

Summary

This summer, as a part of the 2019-2020 RET UCF cohort, I was embedded in a research group of other educators with the focus on discovering elements of Internet of Things devices. We experienced the engineering and manufacturing of flexible strain sensors, and the science behind the next generation of these sensors. The purpose of our summer research was to be exposed to authentic STEM/engineering experiences in order to develop lessons and teaching techniques to bring to our classrooms in order to foster critical thinking and bring real-life application to the abstraction of our content areas.



Research Activities

- Working with Strain Sensors
 - Buckypaper
 - Carbon Nanotubes
 - Carbon Fiber composites
 - 3D Printers
 - FDM
 - SLA
- Hardware Embedded Systems
 - Binary Number System
 - Logic Gates
 - Basis for hardware coding a Full Adder
 - Introduction to Java boolean logic, arrays, for loops, and if statements













Discovering Venn Diagrams through Digital Logic Gates

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S-CP.1.1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). The AND Gate

DESIGN

A.) Build a two-input circuit using an AND gate with a light connected as an output.

A (on or off)	B (on or off)	Light (On or off)



EXPERIMENT

B.) Record every possible combination of switching A and B on/off, and then record the results in the table. (What happens when both are off, when A is on, etc)

Sketch a picture of your circuit here

RESULTS

C.) Based on the results of your experiment, justify why this gate is called the AND gate. VENN DIAGRAM

This venn diagram will be a visual representation of the combination(s) of A and B that produce light in the above experiment. 1.) Label the left circle A and the right circle B

- 2.) Shade the region(s) that produce light!
- 3.) label the region(s) that produce no light with N/A

RET Site: Venn Diagram Logic Gates Lesson Plan

Subject Area(s): Mathematics

Course(s): Algebra 2

Grade Level: 8-12

Suggested Length of Lesson: 70 Minutes

Lesson Summary:

constructing logic gate circuits and testing the various ways two switches need to be engaged in order to illuminate a lamp given each type of gate. These tasks will be developed, and experiences recorded, using the accompanying Venn Diagram Logic Gate lesson printout Prerequisite Knowledge:

Basic structure of Venn diagrams and probability. This is an introductory activity to the probability unit for Algebra 2, therefore students have had prior experience with the basic concepts, though will need a refresher.

Materials/Technology Needed			ere this
	Computers for logic.ly website or logic gate		Within
	kits		
	Venn Diagram Logic Gate Lesson Handout		
Lesson Objective(s)/Learning Goal(s) (2-4)			ndard
	Students will be able to represent with a Venn		Stand
	diagram the following logic statements		— S-C
	 A and B 		50
	 A or B 		a 5
	 Exclusively A/B 		USI
	 Not A/B 		the
	Students will be able to represent the		inte
	probabilities of each logic statement given		eve
	a Venn diagram.		
	Students will be able to explain the basic		
	function of a digital logic gate.		
	Students will be able to correlate		
	probability logic statements with the		
	accompanying area of a Venn diagram		
Standards for Mathematical Practice			ruction
1	Look for and make use of structure		Scaffol
1	Use appropriate tools strategically		Multipl
2	Reason abstractly and quantitatively		Small g
1	Make sense of problems and persevere in		Discove
	solving them		
Evi	dence of Learning (Assessment Plan)		
1	Students will complete the Venn Diagram		
	Logic Gate Assessment Tool, which will have		
	them justify solutions, complete short answer		
	responses, and use critical thinking to solve		
	an open-ended logic ate full adder truth		
	table.		

Lesson Plan



Lesson Learned and Assumptions

This program offered me the unique and enriching experience of interacting with many facets of Inter of Things engineering and research. I have been able to think about my mathematics lessons in terms of their engineering connections in order to show students that engineering is accessible, creative, and exciting.









This lessons will be implemented using the following:

- Scaffolding
- Multiple Representations
- Small Groups
- Discovery-based Learning

The lesson will be implemented on a block day, and should be completed within 90 minutes

In my years teaching algebra 2 standard and honors, I have noticed a perennial disconnect with the logic associated with Venn diagrams, how to fill and shade them, and probability as a whole. I developed an interactive, discovery, tactile STEM-based lesson to introduce the fundamental logic of AND, OR, and NOT as experienced through constructing and interacting with digital logic gates. As a result of this lesson, students will be able to write a truth table given a digital logic circuit, construct a digital logic circuit from a truth table, and translate the circuit and truth table to a Venn diagram.

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Acknowledgments

References