

BLACK HORSE PIKE REGIONAL SCHOOL DISTRICT

COMPUTER SCIENCE

Credits: 2.5 Semester Course

2019-2020 Syllabus

Supervisor: Mary-Alice Baratta

Curriculum Writers: Stephen Arena and Carolyn Smart

Computer Science deals with the theory and methods of processing information using digital computers, the design of computer hardware and software, and the applications of computers. This course covers topics including computational thinking, computer programming, the design and development of interactive animations, games, and applications, data gathering and analysis, and the global impact of advancements in computer science.

MARKING PERIOD 1/3

Unit 1 - Problem Solving and Computing (1-3 Weeks)

The Problem Solving unit is a highly interactive and collaborative introduction to the field of computer science, as framed within the broader pursuit of solving problems. Through a series of puzzles, challenges, and real world scenarios, students are introduced to a problem solving process that they will return to repeatedly throughout the course. Students then learn how computers input, output, store, and process information to help humans solve problems. The unit concludes with students designing an application that helps solve a problem of their choosing.

Unit 2 - Interactive Animation and Games (7 weeks)

In the Interactive Games and Animations unit, students build on their coding experience as they create programmatic images, animations, interactive art, and games. Starting off with simple, primitive shapes and building up to more sophisticated sprite-based games, students become familiar with the programming concepts and the design process computer scientists use daily. They then learn how these simpler constructs can be combined to create more complex programs. In the final project, students develop a personalized, interactive program. Along the way, they practice design, testing, and iteration, as they come to see that failure and debugging are an expected and valuable part of the programming process.

MARKING PERIOD 2/4

Unit 3 - The Design Process (6 weeks)

The Design Process unit transitions students from thinking about computer science as a tool to solve their own problems towards considering the broader social impacts of computing. Through a series of design challenges, students are asked to consider and understand the needs of others while developing a solution to a problem. The second half of the unit consists of an iterative team project, during which students have the opportunity to identify a need that they care about, prototype solutions both on paper and in App Lab, and test their solutions with real users to get feedback and drive further iteration.

Unit 4 - Data and Society (2-5 weeks)

The Data and Society unit is about the importance of data in solving problems and highlights how computers can help in this process. The first chapter explores different systems used to represent information in a computer and the challenges and tradeoffs posed by using them. In the second chapter students learn how collections of data are used to solve problems, and how computers help to automate the steps of this process. In the final project, students gather their own data and use it to develop an automated solution to a problem.

Resources

Code.org Website, Videos, and Activity Guides

Grading Policy

40% Classwork/Homework

40% Major Assessments

10% Minor Assessments

10% Class Participation

Late Work Submission Policy

Daily Work: A pupil who has been absent from school will be given an opportunity to make up assignments, provided the assignments are completed during a period equal to the length of his/her absence. That period may be extended for the completion of long term/Minor/Major assignments at the discretion of the teacher (on an individual basis and specific to the reason for absence when clearly communicated with the teacher).

When Due Dates are Posted for Assignments: There will be a 10% reduction for every day late after the posted due date in Genesis.

Black Horse Pike Regional School District

COMPUTER SCIENCE CURRICULUM

Grades 10 - 12

MISSION STATE OF THE BLACK HORSE PIKE REGIONAL SCHOOL DISTRICT:

The mission of the Black Horse Pike Regional School District is to educate a diverse population in an atmosphere consistent with the ideals of a free and democratic society. We are committed to an exemplary educational program, based upon the New Jersey Student Learning Standards as adopted by the State Board of Education. It is the expectation of this district that all pupils achieve the New Jersey Student Learning Standards, NJ Common Core Standards and Next Generation Science Standards, at all levels. We will continue to improve students' and teachers' technological literacy as a means of preparing for the future with confidence and creativity. Our schools will ensure the safety and security of all students and strive to provide the best learning environment. We will enhance our students' growth by providing them with a creative, purposeful, and ethical atmosphere. We are dedicated to providing our students an opportunity to achieve academic goals, develop good citizenship skills, and make a positive contribution to society.

VISION STATEMENT OF THE BLACK HORSE PIKE REGIONAL SCHOOL DISTRICT:

The Black Horse Pike Regional School District is a community of lifelong learners nurturing the development of critical thinkers and involved citizens prepared to lead fulfilling lives in a changing world.

