Internet of Things (IoT) at UCF

UNIVERSITY OF CENTRAL FLORIDA

UCF RET Site: Collaborative Multidisciplinary Engineering Design Experiences for Teachers

M/J Earth-Space Science

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RET Site: CoMET Lesson/Unit Plan

The Art of Cross-Curricular Teaching: An Introduction to IoT in Middle School Earth/Space Science

Course(s): M/J Earth Space Science
Grade Level: 7th
Suggested Length of Lesson: 4 days

Materials/Technology Needed

- Student Interactive Notebook (Handouts)
- PowerPoint Presentation
- Solar Plate (solarplate.com)
- Teacher-provided transparent mask
- Scissors
- Writing Utensil
- Projector and Screen
- Internet access
- Student computers/tablet

Where this Fits

- History and future advantages of space exploration

Lesson Objective(s)/Learning Goal(s)

- Students will be able to explain the history of space exploration
- Students will be able to explain the impact of space exploration on modern technology development
- Students will be able to justify further space development, citing knowledge of history and future technological implications

Standard(s)/Benchmark(s) Addressed

- *Standards:*
- **SC.912.E.5.7:** Relate the history of and explain the justification for future space exploration and continuing technology development
- **LAFS.7.W.1:** Write arguments to support claims with clear reasons and relevant evidence.
  - a. Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.
  - b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.
  - c. Establish and maintain a formal style.
  - d. Provide a concluding statement or section that follows from and supports the argument presented.
- **SC.68.CS-PC.2.1:** Analyze the positive and negative impacts of computing, social networking and web technologies on human culture.

Standards for Mathematical Practice

- N/A

Instructional Strategies

- Fill-in-the-blank notes
- Hands-on experience
- Motion integration
- Audio/visual presentation
- Small groups

Evidence of Learning (Assessment Plan)

- **Pre/post assessment**
- **Laboratory assessment**
- **Formative quick writing checks**

Description of Lesson Activity/Experiences

A note to the reader:

The lessons with in this lesson plan are designed to be embedded in a space exploration unit. Prior to these lessons, students are expected to be familiar with the following content:

- *History of space exploration*
- *Human limitations in space exploration*

This lesson is designed to enhance the experience of space technologies by digging deeper into the process by which these technologies are designed, fabricated and programmed.

Day 1 – Sensors/Microchips

1. Administer a pre-test to assess for prior knowledge (see attachment).
2. Pass out the interactive notebooks containing the fill in the blank notes and activities.
3. Complete essential question opener; answer with associated video (see slide 4).
4. Instruct students to write their five favorite foods on the top of their paper with a magic marker (see slide 5).
5. Challenge the students to complete the same list on an index card (see slide 6).
6. Challenge the students to complete the same list on a grain of rice (see slide 7).
7. Present video "How to make a Microprocessor" (see slide 7).
8. Present notes on photolithography (see slide 9). Students will take notes in associated Cornell Notes Page.
9. Present video "UCF-RET Photolithography Example" (see slide 10).
10. Begin lab, "Photolithography Lab". Follow directions on page to complete lab with students.
11. Present follow up question about scaling (see slide 13).
12. Instruct students to complete their "Quick Write" about the day's activities in their notes.
13. Present video "Sand to Silicon" (see slide 14).

Day 2 – Computer Programming

1. Complete essential question opener. Discuss answers with students (see slide 15).
2. Open video from BrainPop.com "Computer Programming" (see slide 16).
3. Present video twice. During first presentation, students only watch the video. During second viewing, students complete their notes on associated Cornell Note Page (see slides 16-20).
4. Allow students to access the Internet through a device. Access code.org. Access flappy birds coding game.
5. Present video to introduce the flappy bird coding activity.
6. Allow students to work through the coding commands on the flappy birds game.
7. Instruct students to complete their "Quick Write" about the day's activities in their notes.

Day 3 – Conditional Statement Practice

1. Complete essential question opener. Discuss answers with students (see slide 25).
2. Present notes on Conditional Statements. Students complete notes in associated Cornell Note Page (see slides 25-26).
3. Present C language format of conditional statements with students (see slides 27-28).
4. Allow students to make their own conditional statement using the C programming language (see slide 29-30).
5. Create small student groups. Practice reading conditional statements with students (see slides 31-33).
6. Present slides which connect microchip, computer programming, and conditional statements to NASA technology (see slides 34-35).

Day 4 – Internet of Things/Spinoffs

1. Complete essential question opener. Discuss answers with students (see slide 36).
2. Present notes on Spinoffs. Present video "4 Awesome NASA Invention You Use Every Day" (see slide 37).
3. Present notes on Internet of Things. Present video "How it works: The Internet of Things" (see slide 38).
4. Allow students to access the Internet through a device. Instruct students to complete Interactive Notebook page, performing further research on other NASA Spinoffs (see slide 39).
5. Instruct students to complete their "Quick Write" about the day's activities in their notes (see slide 40).
6. Administer unit post-test.

Recommended Assessment(s) and Steps

- Pre-assessment to check for prior knowledge
- Formative assessment throughout the unit to check for comprehension
- Post-assessment to check for knowledge gained

List of Materials/Resources Used

- Brainpop.com
- code.org
- Solar Plates
- PowerPoint
- Science Fusion Textbook

Important Vocabulary

Term	Definition
Photolithography	The process by which light imprints on a light sensitive surface.
Microchip	A small, semi-conductive surface used to create integrated circuits.
Computer Programming	The process by which computers are given commands and allowed to perform complex processes
Conditional Statement	A statement in computer programming which requires a condition to be true in order for a specific response to occur.
Spinoff	When a NASA technology is made available to the free market for lay people.

Troubleshooting Tips

Be sure to monitor the room during labs and to have further conversation than what is enclosed in the slides. Many students my have more experience than others in this information. Feel free to modify this lesson plan to be helpful for all students. For example, allow students with more experience to code a different game if the flappy birds coding game is too basic for their experience.

Other Helpful Information

Attachments

- PowerPoint for lecture
- Interactive Notebook pages
    - Sensors Cornell Notes Page
    - Photolithography lab
    - Computer Programming Cornell Notes Page
    - Conditional Statements Cornell Notes Page
    - Spinoffs Activity Page
- Pre-test

References

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