



Internet of Things (IoT) at UCF



UNIVERSITY OF CENTRAL FLORIDA

*UCF RET Site: Collaborative Multidisciplinary
Engineering Design Experiences for Teachers*

2003010: M/J Physical Science

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Collaborative Multidisciplinary Engineering
Design Experiences for Teachers

7/27/2017

READ THIS FIRST

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- These lessons will be published. All work should be your own. Be sure to cite references where appropriate and only use images in the public domain/creative commons or that you develop. All lessons will be run through turnitin.com prior to publication.
- Remember to do your 3R reflection include an updated copy of your lesson plan, developed assessment tools, presentation materials, to the evaluator. See implementation plan instructions developed by the evaluator. Send within a week after completing the lesson to bonnie.swan@ucf.edu

RET Site: CoMET Lesson/Unit Plan

Course(s): 2003010 M/J Physical Science

Grade Level: 8th

Suggested Length of Lesson: This unit plan has lessons for each quarter in the school year. Each lesson takes 2.5 days to complete.

<p>Materials/Technology Needed</p> <ul style="list-style-type: none"> ▪ Laptop ▪ iPad ▪ Engineer Survey ▪ Pasco Wireless Smart Car ▪ Pasco Wireless Temperature Sensor ▪ Pasco Wireless Ph Sensor ▪ SPARKvue 2.7.0 Software Program ▪ Lab Reports ▪ Six-volt lantern battery ▪ Alligator clip wires ▪ Six-volt light bulb and socket ▪ Small pieces of wood (4in x 4in) ▪ thumbtacks ▪ heavy duty aluminum foil ▪ Poster 	<p>Where this Fits</p> <ul style="list-style-type: none"> ▪ Engineer survey is for first week of school during introduction to physical science, science equipment, and lab safety review. ▪ Force and motion lab fits within in the 1st quarter of the school year. Orange County Public Schools scope and sequence, and instructional focus calendar plans for the force and motion to be taught during that time. ▪ Thermal Energy, heat, and temperature lab fits within in the 1st and 2nd quarter where energy transformations are taught, according to OCPS scope and sequence. ▪ If Could Build a Sensor research project and presentation takes place at the end of 1st semester, and beginning of 2nd semester. It is an extension to student understanding of sensors. ▪ Acids vs Bases lab fits within in the 3rd quarter where chemistry and properties of matters are taught, according to OCPS scope and sequence. ▪ Engineer design challenge unit is implemented at the end of the year during the 4th quarter. It is the perfect time for students to build a sensor of their own, and complete an engineer career research project.
<p>Lesson Objective(s)/Learning Goal(s)</p> <ul style="list-style-type: none"> ▪ Lesson Objective(s)/Learning Goal(s) ▪ evaluate a scientific investigation using evidence of scientific thinking and/or problem solving ▪ identify test variables (independent variables) and/or outcome variables (dependent variables) in each scientific investigation ▪ interpret data to make predictions and/or defend conclusions ▪ analyze data to make predictions and/or defend conclusions ▪ describe that an unbalanced force acting on an object changes its speed and/or direction 	<p>Standard(s)/Benchmark(s) Addressed</p> <ul style="list-style-type: none"> ▪ <i>Standards:</i> <ul style="list-style-type: none"> – <i>SC.8. N.1.1 - Define a problem from the eighth-grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. (Content Complexity Level 3)</i> – <i>SC.6. P.13.3 - Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both. (Content Complexity Level 2)</i>

<ul style="list-style-type: none"> ▪ explain how an unbalanced force acting on an object changes its speed and/or direction ▪ interpret graphs of distance and time for an object moving at a constant speed ▪ analyze graphs of distance and time for an object moving at a constant speed ▪ predict how the graph would change if the object were moving at a faster or slower speed ▪ explain the direction of heat flow between objects of different temperatures, and the results of an object gaining heat or losing heat. ▪ Compare acids and bases ▪ Recognize and explain the different engineer fields 	<ul style="list-style-type: none"> – <i>SC.6. P.12.1 - Measure and graph distance versus time for an object moving at constant speed. Interpret this relationship. (Content Complexity Level 3)</i> – <i>SC.7. P.11.4 observe and describe how heat flows in predictable ways, and recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</i> – <i>SC.8. P.8.8-Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. (Content Complexity Level 2)</i>
<p>Standards for Mathematical Practice</p> <ul style="list-style-type: none"> ▪ MAFS.8. SP.1.1-Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 	<p>Instructional Strategies</p> <ul style="list-style-type: none"> ▪ Accountable talk ▪ Analysis of peer work (gallery walk) ▪ Project based learning ▪ Journaling/Reflection ▪ Educational Videos ▪ Modeling ▪ Cooperative learning ▪ Rubrics
<p>Evidence of Learning (Assessment Plan)</p> <ul style="list-style-type: none"> ▪ Lab Equipment Quiz ▪ Completion of lab reports ▪ Oral presentation ▪ Poster projects ▪ Research papers ▪ Sensor Project 	
<p>Description of Lesson Activity/Experiences</p> <p>The focus for this school term will be exposing middle school students to wireless network sensors. Each quarter will consist of a learning experience that supports the focus.</p> <p>August</p> <p>The first two weeks of school are the introductory phases of the school year. In an 8th grade Physical Science course, lab safety and orientation are taught during this time. The benchmark for the lesson is SC.8. N.1.1- nature of science. The learning target is, students can identify and define scientific instruments used to conduct experiments and/or investigations. The other benchmark is SC.6. N.2.3-fields of science. The learning targets are students can identify and define the components of STEM, and express their interest in the different fields of STEM.</p> <ul style="list-style-type: none"> • Engineer Survey- students take a survey to assess their attitudes and attributes to the STEM field. The survey can be accessed at the following link: https://docs.google.com/forms/d/e/1FAIpQLSfacA9YWIZd4myXuGSu8DDdla1l_VHIHgwgzblbnpGkAOGOSw/viewform?usp=sf_link • Lab Equipment 2017- students will take Cornell notes on the lab equipment for 2017 school year. Teacher presents notes in a PowerPoint presentation. During the presentation, my students will be 	

