AP Computer Science Principles

UBD Curriculum

Egg Harbor Township High School

Business and Computer Science Department

CTE

Career and Technical Education

Created By: Adam Swift

Coordinated By: Dr. Carmelita Graham

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DISTRICT MISSION STATEMENT

Our mission in the Egg Harbor Township School District is to partner with the student, family, school, and community to provide a safe learning environment that addresses rigorous and relevant 21st Century standards and best practices which will develop academic scholarship, integrity, leadership, citizenship, and the unique learning style of students, while encouraging them to develop a strong work ethic and to act responsibly in their school community and everyday society.

CAREER AND TECHNICAL EDUCATION

Mission:

New Jersey's Office of Career and Technical Education seeks to prepare students for career opportunities of the 21st century, succeed as global citizens and support healthy economic growth for New Jersey. Career and Technical Education prepares students to succeed as global citizens for career opportunities for the 21st Century and to support healthy economic growth within the state.

INTRODUCTION

The most precious resource teachers have is time. Regardless of how much time a course is scheduled for, it is never enough to accomplish all that one would like. Therefore, it is imperative that teachers utilize the time they have wisely in order to maximize the potential for all students to achieve the desired learning.

High quality educational programs are characterized by clearly stated goals for student learning, teachers who are well-informed and skilled in enabling students to reach those goals, program designs that allow for continuous growth over the span of years of instruction, and ways of measuring whether students are achieving program goals.

EGG HARBOR TOWNSHIP SCHOOL DISTRICT CURRICULUM TEMPLATE

The Egg Harbor Township School District has embraced the backward-design model as the foundation for all curriculum development for the educational program. When reviewing curriculum documents and the Egg Harbor Township curriculum template, aspects of the backward-design model will be found in the stated enduring *understandings/essential questions, unit assessments,* and *instructional activities*. Familiarization with backward-design is critical to working effectively with Egg Harbor Township's curriculum guides.

GUIDING PRINCIPLES: WHAT IS BACKWARD DESIGN?

WHAT IS UNDERSTANDING BY DESIGN?

"Backward design" is an increasingly common approach to planning curriculum and instruction. As

its name implies, “backward design” is based on defining clear goals, providing acceptable evidence of having achieved those goals, and then working ‘backward’ to identify what actions need to be taken that will ensure that the gap between the current status and the desired status is closed.

Building on the concept of backward design, Grant Wiggins and Jay McTighe (2005) have developed a structured approach to planning programs, curriculum, and instructional units. Their model asks educators to state goals; identify deep understandings, pose essential questions, and specify clear evidence that goals, understandings, and core learning have been achieved.

Program based on backward design use desired results to drive decisions. With this design, there are questions to consider, such as: What should students understand, know, and be able to do? What does it look like to meet those goals? What kind of program will result in the outcomes stated? How will we know students have achieved that result? What other kinds of evidence will tell us that we have a quality program? These questions apply regardless of whether they are goals in program planning or classroom instruction.

The backward design process involves three interrelated stages for developing an entire curriculum or a single unit of instruction. The relationship from planning to curriculum design, development, and implementation hinges upon the integration of the following three stages.

Stage I: Identifying Desired Results: Enduring understandings, essential questions, knowledge and skills need to be woven into curriculum publications, documents, standards, and scope and sequence materials. Enduring understandings identify the “big ideas” that students will grapple with during the course of the unit. Essential questions provide a unifying focus for the unit and students should be able to answer more deeply and fully these questions as they proceed through the unit. Knowledge and skills are the *“stuff”* upon which the understandings are built.

Stage II: Determining Acceptable Evidence: Varied types of evidence are specified to ensure that students demonstrate attainment of desired results. While discrete knowledge assessments (e.g.: multiple choice, fill-in-the-blank, short answer, etc...) will be utilized during an instructional unit, the overall unit assessment is performance-based and asks students to demonstrate that they have mastered the desired understandings. These culminating (summative) assessments are authentic tasks that students would likely encounter in the real-world after they leave school. They allow students to demonstrate all that they have learned and can do. To demonstrate their understandings students can explain, interpret, apply, provide critical and insightful points of view, show empathy and/or evidence self-knowledge. Models of student performance and clearly defined criteria (i.e.: rubrics) are provided to all students in advance of starting work on the unit task.

Stage III: Designing Learning Activities: Instructional tasks, activities, and experiences are aligned with stages one and two so that the desired results are obtained based on the identified evidence or assessment tasks. Instructional activities and strategies are considered only once stages one and two have been clearly explicated. Therefore, congruence among all three stages can be

ensured and teachers can make wise instructional choices.

At the curricular level, these three stages are best realized as a fusion of research, best practices, shared and sustained inquiry, consensus building, and initiative that involves all stakeholders. In this design, administrators are instructional leaders who enable the alignment between the curriculum and other key initiatives in their district or schools. These leaders demonstrate a clear purpose and direction for the curriculum within their school or district by providing support for implementation, opportunities for revision through sustained and consistent professional development, initiating action research activities, and collecting and evaluating materials to ensure alignment with the desired results. Intrinsic to the success of curriculum is to show how it aligns with the overarching goals of the district, how the document relates to district, state, or national standards, what a high quality educational program looks like, and what excellent teaching and learning looks like. Within education, success of the educational program is realized through this blend of commitment and organizational direction.