Black Horse Pike Regional School District

COMPUTER SCIENCE

| PROBLEM SOLVING AND COMPUTING | INTERACTIVE ANIMATIONS AND GAMES | THE DESIGN PROCESS | DATA AND SOCIETY |
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| <ul style="list-style-type: none"> • The Problem Solving Process • Computers and Problem Solving | <ul style="list-style-type: none"> • Images and Animations • Building Games | <ul style="list-style-type: none"> • Using Centered Design • App Prototyping | <ul style="list-style-type: none"> • Representing Information • Solving Data Problems |

PACING GUIDE:

| UNIT | TIME FRAME |
|--------------------------------------|-------------------------|
| 1 – Problem Solving and Computing | Approximately 1-3 Weeks |
| 2 – Interactive Animations and Games | Approximately 7 Weeks |
| 3 – The Design Process | Approximately 6 Weeks |
| 4 – Data and Society | Approximately 2-5 Weeks |

Black Horse Pike Regional School District

COMPUTER SCIENCE

NEW JERSEY STUDENT LEARNING STANDARDS:

[The 12 Career Ready Practices](#)

These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.

[Career Awareness, Exploration, and Preparation \(9.2\)](#)

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.

SOCIAL AND EMOTIONAL LEARNING:

[New Jersey SEL Competencies & Sub-Competencies](#)

Social and emotional learning (SEL) refers to the process by which children and adults acquire and effectively apply the knowledge, attitudes and skills necessary to do the following: understand and manage emotions; set and achieve positive goals; feel and show empathy for others; and make responsible decisions. Students in SEL programs are more likely to attend school and receive better grades, and are less likely to have conduct problems. Successful infusion of SEL can result in positive behaviors, increased academic success, and caring communities.

Black Horse Pike Regional School District

COMPUTER SCIENCE

Unit 1: Problem Solving and Computing

| ESSENTIAL QUESTIONS | ENDURING UNDERSTANDINGS |
|---|--|
| <ol style="list-style-type: none">1. What strategies and processes can I use to become a more effective problem solver?2. How do computers help people to solve problems?3. How do people and computers approach problems differently?4. What does a computer need from people in order to solve problems effectively? | <p>Students will learn how to:</p> <ul style="list-style-type: none">● Identify the defining characteristics of a computer and how it is used to solve information problems.● Use a structured problem solving process to address problems and design solutions that use computing technology.● Collaborate with their peers.● View computer science as relevant, fun, and empowering. <p>Students end the unit by proposing their own app to solve a problem</p> |

Black Horse Pike Regional School District

| UNIT 1: PROBLEM SOLVING AND COMPUTING | |
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| LEARNING TARGETS | STANDARDS |
| 1. Communicate and collaborate with classmates in order to solve a problem | 1. 9.3.IT.1 |
| 2. Interactively improve a solution to a problem | 2. 8.2.12.E.1 |
| 3. Identify different strategies used to solve a problem | 3. 8.2.12.E.1 |
| 4. Given a problem, identify individual actions that would fall within each step of the problem solving process | 4. 8.2.12.E.1 |
| 5. Identify useful strategies within each step of the problem solving process | 5. 8.2.12.E.1 |
| 6. Apply the problem solving process to approach a variety of problems | 6. 8.2.12.E.1 |
| 7. Assess how well-defined a problem is and use strategies to define the problem more precisely | 7. 8.2.12.E.1 |
| 8. Identify a computer as a machine that processes information | 8. 8.2.12.E.2 |
| 9. Provide a high level description of the different parts of the Input - Output - Store - Process model of a computer | 9. 8.2.12.E.2 |
| 10. Identify the inputs and outputs of common computing devices | 10. 8.2.12.E.2 |
| 11. Select the inputs and outputs used to perform common computing tasks | 11. 8.2.12.E.2 |
| 12. Define processing as the work done (possibly by a computer) to turn an input into an output | 12. 8.2.12.E.1 |
| 13. Define an algorithm as the series of commands a computer uses to process information | 13. 8.2.12.E.1 |
| 14. Develop and iteratively improve an algorithm for processing information based on given constraints | 14. 8.2.12.E.1 |
| 15. Describe how information can be processed to solve a particular problem. | 15. 8.2.12.E.1 |
| 16. Identify a possible source of a given input. | 16. 8.2.12.E.1 |
| 17. Determine what information should be stored on a device for later. | 17. 8.2.12.E.1 |
| 18. Identify and define a problem that could be solved using computing | 18. 8.2.12.E.1 |
| | 19. 9.3.IT-WD.1, 9.3.IT-WD.5, 8.2.12.C.7, 8.2.12.D.1, 9.3.IT.2 |

