daily work and personal lives.
	ES.IC.1 Continued growth.

Computing in Society	**Social Interactions** Communication with peers, teachers, and others using technology.	
	ES.SI.1 Continued growth.	
	9-12	
Digital Citizenship	**Safety, Law, and Ethics** Positive and negative social and ethical behaviors for using technology.	
	ES.SLE.1 Evaluate computational artifacts to maximize their beneficial effects and minimize harmful effects on society.	
	Responsible Use Safe and ethical behaviors in the digital world.	
	ES.RU.1 Continued growth.	
	Privacy Personal privacy concepts.	
	ES.P.1 Continued growth.	

Glossary Terms

1. Acceptable Use Policy (AUP): a written document approved by an organization outlining terms and conditions for users

2. Accuracy: the quality of being correct or precise

3. addressing: assigning an IP address for a device

4. algorithm: a step-by-step process to complete a task

5. authentication methods: the verification of the identity of a person or process

6. bandwidth: a maximum rate of data transfer across a given path

7. bias: an unfair belief about a person or group based on a stereotype

8. code: a set of instructions used to tell a computer what to do

9. computational model: mathematical model simulating complex problems

10. computational thinking: the human ability to formulate problems so that their solutions can be represented as computational steps or algorithms to be executed by a computer

11. computer science: the study of computers and algorithmic processes, including their principles, hardware and software designs, implementation, and impact on society

12. conditionals: a programming structure that performs different actions depending on whether a given expression evaluates to *true* or *false*

13. copyright: legal protection that creators have over the things they create

14. Creative Commons: a set of various licenses that allow people to share their copyrighted work be copied, edited, built upon, etc., while retaining the copyright to the original work

15. curate: collect, select, and present information

16. cyberbullying: using digital devices, sites, and apps to repeatedly intimidate, harm, and upset someone

17. cybersecurity: a set of techniques used to protect the integrity of networks, programs, and data from attack, damage, or unauthorized access

18. data: quantities, characters, or symbols that are the inputs and outputs of computer programs

19. decompose: break down into small, manageable parts

20. delay: the amount of time needed for information to travel from one device to another

21. device: a unit of physical hardware that provides one or more computing functions within a computing system. It can provide input to the computer, accept output, or both

22. digital citizen: someone who navigates the possibilities and pitfalls of the digital world

23. digital citizenship: the practice of navigating the digital world safely, responsibly, and ethically

24. digital etiquette: a set of rules for how to behave online

25. digital identity: also known as digital footprint; all the information online about a person, either posted by that person or others, intentionally or unintentionally

26. equity: all students have similar opportunities to achieve similar levels of success

27. external storage: any type of storage device that is connected to or controlled by a computer but is not integrated within it, such as flash drive, cloud storage, external hard drive

28. evaluate: to carefully examine something to figure out its reliability

29. fair use: ability to use copyrighted work without permission, but only in certain ways and in specific situations

30. hardware: the physical components that make up a computing system, computer, or computing device

31. identity theft: when an individual gains access and uses a person's private identifying information

32. intellectual property: any product of the human intellect that the law protects from unauthorized use by others

33. interactive data visualization enables direct actions on a plot to change elements and link between multiple plots

34. iterative: a repetition of a process

35. IP address: a unique string of characters identifying a device communicating over a network

36. load: a measure of the amount of computation work the system does over time

37. loop: a programming structure that repeats a sequence of instructions

38. malware: is a general term covering all the different types of threats to your computer, such as viruses, spyware, worms, trojans.

39. nested: when a control structure is placed inside of the body or main part of another control structure

40. network: a group of computing devices (personal computers, phones, servers, switches, routers, etc.) connected by cables or wireless media for the exchange of information and resources

41. peripheral: a device that connects to a computer to provide additional functionality

42. piracy: unauthorized reproduction, distribution, or use of copyrighted material

43. plagiarism: using another creator's work as one's own

44. public domain: creative work that is not protected by copyright and free to use without permission

45. redundancy: the duplication of critical components or functions of a system with the intention of increasing reliability

46. router: a device used to connect one network to another

47. scalability: the ability of a network to add users

48. security patch/update: a small snippet of code aimed to improve existing software or fix bugs