INTENT OF THE GUIDE

This guide is intended to provide teachers with course objective and possible activities, as well as assist the teacher in planning and delivering instruction in accordance with the New Jersey Core Curriculum Content Standards. The guide is not intended to restrict or limit the teacher's resources or individual instruction techniques. It is expected that the teacher will reflectively adjust and modify instruction and units during the course of normal lessons depending on the varying needs of the class, provided such modified instruction attends to the objectives and essential questions outlined below.

Unit Name: Introduction to Computer Science Principles
Time Frame: Approximately 2 weeks
Author: Adam Swift

UNIT 1

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

Students will be introduced to the course and what computer science is. Students will reflect on the computing innovation that has had the greatest impact on their lives, then consider that innovation in light of the seven big ideas of CSP. They will write about this innovation and its impact. Students will also learn about different programming concepts, developing simple algorithms. All software will involve block programming (Scratch, Snap, Blockly). Lastly, students will consider/analyze/explain the notion "program or be programmed" as it relates to social media websites.

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
Google Accounts – use for Portfolios
AppInventor Software (Emulator)
Finch Robots
Software – SNAP, Scratch, Blockly
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.

Internet Resource Links:

https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles
http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
http://www.finchrobot.com/teaching/grades-9-12
https://code.org/educate/csp
https://codehs.com/
http://csunplugged.org/activities/

STAGE ONE

GOALS AND STANDARDS

Students will understand the expectations for the AP Computer Science Principles exam including the three different components: Programing Performance Task, Impact of Computing Innovation Performance Task, and multiple choice exam. They will be able to reflect on the impact of technology and innovation in their lives. Students will be able to create mini programs for mobile apps and robotics.

LA.11-12.RST.11-12.2 - Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, process information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.11-12.RST.11-12.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.11-12.WHST.11-12.2.A - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.11-12.WHST.11-12.2.B - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
CRP.K-12.CRP2.1 - Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
TECH.8.1.12.A.CS1 - Understand and use technology systems.
TECH.8.1.12.B.CS1 - Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12.B.CS1 - The cultural, social, economic and political effects of technology
TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.2.12.E.1 - Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.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).
12.9.3.IT-PRG.4 - Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5 - Apply an appropriate software development process to design a software application.
12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.

ENDURING UNDERSTANDING

EU 4.1 Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.
EU 4.2 Algorithms can solve many, but not all, computational problems.
EU 5.1 Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society).
EU 5.2 People write programs to execute algorithms.

ESSENTIAL QUESTIONS

What is the Computer Science Principles Course?
Why is it important to study the impact of computing technology?
What is meant by the phrase "Program or Be Programmed?"
How has technology/innovation impacted your life (both positive and negative)?
What is block based programming and how can it be used to create meaningful programs?
How are algorithms implemented and executed on computers and computational devices?
How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge?

KNOWLEDGE AND SKILLS

Students will …

- Understand what computer science is and the vast impact it has on a variety of fields.
- Reflect on and write about the impact technology/innovation has had on their lives.
- Define the term algorithms as well as be able to develop their own basic alogrithms.
- Complete basic programs using block programming software to create algorithims.

STAGE TWO

PERFORMANCE TASKS

After an introduction to the framework of AP Computer Science Principles Curriculum including the format of the AP exam, students will consider the impact of technology/innovation on their lives. They will write about this technology/innovation explaining the impact it has had (positive, negative, or both). Students will share there papers with the class to spark discussion and reflection on the need to be creators of technology and not passive users. This will lead to conversations about the what computer science is and the vast role it plays in just about every career field.

Students will learn how to program using Block Programming. First, they will demystify the term algorithms indentifying it as a simple procedure. Next, they will transition into implementing their own algorithms to create basic mobile apps using AppInventor and software for robotics. Students will complete a variety of tutorials that work them through the development stages for both of these activities. By the end of the unit students will understand the features of the mobile app design software, App Inventor.

OTHER EVIDENCE

Quizzes/Test
Completion of assigned worksheets/questions
Classroom discussion and interaction during activities
Completion of programming projects using App Inventor
Completion of Chapters in *Blown to Bits*
Written reflection on technology/Innovation of their choice

STAGE THREE

LEARNING PLAN

Understanding the role of technology/innovation in their lives and evaluate the importance of programming not “being programmed.”

- Exploration of AP CS Principles Course
    - Understanding the format of CS Principles Course/Exam and expectations of College Board
    - Understand/Explore the impact of computer science in “everything”

- Reflect on the impact of technology/innovation
    - Read Chapters in *Blown to Bits*
    - Discussion on technology/innovation in our world today
    - Write relfection on the technology/innovation that has had the biggest impact on their lives

- Introduction to Block Programming
    - Hour of Code Projects
    - AppInventor – App Inventor Set Up and Tutorial Completion
    - Programming Robots – block programming (or for more advanced CS students, use of Java Programming Language)

- Worksheets from CSUnplugged
    - http://csunplugged.org/

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Unit Name: Mobile Apps & Pair Programming
Time Frame: Approximately 4 weeks
Author: Adam Swift

UNIT 2

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

Students will be introduced to Mobile App Design through the use of App Inventor. Students will implement App Inventor's event-drive programming model. They will start by completing guided tutorials before being presented with exercises that challenge them to extend their understanding by either solving these individually or together. Completion of these programs will provide students with computational artifacts. This unit will tie into the STEM process in developing basic mobile apps from scratch (design, create, evaluate, and improve). It will also cover basic programming concepts of algorithms and abstraction. Additionally, students will be introduced to binary numbers. They will understand how binary works and binary's role in our digital world. Finally, this unit will also include discussions of the Internet (online usage, online safety, and online ethics) and Cloud Computing. Both of these are at the foundation of App Inventor.