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| <p>19. Design an app that inputs, outputs, stores, and processes information in order to solve a problem</p> <p>20. Provide and incorporate targeted peer feedback to improve a computing artifact</p> | <p>20. 9.3.IT-WD.1, 9.3.IT-WD.5, 8.2.12.C.7, 8.2.12.D.1, 9.3.IT.2</p> |
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| UNIT 1: PROBLEM SOLVING AND COMPUTING | | |
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| IN-CLASS ACTIVITIES/ASSIGNMENTS | FORMATIVE ASSESSMENTS | SUMMATIVE ASSESSMENTS |
| <ol style="list-style-type: none"> 1. Code.org Website, Videos, and Activity Guides 2. Think-Pair-Share - a three-part activity where students are presented with a problem or task to work on. 3. Peer feedback - the practice where students give each other feedback on work they have done. 4. Journaling - a tool for individual reflection in a form that can be revisited as students develop their skills and understandings. <p><u>Chapter 1 - The Problem Solving Process</u></p> <ul style="list-style-type: none"> • Lesson 1: Intro to Problem Solving • Lesson 2: The Problem Solving Process • Lesson 3: Exploring Problem Solving <p><u>Chapter 2 – Computers and Problem Solving</u></p> <ul style="list-style-type: none"> • Lesson 4: What is a Computer • Lesson 5: Input and Output • Lesson 6: Processing • Lesson 7: Apps and Storage • Lesson 8: Project - Propose an App | <ul style="list-style-type: none"> • Questioning Strategies & Discussion • Chapter 1 Quiz • Chapter 2 Quiz • Classwork/Homework Assignments | <ul style="list-style-type: none"> • Unit 1 Test • Unit 1 Project <ul style="list-style-type: none"> ○ Propose and App |

ACCOMMODATION/MODIFICATION OPTIONS: [General Classes](#), [Special Education](#), [504 Students](#), [At Risk Students](#), [Gifted & Talented](#)

Black Horse Pike Regional School District

COMPUTER SCIENCE

Unit 2: Interactive Animations and Games

| ESSENTIAL QUESTIONS | ENDURING UNDERSTANDINGS |
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| <ol style="list-style-type: none"> 1. What is a computer program? 2. What are the core features of most programming languages? 3. How does programming enable creativity and individual expression? 4. What practices and strategies will help me as I write programs? 5. How do software developers manage complexity and scale? 6. How can programs be organized so that common problems only need to be solved once? 7. How can I build on previous solutions to create even more complex behavior? | <p>Students will learn how to:</p> <ul style="list-style-type: none"> ● Create an interactive animation or game that includes basic programming concepts such as control structures, variables, user input, and randomness. ● Work with others to break down tasks using objects (sprites) and functions. ● Give and respond constructively to peer feedback and work with their teammates to complete a project. ● View themselves as computer programmers, and see programming as a fun and creative form of expression. <p>Both of the major projects at the end of each chapter offer students an opportunity to demonstrate what they've learned while leveraging creativity and peer feedback.</p> |

Black Horse Pike Regional School District

UNIT 2: INTERACTIVE ANIMATIONS AND GAMES

LEARNING TARGETS

STANDARDS

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| 1. Identify how computer science is used in a field of entertainment. | 1. 8.2.12.A.3 |
| 2. Reason about locations on the Game Lab coordinate grid. | 2. 8.2.12.E.4 |
| 3. Communicate how to draw an image in Game Lab, accounting for shape position, color, and order. | 3. 8.2.12.E.4 |
| 4. Use a coordinate system to place elements on the screen. | 4. 8.2.12.E.3 |
| 5. Sequence code correctly to overlay shapes. | 5. 8.2.12.E.3 |
| 6. Use and reason about drawing commands with multiple parameters. | 6. 8.2.12.E.3 |
| 7. Generate and use random numbers in a program. | 7. 8.2.12.E.3 |
| 8. Identify a variable as a way to label and reference a value in a program. | 8. 8.2.12.E.3 |
| 9. Use variables in a program to store a piece of information that is used multiple times. | 9. 8.2.12.E.3 |
| 10. Create and use a sprite. Use dot notation to update a sprite's properties. | 10. 8.2.12.E.3 |
| 11. Explain how the draw loop allows for the creation of animations in Game Lab. | 11. 8.2.12.E.4 |
| 12. Use the draw loop in combination with the randomNumber() command, shapes, and sprites to make simple animations. | 12. 8.2.12.E.3 |
| 13. Describe the connection between updating a sprite's location properties and sprite movement on the screen. | 13. 8.2.12.E.4 |
| 14. Read and follow the steps of a short program written in pseudocode that manipulates variable values. | 14. 8.2.12.E.3 |
| 15. Use the counter pattern to increment or decrement sprite properties. | 15. 8.2.12.E.3 |
| 16. Identify which sprite properties need to be changed, and in what way, to achieve a specific movement | 16. 8.2.12.E.3 |
| 17. Evaluate simple and compound Boolean statements. Use the value of a Boolean statement to determine whether a command should be executed. | 17. 8.2.12.E.3 |
| 18. Use conditionals to react to changes in variables and sprite properties and to keyboard input. | 18. 8.2.12.E.3 |
| 19. Move sprites in response to keyboard input. | 19. 8.2.12.E.3 |

