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FAU Hack-a-Thons: An Introduction to Computational and Hardware, Logistical Skills, and Intense Training for Outcomes-Based Learning for Developing Internet of Things Products

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FAU Hack-a-Thons
An Introduction to Computational and Hardware, Logistical Skills, and Intense Training for Outcomes Based Learning for Developing: Internet of Things Products

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***Abstract*—In preparation for the upcoming FAU Hack-a-Thon, we have implemented extensive support structures to ensure that all participating teams are thoroughly prepared for the competition. This preparation includes the provision of online support from a variety of programming experts from IBM and experienced Hack-a-Thon participants. This support is accessible 24/7 in the three weeks leading up to the event, aimed at ensuring all teams are up to speed and ready to participate. Our proactive approach focuses on encouraging teams to engage deeply with the training materials, consistently reminding them of their capability to successfully compete with adequate preparation.**

During the event, teams are expected to utilize the skills they have honed in areas such as teamwork, programming, and hardware development to create innovative Internet of Things (IoT) products. The support continues throughout the 24-hour event, with resources readily available to assist teams in overcoming any technical challenges they encounter. This setup aims to simulate real-world problem-solving scenarios that participants are likely to face in their professional careers, thus enhancing their experience and skills in a practical, hands-on manner.

The Hack-a-Thon not only focuses on technical skills development but also emphasizes the cultivation of soft skills such as communication, teamwork, and time management. By the end of the event, participants are expected to present their projects to a panel of industry experts and faculty, demonstrating not only their technical prowess but also their ability to communicate their ideas effectively. This comprehensive approach ensures that participants leave the Hack-a-Thon with enhanced skills, increased confidence, and a significant competitive edge in the job market, as many past participants have noted the value of this experience during job interviews.

***Index Terms*—AI, Hack-a-Thon, Hackathon, Internet of Things, IOT, NodeRed, IBM Cloud, Watson, Slack, GIT, GitHub, Outcomes Based Learning, Raspberry Pi, ESP8266, ESP32, ESP32 CAM**

I. Introduction

For the past six years, the Hack-a-Thons [1] at Florida Atlantic University (FAU) have offered Outcome-Based Learning opportunities, enabling participants to rapidly develop their knowledge and skills within a supportive setting. This program encourages participants to engage in trial and error, allowing them to fail early and often with the objective of refining their skills to achieve practical outcomes, thereby gaining valuable experience, success, and confidence. Over three intense weekly training sessions, one hundred participants are introduced to several key tools and resources: Educational and team productivity tools: Participants learn to use Slack, GitHub, and Canvas, an educational Learning Management System (LMS). Support staff access: Participants have direct access to support staff through a dedicated team base. Cloud technology: They explore IBM Cloud Services [2] . Programming interfaces: They work with Node-RED [3]. Artificial intelligence: They engage with IBM's AI Watson.

Fig. 1. Students gain hands-on experience, building products and presenting to industry judges

Starting from the second session, participants must demonstrate that they have completed the assignments from the previous session to continue. They form teams of two to four people to compete in the 24-hour Hack-a-Thon, applying their skills in teamwork, programming, and hardware development to create Internet of Things (IoT) products. At the conclusion of the event, approximately two-thirds of the teams successfully complete their projects, which are then showcased and evaluated by a panel of industry VIPs, faculty, and staff. Figure 1. The top three projects are recognized, and many participants later discuss their Hack-a-Thon experience in job interviews.

II. Diversity

FAU Hack-a-Thons are noted for their inclusivity, attracting students from a variety of educational levels, geographic regions, and abilities, including high school students and graduates. Participants also come from diverse engineering societies such as the Society of Women Engineers, the National Society of Black Engineers, the Society of Hispanic Engineers, and IEEE. The events are accessible to students with vision and hearing impairments, ensuring everyone has the opportunity to participate.

This diversity enriches the event by bringing together a wide range of perspectives, which enhances creativity and innovation. It fosters a collaborative environment where participants can exchange ideas and develop unique problem-solving approaches, crucial for successful innovation in technology.

III. Goal and Expectations

The primary goal of the Hack-a-Thon is to equip participants with the experience needed to implement an IoT-type device within a 24-hour session. Participants are expected to develop the skills introduced during the sessions and to effectively communicate with the support team to resolve any issues. They are tasked with programming, prototyping, and packaging their product. Additionally, participants must present their products and discuss them during interviews with guest judges. We encourage the creation of both prototypes and finished goods, supported by available services such as 3D printing, PCB fabrication, and laser cutting. Additional parts are also available upon request from the EECS Parts Lab to ensure participants can complete their projects.