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
AppInventor Software (Emulator)
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.

Internet Resource Links:

https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles
http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
https://code.org/educate/csp
http://csunplugged.org/activities/

STAGE ONE

GOALS AND STANDARDS

Students will be able to create mobile apps from the design stage to programming stage using AppInventor. They will complete multiple apps that will serve as artifacts from their learning. In developing their apps students will also see programming as a collaborative/community activity through pair programming assignments. Students will also develop an understanding of the Internet and Cloud Computing. They will better understand the functionality of the internet (which they use every day) as well as become better consumers of this technology.

LA.11-12.RST.11-12.2 - Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, process information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.11-12.RST.11-12.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CRP.K-12.CRP2.1 - Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
TECH.8.1.12.A.CS1 - Understand and use technology systems.
TECH.8.1.12.B.CS1 - Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12.B.CS1 - The cultural, social, economic and political effects of technology
TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.2.12.E.1 - Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.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.
TECH.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).
12.9.3.IT.4 - Demonstrate positive cyber citizenry by applying industry accepted ethical practices and behaviors.
12.9.3.IT-PRG.4 - Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5 - Apply an appropriate software development process to design a software application.
12.9.3.IT-PRG.7 - Demonstrate software testing procedures to ensure quality products.
12.9.3.ST-ET.1 - Use STEM concepts and processes to solve problems involving design and/or production.
12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.

ENDURING UNDERSTANDING

EU 1.1 Creative development can be an essential process for creating computational artifacts.
EU 1.2 Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.
EU 1.3 Computing can extend traditional forms of human expression and experience.
EU 4.1 Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.
EU 4.2 Algorithims can solve many, but not all, computational problems.
EU 5.1 Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society).
EU 5.4 Programs are developed, maintained, and used by people for different purposes.
EU 6.1 The Internet is a network of autonomous systems.
EU 6.3 Cybersecurity is an important concern for the Internet and the systems built on it.
EU 7.1 Computing enhances communication, interaction, and cognition.

ESSENTIAL QUESTIONS

How can a creative development process affect the creation of computational artifacts?

How can computing and the use of computational tools foster creative expression?
How does one use App Inventor and event-driven programming to build a mobile app?
What are the various hardware and software abastractions that make up a modern digital computer?
What is the binary number system that underlies all digital representation?
What is digital citizenship?

KNOWLEDGE AND SKILLS

Students will …

- Understand binary code and its role in everything digital.
- Understand how the internet and cloud computer works including its role in App Inventor.
- Develop their digital citizenship with a focus on online usage, online safety, and online ethics.
- Be able to implement the design process and algorithims in developing functioning mobile apps.
- Understand the STEM design process and implement it when creating mobile apps.
- Enhance their ability to work in collaboration with others through pair programming.

STAGE TWO

PERFORMANCE TASKS

Students will learn basic concepts associated with the Internet and cloud computing. As part of this material students will evaluate and reflect on their digitial citizenship. They will understand the importance of online usage, online safety, and online ethics. Students will also learn about and complete worksheets on Binary Code including what it is, why it is used, and demo's of its role in our digital world. With a basic understanding of the internet and cloud computing students will start to consider the role both play in App Inventor (online mobile app development). This material will be reinforced through the reading of chapters in *Blown to Bits*.

Students will begin to create more complex event-drive mobile apps. They will focus on both the design element and the programming element. Creating mobile apps will require them to work through the STEM process. Students will have to follow provided guidelines when completing their apps while also adding an unique aspect that they develop on their own.

OTHER EVIDENCE

Quizzes/Test
Completion of assigned worksheets/questions (focus on Binary Code)
Classroom discussion and interaction during activities
Completion of programming projects using App Inventor
Completion of Chapters in *Blown to Bits*

STAGE THREE

LEARNING PLAN

Understanding the basics of the Internet and Cloud Computing as well as the role of binary in our digital world.

- Reflect on their usage of the internet
    - Define the term Digital Citizenship
    - Evaluate online usage, online safety, and online ethics
    - Understand the role of binary as it pertains to data and information transmission online
        - CSUnplugged Activities

    - Transition into how all of this is used, with a focus on its application when using App Inventor.

