RIVER DELL REGIONAL SCHOOL DISTRICT

Course: STEMputer
Alignment: 2020 NJSLS
BOE Born On: August 21, 2023

Authored by
Vito DeLaura, Assistant Superintendent of Curriculum, Instruction & Technology
Dr. Lisa Torres, Supervisor of ELA & SS 7-12
Tiffany Correa, Supervisor of PD & Special Projects
Anthony Ciccotelli, STEM Teacher

Introduction

Computer science and design thinking education prepares students to succeed in today's knowledge-based economy by providing equitable and expanded access to high-quality, standards-based computer science and technological design education.

Mission

River Dell's curricula is designed to promote student achievement through the development of college and career readiness skills with a focus on equal access, inclusivity, and students' individuality. The mission of the curriculum is to prepare students to live and to work in a global society as active citizens and as contributing responsible community members. The program outlined in this curriculum engages students in broad-based, experiential learning that will enhance the development of critical thinking, communication, and analytical/relational skills. This curriculum is constructed to meet students at their developmental level and to support their progression through varied levels of engagement, skill attainment, exploration, inquiry, and analysis assisting them to mature into their authentic selves.

Vision

All students have equitable access to a rigorous computer science and design thinking education. Students will benefit from opportunities to engage in high-quality technology programs that foster their ability to:

- Develop and apply computational and design thinking to address real-world problems and design creative solutions;
- Engage as collaborators, innovators, and entrepreneurs on a clear pathway to success through postsecondary education and careers;
- Navigate the dynamic digital landscape to become healthy, productive, 21st century global-minded individuals; and
- Participate in an inclusive and diverse computing culture that appreciates and incorporates perspectives from people of different genders, ethnicities, and abilities.

Scope and Sequence

Unit 1: Computing Systems (4 Weeks)
Unit 2: Networks and the Internet (4 Weeks)
Unit 3: Impacts of Computing (4 Weeks)
Unit 4: Data Analysis (4 Weeks)
Unit 5: Algorithms & Programming (4 Weeks)

Technology

Technology integration is the seamless and effective use of 21st Century technology within an instructional setting to support students and teachers in the learning process with administrative support and evaluation:

Standards 8.1 Computer Science

- Computer Science, previously a strand entitled 'Computational Thinking: Programming' in standard 8.2 of the 2014 NJSLS-Technology, outlines a comprehensive set of concepts and skills, such as data and analysis, algorithms and programming, and computing systems.

Standard 8.2 Design Thinking

- This standard, previously standard 8.2 Technology Education of the 2014 NJSLS – Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The new framework design, detailed previously, includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts.

New Jersey Administrative Code Summary and Statues:

The following sections outline skills and special categories mandated by the state of New Jersey for all K-12 curriculum.

Integration of 21st Century Skills and Themes and Interdisciplinary Connections
District Boards of Education shall be responsible for the review and continuous improvement of curriculum and instruction based upon changes in knowledge, technology, assessment results, and modifications to the NJSLS, according to N.J.A.C. 6A:8-2.

1. District Boards of Education shall include interdisciplinary connections throughout the K–12 curriculum.
2. District Boards of Education shall integrate into the curriculum 21st Century themes and skills (N.J.A.C. 6A:8-3.1(c). Twenty-first Century themes and skills integrated into all content standards areas (N.J.A.C. 6A:8-1.1(a)3).

"Twenty-first Century themes and skills" means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, communication and collaboration; information, media, technology skills; and life and career skills, including flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility

Dissection Law: N.J.S.A. 18A:35-4.25 and N.J.S.A. 18A:35-4.24 authorizes parents or guardians to assert the right of their children to refuse to dissect, vivisect, incubate, capture or otherwise harm or destroy animals or any parts thereof as part of a course of instruction.

Amistad Law: N.J.S.A. 18A 52:16A-88 Every Board of Education shall incorporate the information regarding the contributions of African Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28 Every Board of Education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A Board of Education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A Board of Education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Asian Americans and Pacific Islanders: N.J.S.A. S4021 This will ensure that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards for Social Studies for students in kindergarten through Grade 12.

Career Readiness, Life Literacies, and Key Skills (NJSLS-CLKS):

- Standard 9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially secure, and successful careers.
- Standard 9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.
- Standard 9.3 This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.
- Standard 9.4 Life Literacies and Key Skills. This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Climate Change *(This will be modified based off of content)*
Standards in Action: Climate Change Earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. Global climate change has already resulted in a wide range of impacts across New Jersey and in many sectors of its economy. The addition of academic standards that focus on climate change is important so that all students will have a basic understanding of the climate system, including the natural and human-caused factors that affect it. The underpinnings of climate change span across physical, life, as well as Earth and space sciences. The goal is for students to understand climate science to inform decisions that improve quality of life for themselves, their community, globally and to know how engineering solutions can allow us to mitigate impacts, adapt practices, and build resilient systems.