IV. Decisions: Equipment and Themes

Each year, the FAU Hack-a-Thon design team, composed of Jaramillo, Kalva, & Weinthal, evaluates the latest leading-edge technology that can be reliably and cost-effectively deployed. Starting in 2019, every participant has been provided with a comprehensive IoT kit, containing all necessary parts and sensors, ensuring that each team has access to consistent and state-of-the-art resources.

IoT and AI functionalities are implemented using IBM's Node-RED and IBM Watson, platforms that support sophisticated programming and data analysis tasks necessary for developing IoT applications. This technology stack is chosen not only for its advanced capabilities but also for its accessibility to participants at various skill levels. The themes for each year's Hack-a-Thon are carefully selected by the design team to challenge participants with real-world problems and to introduce them to the potential and limitations of new technologies. These themes are influenced by trends in the industry as well as lessons learned from previous hackathons. By examining what went right and what went wrong in other events—referenced in publications [1], [4], [5], [7] the team can better prepare participants for the complexities of working with new and emerging technologies.

Additionally, the chosen themes encourage participants to explore and address various technology shortcomings or "bugs" that have not been fully vetted in the newest devices. This approach not only tests the participants' problem-solving skills but also their ability to innovate under constraints. The specific project for the Hack-a-Thon is hinted at but not fully disclosed until the third week, maintaining a level of suspense and engagement among the participants.

V. Participant Technical Support

Participants at the FAU Hack-a-Thon have access to essential productivity tools including Slack, GitHub, WebEx, and Canvas (an educational LMS), which facilitate collaboration and project management. They also utilize advanced resources such as IBM Cloud Services, Node-RED, and IBM's AI Watson to enhance their technical capabilities. The support network is composed of IBM engineers, FAU faculty, and Hack-a-Thon alumni who provide guidance and mentorship. This helps in addressing technical challenges promptly and efficiently. Support is available 24/7, ensuring participants can resolve issues at any time during the event, as illustrated in Figure 2.

This robust support system not only aids in immediate problem-solving but also helps in skill development, preparing participants for real-world engineering challenges.

Fig. 2. FAU Hack-a-Thon flyer sponsored by IBM & IEEE

VI. Training Seminars

The FAU Hack-a-Thons operate under a structured model consisting of three weekly, three-hour training sessions, which are conducted in the engineering lecture hall. These sessions are crucial for introducing the participants to the necessary hardware and software needed to undertake their projects.

Throughout the event, we encourage the formation of teams with diverse skill levels to facilitate peer-to-peer mentoring. This approach helps less experienced members benefit from the guidance of more seasoned participants. To ensure all teams are ready for the challenges ahead, each team must demonstrate a minimal level of proficiency in the skills taught during the previous sessions, which is verified by a quiz.

VII. Hack-a-Thon Event Preparation, and Expectations

A. Pre-Event Preparation

Extensive online support is provided by IBM programming experts and seasoned Hack-a-Thon participants, available 24/7 for three weeks leading up to the event. This proactive support ensures all teams are well-prepared, familiar with the necessary technologies, and ready to tackle the Hack-a-Thon challenges.

B. Event Focus

Participants are consistently reminded to maintain focus and engage fully with the preparatory materials, reinforcing the necessity of dedication to succeed. The support team is on hand to assist with technical and conceptual challenges but encourages teams to work independently to develop problem-solving skills.

C. Session 1: Project Introduction & Team Formation

Project Introduction & Team Formation - In this initial session, teams are formed and introduced to the Hack-a-Thon's theme and specific challenges. They are also taught how to use essential software tools such as Slack for communication, GitHub for code repository management, and Canvas as the Learning Management System (LMS). Additionally, participants learn how to interact with their IoT devices, including initial setup, connectivity, and basic programming. This session ensures teams are equipped with the necessary tools and understanding for effective collaboration and project management. Figure 3

Fig. 3. IBM Cloud Discussion

D. Session 2: Technical Deep Dive

This session focuses on the intricate details of the IoT technology stack provided for the Hack-a-Thon. Participants engage in advanced programming tasks involving their IoT devices, learning to optimize device functionality and integrate with cloud services. Critical topics such as NodeRed, Figure 4, security protocols, efficient data handling, and robust device networking are covered. The teams use this time to apply what they've learned from Table I, which lists all tools and technologies available to them, ensuring they are proficient in their use and ready for the next phase of the project. This session is crucial for deepening technical understanding and preparing participants for the intensive development work ahead.