- Programming in App Inventor
    - The focus will be on the STEM process as it pertains to mobile app design.
        - Mobile Apps will be event driven by the user
        - Students will follow procedures to complete their apps but will enhance these by adding a new component of their own.
    - Pair Programming – reinforce programming as a collaborative effort.
    - Labs – I have a Dream Tutorial, I have a Dream Part 1, I Have a Dream Project, Where is North (compass app)

- Worksheets from CSUnplugged
    - Binary Numbers
    - http://csunplugged.org/

- *Blown to Bits*: The Digital Explosion
    - Reading/Discussion

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Unit Name: Creating Graphics & Images
Time Frame: Approximately 4 weeks
Author: Adam Swift

UNIT 3

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

Students will learn about image representation in a digital world (bits, pixels, image compression technique, embedding, etc.). Students will use App Inventor, learning how to add new images to their canvas as well as allow users to interact with their screen to put images onto it. They will be introduced to concepts including variables, lists, and data abstraction. The Paint Pot app, a computational version of finger painting, is presented in four parts each of which is followed by a set of creative project exercises and challenges. This unit will also use the Magic 8 Ball app, which introduces list, and Map Tour which demonstrates the ability to incorporate external data into a mobile app. Students will delve into their first database. They will have to use algorithms to search databases for their desired images. Additionally, students will further their knowledge of the binary number system through an introduction to the idea of a bit as a fundamental unit of data. Through hands on activities students will explore how bits are used to represent images and how redundant parity bits can be used to detect simple data transmission errors. This will be used in introducing Cybersecurity, with a focus on Steganography (hiding information in documents).

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
AppInventor Software (Emulator)
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.

Internet Resource Links:

https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles
http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
https://code.org/educate/csp
http://csunplugged.org/activities/
https://gencyber.utulsa.edu/complete-lesson-plans/
https://niccs.us-cert.gov/formal-education

STAGE ONE

GOALS AND STANDARDS

Students will bridge the gap from binary code to image representation. They will understand how to implement images and make those images changeable by users without destroying the original version of the image. Students will also evaluate images based on the code behind it understanding the

information provided in that code, errors within that code, and how to embed/hide information within it. Students will continue to advance their understanding of abstraction within programming by identifying blocks and their uses in App Inventor but not worrying about the code behind it. This will allow them to develop advanced mobile apps with the focus on the functionality not the micro level detail behind how it is working.

LA.11-12.RST.11-12.2 - Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, process information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.11-12.RST.11-12.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CRP.K-12.CRP2.1 - Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
TECH.8.1.12.A.CS1 - Understand and use technology systems.
TECH.8.1.12.B.CS1 - Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12.B.CS1 - The cultural, social, economic and political effects of technology
TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.1.12.E.CS3 - Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4 - Process data and report results.
TECH.8.2.12.E.1 - Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.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).
12.9.3.IT-PRG.4 - Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5 - Apply an appropriate software development process to design a software application.
12.9.3.IT-PRG.7 - Demonstrate software testing procedures to ensure quality products.
12.9.3.IT-PRG.10 - Design, create and maintain a database.
12.9.3.ST-ET.1 - Use STEM concepts and processes to solve problems involving design and/or production.
12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.

ENDURING UNDERSTANDING

EU 1.2 Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.
EU 2.1 A variety of abstractions built on binary sequences can be used to present all digital data.
EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.
EU 3.1 People use computer programs to process information to gain insight and knowledge.
EU 3.2 Computing facilitates exploration and the discovery of connections in information.
EU 3.3 There are trade-offs when representing information as a digital tool.
EU 5.1 Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society).
EU 5.4 Programs are developed, maintained, and used by people for different purposes.

EU 6.3 Cybersecurity is an important concern for the Internet and the systems built on it.
EU 7.1 Computing enhances communication, interaction, and cognition.

ESSENTIAL QUESTIONS

How can computation be employed to help people process data and information to gain insight and knowledge?
What opportunities do large data sets provided for solving problems and creating knowledge?
How is cybersecurity impacting the ever-increasing number of Internet users?
How are vastly different kinds of data, physical phenomena, and mathematical concepts represented on a computer?
How can binary numbers be used to represent all digital data?
How can algorithims be used to compress data?
How do variables of both simple and structured data, such as lists, enable us to manage the complexity of a program?

KNOWLEDGE AND SKILLS

Students will …

- Understand binary code and its role in digital representation.
- Evaluate the binary code behind graphics and images allowing them to extract information and decipher hidded messages .
- Develop algorithms to process through large data sets and extract useful information.
- Be able to incorporate lists and external data into the mobile apps they design.
- Be able to implement images and allow for modification of these images by users using the app. However, this user modification will not impact the original image file. Students will understand the explanation behind this.

STAGE TWO

PERFORMANCE TASKS

Students will reinforce their knowledge of binary by evaluating its role in graphics/image representation. They will be able to sort through the code behind these graphics, extracting data and deciphering any hidden messages. Students will also learn how to identify redundant parity bits to detect transmission errors. They will understand that there is a large amount of information within pictures they place on the Internet.

With an understanding of the information behind graphics/images, students will implement these into their mobile apps. They will understand how to create apps so that images can be modified by the user of their app without ruining the original version. Students will also create apps that interact with external data. Just as images are compressesd for transmission, students will understand how large list of data can be compressed and then searched for necessary information.

All apps will continue to build on the concepts of abstraction within programming and user driven functionality. Students will improve their understand of variables, lists, and data abstraction as they pertain to programming. They will continue to build their digital portfolio with computational artifacts.

OTHER EVIDENCE

Quizzes/Test
Completion of assigned worksheets/questions

Classroom discussion and interaction during activities
Completion of programming projects using App Inventor
Completion of Chapters in *Blown to Bits*

STAGE THREE

LEARNING PLAN

Understand the basics of graphics and images.