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| 20. Use an if-else statement to control the flow of a program. | 20.8.2.12.E.3 |
| 21. Respond to a variety of types of user input. | 21.8.2.12.E.3 |
| 22. Use conditionals to react to keyboard input or changes in variables / properties. | 22.8.2.12.E.3 |
| 23. Sequence commands to draw in the proper order. | 23.8.2.12.E.3 |
| 24. Apply an iterator pattern to variables or properties in a loop. | 24.8.2.12.E.3 |
| 25. Use the velocity and rotationSpeed blocks to create and change sprite movements. | 25.8.2.12.E.3 |
| 26. Describe the advantages of simplifying code by using higher level blocks. | 26.8.2.12.E.4 |
| 27. Detect when sprites are touching or overlapping and change the program in response. | 27.8.2.12.E.3 |
| 28. Describe how abstractions help to manage the complexity of code. | 28.8.2.12.E.4 |
| 29. Use sprite velocity with the counter pattern to create different types of sprite movement. | 29.8.2.12.E.3 |
| 30. Explain how individual programming constructs can be combined to create more complex behavior. | 30.8.2.12.E.4 |
| 31. Model different types of interactions between sprites. | 31.8.2.12.E.3 |
| 32. Describe how abstractions can be built upon to develop even further abstractions. | 32.8.2.12.E.4 |
| 33. Create and use functions for blocks of code that perform a single high-level task within a program. | 33.8.2.12.E.3 |
| 34. Explain the advantages of using functions in a program. | 34.8.2.12.E.4 |
| 35. Explain how abstractions allow programmers to reason about a program at a higher level. | 35.8.2.12.E.4 |
| 36. Implement different features of a program by following a structured project guide. | 36.8.2.12.D.1, 8.2.12.E.3 |
| 37. Identify core programming constructs necessary to build different components of a game. | 37.8.2.12.D.1 |
| 38. Independently scope the features of a piece of software. | 38.8.2.12.E.3 |
| 39. Create a plan for building a piece of software by describing its major components. | 39.8.2.12.D.1 |
| 40. Implement a plan for creating a piece of software. | 40.8.2.12.D.1, 8.2.12.D.3, 8.2.12.E.3 |

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| IN-CLASS ACTIVITIES/ASSIGNMENTS | FORMATIVE ASSESSMENTS | SUMMATIVE ASSESSMENTS |
|---|---|---|
| <ol style="list-style-type: none"> 1. Code.org Website, Videos, and Activity Guides 2. Think-Pair-Share - a three-part activity where students are presented with a problem or task to work on. 3. Peer feedback - the practice where students give each other feedback on work they have done. 4. Journaling - a tool for individual reflection in a form that can be revisited as students develop their skills and understandings. <p><u>Chapter 1 – Images and Animations</u></p> <ul style="list-style-type: none"> • Lesson 1: Programming for Entertainment • Lesson 2: Plotting Shapes • Lesson 3: Drawing in Game Lab • Lesson 4: Shapes and Randomization • Lesson 5: Variables • Lesson 6: Sprites • Lesson 7: The Draw Loop • Lesson 8: The Counter Pattern Unplugged • Lesson 9: Sprite Movement • Lesson 10: Booleans Unplugged • Lesson 11: Conditionals • Lesson 12: Keyboard Input • Lesson 13: Other Forms of Input • Lesson 14: Project - Interactive Card | <ul style="list-style-type: none"> • Questioning Strategies & Discussion • Chapter 1 Quiz • Chapter 2 Quiz • Classwork/Homework Assignments | <ul style="list-style-type: none"> • Unit 2 Test • Unit 2 Projects <ul style="list-style-type: none"> ○ Interactive Card ○ Design a Game |

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| <p><u>Chapter 2 – Building Games</u></p> <ul style="list-style-type: none"> • Lesson 15: Velocity • Lesson 16: Collision Detection • Lesson 17: Complex Sprite Movement • Lesson 18: Collisions • Lesson 19: Functions • Lesson 20: The Game Design Process • Lesson 21: Using the Game Design Process • Lesson 22: Project – Design a Game | | |
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ACCOMMODATION/MODIFICATION OPTIONS: [General Classes](#), [Special Education](#), [504 Students](#), [At Risk Students](#), [Gifted & Talented](#)

Black Horse Pike Regional School District

COMPUTER SCIENCE Unit 3: The Design Process

| ESSENTIAL QUESTIONS | ENDURING UNDERSTANDINGS |
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| <ol style="list-style-type: none"> 1. How do designers identify the needs of their user? 2. How can we ensure that a user's needs are met by our designs? 3. What processes will best allow us to efficiently create, test, and iterate upon our designs? 4. How do teams effectively work together to develop software? 5. What roles beyond programming are necessary to design and develop software? 6. How do designers incorporate feedback into multiple iterations of a product? | <p>Students will learn how to:</p> <ul style="list-style-type: none"> ● Incorporate the design process ● Determine the needs of the user in design ● Create a user interface ● Use feedback from testing ● Design an app ● Create a working prototype ● Pitch an idea they developed <p>By the end of the unit, students should see the design process as a form of problem solving that prioritizes the needs of a user. They should be able to identify user needs and assess how well different designs address them. In particular they know how to develop a paper and digital prototype, gather and respond to feedback about a prototype, and consider ways different user interfaces do or do not affect the usability of their apps. Students should leave the unit with a basic understand of other roles in software development, such as product management, marketing, design, and testing, and to use what they have learned as a tool for social impact.</p> |