The topic of climate change can easily be integrated into science classes. At each grade level in which systems thinking, managing uncertainty, and building arguments based on multiple lines of data are included, there are opportunities for students to develop essential knowledge and skills that will help them understand the impacts of climate change on humans, animals, and the environment. For example, in the earlier grades, students can use data from firsthand investigations of the school-yard habitat to justify recommendations for design improvements to the school-yard habitat for plants, animals, and humans. In the middle grades, students use resources from New Jersey Department of Environmental Protection, the National Oceanic and Atmospheric Administration (NOAA), and National Aeronautics and Space Administration (NASA), to inform their actions as they engage in designing, testing, and modifying an engineered solution to mitigate the impact of climate change on their community. In high school, students can construct models they develop of a proposed solution to mitigate the negative health effects of unusually high summer temperatures resulting from heat islands in cities across the globe and share in the appropriate setting.

Unit I: Computing Systems (4 Weeks)

Core Ideas	The study of human-computer interaction can improve the design of devices and extend the abilities of humans. Software and hardware determine a computing system's capability to store and process information. The design or selection of a computing system involves multiple considerations and potential trade-offs. Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.
Essential Questions	How are hardware and software computing systems designed to make them user friendly for everyone? How should computing systems be designed to encourage the user to troubleshoot hardware and software issues along the way?
Enduring Understanding	Computing devices should be designed with the end user experience as paramount and always being improved.
Practice	Fostering an Inclusive Computing and Design Culture Building an inclusive and diverse computing culture requires strategies for incorporating perspectives from people of different genders, ethnicities, and abilities. Incorporating these perspectives involves understanding the personal, ethical, social, economic, and cultural contexts in which people operate. Considering the needs of diverse users during the design process is essential to producing inclusive computational products.
Performance Expectations	• Recommend improvements to computing devices in order to improve the ways users interact with the devices. • Design a system that combines hardware and software components to process data. • Justify design decisions and explain potential system trade-offs. • Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.

NJ Standards	Student Learning Objectives	Suggested Tasks/Activities	Resources/Materials
8.1.8.CS.1 8.1.8.CS.2 8.1.8.CS.3 8.1.8.CS.4	Students will be able to: a. Define ergonomics. b. Identify special needs populations. c. Develop ideas and designs that assist users of all ability levels. d. Troubleshoot their own computers/devices using actual problems experienced so far during the school year. e. Create a poster or PowerPoint focusing on design and positive/negative outcomes of any design. f. Use an Arduino microprocessor for an introductory design problem. https://www.youtube.com/watch?v=ap02lvLpsWE&t=33s	a. Discussion on state-of-the-art designs for Smart Phones and how they address or don't address needs of the elderly and special case populations. b. Use PowerPoint to create a presentation on technological outcomes both positive and negative, expected and unexpected. c. Brainstorm a list of student laptop problems/troubleshooting strategies to be shared with the rest of the grade. d. Included in the Arduino kit are several activities which address designing systems which combine hardware and software to solve problems.	PowerPoint Arduino Kits Laptops Additional consumable materials as specified by the instructor. Budget at least $2500./year.

Key Vocabulary	Ergonomics, Anthropometrics, Hardware, Software, troubleshooting, inputs, outputs, desktop, drives, cloud, autosave,
Evidence of Learning	Quizzes, Tests and Rubrics to be developed by instructor. Class Participation is based on individual and partner work during class. Class Participation is based on the ability to listen and contribute to daily class discussions.
Interdisciplinary Connections	**Math Standards** Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. **Science Standards**

	Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3) Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)
Diversity, Equity, & Inclusion	Students will be encouraged to develop an understanding of culturally diverse perspectives regarding technology and its impact on societies. Diversity in the classroom will be openly discussed and celebrated, to create an open, safe space in which students feel free to express different ideas, opinions, and worldviews. Student materials will include names and images that reflect diversity to include people of different cultures and backgrounds as well those with disabilities.
Computer Science and Design Thinking	8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices 8.1.8.CS.2: Design a system that combines hardware and software components to process data. 8.1.8.CS.3: Justify design decisions and explain potential system trade-offs. 8.1.8.CS.4: Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems
Career Readiness, Life Literacies, and Key Skills	9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option. 9.4.8.CI.2: Repurpose an existing resource in an innovative way.
Social Emotional Learning	SELF-MANAGEMENT: Students will manage their time and respect the time of others while collaborating through inquiry-based lessons/activities. Partner work is becoming more and more challenging for the current generation of students. Respect, kindness, patience, flexibility when working in-person all need to be developed in today's youth. Interpersonal skills in general will be emphasized. (e.g. Please, thank you, excuse me, hello, goodbye, smile)