- Evaluating the data behind all graphics and images
    - Understand the role of binary in representing images
        - CSUnplugged – Representing Images Worksheet
    - Explore/Understand how to mine through data behind images to find out a variety of information
        - Cybersecurity – hiding information within images and identify these messages through irregularities within the digital representation of the image
        - Steganography Activity

- Data Mining
    - Creating and Using databases
    - Using algorithms to process through large sets of data

- Programming in App Inventor
    - Inclusion of variables, lists, and data abstraction within students' mobile apps
    - Inclusion of images and image manipulation
    - Incorporation of external data into their mobile apps
    - Labs: Paint Pot 1, Paint Pot 2, Magic 8 Ball, Map Tour Tutorial and Projects

- *Blown to Bits*: Electronic Documents
    - Reading/Discussion

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Unit Name: Exploring Computing: Animation, Simulation, & Modeling
Time Frame: Approximately 4 weeks
Author: Adam Swift

UNIT 4

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

Students will create interactive/fun mobile app games using App Inventor (Mole Mash game, Coin Flip Simulation, etc.). These apps will introduce students to the idea of computer simulation and modeling. The activities in Unit 4 build toward the EU2.3 as students learn that models use abstractions, such as pseudo random number generator, to represent real world situations, in this case, the flipping of a coin; EU3.3 as students learn how PRNG algorithms are used to model randomness inside a computer, such as the Coin Flip app; EU 7.1 as students extend the app model to represent different types of coins, including a biased coin and three-sided coin. This unit will also include modular arithmetic, evaluating equations, etc. The unit ties back into abstraction and how present day programming allows non-computer science experts to utilize their knowledge of CS to succeed in their chosen careers/fields. There will be connections made between how our games model the actual games/activities and also what are some real world examples of modeling and how does it work (weather, climate models, solar system models, stock market models, etc.).

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
AppInventor Software (Emulator)
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.
Data API's

Internet Resource Links:

https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles
http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
https://code.org/educate/csp
http://csunplugged.org/activities/
https://developers.google.com/fusiontables/

STAGE ONE

GOALS AND STANDARDS

Students will undersand the role of Big Data in today's world. They wll be able to define the term big data and begin to explore ways to manage, manipulate, and work with big data. They will explore how to create persistent data as well as share data online by using freely avai

LA.11-12.RST.11-12.2 - Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, process information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.11-12.RST.11-12.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.11-12.WHST.11-12.2.A - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.11-12.WHST.11-12.2.B - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
CRP.K-12.CRP2.1 - Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
TECH.8.1.12.A.CS1 - Understand and use technology systems.
TECH.8.1.12.B.CS1 - Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12.B.CS1 - The cultural, social, economic and political effects of technology
TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.1.12.E.CS3 - Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4 - Process data and report results.
TECH.8.2.12.E.1 - Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.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).
12.9.3.IT.6 - Describe trends in emerging and evolving computer technologies and their influence on IT practices
12.9.3.IT-PRG.4 - Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5 - Apply an appropriate software development process to design a software application.
12.9.3.IT-PRG.7 - Demonstrate software testing procedures to ensure quality products.
12.9.3.IT-PRG.10 - Design, create and maintain a database.
12.9.3.ST-ET.1 - Use STEM concepts and processes to solve problems involving design and/or production.
12.9.3.ST.4 - Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.
12.9.3.ST-SM.3 - Analyze the impact that science and mathematics has on society.

ENDURING UNDERSTANDING

EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.
EU 2.3 Models and simulations use abstraction to generate new understanding and knowledge.
EU 3.3 There are trade-offs when representing information as a digital tool.
EU 4.1 Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.

EU 5.3 Programming is facilitated by appropriate abstractions.
EU 7.1 Computing enhances communication, interaction, and cognition.
EU 7.3 Computing has global effects – both beneficial and harmful – on people and society.
EU 7.4 Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used.

ESSENTIAL QUESTIONS

How can computation be employed to help people process data and information to gain insight and knowledge?
What opportunities do large data sets provided for solving problems and creating knowledge?
How do computers use simulation and modeling to represent real world phenomena?
Why is randomness important and how it is modeled inside a computer?
In what ways does simulation and modeling extend our knowledge and benefit society?

KNOWLEDGE AND SKILLS

Students will …

- Understand the role of animations, simulations and models in a vast number of fields identifying the necessity and importance of these being effective and accurate.
- Identify the role computer science plays in professions requiring/implementing these simulations and models.
- Be able to research and present an argument of how computer science is vital to success in a variety of fields and overall society.
- Implement programming concepts such as randomness, modular arithematic, and Boolean conditions to create mobiles apps.
- Create games and simulations that are fun and interactive for the user.
- Evaluate the impact of developing technology on one's privacy. Is the ability to predict, track, and monitor going to far?

STAGE TWO

PERFORMANCE TASKS

Students will research the role of simulations and modeling in a variety of professional fields. They will understand the social and economic impacts that accurate simulations/models can provide. Students will research and write about an effective (or ineffective) simulation/model including what it was and the positive (or negative) social or economic result that followed.