Black Horse Pike Regional School District

UNIT 3: THE DESIGN PROCESS

LEARNING TARGETS

STANDARDS

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| 1. Critically evaluate an object for how well its design meets a given set of needs | 1. 8.2.2.D.5 |
| 2. Identify empathy for the user as an important component of the design process | 2. 8.2.12.C.2 |
| 3. Critique a design through the perspective of a user profile. | 3. 8.2.12.C.3 |
| 4. Design improvements to a product based on a user profile. | 4. 8.2.12.C.2 |
| 5. Generate multiple strategies for meeting user needs. | 5. 8.2.12.C.4 |
| 6. Organize ideas and strategies into meaningful categories. | 6. 8.2.12.D.6 |
| 7. Analyze and select the most appropriate strategies to meet user needs. | 7. 8.2.12.C.2 |
| 8. Use a paper prototype to test the design of an app. | 8. 8.2.12.C.7 |
| 9. Collect and analyze feedback from user testing with a paper prototype. | 9. 8.2.12.D.1 |
| 10. Use feedback to create a plan for further development of an app | 10.8.2.12.D.1 |
| 11. Categorize and prioritize user feedback for an app | 11.8.2.12.D.1 |
| 12. Improve a screen design based on user feedback. | 12.8.2.12.D.6 |
| 13. Conduct an interview to collect information about user needs | 13.8.2.12.D.6 |
| 14. Analyze interview notes to identify specific user needs | 14.8.2.12.D.6 |
| 15. Design the functionality of an app to address the specific needs of a user | 15.8.2.12.C.7 |
| 16. Identify improvements to an app based on user testing | 16.8.2.12.C.7 |
| 17. Design the user interface of an app | 17.8.2.12.C.7 |
| 18. Develop a plan for collaborating with others to design a computational artifact | 18.8.2.12.C.1 |
| 19. Describe the target users for a computational artifact | 19.8.2.12.A.2 |
| 20. Evaluate a design based its ability to meet target user's needs | 20.8.2.12.C.2 |
| 21. Evaluate the purpose and impact of a computational artifact | 21.8.2.12.C.6 |
| 22. Explain the role of paper prototypes in app development. | 22.8.1.12.E.1 |

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| 23. Create a paper prototype that incorporates the user flow for a computational artifact. | 23.8.1.12.E.1 |
| 24. Design and run test that use paper prototypes to gather feedback on a design | 24.8.1.12.E.1 |
| 25. Analyze user tests to identify features that should be removed, added, or improved | 25.8.2.12.D.2 |
| 26. Assign roles and responsibilities to each team member when collaborating to create a digital artifact | 26.8.1.12.A.3 27.8.2.12.C.6 |
| 27. Select the appropriate input element for a given type of information | 28.8.2.12.E.3 |
| 28. Create a digital prototype of an application screen | 29.8.2.12.E.1 |
| 29. Create an event that detects and responds to user input | 30.8.2.12.E.1 |
| 30. Integrate all components from collaborative work into a final computational artifact. | 31.8.2.12.E.3 |
| 31. Create a digital prototype that incorporates the user flow for a computational artifact | 32.8.2.12.E.4 |
| 32. Design and run tests that use digital prototypes to gather feedback on a design | 33.8.2.12.D.6 |
| 33. Analyze user feedback and test results on a computational artifact | 34.8.2.12.E.4 |
| 34. Categorize and prioritize the issues according to impact and ease of implementation | 35.8.2.12.D.6 |
| 35. Present technical information clearly to non-technical users | 36.8.2.12.D.6 |
| 36. Reflect on the development of an ongoing project | |