Differentiation

Resources/Materials	ELL (English Language Learners)	Special Education	At Risk	Enrichment
	• Provide translated notes and key vocabulary terms • Provide images of key vocabulary terms and concepts • Word banks • Bilingual dictionaries • Assistive translator technology • Sentence frames • Simplified notes • Reduced homework • Simplified word problems • Graphic organizers • Matched sentences or procedures with pictures • Alternative presentation options • 1-2 sentence short responses • Shortened written assignments • Modified tests • Provide notes when student request • Reduce project workload • Short summaries	• Display reminders • Checklist of materials and tasks (printed out or digitally accessible) • Timelines and Calendar for benchmark goals for assignments/assessments/short-term goals (Planner Microsoft) • Assistive technology (dictation, immersive reader, etc...) • Flash cards • Teacher notes • Graphic organizer • Clear parameters and student workspace • Timer to monitor task and duration • Study guides • Guided notes • Choices for alternative assignments • Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work	• Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Scaffolding assignments • Chunking of materials • Allow for errors • Pre-teach materials • Supply teacher demo • Rephrase of questions and directions • Visual cue or signs • Small group assistance or collaboration • Partner or group work on skill development • Assistance by instructional videos or curated videos online • Guide with options for student goal setting	• Provide students with extra problem sets that challenge and involve higher level thinking • Inquiry lead discussions and activities • More complex tasks and projects • Higher level questioning and techniques • Student demoing and explanation • Provide opportunities for students to set personal goals, keep records and monitor their own learning progress • Multiple assessments given in different domains, that showcase student interests, strengths, and needs • Use multiple approaches to accelerate learning within and outside of the school setting • Use enrichment options to extend and deepen learning opportunities within and outside of the school setting

		• Visual cue or signs • Rephrase of questions and directions • Partner or group work on skill development Assistance by instructional videos or curated videos online	• Use of timer or a clock to monitor time of student activity	• Use individualized learning options such as mentorships, internships, online courses, and independent study

Unit II: Networks and the Internet (4 Weeks)	
Core Ideas	Protocols, packets, and addressing are the key components for reliable delivery of information across networks. The information sent and received across networks can be protected from unauthorized access and modification in a variety of ways. The evolution of malware leads to understanding the key security measures and best practices needed to proactively address the threat to digital data.
Essential Questions	How are traditional security efforts being challenged by new security concepts such as blockchain technology? How is the concept of privacy in a constant state of flux in our interconnected digital world?
Enduring Understanding	Life in a digital world needs go beyond just being a user of technology. A broad perspective of both positive and negative impacts is essential as well as a deeper understanding of some of the underpinnings and innerworkings of the gadget(s) are necessary in order to exist as a technologically literate citizen.
Practice	Recognizing and Defining Computational Problems The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts and evaluating each part to determine whether a computational solution is appropriate. When engaging in the practice, students: • Identify complex, interdisciplinary, real-world problems that can be solved computationally • Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures. • Evaluate whether it is appropriate and feasible to solve a problem computationally.
Performance Expectations	• Model how information is broken down into smaller pieces, transmitted as addressed packets through multiple devices over networks and the Internet, and reassembled at the destination. • Model the role of protocols in transmitting data across networks and the Internet and how they enable secure and errorless communication. • Explain how network security depends on a combination of hardware, software, and practices that control access to data and systems. • Explain how new security measures have been created in response to key malware events.