With an understanding of the importance of simulations and modeling students will implement many of the same principles used to create these in developing mobile app games. They will learn how to implement random generator functions, modular arithematic, and Boolean conditions. Students will also influence these games by creating bias or increased likelihood of certain results. In using many of these predefined functions, students will be building on their understanding and appreciation of abstraction. The creation of their games will be the entry level for understanding how to develop full fledge simulations and models.
Lastly students, while respecting and appreciating the importance of and need for simulations and models, will consider the negative impact to individuals. They will consider the privacy issues when data is collected and models formed to make predictions that may or may not be accurate. Studnets will consider the human element that is missing when everything is reduced to data and numbers.

OTHER EVIDENCE

Quizzes/Test
Completion of assigned worksheets/questions
Classroom discussion and interaction during activities
Completion of programming projects using App Inventor
Completion of Chapters in *Blown to Bits*
Research and Written Submission on Simulations/Modelings

STAGE THREE

LEARNING PLAN

Exploring the role of animations, simulations, and modeling. Develop the basic programming knowledge to create these.

- Evaluating the role of animations, simulations, and modeling in a variety of fields
    - Research and Written Report on the role (either positive or negative) of simulations and models on a real world event.
    - Understanding of how non computer science experts use technology/innovation to facilitate their jobs and the advantages one has if they have an elementary understanding of computer science.

- Programming in App Inventor
    - Inclusion of random generator functions, modular arithematic, and Boolean conditions.
    - Enhanced interactiveness and non predictable behavior in designed mobile apps.
    - Consideration of how we can use user play and decision making when playing our games to predict future behaviors and actions within a similar environment.
    - Labs: Mole Mash Tutorials and Projects, Coin Flip Simulation and Experiment, and Logo Game.

- *Blown to Bits*: Privacy
    - Reading/Discussion
    - Debate – Are we taking out/ignoring the human element? Is the collection of data and modeling based on all this data an infringement of our privacy?

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Unit Name: Programming Performance Task & Impact of Computing Innovations Performance Task (Practice)
Time Frame: Approximately 5 weeks
Author: Adam Swift

UNIT 5

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

Performance Task Practice: 12-15 hours

Practice performance task to prepare for the final one submitted to the College Board. The CREATE task is one of two required performance tasks by College Board – a programming one (CREATE) and a written one (EXPLORE). In this programming performance task, students work in pairs to collaboratively develop a mobile app or Kodu Game. This includes going through the entire development process of pitching their project, to designing, implementing, and debugging their final product. Students will track their progress and note challenges along the way documenting these and explaining how they were able to overcome them. They will also take screen shots of their block code and provide explanations for how it works. All documentation will be part of a written portfolio that they will share with the class through an oral presentation or recorded video presentation. They will be provided guidance throughout this process on expectations when completing the official Performance Task.

Explore Practice: 4-5 hours

Practice performance task to prepare for the final one submitted to the College Board. In this practice written performance task, students work independently to research a computing innovation related to mobile apps or game design that has had a significant impact (positive or negative) on our society. This includes finding credible, reliable, and recent sources as well as answering a series of prompts about their chosen innovation. Students then create a visual artifact that demonstrates what they learned about one or more of the effects of the innovation. After completing this activity, the students are asked to reflect on their experience and to brainstorm at least three computing innovations they might want to research for the official Explore Performance Task.

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
AppInventor Software (Emulator)
Kodu Game Lab Software
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.
Kodu Game Lab

Internet Resource Links:
https://apstudent.collegeboard.org/apcourse/ap-computer-science-principles
http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
https://www.kodugamelab.com/

STAGE ONE

GOALS AND STANDARDS

Students will prep for the two performance tasks they will be required to complete as part of the AP Computer Science Principles Exam. For the performance task they will demonstrate the ability to work with a partner to develop a mobile app (AppInventor) or video game (Kodu). They will complete this process from the pitching of their idea to finalization of their project. They will also provide files documenting the process including obstacles along the way and how they overcame these.

Students will prep for the explore performance task by independently researching a computing innovation related to mobile apps or video games that has impacted society. They will have to submit a formal written document based on their research as well as a visual representation of their findings. Students will demonstrate the ability to provide formal writing on their research and an engaging presentation with visual reprsenation of their findings.

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LA.11-12.WHST.11-12.2.A - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
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TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.1.12.E.CS3 - Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4 - Process data and report results.
TECH.8.2.12.E.1 - Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.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).

12.9.3.IT.6 - Describe trends in emerging and evolving computer technologies and their influence on IT practices
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12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.
12.9.3.ST-SM.3 - Analyze the impact that science and mathematics has on society.

ENDURING UNDERSTANDING

EU 1.1 Creative development can be an essential process for creating computational artifacts.
EU 1.2 Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.
EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.
EU 3.1 People use computer programs to process information to gain insight and knowledge.
EU 3.3 There are trade-offs when representing information as a digital tool.
EU 4.1 Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.
EU 5.1 Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society).
EU 5.2 People write programs to execute aglorithms.
EU 5.3 Programming is facilitated by appropriate abstractions.
EU 5.4 Programs are developed, maintained, and used by people for different purposes.
EU 5.5 Programming uses mathematical and logical concepts.
EU 7.1 Computing enhances communication, interaction, and cognition.
EU 7.3 Computing has global effects – both beneficial and harmful – on people and society.
EU 7.4 Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used.
EU 7.5 An investigative process is aided by effective organization and selection of resources. Appropriate technologies facilitate the accessing of information and enable the ability to evaluate the credibility of sources.

