Lesson #2: Computer Science and the Future

Overview:

In this lesson, students will be introduced to computer science and how it is being used in almost every facet of their everyday lives. They will also learn how Python programming is being used in major companies around the world. For the remainder of the lesson students will be working on an unplugged discrete math activity that is related to the Martian challenges.

Student Agency:

Students have control over their learning by relating their own interests to the field of computer science. Later in the lesson, they will be collaborating with their partner to complete a discrete math activity where every group will have a different answer.

Pathway:

- Coding/Computational Thinking

Duration: One class (40 minutes)

Essential Question:

- What is computer programming and why is it important?
- What are the benefits of coding?
- How do all careers have a connection to computer science?

Objectives:

- Students will learn why coding is important to the future by discussing technologies they use in everyday life.
- Students will understand the correlation between real-world problems, problem-solving and coding.
- Students will problem-solve and dissect a discrete math concept.

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Competencies & Practices	**Student Artifacts/Evidence**
Collaboration	Work with a partner to work through the Mars map challenge.
Simulation	The Martian Movie- 4 color theorem Mars map challenge.

Teacher Preparation:

- #003- 8th Grade Python Programming
- Print out copies of #004-Mars Map (at least 3 copies per student)
- Print and cut out #005- Geography Certification Badges (1 badge per team)
- Markers

Materials for Students:

- Mars map printouts
- Markers

Students Prior Knowledge:

Students will not need any prior knowledge for this lesson.

Concepts:

- Computer Science- study of computers and computational systems.

Habits of Mind:

- Persisting
- Listening with Understanding and Empathy
- Thinking Flexibly
- Thinking and Communicating with Clarity and Precision

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Lesson Sequence:

1. **Anticipatory Set:**
    a. Open the Google Slideshow, #003-8th Grade Python Programming.

Remarks

b. Slide 1:
    i. We are constantly surrounded by computer science. From the cars we drive to the electronic devices we use everyday.

c. Slide 2:
    i. Python is a very common language and you will be learning it in 8th grade! Previously you used Scratch to learn to code. Scratch is a block-based programming language and it's called that because you grab a block of code then drag it over to make it do something, correct? In this class, we will be learning line-based coding. Python is line-based coding. Basically you will be typing and creating your code instead of using pre-created blocks like Scratch.

d. Slide 3:
    i. So why is learning python programming important? Because many companies use the coding language Python! It's an extremely fast growing language that is easy to learn! Apps and websites that we use on a daily basis, use python as one of their main programming languages.

Teacher Tip: To engage students ask them how many of them have used Netflix or Spotify in the last two or three days. Start to name a few more and ask them to raise their hands if they have used the website or app.

e. Slide 4:
    i. Why is learning a coding language important? Computer Science related jobs are the fastest growing and most in demand jobs out there! They aren't slowing down! If we look at the graph, from the years 2010-2020, Computer occupations are up to more than half

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of the occupations out there! The median annual wages for CS related jobs are over $100,000 a year!

f. Slide 5:
   i. Computer Science is connected to every job out there. Even when you don't think you're using CS, you actually are in some way!

      Teacher Tip: The images in the Google Slideshow may be older. It is best to use recent findings or news related to CS.

   ii. Humanities: Jobs related to the humanities, use CS to analyze history or society. For example, a few years ago, the Library of Congress started to archive some tweets from users. Historians and scientists are using computer science to digitize and analyze historical documents to find out more about our ancestors!
   iii. Government: The government has a huge need for CS related jobs. An example would be cybersecurity. Our country is constantly stopping attacks from hackers whether they are inside or outside of the country.
   iv. Are you interested in the medical field? They're creating algorithms to analyze large datasets for cancer research. Due to technology and CS, we're getting closer to understanding cancer and potentially finding a cure.
   v. If you're interested in science, use DNA and coding to not only tell the FBI and cops the who the person's DNA is connected to but also it will tell them details like whether the person is a smoker or the person's age. They're also using computer science to help with conservation efforts such as saving eagles from flying into wind turbines.
   vi. Movies we watch and the entertainment industry use CS all of the time. Anytime you see a movie from Pixar or a movie that uses CGI, they use coding.
   vii. The need for computer science jobs is growing at an alarming rate and isn't slowing down anytime soon. Students your age are learning to code at younger ages because the job market is so large!

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g. Slide 6:
   i. So that brings us back to this class! We will be learning python programming by completing a simulation based on The Martian movie. Basically we'll be putting ourselves in the place of Mark Watney and we're stranded on Mars.
      Video Connection: The movie trailer is found in the Google Slideshow but can also be accessed with the following link. (edited student version) https://youtu.be/IudVdEkq8Zk
   ii. Throughout the next 30 days, we'll be basically playing a game. In this game, you will be working with a partner to complete certain tasks related to python or problem-solving. If you are successful, you can place your badge/certification on the leaderboard. The more badges you obtain the more likely it is that you will safely get off Mars- the less badges or certifications the worse!

h. Slide 7:
   i. Our first task will be looking at a map of Mars! You'll be working with your partner to problem-solve!

2. Engaging Activities:

Remarks

a. Gaining the first certification doesn't involve python programming but instead involves problem-solving!
b. Hand each student 2 copies of the #004-Mars Map and many different colors of markers . The only rule to begin is that no adjacent (touching) region can have the same color.
   Teacher Tip: Show students an example of colors not touching each other. https://upload.wikimedia.org/wikipedia/commons/thumb/8/8a/Four_Colour_Map_Example.svg/330px-Four_Colour_Map_Example.svg.png .
c. Give students time to try using as many colors as they would like. Walk around the room to be sure students are following directions. During this time, they should be collaborating with their partner.

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   d. After a few minutes stop and have students show their success. Hand out more blank maps to students.
   e. Now, instead of using as many colors as you would like, this time, you can only use 4 colors.
   f. Give students time to collaborate and try to color their maps using only 4 colors.

3. **Share out:**
   a. Depending on time, see if anyone is successful. If student groups were successful, they will earn a Geography Badge/Certification.
4. **Wrap up:**

   Remarks

   a. As I'm sure you noticed, using 4 colors was much harder than using many different colors.
   b. During this task, you were problem-solving! Problem-solving is the basis of computer programming! While you weren't actually using a computer, you were solving a complex problem- and that's what computer scientists do!

Assessment Questions	**Yes**	**No**
How is computer science related to every discipline?		

Activities for Relearning:

For the 4 color theorem activity, students should be encouraged to work with their partner.

Activities for Enrichment:

Students can research the 4 color theorem.

Resources for Teachers:

- https://en.wikipedia.org/wiki/Four_color_theorem

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