

Designing Hybrid Learning Modules with AI Integration

Student Name: Alberto De La Cruz

Department of Leadership, Technology, and Human Development

Georgia Southern University

Professor: Dr. Carl Sorgen

EDLD 9534 Pedagogical Issues in Educational Leadership

Date: July 13, 2025

Module Overview

Title: Bridging STEM and Non-STEM Majors: Exploring Computer Science and Cybersecurity Fundamentals

Audience: Undergraduate Students (first- and second-year)

Format: Hybrid (two asynchronous modules, three synchronous modules)

AI Tool Used: ChatGPT (to improve workshop overview, objectives, and outcomes)

Rationale: The workshop series addresses a vital need in today's world: equipping individuals from diverse academic backgrounds with essential knowledge in computer science and cybersecurity. As technology becomes more integrated into all areas of life, the ability to understand and apply basic principles of programming, cybersecurity, and IoT has moved beyond STEM fields. This series helps bridge the gap between STEM and non-STEM majors, promoting interdisciplinary collaboration and empowering participants to confidently engage with technology in their studies, careers, and daily lives.

The series is built around inclusivity, understanding that non-STEM participants might find technical topics intimidating. By emphasizing fundamentals, the workshops offer an accessible way into areas like programming, cybersecurity, and IoT, no matter their experience level. This helps non-STEM learners develop important skills while STEM participants strengthen their core knowledge. This interdisciplinary method promotes diverse perspectives, which are crucial for tackling complex, real-world challenges in technology and innovation.

Furthermore, including cybersecurity in the curriculum emphasizes the urgent need to address digital vulnerabilities in a more connected world. Cybersecurity is no longer just the responsibility of IT specialists; people from all fields need to understand basic principles to safeguard themselves and their organizations. By incorporating hands-on activities and practical applications, the workshop ensures participants not only grasp theoretical concepts but also gain the confidence to apply these skills in real-world situations.

This workshop series also addresses the increasing need for digital literacy and critical thinking. As more industries adopt AI, IoT, and other advanced technologies, graduates from all fields must understand how these systems function and how to use them responsibly. By connecting STEM and non-STEM majors, this program prepares participants to navigate and contribute to a rapidly changing technological world, fostering a generation of professionals who are both technically skilled and interdisciplinary thinkers.

In conclusion, this workshop series is a timely and necessary initiative that promotes inclusivity, develops essential skills, and prepares participants to succeed in a technology-driven world. By emphasizing collaboration between STEM and non-STEM fields, it establishes a foundation for innovation, critical thinking, and problem-solving across disciplines.

Teaching Strategies

1. **Peer-Assisted Learning:** Students were paired with peers who had stronger STEM backgrounds, fostering collaboration and mutual learning.
2. **Hands-On Focus:** Each module emphasized practical applications, allowing students to grasp theoretical concepts through real-world problem-solving.
3. **Progressive Skill Building:** Modules introduced foundational concepts first, gradually advancing to complex systems involving multi-sensor integration and mobile app development.

Workshop Learning Outcome

By the end of the workshops, students will gain the ability to:

1. Understand fundamental concepts of computing, cybersecurity, and engineering.
2. Work with Internet of Things (IoT) sensors, Raspberry Pi, and Arduino microcontrollers.
3. Utilize Micro:bit and Makecode for introductory programming.
4. Simulate and analyze network environments using tools like Packet Tracer.
5. Apply cybersecurity tools for password cracking and vulnerability assessments.
6. Collaborate effectively in diverse teams to solve technical challenges.

AI Integration Highlights

1. **AI-Assisted Learning:** Use AI tools like ChatGPT to generate explanations, examples, and additional resources for cybersecurity and programming concepts. In addition, deploy AI-driven debugging tools to enhance coding efficiency and error identification.
2. **AI-Enhanced Assessments:** Utilize AI to evaluate code automatically for functionality and optimization by incorporating AI-powered simulators for testing IoT and Smart Home prototypes under simulated real-world conditions.
3. **AI for Collaboration and Problem-Solving:** Introduce AI-driven IoT analytics tools to monitor and optimize sensor performance while using AI-based assistants in Android Studio to streamline app development.