ESSENTIAL QUESTIONS

How does computer science foster teamwork, collaboration, and creativity?
What is the STEM design process and how is it implemented when creating a mobile app or video game?
Why is documentation necessary when completing projects?
What impact has innovation/technology had on our society?
How can you better communicate your research and findings to a broader audience whether this is through writing or oral presentation?

KNOWLEDGE AND SKILLS

Students will …

- Understand the expectations of the performance tasks on the AP Computer Science Principles Exam.
- Be able to create a mobile app or video game artifact to include in their digital portfolio as well as documentation explaining the process of its development from proposal to project completion.
- Understand the importance of collaboration, communication, and teamwork in completing computer science projects.
- Be able to identify quality sources when searching information.
- Develop a well written formal document outlining their research findings and drawing a conclusion from it.
- Provide an informative and convincing oral presentation with the necessary visual aides to suppor their argument.

PERFORMANCE TASKS

Students will deisng their own mobile app or video game to satisfy the CREATE task that is part of the AP Exam. This will be practice for the official assignment that the students will have to submit to College Board. This project will implement a variety of concepts learned throughout the first four units. Students will understand the complexity of developing a project from formation of an idea to the finished product. They will also document this process. By the end of the CREATE task students will have a fully developed mobile app or video game to include in their portfolios as well as documentation of the process in completing it.

Students will complete the EXPLORE task which will require research and identification of a technology/innovation related to mobile apps or video games that has impacted society. Students will have to find and use crediable resources in putting together a formal written document and oral presentation with necessary visual aids supporting this presentation. Students will demonstrate the ability to research, process information, and draw conclusions both in written and verbal form. This assignment will serve as practice for a similar task they will need to complete as part of the AP Computer Science Principles Exam.

OTHER EVIDENCE

Completion of the CREATE task – finalized Mobile App/Video Game
Written documentation of the process in completing the CREATE task
Formal written document identifying a technology/innovation that has had a significant societal impact
Presentaiton and visual representation of research findings

STAGE THREE

LEARNING PLAN

Completion of projects/assignments in preparation for the Performance Tasks component of the AP Computer Science Principles Exam.

- Create Task
    - Completion of mobile app using AppInventor or video game using Kodu
    - Documentaion of process in completing the task
    - Reflection on collaboration and partner contributions throughout the project

- Explore Task
    - Research of technology/innovation that has had a significant societal impact
    - Identify quality, academic sources
    - Develop a well written formal document outlining their findings
    - Develoop an Oral Presentaiton supported by visuals

- *Blown to Bits*
    - Reading/Discussion

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Unit Name: Algorithms and Procedural Abstraction
Time Frame: Approximately 4 weeks
Author: Adam Swift

UNIT 6

Subject: Computer Science
Course/Grade: AP Computer Science Principles (9-12)
School: Egg Harbor Twp High School
Country: USA
State/Group: NJ

UNIT SUMMARY

In Unit 6, algorithms and procedures are examined in more detail. Students will learn what algoirthms are as well as how they are part of their everyday life. Students will implement algorithmic thinking through the creation of a simple Pong game (loops, if/else, etc.) using either App Inventor or Scratch. Additionally, students will complete the Logo apps introducing them to procedural abstraction and teaching them how to define and use procedures –blocks of code that perform a specific task. They will learn how to analyze the efficiency of algorithms and determine the limits of algorithms. They will be introduced to different algorithms through the completion of CS Unplugged activities on searching and sorting algorithms. The efficiency of these algorithms will be analyzed both experimentally and through mathematical concepts such as functions and graphs. The real world connection for this unit will focus on the impact of Web searching algorithms on our lives.

UNIT RESOURCES

Book – *Blown to Bits* (electronic copy provided)
Google Classroom
AppInventor Software (Emulator)
Planning Posterboard (mapping programs)
Mini-Whiteboards: Tracing Programs
Pens, Pencils, Markers, & Expo Markers
Computers
Internet Access
The New York Times, Wall Street Journal, Wired, etc.

Internet Resource Links:

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http://www.appinventor.org/
http://ai2.appinventor.mit.edu/
https://code.org/educate/csp
http://csunplugged.org/activities/
https://scratch.mit.edu/

STAGE ONE

GOALS AND STANDARDS

Students will reinforce their understanding of algorithms though the creation of mini apps. They will also learn about commonly used algorithms in computer science (searching and sorting). Students will explore how these algorithms execute through hands on activities which will allow them to explain the execution pattern and efficiency of each. Students will be able to develop their own algorithms with increased efficiency after these activities.

With a better understanding of algorithms ,students will explore how algorithms are applied in Web searching. Students will understand the logic behind web engine algorithms and data collection as well as how both are used to quickly and accurately predict what information a user is looking for.

LA.11-12.RST.11-12.2 - Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, process information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.11-12.RST.11-12.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CRP.K-12.CRP2.1 - Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
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TECH.8.1.12.B.CS1 - Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12.B.CS1 - The cultural, social, economic and political effects of technology
TECH.8.2.12.E.CS1 - Computational thinking and computer programming as tools used in design and engineering.
TECH.8.1.12.E.CS3 - Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4 - Process data and report results.
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12.9.3.IT-PRG.7 - Demonstrate software testing procedures to ensure quality products.
12.9.3.IT-PRG.10 - Design, create and maintain a database.
12.9.3.ST-ET.1 - Use STEM concepts and processes to solve problems involving design and/or production.
12.9.3.ST.6 - Demonstrate technical skills needed in a chosen STEM field.