doing Cornell notes. The Cornell notes require them to create a question using the vocabulary word, write the answer, and an illustration to support their answer. Presentation and Cornell notes template can be accessed below.

[https://docs.google.com/a/ocps.net/presentation/d/1atMhqgVla3G7gnjWYWW8S-](https://docs.google.com/a/ocps.net/presentation/d/1atMhqgVla3G7gnjWYWW8S-droAIGC2s6KFn48A5DYg/edit?usp=sharing)

[droAIGC2s6KFn48A5DYg/edit?usp=sharing](https://docs.google.com/a/ocps.net/presentation/d/1atMhqgVla3G7gnjWYWW8S-droAIGC2s6KFn48A5DYg/edit?usp=sharing)

https://docs.google.com/document/d/1hAb54bDo_TB7nGk2LakGVGvj_mO9xvSN921FUEXcAKQ/edit

August/September

After reviewing nature of science, the next unit to cover is force and motion. The benchmarks are SC.6.P.13.3/SC.6.P.12.. The learning targets are students will analyze velocity over time graphs, and describe the relationship between force, mass, and acceleration. Students must understand the relationship between force and motion, and define position, velocity, and acceleration. During this unit, students will conduct labs investigating the relationship between force and motion. Students will use a wireless smart cart in the lab. Before using the wireless smart cart, students receive a brief demo on how to use it, along with a short video. The link for the demo presentation and video is below, as well as an example of a lab report students can complete.

<https://youtu.be/vJ1LJq3WPJg>

<https://docs.google.com/a/ocps.net/presentation/d/1Qqajy3CaFtbucxQqrmHEQIXBwfOnW1QXAgFoEcUAA/edit?usp=sharing>

<https://docs.google.com/a/ocps.net/document/d/1RSGj8nCph4rixhozLn0g7Txtv8VjfQhn5zFqK76UYw/edit?usp=sharing>

November/December

During this time of year, the unit thermal energy, temperature, and heat is covered. Students can complete different labs using a temperature sensor. Before using the wireless temperature sensor, students receive a brief demo on how to use it, along with a short video. The link for the demo presentation and video is below, as well as an example of a lab report the example I used is attached is in the link below.

<https://docs.google.com/a/ocps.net/document/d/1YpRiFE0JfxHbM5wwYQ7wW01eaa3mXea6SiXEVoBvvHM/eit?usp=sharing>

<https://www.youtube.com/watch?v=ABGtDJLDrSI>

December/January

Each year my class gets project per semester. The semester project this year will focus on sensors. Students will be required to choose a design sensor that can be used in a field, or everyday lives. They will research sensors that have been developed for support. Examples of rubrics to use for paper, oral presentation, and poster are provided at the link below.

<https://www.cte.cornell.edu/documents/Science%20Rubrics.pdf>

February/March

During 3rd quarter, properties of matter is a major unit. Students learn to classify matter based on its physical and chemical properties. pH is a property of matter. We determine the pH of a substance by measuring how acidic or basic it is. Then, we classify the substance as an acid or base. The students don't necessarily need a report, but maybe a chart that has them write rather the substance is an acid or base, and the pH it is reading on the sensor to support their reasoning.

Before using the wireless pH sensor, students receive a brief demo on how to use it, along with a short video

<https://www.youtube.com/watch?v=KpR8sOdo82s>

April/May

Engineer Desing Project- simple sensor: students will be given the following materials: wood, aluminum foil, battery, light bulb, wires, water, and a beaker. They would be instructed to use the materials given to build a sensor that can detect water.

Semester project-If I could be an engineer, I would be this kind....

Students will research an engineer field to write a one-page paper on and create a poster about. Students will be provided a rubric for the paper and the poster. Some examples are in the link above where posters and presentations are mentioned.

Recommended Assessment(s) and Steps

- Lab Quiz
- Prior to lab ensure students understand how to fill out the lab report when completing the experiment
- Teacher needs to practice with sensor prior to teaching students how to use it
- All activities and assignments requirements need to be clear and understandable for students (student friendly)
- Students need to be given rubrics for paper, poster, and oral presentations.

List of Materials/Resources Used

- PASCO Ph sensor, temperature sensor, and wireless smart cart
- Sparkvue software for wireless sensors
- Laptops
- Lab handouts
- Weights/mass bars
- Sand
- Water
- Containers
- Desk lamp
- Vinegaer, bleach, ammonia, lemon juice, dish liquid, shampoo, milk (small beakers for each)
- Youtube videos

You can create multiple lesson plans if you are developing a unit.

Attachments

List here any lesson or activity attachments not included within this document, such as the following:

- PowerPoints for lecture
- Lab Reports

References

Science Rubrics. (n.d.). Retrieved July 21, 17, from

<https://www.cte.cornell.edu/documents/Science%20Rubrics.pdf>

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