Lauren Bracken Ocoee Middle School, Ocoee, FL 34761 Lessons Learned Lesson Plan This experience has offered me a wealth of knowledge in the field A note to the reader: of IoT development. The following are areas in which my The lessons within this lesson plan are designed to be embedded knowledge was most enhanced: in a space exploration unit. Prior to these lessons, students are • The fabrication of sensors and microchips expected be familiar with the following content: • Basic coding in JAVA and C History of space exploration Networking Architecture Human limitations in space exploration • Applications of the Internet of Things Scan for a tutorial on how to use solar plates Day 1 <u>Sensors/Microchips</u> Participating in this program has allowed Internet • Unit Pre-Test truly coding. realize that enjoying Notes on Photolithography melds logic and and Scaling Photolithography Lab intend to further my study science and enrich Quick Write reflection well as my personal career. about the day's activities Day 2 Computer Programming Implementation Strategy Notes using 00 "Computer Programming" Access Students work on an individual BWelcome block-coding assignment. Quick Write reflection about the day's activities CODE YOUR OWN and included the following learning strategies: FLAPPY GAME Audio/Visual presentation ah ahi ah a da in ah a • Hands-on experience #include "msp430fg4618.h" • Written notes and reflection int main(void) { volatile unsigned int i; • Fill-in-the-blank notes WDTCTL = WDTPW | WDTHOLD; P2DIR |= 0x06; Peer-support activities $P2OUT \&= 0 \times 00;$ Day 3 Conditional Statement Practice Movement integration for (;;){ for(i=0;i<=20000;i++);</pre> Notes on Conditional Statements **if(!(P1IN & 0x02))** P2OUT^=0x02; Work in partners to create Acknowledgments **if(!(**P1IN & 0x01)) verbal conditional statement P2OUT^=0x04; Quick Write reflection about return 0; the day's activities Day 4 Internet of Things /NASA Spinoffs success of my experience in this program. References Notes on Spinoffs & Internet of Things • Students perform further research on other NASA *Education,* 63, 22-35. doi:10.1016/j.tate.2016.12.005. Spinoffs



Research activities offered:

The Art of Cross-Curricular Teaching: An Introduction to IoT in Middle School Earth/Space Science SUCF SCIENCE Summary The National Science Foundation funded a Research Experience for Teachers (RET) program hosted by the University of Central Florida. Sensor fabrication • Coding through JAVA and C languages Mobile Programming From the experience, the following activities were chosen to be implemented in the classroom: Introduction to Photolithography • Thinking in code Conditional Statements • Internet of Things/Spinoffs While rewarding for the teacher participants, the program is designed to inspire students to pursue careers in STEM. **Research Activities** Module 1: Design and Fabrication of Environmental Sensors Introduction to methods of photolithography Advantages and efficiency of scaling • Etch a design on silicon wafer • Detect heavy metals through electrode Module 2: Interface and Testing Basics of Binary and Hexadecimal • Truth tables, Conditional Statements, & Loops Programming in the C-Language Introduction to MSP430 and Basys 2 boards Module 3: Software and Networking Programming in Java Introduction to a Raspberry Pi Layers of OSI Networking Design and host a webpage using HTML Module 4: Mobile Programming Create Android apps using JAVA and XML Connect Raspberry Pi to Android





Unit Post-Test





In Earth/Space Science, the standards require students to understand how technology and space exploration affect Florida's economy. This additional IoT unit explores the development of technology from the hardware, through programming, and finally to applications for NASA and consumer market spinoffs.

The lesson plan was designed with multiple means of presentation

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Christ, T., Arya, P., & Chui, M. (2017). Video Use in teacher education: An international survey of practices. *Teaching and Teacher* Hasan, S. H., Alghazzawi, S. M., & Zafar, A. (2017). Integrating JAVA coding into project based learning in M-learning environment. *Malaysian Journal of Computer Science,30*(2), 91-98. Retrieved June 30, 2017. Trimmer, W. (1989). Microrobots and Micromechanical Systems. *Sensors and Actuators,19*, 267-287.