ENDURING UNDERSTANDING

EU 2.2 Multiple levels of abstraction are used to write programs or create other computational artifacts.
EU 4.1 Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.
EU 4.2 Algorithms can solve many, but not all computational problems.
EU 5.3 Programming is facilitated by appropriate abstractions.
EU 5.5 Programming uses mathematical and logical concepts.

ESSENTIAL QUESTIONS

How are multiple levels of abstraction used to create computational artifacts?
In what ways are some algorithms better than others?

What limits do algorithms have?
What kinds of problems are easy, what kinds are difficult, and what kinds are impossible to solve algorithmically?
How do computer programs implement algorithms?

KNOWLEDGE AND SKILLS

Students will …

- Understand what algorithms are and their role in computer science.
- Evaluate the efficiency of different algorithms with a focus on searching and sorting.
- Design and test algorithms to be used in their programs.
- Implement procedural abstraction by defining procedures to execute more complex algorithms.
- Understand the impact of algorithms on Web searching.
- Understand how algorithms are used to filter through the vast amount of information on the internet.

STAGE TWO

PERFORMANCE TASKS

Students will create procedures that implement more complex algorthims within their apps. They will understand the value procedural abstraction (creating a procedure they can easily call that executes multliple steps) when programming. They will generate procedures to be implemented in their apps and test their efficiency.

Students will investigate common searching and sorting algorithms understanding how procedural abstraction makes their use easier. They will mathematically evaluate the efficiency of these algorithms. They will complete interactive activities demonstrating how each of these algorithms works.

Students will make the connection between algorithms and Web searching. They will understand the use of algorithms in web searching allowing technology to provide the results the user is looking for. Students will reflect on the accuracy of web searches. They will also consider the amount of data collected and the ability of algorithms to mine through this data in generating these results. Students will appreciate the efficiency and effectiveness of such algorithims.

OTHER EVIDENCE

Quizzes/Test
Completion of assigned worksheets/questions
Classroom discussion and interaction during activities
Completion of programming projects using App Inventor
Completion of Chapters in *Blown to Bits*
Classroom demonstration of Common Algoirithm Execution

STAGE THREE

LEARNING PLAN

Explore the role/importance of procedural abstraction and algorithims in computer science.

- Analyzing Algorithms
    - Identify commonly used searching and sorting algorithms
    - Anaylze algorithms
        - CSUnplugged demonstrations of algorithms

        - Analysis of efficiency based on demonstrations
        - Understand the procedural abstraction behind these common algorithms
    - Understand/Explore mathematical functions and graphs used to determine algorithm efficiency

- Programming in App Inventor
    - Understand the use of algorithms in every day life
    - Develop efficient algorithims within mobile apps
    - Implement procedural abstraction to make the use of complex aglorithms easier
    - Labs: Logo (Part 1 & 2), The Pong Game, Debugging Pong

- *Blown to Bits*: Web Searches
    - Reading/Discussion
        - How much data is being collected on us? Do you have any issues with the amount of information collected on you to assist with web searches?

- AP Computer Science Principles Exam Review Questions (Prep Book)
    - *Fast Track to a 5: Preparing for AP® Computer Science Principles Examination*

Curriculum Resources - Differentiated Instruction

Special Education Interventions in General Education

Visual Supports
Extended time to complete tests and assignments
Graphic Organizers
Mnemonic tricks to improve memory
Study guides
Use agenda book for assignments
Provide a posted daily schedule
Use of classroom behavior management system
Use prompts and model directions
Use task analysis to break down activities and lessons into each individual step needed to complete the task
Use concrete examples to teach concepts
Have student repeat/rephrase written directions
Heterogeneous grouping

Resources:

Do to Learn:
http://www.do2learn.com/

Sen Teacher:
http://www.senteacher.org/

Intervention Central:
http://www.interventioncentral.org/

Learning Ally:
https://www.learningally.org/

English Language Learners Interventions in Regular Education

Resources:

FABRIC - Learning Paradigm for ELLs (NJDOE)
www.nj.gov/education/bilingual/pd/**fabric**/**fabric**.pdf

Guide to Teaching ELL Students
http://www.colorincolorado.org/new-teaching-ells

Edutopia - Supporting English Language Learners
https://www.edutopia.org/blog/strategies-and-resources-supporting-ell-todd-finley

Reading Rockets
http://www.readingrockets.org/reading-topics/english-language-learners

Gifted and Talented Interventions in Regular Education
Resources:

Who are Gifted and Talented Students
http://www.npr.org/sections/ed/2015/09/28/443193523/who-are-the-gifted-and-talented-and-what-do-they-need

Hoagies Gifted Education Page
http://www.hoagiesgifted.org/programs.htm

21st Century Learning
Resources:

Partnership for 21st Century Learning
http://www.p21.org/

Career Ready Practices (NJDOE)
http://www.nj.gov/education/cte/hl/CRP.pdf