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| IN-CLASS ACTIVITIES/ASSIGNMENTS | FORMATIVE ASSESSMENTS | SUMMATIVE ASSESSMENTS |
|--|---|---|
| <ol style="list-style-type: none"> 1. Code.org Website, Videos, and Activity Guides 2. Think-Pair-Share - a three-part activity where students are presented with a problem or task to work on. 3. Peer feedback - the practice where students give each other feedback on work they have done. 4. Journaling - a tool for individual reflection in a form that can be revisited as students develop their skills and understandings. <p><u>Chapter 1 - User Centered Design</u></p> <ul style="list-style-type: none"> • Lesson 1: Analysis of Design • Lesson 2: Understanding Your User • Lesson 3: User-Centered Design Micro Activity • Lesson 4: User Interfaces • Lesson 5: Feedback and Testing • Lesson 6: Identifying User Needs • Lesson 7: Project - Paper Prototype <p><u>Chapter 2 - App Prototyping</u></p> <ul style="list-style-type: none"> • Lesson 8: Designing Apps for Good • Lesson 9: Market Research • Lesson 10: Paper Prototypes • Lesson 11: Prototype Testing • Lesson 12: Digital Design • Lesson 13: Linking Screens | <ul style="list-style-type: none"> • Questioning Strategies & Discussion • Chapter 1 Quiz • Chapter 2 Quiz • Classwork/Homework Assignments | <ul style="list-style-type: none"> • Unit 3 Test • Unit 3 Projects <ul style="list-style-type: none"> ○ Paper Prototype ○ App Presentation |

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| <ul style="list-style-type: none">• Lesson 14: Testing the App• Lesson 15: Improving and Iterating | | |
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ACCOMMODATION/MODIFICATION OPTIONS: [General Classes](#), [Special Education](#), [504 Students](#), [At Risk Students](#), [Gifted & Talented](#)

Black Horse Pike Regional School District

COMPUTER SCIENCE Unit 4: Data and Society

| ESSENTIAL QUESTIONS | ENDURING UNDERSTANDINGS |
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| <ol style="list-style-type: none"> 1. Why is representation important in problem solving? 2. What features does a representation system need to be useful? 3. What is necessary to create usable binary representation systems? 4. How can we combine systems together to get more complex information? 5. How does data help us to solve problems? 6. How do computers and humans use data differently? 7. What parts of the data problem solving process can be automated? | <p>Students will learn how to:</p> <ul style="list-style-type: none"> ● Use data to solve problems ● See patterns in data and understand what it means ● Use binary programming ● Keep data secure ● Use data in problem solving ● Interpret data ● Automate data decisions ● Make recommendations based on data <p>By the end of the unit, students should have a broad understanding of the role of data and data representation in solving information problems. They should be able to explain the necessary components of any data representation scheme, as well as the particulars of binary and common ways that various types of simple and complex data are represented in binary code. Students should also be able to design and implement a data-based solution to a given problem and determine how the different aspects of this problem solving process could be automated.</p> |

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| <p>8. What kinds of problems do computers use data to solve in the real world?</p> | |
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Black Horse Pike Regional School District

UNIT 4: DATA AND SOCIETY

LEARNING TARGETS

STANDARDS

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| 1. Provide examples of how representing data in different ways can affect its ability to solve different problems. | 1. 8.2.12.C.2 |
| 2. Choose the best way to represent some information based on how it will be used. | 2. 8.2.12.C.1 |
| 3. Describe the necessary features of a system for representing information | 3. 8.2.12.B.1 |
| 4. Create and use a system for representing information | 4. 8.2.12.A.2 |
| 5. Define a binary system as one that uses just two possible states to represent information | 5. 8.2.12.E.1 |
| 6. Use the ASCII system to encode and decode text information in binary | 6. 8.2.12.E.1 |
| 7. Create and manipulate binary patterns to represent black and white images | 7. 8.2.12.E.4 |
| 8. Describe common features of systems used to represent information in binary | 8. 8.2.12.E.4 |
| 9. Use a binary system to represent numbers. | 9. 8.2.12.E.4 |
| 10. Extend a representation system based on patterns. | 10. 8.2.12.E.4 |
| 11. Apply a method of encryption to ensure the secure transmission of data. | 11. 8.1.12.D.1 |
| 12. Use both physical and digital security measures to secure data. | 12. 8.1.12.D.1 |
| 13. Use multiple binary systems to decode information. | 13. 8.1.12.C.1 |
| 14. Determine the most appropriate encoding system for a given piece of information. | 14. 8.1.12.D.2 |
| 15. Choose and justify the use of different binary representation systems depending on the information being represented | 15. 8.1.12.F.1 |
| 16. Encode and decode information represented in binary numbers and ASCII text | 16. 8.1.12.F.1 |
| 17. Create a generalized representation system for many instances of a complex type of information | 17. 8.1.12.F.1 |
| 18. Use the problem solving process to answer a question using data. | 18. 8.2.12.E.1 |
| 19. Identify and collect relevant data to help solve a problem. | 19. 8.2.12.E.1 |
| 20. Use data to draw conclusions. | 20. 8.2.12.E.1 |
| 21. Give examples of how data is collected from sensors and tracking user behavior. | 21. 8.2.12.E.2 |