NJ Standards	Student Learning Objectives	Suggested Tasks/Activities	Resources/Materials

8.1.8.NI.1 8.1.8.NI.2 8.1.8.NI.3 8.1.8.NI.4	The student will be able to: a. Begin to understand some of the underpinnings of data transmission across the internet. b. Explain what "the cloud" actually is. c. Gain an understanding of malware and security protocols. d. Explain how the internet began and how it actually works. e. Describe blockchain technology and analyze its future potential	a. Research Internet History with a partner or in groups. b. Off the Grid Challenge - Live one day without the Internet.. Can you do it? c. Save to the cloud, c drive and a thumb drive. d. Class discussions on recent cases of hacking and identity theft. e. Investigate Blockchain technology by finding visual models, videos, diagrams etc. To clarify the concept.	YouTube PowerPoint

Key Vocabulary	Cloud, malware, packets, data, Internet, blockchain, metaverse, digital assets. Modem, router, decentralization.
Evidence of Learning	Quizzes, Tests and Rubrics to be developed by instructor. Class Participation is based on individual and partner work during class. Class Participation is based on the ability to listen and contribute to daily class discussions.
Interdisciplinary Connections	**Mathematics Standards** 7. Look for and Make Use of Structure. Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, the students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. **Science Standards** • MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
Diversity, Equity, & Inclusion	Students will be encouraged to develop an understanding of culturally diverse perspectives regarding technology and its impact on societies. Diversity in the classroom will be openly discussed and celebrated, to create an open, safe space in which students feel free to express different ideas, opinions, and worldviews. Student materials will include names and images that reflect diversity to include people of different cultures and backgrounds as well those with disabilities.
Computer Science and Design Thinking	8.1.8.NI.1: Model how information is broken down into smaller pieces, transmitted as addressed packets through multiple devices over networks and the Internet, and reassembled at the destination. 8.1.8.NI.2: Model the role of protocols in transmitting data across networks and the Internet and how they enable secure and errorless communication 8.1.8.NI.3: Explain how network security depends on a combination of hardware, software, and practices that control access to data and systems. 8.1.8.NI.4: Explain how new security measures have been created in response to key malware events.
Career Readiness, Life Literacies, and Key Skills	9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem. 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event.
Social Emotional Learning	SELF-Management: Students will manage their time and respect the time of others while collaborating through inquiry-based lessons/activities.

	Partner work is becoming more and more challenging for the current generation of students. Respect, kindness, patience, flexibility when working in-person all need to be developed in today's youth. Interpersonal skills in general will be emphasized. (e.g. Please, thank you, excuse me, hello, goodbye, smile)

Differentiation

Resources/Materials	ELL(English Language Learners)	Special Education	At Risk	Enrichment
	• Provide translated notes and key vocabulary terms • Provide images of key vocabulary terms and concepts • Word banks • Bilingual dictionaries • Assistive translator technology • Sentence frames • Simplified notes • Reduced homework • Simplified word problems • Graphic organizers • Matched sentences or procedures with pictures • Alternative presentation options • 1-2 sentence short responses • Shortened written assignments • Modified tests • Provide notes when student request • Reduce project workload	• Display reminders • Checklist of materials and tasks (printed out or digitally accessible) • Timelines and Calendar for benchmark goals for assignments/assessments/short-term goals (Planner Microsoft) • Assistive technology (dictation, immersive reader, etc...) • Flash cards • Teacher notes • Graphic organizer • Clear parameters and student workspace • Timer to monitor task and duration • Study guides • Guided notes • Choices for alternative assignments • Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Visual cue or signs • Rephrase of questions and directions • Partner or group work on skill development Assistance by instructional videos or curated videos online	• Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Scaffolding assignments • Chunking of materials • Allow for errors • Pre-teach materials • Supply teacher demo • Rephrase of questions and directions • Visual cue or signs • Small group assistance or collaboration • Partner or group work on skill development • Assistance by instructional videos or curated videos online • Guide with options for	• Provide students with extra problem sets that challenge and involve higher level thinking • Inquiry lead discussions and activities • More complex tasks and projects • Higher level questioning and techniques • Student demoing and explanation • Provide opportunities for students to set personal goals, keep records and monitor their own learning progress • Multiple assessments given in different domains, that showcase student interests, strengths, and needs • Use multiple approaches to accelerate learning within and outside of the school setting • Use enrichment options to extend and deepen learning opportunities within and outside of the school setting • Use individualized learning options such as mentorships, internships, online courses, and independent study

	• Short summaries		student goal setting • Use of timer or a clock to monitor time of student activity	

Unit III: Impacts of Computing 1 (4 Weeks)