49. sequence: a set of logical steps carried out in order

50. server: a device that hosts services that other devices can access

51. software: programs that run on a computing system, computer, or other computing device

52. switch: a network device that connects several devices to forward data to the destination device

53. technology: the methods, systems, and devices which are the result of scientific knowledge being used for practical purposes

54. topology: a diagram representing the network and its devices

55. troubleshooting: a systematic approach to problem solving that is often used to find and resolve a problem, error, or fault within software or a computing system

56. unplugged activity: an activity that can be conducted without the use of computers or electronic equipment

57. variables: a placeholder that is used to keep track of a value that can change while a program is running, the value can be numbers, text, or a logical value.

K-12 Progression Chart

Technology Systems		
Technology Systems Networks & Internet	**Technology Systems Hardware and Software**	**Troubleshooting**
K.NI.1 Recognize that computing devices can be connected.	**K.HS.1** Follow directions to use computing devices to perform a variety of appropriate tasks.	**K.T.1** Understand technology systems might not work as expected.
1.NI.1 Recognize that connecting computing devices allows information sharing.	**1.HS.1** Use appropriate terminology to identify common computing devices and components. **1.HS.2** With guidance, use a computing device to perform a variety of tasks. **1.HS.3** Recognize users have different technology needs.	**1.T.1** Understand technology systems might not work as expected and with guidance use appropriate terminology to describe a problem.
2.NI.1 Explain that connecting computing devices allows information sharing.	**2.HS.1** Identify the components and the basic functions of a computer system. **2.HS.2** Independently use a computing device to perform a variety of tasks. **2.HS.3** Recognize users have different technology needs and preferences.	**2.T.1** Understand technology systems might not work as expected and independently use appropriate terminology to describe a problem.
3.NI.1 Recognize that information is sent and received over physical or wireless paths.	**3.HS.1** Identify the components and the basic functions of a computer system including peripherals and external storage features. **3.HS.2** Continued growth. **3.HS.3 Continued growth.**	**3.T.1** With guidance, apply basic troubleshooting strategies.
4.NI.1 Recognize that computing devices can be connected in a variety of ways to share information.	**4.HS.1** Explain the difference between hardware and software. **4.HS.2 Continued growth.** **4.HS.3 Continued Growth**	**4.T.1** Continued growth.

Technology Systems		
Technology Systems Networks & Internet	**Technology Systems Hardware and Software**	**Troubleshooting**
5.NI.1 Understand that computing devices can be connected in a variety of ways to share information.	**5.HS.1** Compare and contrast physical and virtual systems. **5.HS.2** Continued growth. **5.HS.3** Continued growth.	**5.T.1** Continued growth. .
6.NI.1 Explain how data is sent across networks.	**6.HS.1** Use hardware and/or software to complete a task. **6.HS.2** Use software features to accomplish a goal. **6.HS.3** Organize, store, and retrieve digital information with guidance **6.HS.4** Identify threats to technology systems. (CYSEC) **6.HS.5** Identify security measures to protect technology systems. (CYSEC)	**6.T.1** Apply basic troubleshooting strategies.
7.NI.1 Model how data is sent from one computer to another across networks.	**7.HS.1** Compare and contrast hardware and/or software options to complete a task. **7.HS.2** Continued growth. **7.HS.3** Organize, store, and retrieve digital information with minimal guidance. **7.HS.4** Describe threats to technology systems. (CYSEC) **7.HS.5** Explain how security measures protect technology systems. (CYSEC)	**7.T.1** Continued growth.
8.NI.1 Investigate how data is sent from one computer to another across networks.	**8.HS.1** Choose appropriate hardware and/or software to complete a task.	**8.T.1** Continued growth.