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| 22. Determine data that would be helpful in solving a problem, and how that data could be collected. | 22.8.2.12.E.3 |
| 23. Distinguish between data that users intentionally and unintentionally produce. | 23.8.2.12.D.6 |
| 24. Identify and remove irrelevant data from a data set. | 24.8.2.12.D.6 |
| 25. Create a bar chart based on a set of data. | 25.8.2.12.D.2 |
| 26. Explain why a set of data must be cleaned before a computer can use it. | 26.8.2.12.D.2 |
| 27. Use tables and visualizations summarizing data to support a decision | 27.8.2.12.C.2 |
| 28. Identify additional data that could be collected to improve a decision | 28.8.2.12.C.2 |
| 29. Visually organize data to highlight relationships and support a claim. | 29.8.2.12.C.4 |
| 30. Use cross tabulation to find patterns and relationships in data | 30.8.2.12.C.4 |
| 31. Design and implement an algorithm for making decisions using data as inputs | 31.8.2.12.C.2 |
| 32. Explain the benefits and drawbacks of using computers for automated decision making | 32.8.2.12.C.4 |
| 33. Interpret collected data to identify patterns | 33.8.2.12.C.4 |
| 34. Apply the data problem solving process to a personally relevant topic | 34.8.2.12.C.4 |
| 35. Determine appropriate sources of data needed to solve a problem | 35. 8.2.12.D.6 |

| IN-CLASS ACTIVITIES/ASSIGNMENTS | FORMATIVE ASSESSMENTS | SUMMATIVE ASSESSMENTS |
|--|---|--|
| <ol style="list-style-type: none"> 1. Code.org Website, Videos, and Activity Guides 2. Think-Pair-Share - a three-part activity where students are presented with a problem or task to work on. 3. Peer feedback - the practice where students give each other feedback on work they have done. 4. Journaling - a tool for individual reflection in a form that can be revisited as students develop their skills and understandings. <p><u>Chapter 1 - Representing Information</u></p> <ul style="list-style-type: none"> • Lesson 1: Representation Matters • Lesson 2: Patterns and Representation • Lesson 3: ASCII and Binary Representation • Lesson 4: Representing Images • Lesson 5: Representing Numbers • Lesson 6: Keeping Data Secret • Lesson 7: Combining Representations • Lesson 8: Project - Create a Representation <p><u>Chapter 2 - Solving Data Problems</u></p> <ul style="list-style-type: none"> • Lesson 9: Problem Solving and Data • Lesson 10: Problem Solving with Big Data • Lesson 11: Structuring Data • Lesson 12: Making Decisions with Data | <ul style="list-style-type: none"> ● Questioning Strategies & Discussion ● Chapter 1 Quiz ● Chapter 2 Quiz ● Classwork/Homework Assignments | <ul style="list-style-type: none"> ● Unit 4 Test ● Unit 4 Projects <ul style="list-style-type: none"> ○ Create a Representation ○ Make a Recommendation |

| | | |
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| <ul style="list-style-type: none">• Lesson 13: Interpreting Data• Lesson 14: Automating Data Decisions• Lesson 15: Project - Make a Recommendation | | |
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ACCOMMODATION/MODIFICATION OPTIONS: [General Classes](#), [Special Education](#), [504 Students](#), [At Risk Students](#), [Gifted & Talented](#)

Black Horse Pike Regional School District

NEW JERSEY SOCIAL AND EMOTIONAL STANDARDS

To be included in lesson plans, when applicable.

Self-Awareness (SEL.PK-12.1)

- SEL.PK-12.1.1 Recognize one's feelings and thoughts.
- SEL.PK-12.1.2 Recognize the impact of one's feelings and thoughts on one's own behavior.
- SEL.PK-12.1.3 Recognize one's personal traits, strengths, and limitations.
- SEL.PK-12.1.4 Recognize the importance of self-confidence in handling daily tasks and challenges.

Self-Management (SEL.PK-12.2)

- SEL.PK-12.2.1 Understand and practice strategies for managing one's own emotions, thoughts and behaviors.
- SEL.PK-12.2.2 Recognize the skills needed to establish and achieve personal and educational goals.
- SEL.PK-12.2.3 Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.

Social Awareness (SEL.PK-12.3)

- SEL.PK-12.3.1 Recognize and identify the thoughts, feelings and perspectives of others.
- SEL.PK-12.3.2 Demonstrate an awareness of the differences among individuals, groups and other's cultural backgrounds.
- SEL.PK-12.3.3 Demonstrate an understanding of the need for mutual respect when viewpoints differ.
- SEL.PK-12.3.4 Demonstrate an awareness of the expectations for social interactions in a variety of settings.

Responsible Decision-Making (SEL.PK-12.4)

- SEL.PK-12.4.1 Develop, implement and model effective problem-solving and critical thinking skills.
- SEL.PK-12.4.2 Identify the consequences associated with one's actions in order to make constructive choices.
- SEL.PK-12.4.3 Evaluate personal, ethical, safety, and civic impact of decisions.