Core Ideas	Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings.
Essential Questions	Do citizens in today's world understand the positive and negative outcomes that are brought about by new technology and innovation? What biases are inherently baked into artificial intelligence by the programmers who create them?
Enduring Understanding	Self-reflection of how our lives are impacted daily by technology should be a constant theme in an effort to develop self-management skills for students.
Practice	Fostering an Inclusive Computing and Design Culture Building an inclusive and diverse computing culture requires strategies for incorporating perspectives from people of different genders, ethnicities, and abilities. Incorporating these perspectives involves understanding the personal, ethical, social, economic, and cultural contexts in which people operate. Considering the needs of diverse users during the design process is essential to producing inclusive computational products. Collaborating Around Computing and Design Collaborative Computing is the process of performing a computational task by working on pairs in teams. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes tan working independently. Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Students should use collaborative tools to effectively work together and to create complex, artifacts. When engaging in this practice, students: • Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities. • Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness. • Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders. • Evaluate and select technological tools that can be used to collaborate on a project.
Performance Expectations	• Compare the trade-offs associated with computing technologies that affect individuals' everyday activities and career options. • Describe issues of bias and accessibility in the design of existing technologies.

NJ Standards	Student Learning Objectives	Suggested Tasks/Activities	Resources/Materials
8.1.8.IC.1 8.1.8.IC.2	The student will be able to: a. Point out negative and positive outcomes in our interconnected world both foreseen and unforeseen. b. Site examples of bias built into a wide variety of technologies.	Engage students in discussions, role playing, group think tanks in which positive and negative outcomes arise along with natural biases. Brainstorm solutions for overcoming bias. Use Chat GPT and discuss possible bias.	Internet based research. Chat GPT

Key Vocabulary	Bias, prejudice, Chat GPT,
Evidence of Learning	Quizzes, Tests and Rubrics to be developed by instructor. Class Participation is based on individual and partner work during class. Class Participation is based on the ability to listen and contribute to daily class discussions.

Interdisciplinary Connections	**Mathematics Standards** 5. Use Appropriate Tools Strategically Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight gained and limitations. For example mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the mathematical resource, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. **Science Standards** • MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Diversity, Equity, & Inclusion	Students will be encouraged to develop an understanding of culturally diverse perspectives regarding technology and its impact on societies. Diversity in the classroom will be openly discussed and celebrated, to create an open, safe space in which students feel free to express different ideas, opinions, and worldviews. Student materials will include names and images that reflect diversity to include people of different cultures and backgrounds as well those with disabilities.
Computer Science and Design Thinking	8.1.8.IC.1: Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options. 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies.
Career Readiness, Life Literacies, and Key Skills	9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option. 9.4.8.CI.2: Repurpose an existing resource in an innovative way. 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions.
Social Emotional Learning	SELF-AWARENESS: The abilities to understand one's own emotions, thoughts, and values and how they influence behavior across contexts. SOCIAL AWARENESS: The abilities to understand the perspectives of and empathize with others, including those from diverse backgrounds, cultures, and contexts. SELF-MANAGEMENT: The abilities to manage one's emotions, thoughts, and behaviors effectively in different situations and to achieve goals and aspirations. RELATIONSHIP SKILLS: The abilities to establish and maintain healthy and supportive relationships and to effectively navigate settings with diverse individuals and groups. RESPONSIBLE DECITION-MAKING: The abilities to make caring and constructive choices about personal behavior and social interactions across diverse situations.

Differentiation

Resources/Materials	ELL (English Language Learners)	Special Education	At Risk	Enrichment
	• Provide translated notes and key vocabulary terms • Provide images of key vocabulary terms and concepts • Word banks • Bilingual dictionaries • Assistive translator technology • Sentence frames • Simplified notes • Reduced homework • Simplified word problems • Graphic organizers	• Display reminders • Checklist of materials and tasks (printed out or digitally accessible) • Timelines and Calendar for benchmark goals for assignments/assessments/short-term goals (Planner Microsoft) • Assistive technology (dictation, immersive reader, etc...) • Flash cards • Teacher notes • Graphic organizer • Clear parameters and student workspace	• Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Scaffolding assignments • Chunking of materials • Allow for errors	• Provide students with extra problem sets that challenge and involve higher level thinking • Inquiry lead discussions and activities • More complex tasks and projects • Higher level questioning and techniques • Student demoing and explanation • Provide opportunities for students to set personal

	• Matched sentences or procedures with pictures • Alternative presentation options • 1-2 sentence short responses • Shortened written assignments • Modified tests • Provide notes when student request • Reduce project workload • Short summaries	• Timer to monitor task and duration • Study guides • Guided notes • Choices for alternative assignments • Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Visual cue or signs • Rephrase of questions and directions • Partner or group work on skill development Assistance by instructional videos or curated videos online	• Pre-teach materials • Supply teacher demo • Rephrase of questions and directions • Visual cue or signs • Small group assistance or collaboration • Partner or group work on skill development • Assistance by instructional videos or curated videos online • Guide with options for student goal setting • Use of timer or a clock to monitor time of student activity	goals, keep records and monitor their own learning progress • Multiple assessments given in different domains, that showcase student interests, strengths, and needs • Use multiple approaches to accelerate learning within and outside of the school setting • Use enrichment options to extend and deepen learning opportunities within and outside of the school setting • Use individualized learning options such as mentorships, internships, online courses, and independent study