Curriculum Map

Workshop	Module	Learning Outcomes	Delivery Mode	Key Activities	Assessment Methods	AI Integration
Workshop 1:	Cybersecurity Fundamentals	- Understand the CIA Triad principles (Confidentiality, Integrity, Availability).	Asynchronous	- Video lecture on Cybersecurity concepts. - Hands-on cryptography activities (encryption and decryption).	- Quiz on CIA Triad principles. - Observation of student performance during cryptography exercises.	- Use AI tools (e.g., ChatGPT) to explain cybersecurity concepts and generate sample encryption algorithms.
		- Use cybersecurity tools for password cracking and network monitoring		- Explore password-cracking tools and network traffic monitoring software.	- Completion of a guided lab worksheet documenting tool usage and findings.	- AI-based vulnerability scanners to simulate real-world cybersecurity scenarios.
Workshop 2:	Introduction to Computer Science and Programming Fundamentals	- Learn programming concepts like variables and iteration structures. - Learn block-based programming using Makecode.	Asynchronous	- Video lecture on computer science and programming concepts. - Program conditional statements, iteration structures, and variables on Micro:bit.	- Code review of completed Micro:bit programs. - Peer feedback on programming tasks. - Instructor review.	- Use AI-based debugging tools to identify errors in programming tasks. - AI visualizations for block-based coding.

		- Understand the interface between programming and hardware.		- Simulate programs using the Makecode simulator and upload them to the Micro:bit.	- Code review of completed Micro:bit programs. - Peer feedback on programming tasks. - Instructor review.	- AI-powered simulators to predict outcomes of student programs.
Workshop 3:	Introduction to Raspberry Pi and IoT Sensors	- Configure Raspberry Pi for IoT sensor interfacing.	Synchronous (in-person)	- Initial setup of Raspberry Pi and basic configuration tasks.	- Checklist rubric for successful Raspberry Pi setup. - Instructor observation during configuration.	- Use AI assistants for step-by-step Raspberry Pi configuration tasks.
		- Program IoT sensors (motion, ultrasonic, and LED).		- Hands-on interfacing of Raspberry Pi with motion and ultrasonic sensors.	- Prototype performance evaluation (e.g., proper sensor functionality).	- AI-driven IoT tools to optimize sensor performance and detect configuration errors.
		- Develop basic text-based programming skills using Leafpad.		- Write and debug simple programs to control sensors.	- Debugging exercise evaluated by the instructor. - Peer review of code.	- AI-powered auto-completion and debugging tools in text editors.
Workshop 4:	Advanced IoT with Raspberry Pi	- Understand and interface advanced sensors (LED matrix, ultrasonic).	Synchronous (in-person)	- Build and debug prototypes that measure distance and	- Functional prototype demonstration	- AI-powered analytics to visualize sensor data

				display messages on LED matrices.	and testing. - Group presentation of prototype features and design.	(e.g., distance measurements).
		- Strengthen programming and troubleshooting skills.		- Convert sensor data (e.g., distance) into actionable outputs using Raspberry Pi.	- Debugging challenge graded for problem-solving and troubleshooting.	- AI-assisted troubleshooting tools for identifying and fixing hardware-sensor integration issues.
Workshop 5:	Smart Home IoT Systems with Arduino	- Assemble and program Smart Home IoT systems using Arduino.	Synchronous (in-person)	- Hands-on assembly of Smart Home kits (e.g., motion detectors, servo motors).	- Rubric-based assessment of Smart Home assembly quality and functionality.	- AI recommendations for optimizing Smart Home sensor configurations and performance monitoring.
		- Configure Arduino boards to interface with sensors.		- Use the Arduino IDE to write, upload, and test programs for multiple sensors.	- Individual assessment of Arduino programming tasks. - Instructor evaluation of troubleshooting skills.	- AI-powered IDE debugging tools for Arduino programming.
	Mobile App Integration with Android Studio	- Design simple mobile app interfaces to control IoT systems.		- Use the drag-and-drop interface in Android Studio to create a functional UI.	- Evaluation of app design through a checklist-based rubric. - Peer critique	- AI-based design assistants (e.g., Copilot) to recommend UI improvements and streamline app development.

					of app functionality and design.	
		- Combine sensors into a single functional system.		- Test and present Smart Home prototypes, ensuring all sensors integrate and function as expected.	- Final project evaluation: functionality, innovation, and teamwork. - Group presentation and Q&A session.	- AI-powered simulations to test Smart Home prototypes under different environmental conditions.