Relationship Skills (SEL.PK-12.5)

- SEL.PK-12.5.1 Establish and maintain healthy relationships.
- SEL.PK-12.5.2 Utilize positive communication and social skills to interact effectively with others.
- SEL.PK-12.5.3 Identify ways to resist inappropriate social pressure.
- SEL.PK-12.5.4 Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.
- SEL.PK-12.5.5 Identify who, when, where, or how to seek help for oneself or others when needed.

Black Horse Pike Regional School District

NJSLS - 21ST CENTURY LIFE AND CAREERS

THE 12 CAREER READY PRACTICES

To be included in lesson plans, when applicable.

Standards (CRP.K-12.CRP)

- CRP.K-12.CRP1: Act as a responsible and contributing citizen and employee.
- CRP.K-12.CRP2: Apply appropriate academic and technical skills.
- CRP.K-12.CRP3: Attend to personal health and financial well-being.
- CRP.K-12.CRP4: Communicate clearly and effectively and with reason.
- CRP.K-12.CRP5: Consider the environmental, social and economic impacts of decisions.
- CRP.K-12.CRP6: Demonstrate creativity and innovation.
- CRP.K-12.CRP7: Employ valid and reliable research strategies.
- CRP.K-12.CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP.K-12.CRP9: Model integrity, ethical leadership and effective management.
- CRP.K-12.CRP10: Plan education and career paths aligned to personal goals.
- CRP.K-12.CRP11: Use technology to enhance productivity.
- CRP.K-12.CRP12: Work productively in teams while using cultural global competence.

NJSLS - 21ST CENTURY LIFE AND CAREERS

CAREER AWARENESS, EXPLORATION, AND PREPARATION

To be included in lesson plans, when applicable.

Standards (CAEP.9.2.12.C)

- CAEP.9.2.12.C1: Review career goals and determine the steps necessary for attainment.
- CAEP.9.2.12.C2: Modify Personalized Student Learning Plans to support declared goals.
- CAEP.9.2.12.C3: Identify transferable career skills and design alternate career plans.
- CAEP.9.2.12.C4: Analyze how economic conditions and societal changes influence employment trends and future education.
- CAEP.9.2.12.C5: Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
- CAEP.9.2.12.C6: Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
- CAEP.9.2.12.C7: Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.
- CAEP.9.2.12.C8: Assess the impact of litigation and court decisions on employment laws and practices.
- CAEP.9.2.12.C9: Analyze the correlation between personal and financial behavior and employability.

Black Horse Pike Regional School District

NEW JERSEY STUDENT LEARNING STANDARDS: TECHNOLOGY (CTE)

STANDARDS 8.1 EDUCATIONAL TECHNOLOGY

- 8.1.12.A.1 Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
- 8.1.12.A.2 Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
- 8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
- 8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
- 8.1.12.A.5 Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
- 8.1.12.B.2 Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
- 8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
- 8.1.12.D.1 Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
- 8.1.12.D.2 Evaluate consequences of unauthorized electronic access (e.g., hacking) and disclosure, and on dissemination of personal information.
- 8.1.12.D.3 Compare and contrast policies on filtering and censorship both locally and globally.
- 8.1.12.D.4 Research and understand the positive and negative impact of one's digital footprint.
- 8.1.12.D.5 Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.
- 8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
- 8.1.12.E.2 Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
- 8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

STANDARDS 8.2 TECHNOLOGY EDUCATION, ENGINEERING, DESIGN, AND COMPUTATIONAL THINKING - PROGRAMMING

- 8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
- 8.2.12.A.2 Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
- 8.2.12.A.3 Research and present information on an existing technological product that has been repurposed for a different function.
- 8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
- 8.2.12.B.2 Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.

- 8.2.12.B.3 Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
- 8.2.12.B.4 Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
- 8.2.12.B.5 Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.
- 8.2.12.C.1 Explain how open source technologies follow the design process.
- 8.2.12.C.2 Analyze a product and how it has changed or might change over time to meet human needs and wants.
- 8.2.12.C.3 Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
- 8.2.12.C.4 Explain and identify interdependent systems and their functions.
- 8.2.12.C.5 Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
- 8.2.12.C.6 Research an existing product, reverse engineer and redesign it to improve form and function.
- 8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
- 8.2.12.D.1 Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
- 8.2.12.D.2 Write a feasibility study of a product to include: economic, market, technical, financial, and management factors, and provide recommendations for implementation.
- 8.2.12.D.3 Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
- 8.2.12.D.4 Assess the impacts of emerging technologies on developing countries.
- 8.2.12.D.5 Explain how material processing impacts the quality of engineered and fabricated products.
- 8.2.12.D.6 Synthesize data, analyze trends and draw conclusions regarding the effect of a technology on the individual, society, or the environment and publish conclusions.
- 8.2.12.E.1 Demonstrate an understanding of the problem-solving capacity of computers in our world.
- 8.2.12.E.2 Analyze the relationships between internal and external computer components.
- 8.2.12.E.3 Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
- 8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).