Unit IV: Data Analysis (4 Weeks)	
Core Ideas	People use digital devices and tools to automate their collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data. Data is represented in many formats. Software tools translate the low-level representation of bits into a form understandable by individuals. Data is organized and accessible based on the application used to store it. The purpose of cleaning data is to remove errors and make it easier for computers to process. Computer models can be used to simulate events, examine theories and inferences, or make predictions.
Essential Questions	How can data collection, processing and use be subject to opinions and biases? How does the application of processed data in error magnify exponentially?
Enduring Understanding	Data driven decision making is only as good as the integrity of the processed data and those who processed and interpret it.
Practice	Developing and Using Abstractions Abstractions are formed by identifying patterns and extracting common features from specific examples in order to create generalization. Using generalized solutions and parts of solutions designed for reuse simplifies the development process by managing complexity. When engaging in this practice, students: • Extract common features from a set of interrelated processes or complex phenomena. • Evaluate existing technological functionalities and incorporate them into new designs. • Create modules and develop points of interactions that can apply to multiple situations and reduce complexity. • Model phenomena and process and simulate systems to understand and evaluate potential outcomes.

Performance Expectations	• Organize and transform data collected using computational tools to make it usable for a specific purpose. • Explain the difference between how the computer stores data as bits and how the data is displayed. • Identify the appropriate tool to access data on its file format. • Transform data to remove errors and improve the accuracy of the data for analysis. • Test, analyze and refine computational models. • Analyze climate change computational models and propose refinements.

NJ Standards	Student Learning Objectives	Suggested Tasks/Activities	Resources/Materials
8.1.8.DA.1 8.1.8.DA.2 8.1.8.DA.3 8.1.8.DA.4 8.1.8.DA.5 8.1.8.DA.6	Students will be able to: a. Understand how data is collected. b. Understand how data is stored. c. Identify the difference between RAM and ROM. d. Explain the history of data storage including, hard drives, floppy drives, thumb drives , cloud storage, etc. e. Understand how data is analyzed. f. Perform a simple data analysis that produces a climate change analysis.	Locate computer simulations or YouTube videos that illustrate the flow of data from collection though use and application. Assign students a project on climate change with a focus on data collection and analysis. Create a PowerPoint on the History of Data Storage.	Simulations, YouTube, PowerPoint

Key Vocabulary	RAM, ROM, Cloud, HD, Floppy Disk,
Evidence of Learning	Quizzes, Tests and Rubrics to be developed by instructor. Class Participation is based on individual and partner work during class. Class Participation is based on the ability to listen and contribute to daily class discussions.
Interdisciplinary Connections	**Mathematics standards.** Construct viable arguments and critique the reasoning of others. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of New Jersey Student Learning Standards for Mathematics 9 and others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. **Science Standards** • MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Diversity, Equity, & Inclusion	Students will be encouraged to develop an understanding of culturally diverse perspectives regarding technology and its impact on societies. Diversity in the classroom will be openly discussed and celebrated, to create an open, safe space in which students feel free to express different ideas, opinions, and worldviews. Student materials will include names and images that reflect diversity to include people of different cultures and backgrounds as well those with disabilities.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.2: Explain the difference between how the computer stores data as bits and how the data is displayed. 8.1.8.DA.3: Identify the appropriate tool to access data based on its file format. 8.1.8.DA.4: Transform data to remove errors and improve the accuracy of the data for analysis.
Career Readiness, Life Literacies, and Key Skills	9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. 9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure. 9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation.