Technology Systems		
Technology Systems Networks & Internet	**Technology Systems Hardware and Software**	**Troubleshooting**
	8.HS.2 Continued growth. **8.HS.3** Organize, store, and retrieve digital information efficiently. **8.HS.4** Describe ways to protect against threats to technology systems. (CYSEC) **8.HS.5** Compare and contrast security measures used to protect technology systems. (CYSEC)	
9.NI.1 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). **9.NI.2** Understand the implications of accessing publicly available Internet connections. (CYSEC)	**9.HS.1** Compare and contrast appropriate device/hardware/software to complete a task. **9.HS.2** Define software and security patches/updates. (CYSEC) **9.HS.3** Explain why a backup is necessary. (CYSEC)	**9.T.1** Describe basic hardware and software problems using appropriate and accurate terminology.
10.NI.1 Identify and define different network connection types (e.g., Wi-Fi, mobile data, ethernet). **10.NI.2** Identify networkable devices.	**10.HS.1** Continued Growth **10.HS.2** Recognize the importance of and effectively perform software and security patches/updates. (CYSEC) **10.HS.3** Identify important data or systems that need redundancy. (CYSEC)	**10.T.1** Follow appropriate guidelines that convey systematic troubleshooting techniques to identify and fix errors.
11.NI.1 Compare and contrast different network connection types (e.g., Wi-Fi, mobiledata, ethernet). **11.NI.2** Understand the global impact of networkable devices.	**11.HS.1** Continued growth. **11.HS.2** Identify and choose hardware and software to help protect a system. (CYSEC)	**11.T.1** Continued growth.

Technology Systems		
Technology Systems Networks & Internet	**Technology Systems Hardware and Software**	**Troubleshooting**
	11.HS.3 Identify different options for redundancy (e.g., cloud storage, external, duplicate devices). (CYSEC)	
12.NI.1 Choose an appropriate network connection given a scenario or situation. **12.NI.2** Compare and contrast the benefits and security risks of networkable devices.	**12.HS.1** Continued growth. **12.HS.2** Continued growth. **12.HS.3** Implement redundancy. (CYSEC)	**12.T.1** Implement systematic troubleshooting strategies to identify and fix errors.
ES.NI.1 Examine the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing. **ES.NI.2** Explain how the characteristics of the Internet influence the systems developed on it. **ES.NI.3** Develop solutions to security threats. (CYSEC) **ES.NI.4** Give examples to illustrate how sensitive data can be affected by malware and other attacks. (CYSEC) **ES.NI.5** Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). **ES.NI.6** Compare ways software developers protect devices and information from unauthorized access. (CYSEC)	**ES.HS.1** Categorize and describe the different functions of operating system software. **ES.HS.2** Categorize the roles of operating system software. **ES.HS.3** Demonstrate familiarity and knowledge of the programming environment.	**ES.T.1** Continued growth.

Computational Thinking		
Problem Solving and Algorithms: Strategies for understanding and solving problems	**Data Creation & Analysis: Data can be collected, used, and presented with computing devices or digital tools**	**Development and Design: Design processes create new, useful, and imaginative solutions to solve problems**
K.PSA.1 With guidance, determine if a program works	**K.PSA.2** Use trial and error in attempt to solve a problem. **K.DA.1** With guidance, draw conclusions and make predictions based on picture graphs or patterns, with or without a computing device.	**K.DD.1** With guidance, create programs to follow a sequence.
1.PSA.1 Solve a problem through trial and error using given materials/resources. **1.PSA.2** Follow a set of instructions (Algorithms) to complete a task. **1.PSA.3** Define debug **1.PSA.4** Identify and practice debugging strategies including 'Go back to when it worked'	**1.DA.1** With guidance, identify and interpret data from a chart or graph to make a prediction, with or without a computing device.	**1.DD.1** With guidance, create programs to accomplish tasks that includes sequencing or looping.
2.PSA.1 Use problem solving steps: understanding the task, considering various strategies, isolate and debug **2.PSA.2** Break a task into smaller steps to identify patterns or solve the problem. **2.PSA.3** Define Algorithms	**2.DA.1** With guidance, construct and interpret data and present it in a chart or graph to make a prediction, with or without a computing device.	**2.DD.1** Independently or collaboratively create programs to accomplish tasks that include sequencing or looping.
3.PSA.1 Solve a task by breaking it into smaller pieces. **3.PSA.2** Debug a program that includes sequencing.	**3.DA.1** Collect and organize data in various visual formats.	**3.DD.1** Independently or collaboratively create programs that use sequencing and looping. **3.DD.2** Convert an algorithm into code.
4.PSA.1 Decompose (break down) a large task into smaller, manageable subtasks.	**4.DA.1** Organize and present collected data visually to highlight comparisons.	**4.DD.1** Independently and collaboratively create programs that use sequencing, loops, and conditionals.

Computational Thinking		
Problem Solving and Algorithms: Strategies for understanding and solving problems	**Data Creation & Analysis: Data can be collected, used, and presented with computing devices or digital tools**	**Development and Design: Design processes create new, useful, and imaginative solutions to solve problems**
4.PSA.2 Debug a program that includes sequencing or loops. **4.PSA.3** Identify multiple solutions to a task.		
5.PSA.1 Create a sequence of instructions from a previous decomposed task. **5.PSA.2** Debug a program that includes sequencing, loops, or conditionals. **5.PSA.3** Work collaboratively to explore multiple solutions to a task.	**5.DA.1** Organize and present collected data to highlight comparisons and support a claim.	**5.DD.1** Independently create programs that use sequencing, loops, and conditionals. 5.DD.2 Create a solution to problems using a design method.
6.PSA.1 Identify and test an algorithm to solve a problem. **6.PSA.2** Debug a program that includes sequencing, loops, or conditionals. **6.PSA.3** Compare/contrast the efficiencies of multiple solutions to a task	**6.DCA.1** Collect and analyze data to support a claim.	**6.DD.1** Use programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.
7.PSA.1 Modify and test an algorithm to solve a problem. **7.PSA.2** Continued growth.	**7.DCA.1** Represent data, in more than one way, to defend your claim.	**7.DD.1** Modify programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.
8.PSA.1 Create and test an algorithm to solve a problem across disciplines. **8.PSA.2** Continued growth.	**8.DCA.1** Represent data from multiple sources to defend or refute a claim.	**8.DD.1** Create programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.
9.PSA.1 Identify, recognize, and use an algorithm to solve a complex problem across disciplines.	**9.DCA.1** Collect and analyze complex data.	
10.PSA.1 Create and test an algorithm to solve a complex problem across disciplines.	**10.DCA.1** Represent complex data in more than one way to support a claim.	

Computational Thinking		
Problem Solving and Algorithms: Strategies for understanding and solving problems	**Data Creation & Analysis: Data can be collected, used, and presented with computing devices or digital tools**	**Development and Design: Design processes create new, useful, and imaginative solutions to solve problems**
11.PSA.1 Demonstrate ways a given algorithm applies to problems across disciplines and explain the benefits and drawbacks of choices made.	**11.DCA.1** Represent complex data in multiple ways to defend a student-generated claim.	
12.PSA.1 Use and adapt common algorithms to solve computational problems.	**12.DCA.1** Represent complex data using interactive data visualizations or computational models.	

Information Literacy			
Access: Effective searches strategies can locate information for intellectual or creative pursuits	**Evaluate: Information sources can be evaluated for accuracy, currency, appropriateness, and purpose**	**Create: It is important to both consume and produce information to be digitally literate.**	**Intellectual Property: Respect for the rights and obligations for the right and obligations of using and sharing intellectual property**
K.A.1 With guidance, use a keyword search with a teacher selected online resource. **1.A.1** Use a keyword search with a teacher selected online resource.	**K.E.1** Name various information sources. **1.E.1** With guidance, evaluate information for research purposes.	**K.C.1** With guidance, create a digital product. **1.C.1** Independently or with guidance, create a digital product.	**K.IP.1** Discuss that creative works have owners (copyright). **K.IP.2** Understand that credit should be given to the creator of a creative work. **1.IP.1** Understand that creative works have owners.
2.A.1 Continued Growth	**2.E.1** With guidance, determine whether the purpose of content is to inform or to influence actions.	**2.C.1** Independently or collaboratively, create a digital product.	**2.IP.1** Understand that students own their creative works.
3.A.1 Use basic search strategies with teacher selected online sources.	**3.E.1** With guidance, compare and contrast resources based on content and the author's purpose.	**3.C.1** Continued growth.	**3.IP.1** Define copyright.
4.A.1 Use multiple teacher-selected online resources to locate information.	**4.E.1** With guidance, use a strategy to evaluate information for research purposes.	**4.C.1** Continued growth.	**4.IP.1** Demonstrate an understanding of copyright and fair use.
5.A.1 Refine a keyword search to improve results.	**5.E.1** Continued growth.	**5.C.1** Independently or collaboratively, create a digital product using two or more tools.	**5.IP.1** With guidance, demonstrate an understanding of ethical issues in copyright and fair use.