Social Emotional Learning	SELF-AWARENESS: The abilities to understand one's own emotions, thoughts, and values and how they influence behavior across contexts. SOCIAL AWARENESS: The abilities to understand the perspectives of and empathize with others, including those from diverse backgrounds, cultures, and contexts. SELF-MANAGEMENT: The abilities to manage one's emotions, thoughts, and behaviors effectively in different situations and to achieve goals and aspirations. RELATIONSHIP SKILLS: The abilities to establish and maintain healthy and supportive relationships and to effectively navigate settings with diverse individuals and groups. RESPONSIBLE DECITION-MAKING: The abilities to make caring and constructive choices about personal behavior and social interactions across diverse situations.			
Differentiation				
Resources/Materials	**ELL (English Language Learners)**	**Special Education**	**At Risk**	**Enrichment**
	• Provide translated notes and key vocabulary terms • Provide images of key vocabulary terms and concepts • Word banks • Bilingual dictionaries • Assistive translator technology • Sentence frames • Simplified notes • Reduced homework • Simplified word problems • Graphic organizers • Matched sentences or procedures with pictures • Alternative presentation options • 1-2 sentence short responses • Shortened written assignments • Modified tests • Provide notes when student request • Reduce project workload • Short summaries	• Display reminders • Checklist of materials and tasks (printed out or digitally accessible) • Timelines and Calendar for benchmark goals for assignments/assessments/short-term goals (Planner Microsoft) • Assistive technology (dictation, immersive reader, etc...) • Flash cards • Teacher notes • Graphic organizer • Clear parameters and student workspace • Timer to monitor task and duration • Study guides • Guided notes • Choices for alternative assignments • Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Visual cue or signs • Rephrase of questions and directions • Partner or group work on skill development Assistance by instructional videos or curated videos online	• Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Scaffolding assignments • Chunking of materials • Allow for errors • Pre-teach materials • Supply teacher demo • Rephrase of questions and directions • Visual cue or signs • Small group assistance or collaboration • Partner or group work on skill development • Assistance by instructional videos or curated videos online • Guide with options for student goal setting • Use of timer or a clock to monitor time of student activity	• Provide students with extra problem sets that challenge and involve higher level thinking • Inquiry lead discussions and activities • More complex tasks and projects • Higher level questioning and techniques • Student demoing and explanation • Provide opportunities for students to set personal goals, keep records and monitor their own learning progress • Multiple assessments given in different domains, that showcase student interests, strengths, and needs • Use multiple approaches to accelerate learning within and outside of the school setting • Use enrichment options to extend and deepen learning opportunities within and outside of the school setting • Use individualized learning options such as mentorships, internships, online courses, and independent study

Unit V: Algorithms & Programming (4 Weeks)

Core Ideas	Individuals design algorithms that are reusable in many situations. Algorithms that are readable are easier to follow, test, and debug. Programmers create variables to store data values of different types and perform appropriate operations on their values. Control structures are selected and combined in programs to solve more complex problems. Programs use procedures to organize code and hide implementation details. Procedures can be repurposed in new programs. Defining parameters for procedures can generalize behavior and increase reusability. Individuals design and test solutions to identify problems taking into consideration the diverse needs of the users and the community.
Essential Questions	How are basic programming concepts essential to all students and helpful no matter what their chosen future profession? How does understanding basic programming concepts connect to diversity and bias sensitive app development?
Enduring Understanding	Basic programming concepts can be applied to many different future life situations and skills used to solve problems.
Practice	Testing and Refining Computational Artifacts Testing and refinement is the deliberate and iterative process of improving a computational artifact. This process includes debugging (identifying and fixing errors) and comparing actual outcomes to intended outcomes. Students also respond to the changing needs and expectations of end users and improve performance, reliability, usability and accessibility of artifacts. When engaging in this practice , students: • Systematically test computational artifacts by considering all scenarios and using test cases. • Identify and fix errors using a systematic process. • Evaluate and refine a computational artifact, multiple times to enhance its performance, reliability, usability, and accessibility.
Performance Expectations	• Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode. • Create clearly named variables that represent different data types and perform operations on their values. • Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. • Decompose problems and sub-problems into parts to facilitate the design, implementation and review of programs. • Create procedures with parameters to organize code and make it easier to reuse. • Refine a solution that meets users' needs by incorporating feedback from team members and users. • Design programs, incorporating existing code, media, and libraries, and give attribution. • Systematically test and refine programs using a range of test cases and users. • Document programs in order to make them easier to follow, test and debug.