Information Literacy			
Access: Effective searches strategies can locate information for intellectual or creative pursuits	**Evaluate: Information sources can be evaluated for accuracy, currency, appropriateness, and purpose**	**Create: It is important to both consume and produce information to be digitally literate.**	**Intellectual Property: Respect for the rights and obligations for the right and obligations of using and sharing intellectual property**
6.A.1 Use a variety of strategies to refine and revise search results	**6.E.1** Evaluate information and its sources.	**6.C.1** Repurpose or remix original works following fair use guidelines	**6.IP.1** With guidance, properly use copyrighted works, works in the creative commons, and works in the public domain.
7.A.1 Continued growth.	**7.E.1** Independently, evaluate information and its sources using student selected processes and strategies.	**7.C.1** Continued growth.	**7.IP.1** With minimal guidance, properly use copyrighted works, works in the creative commons, and works in the public domain.
8.A.1 Use advanced search strategies to locate information online.	**8.E.1** Continued growth.	**8.C.1** Continued growth.	**8.IP.1** Properly use copyrighted works, works in the creative commons, and works in the public domain.
9.A.1 Plan and employ effective research strategies to locate information.	**9.E.1** Evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.	**9.C.1** Create original works or responsibly repurpose or remix digital resources into new creations to communicate an idea.	**9.IP.1** Properly use copyrighted works, works in the creative commons, and works in the public domain.
10.A.1 Curate relevant information from digital resources using a variety of tools and methods.	**10.E.1** Gather accurate, credible, and relevant sources of information, media, data, or other resources showing different perspectives.	**10.C.1** Choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.	**10.IP.1** Demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.
11.A.1 Devise new search strategies based on information gaps and new understanding.	**11.E.1** Use accurate, credible, and relevant sources of information, media, data, or other resources showing different perspectives.	**11.C.1** Publish or present content that customizes the message and medium for their intended audiences to communicate an idea.	**11.IP.1** Explain the beneficial and harmful effects that intellectual property laws can have on innovation, creativity, and collaboration.
12.A.1 Build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.	**12.E.1** Explain source selection based on accuracy, perspective, credibility, and relevance of information, media, data, or otherresources.	**12.E.1** Exhibit perseverance, a tolerance for ambiguity, and the capacity to work with open-ended problems in the design and creation process	**12.IP.1** Debate laws and regulations that impact the development and use of software.

Computing in Society

Impacts of Computing: Past, present, and possible future impact of technology on society	Social Interactions: Technology facilitates collaboration with others
K.IC.1 List different ways technologies are used in daily life.	**K.SI.1** With guidance, use technology to share thinking with teachers or adults
1.IC.1 Identify how technologies are used in and out of school.	**1.SI.1** With guidance, use technology to share thinking with peers.
2.IC.1 Identify how technologies are used in the workforce.	**2.SI.1** With guidance, use technology to communicate with others outside of the classroom.
3.IC.1 Identify computing technologies that have changed the world.	**3.SI.1** Recognize that there are various collaborative technologies. **3.SI.2** With guidance, use collaborative technology to seek out diverse perspectives.
4.IC.1 Give examples of computing technologies that influence society today.	**4.SI.1** With guidance, use collaborative technology to interpret diverse perspectives.
5.IC.1 Explain how computing technologies can change the future.	**5.SI.1** With guidance, use collaborative technology to compare and contrast diverse perspectives.
6.IC.1 Identify the positive and negative impacts of technology, including bias and accessibility. **6.IC.2** Investigate past, present, and future technologies.	**6.SI.1** Use collaborative technology. **6.SI.2** Identify how social interactions can impact a person's self-image.

Digital Citizenship

Responsible Use: Respect and dignity in virtual and physical communities	Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.	Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.
K.RU.1 Discuss positive and negative behaviors when using electronic communication. (CYSEC) **K.RU.2** With guidance, identify appropriate manners while participating in an online community. No Standards at this Level **K.RU.4** Comply with Acceptable Use Policies.	**K.SE.1** With guidance, use technology in safe and correct ways. (CYSEC) **K.SE.2** With guidance, use authentication methods to access technology. (CYSEC)	No standards at this level

Digital Citizenship		
Responsible Use: Respect and dignity in virtual and physical communities	**Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.**	**Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.**
1.RU.1 Identify positive and negative behaviors when using electronic communication. (CYSEC) **1.RU.2** Discuss reporting inappropriate electronic content. (CYSEC) No Standards at this Level **1.RU.4** Comply with Acceptable Use Policies.	**1.SE.1** Identify how to use technology in safe and correct ways. (CYSEC) **1.SE.2** Understand the differences between a username and an authentication method and independently use them to access technology. (CYSEC)	**1.DI.1** Recognize that you have a digital identity.
2.RU.1 Explain positive and negative behaviors when using electronic communication. (CYSEC) **2.RU.2** Know and identify how to report concerns regarding online content and behaviors. (CYSEC) **2.RU.3** Develop a code of conduct, explain, and practice appropriate behavior and responsibilities while participating in an online community. **2.RU.4** Comply with Acceptable Use Policies.	**2.SE.1** Explain how to use technology in safe and correct ways. (CYSEC) **2.SE.2** Identify strategies for protecting authentication methods. (CYSEC) **No standards at this level** **2.SE.4** Recognize the risks of interacting online with others. (CYSEC)	**2.DI.1** Define digital identity.
3.RU.1 Identify and discuss positive and negative uses of technology and information and their impact. (CYSEC) **3.RU.2** Recognize similarities and differences between in-person bullying and cyberbullying. **3.RU.3** Continued growth.	**3.SE.1** Identify problems that relate to inappropriate use of computing devices and networks. (CYSEC) **3.SE.2** Keep authentication methods confidential and be proactive if they are compromised. (CYSEC)	**3.DI.1** Recognize the permanence of their actions in the digital world.

Digital Citizenship		
Responsible Use: Respect and dignity in virtual and physical communities	**Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.**	**Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.**
3.RU.4 Comply with Acceptable Use Policies.	**3.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **3.SE.4** Identify the difference between public and private information. (CYSEC)	
4.RU.1 Discuss basic issues related to the appropriate use of technology and information, and the consequences of inappropriate use. (CYSEC) **4.RU.2** Identify strategies for dealing responsibly with cyberbullying and reporting inappropriate behavior. **4.RU.3** Continued growth. **4.RU.4** Comply with Acceptable Use Policies.	**4.SE.1** Identify and explain issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (CYSEC) **4.SE.2** Create secure authentication to ensure privacy. (CYSEC) **4.SE.3** Continued growth. **4.SE.4** Recognize when it is safe to share private information online. (CYSEC)	**4.DI.1** Explain the importance of your digital identity.
5.RU.1 Demonstrate an understanding of the appropriate use of technology and information and the consequences of inappropriate use. (CYSEC) **5.RU.2** Use strategies that prevent and deal responsibly with cyberbullying and inappropriate behavior. **5.RU.3** Continued growth. **5.RU.4** Comply with Acceptable Use Policies.	**5.SE.1** Recognize that there are real-world cybersecurity problems (i.e., hacking) when interacting online. (CYSEC) **5.SE.2** Continued growth. **5.SE.3** Continued growth. **5.SE.4** Apply strategies to keep your private information safe online. (CYSEC)	**5.DI.1** Continued Growth