NJ Standards	Student Learning Objectives	Suggested Tasks/Activities	Resources/Materials
8.1.8.AP.1 8.1.8.AP.2 8.1.8.AP.3 8.1.8.AP.4 8.1.8.AP.5 8.1.8.AP.6 8.1.8.AP.7 8.1.8.AP.8 8.1.8.AP.9	Students will be able to: a. Write simple pseudocode to perform a sequence of operations. b. Create variables of different data types. c. Develop simple code to solve a problem. d. Explore the basics of the Python programming language. e. Debug and fix errors that occur in their programs. f. Develop a capstone project in which they create an original program.	Writing code Compile Debug Rewrite Solve a particular problem using the Python programming language.	Computer Python Compiler

Key Vocabulary	Algorithm, Pseudocode, iteration, debug

Evidence of Learning	Quizzes, Tests and Rubrics to be developed by instructor. Class Participation is based on individual and partner work during class. Class Participation is based on the ability to listen and contribute to daily class discussions. Capstone Project
Interdisciplinary Connections	**Mathematics Standards** Reason abstractly and quantitatively. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. **Science Standards** • MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
Diversity, Equity, & Inclusion	Students will be encouraged to develop an understanding of culturally diverse perspectives regarding technology and its impact on societies. Diversity in the classroom will be openly discussed and celebrated, to create an open, safe space in which students feel free to express different ideas, opinions, and worldviews. Student materials will include names and images that reflect diversity to include people of different cultures and backgrounds as well those with disabilities.
Computer Science and Design Thinking	8.1.8.AP.1: Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode. 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values. 8.1.8.AP.3: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. 8.1.8.AP.4: Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs. 8.1.8.AP.5: Create procedures with parameters to organize code and make it easier to reuse
Career Readiness, Life Literacies, and Key Skills	9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option. 9.4.8.CI.2: Repurpose an existing resource in an innovative way. 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions. 8.1.8.AP.6: Refine a solution that meets users' needs by incorporating feedback from team members and users. 8.1.8.AP.7: Design programs, incorporating existing code, media, and libraries, and give attribution. 8.1.8.AP.8: Systematically test and refine programs using a range of test cases and users. 8.1.8.AP.9: Document programs in order to make them easier to follow, test, and debug
Social Emotional Learning	SELF-AWARENESS: The abilities to understand one's own emotions, thoughts, and values and how they influence behavior across contexts. SOCIAL AWARENESS: The abilities to understand the perspectives of and empathize with others, including those from diverse backgrounds, cultures, and contexts. SELF-MANAGEMENT: The abilities to manage one's emotions, thoughts, and behaviors effectively in different situations and to achieve goals and aspirations. RELATIONSHIP SKILLS: The abilities to establish and maintain healthy and supportive relationships and to effectively navigate settings with diverse individuals and groups. RESPONSIBLE DECITION-MAKING: The abilities to make caring and constructive choices about personal behavior and social interactions across diverse situations.

Differentiation

Resources/Materials	ELL (English Language Learners)	Special Education	At Risk	Enrichment
	• Provide translated notes and key vocabulary terms • Provide images of key vocabulary terms and concepts • Word banks • Bilingual dictionaries	• Display reminders • Checklist of materials and tasks (printed out or digitally accessible) • Timelines and Calendar for benchmark goals for assignments/assessments/short-term goals (Planner Microsoft)	• Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments	• problem sets that challenge and involve higher level thinking • Inquiry lead discussions and activities • More complex tasks and projects

	• Assistive translator technology • Sentence frames • Simplified notes • Reduced homework • Simplified word problems • Graphic organizers • Matched sentences or procedures with pictures • Alternative presentation options • 1-2 sentence short responses • Shortened written assignments • Modified tests • Provide notes when student request • Reduce project workload • Short summaries	• Assistive technology (dictation, immersive reader, etc...) • Flash cards • Teacher notes • Graphic organizer • Clear parameters and student workspace • Timer to monitor task and duration • Study guides • Guided notes • Choices for alternative assignments • Students are asked to come for extra help to review/retake assessment and homework assignments • Students are allowed time and a half on assessments • Provide the student with frequent check-ins during class-time work • Visual cue or signs • Rephrase of questions and directions • Partner or group work on skill development • Assistance by instructional videos or curated videos online	• Provide the student with frequent check-ins during class-time work • Scaffolding assignments • Chunking of materials • Allow for errors • Pre-teach materials • Supply teacher demo • Rephrase of questions and directions • Visual cue or signs • Small group assistance or collaboration • Partner or group work on skill development • Assistance by instructional videos or curated videos online • Guide with options for student goal setting • Use of timer or a clock to monitor time of student activity	• Higher level questioning and techniques • Student demonstration and explanation • Provide opportunities for students to set personal goals, keep records and monitor their own learning progress • Multiple assessments given in different domains, that showcase student interests, strengths, and needs • Use multiple approaches to accelerate learning within and outside of the school setting • Use enrichment options to extend and deepen learning opportunities within and outside of the school setting • Use individualized learning options such as mentorships, internships, online courses, and independent study