Digital Citizenship

Responsible Use: Respect and dignity in virtual and physical communities	Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.	Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.
6.RU.1 Identify different forms of cyberbullying. **6.RU.2** Identify strategies to stop cyberbullying. **6.RU.3** Use appropriate digital etiquette in a variety of situations. **6.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**6.SE.1** Identify steps for responding to uncomfortable situations when interacting online. (CYSEC) **6.SE.2** Identify basic methods to maintain digital privacy and security. (CYSEC) **6.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **6.SE.4** Identify threats to personal cybersecurity. (CYSEC)	**6.DI.1** Describe personal online usage and determine how it affects identity on- and offline.
7.RU.1 Describe different forms of cyberbullying and the effects on all parties involved. **7.RU.2** Identify strategies to prevent and stop cyberbullying. **7.RU.3** Continued growth. **7.RU.4** Understand the purpose of and comply with Acceptable Use Policies.	**7.SE.1** Continued growth. **7.SE.2** Identify a variety of methods to maintain digital privacy and security. (CYSEC) **7.SE.3** Continued growth. **7.SE.4** Describe how to respond to threats to personal cybersecurity. (CYSEC)	**7.DI.1** Evaluate how digital identity can impact a person now and in the future.
8.RU.1 Describe different forms of cyberbullying and the effects on all parties involved. **8.RU.2** Identify strategies to prevent and stop cyberbullying. **8.RU.3** Continued growth.	**8.SE.1** Continued growth. **8.SE.2** Identify advanced methods to maintain digital privacy and security. (CYSEC) **8.SE.3** Continued growth. **8.SE.4** Discuss the consequences of identity theft. (CYSEC)	**8.DI.1** Continued growth.

Digital Citizenship		
Responsible Use: Respect and dignity in virtual and physical communities	**Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.**	**Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.**
8.RU.4 Understand the purpose of and comply with Acceptable Use Policies.		
9.RU.1 Apply cyberbullying prevention strategies. **9.RU.2** Apply safe and ethical behaviors to personal electronic communication and interaction. (CYSEC) **9.RU.3** Continued growth. **9.RU.4** Understand the purpose and comply with Acceptable Use Policies.	**9.SE.1** Recognize the effects sharing information online can have on others' privacy. (CYSEC) **9.SE.2** Know how to modify their account settings to protect privacy and security. (CYSEC) **9.SE.3** Recognize that data-collection technology can be used to track navigation online. (CYSEC) **9.SE.4** Describe ways to prevent identity theft. (CYSEC)	**9.DI.1** Manage a digital identity and be aware of the permanence of actions in the digital world. (CYSEC)
10.RU.1 Continued growth. **10.RU.2** Continued growth. **10.RU.3** Continued growth. **10.RU.4** Understand the purpose and comply with Acceptable Use Policies.	**10.SE.1** Implement best practices to secure personal information. (CYSEC) **10.SE.2** Recognize the importance of monitoring your private data. (CYSEC) **10.SE.3** Manage personal data to maintain digital privacy and security and are aware of data-collection technology used to track online behaviors. (CYSEC) **10.SE.4** Identify if their private data has been altered and can react appropriately. (CYSEC)	**10.DI.1** Continued growth.
11.RU.1 Continued growth. **11.RU.2** Continued growth. **11.RU.3** Continued growth.	**11.SE.1** Understand encryption and how it is used to protect data. (CYSEC)	**11.DI.1** Continued growth.

Digital Citizenship		
Responsible Use: Respect and dignity in virtual and physical communities	**Safety & Ethics: There are both positive and negative impacts in social and ethical behaviors for using technology.**	**Digital Identity: Responsibilities and opportunities of living, learning, and working in an interconnected digital world.**
11.RU.4 Understand the purpose and comply with Acceptable Use Policies.	**11.SE.2** Explain the privacy concerns related to the collection and generation of data through automated processes. (CYSEC) **11.SE.3** Continued growth. **11.SE.4** Develop a plan to recover from an incident that was tied to unauthorized access. (CYSEC)	
12.RU.1 Continued growth. **12.RU.2** Continued growth. **12.RU.3** Continued growth. **12.RU.4** Understand the purpose and comply with Acceptable Use Policies.	**12.SE.1** Continued growth. **12.SE.2** Illustrate how sensitive data can be affected by malware and other attacks. (CYSEC) **12.SE.3** Continued growth. **12.SE.4** Continued growth.	**12.DI.1** Continued growth.