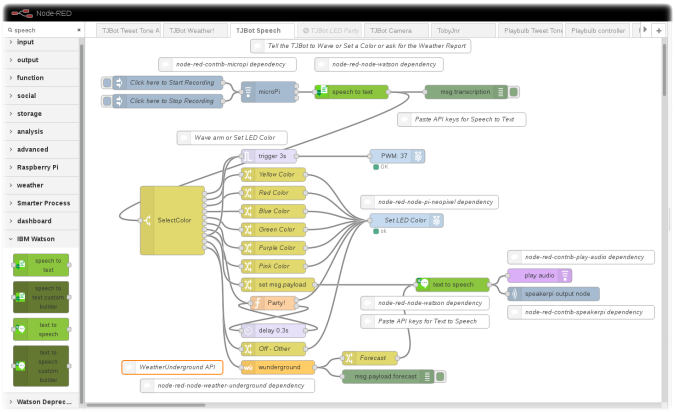

Fig. 4. Session 2: NodeRed Demo

E. Session 3: Final Preparations and Strategy

The final session before the marathon event allows teams to refine their strategies and address any remaining technical or conceptual challenges. Participants review their progress, finalize their project plans, and ensure all components are fully functional. They also practice their presentation skills, preparing to effectively showcase their projects to the judges. This session is vital for solidifying team strategies and smoothing out any last-minute issues that could hinder their performance during the 24-hour coding session.

F. Participant Experiences 2016: IOT using the Raspberry Pi 2: Sensors, Camera and Web pages.

In 2016, participants engaged with projects that incorporated the Raspberry Pi 2 to connect to IBM Cloud and perform various IoT tasks. Vishnu Chinta from IBM support staff showcased a computer vision application that utilized object recognition software to humorously determine if Raspberry Pi camera is seeing a 'Hot Dog' or 'Not Hot Dog,' announcing results via text-to-speech. Other projects included a Fingerprint Reader for Access Control, Figure 5, Object Recognition using the Raspberry Pi Camera and OpenCV for image analysis.

Kits							Full Kit
30		2018 Feb. Engineers Week: IBM Hack-A-Thon			$111.0	$3,341.03	
Quan				Kit-q	$ea(Kit)	$ Kit	$total
30	P		Mini External USB Stereo Speaker	1	12.500	$12.50	375.00
30	P		Mini USB Microphone	1	5.950	$5.95	178.50
30	P		SanDisk 16GB microSD Ultra 98MB/s C10	1	10.050	$10.05	301.50
30	P		**Raspberry Pi**	1	35.000	$35.00	1050.00
30	S	CP9700 or MCP97(	Temperature Sensor, to92 -- see data sheet	1	0.260	$0.26	7.80
30	P		Raspberry Pi Camera Board v2	1	23.750	$23.75	712.50
30	P		**Raspberry Pi, power supply 5v 2.5 amp w/ cable**	1	5.390	$5.39	161.70
30	P		12 Bit I2C 4 CH ADS1015 Module ADC	1	1.940	$1.94	58.20
60	P		NeoPixel WS2811 led chips RGBf8 8mm RGB LED - 100 Pack	2	0.180	$0.36	21.59
30	S		Ping - Ultrasonic Sensor, hrs-04	1	0.820	$0.82	24.60
30	S		PiR sensor, Pasive iR	1	0.990	$0.82	24.48
30	S		Gyro, Accelerometer 6dof, gy-521	1	1.200	$1.20	36.00
30	S		servo, mini, sg90	1	1.468	$1.47	44.04
30	S		dht11 temp/ humidity	1	0.980	$0.98	29.40
30	S	Fragile - do not ben(	GL5516 CdS Photo Cell	1	0.202	$0.20	6.06
30	S	tcrt5000 pair	TCRT5000 Infrared IR infrared Reflective Optical Sensor IrLed & IrNPN	1	0.120	$0.12	3.60
30	V	bd-c403g9 -or- 3622	LED Display, DUAL, 7-segment, 2-Cathodes	1	0.236	$0.24	7.08
30	T		Jumper wires F-F 10pcs	1	0.600	$0.60	18.00
30	T		Jumper wires M-F 40pcs	1	0.922	$0.92	27.66
30	P		**TJBot Chipboard and frame**	1		$0.00	0.00
60	Q		MPSA63 or MPSA64 PnP -- G=10k+ , TO-92	2	0.150	$0.30	9.00
120	Q	pn2222a	2n2222 or 2n3904 or PN2222 NPN Transistor, to92	4	0.064	$0.26	7.68
120	Q	pn2907	2n2907 or 2n3906 or PN2907 PNP Transistor, to92	4	0.022	$0.09	2.64
30	Q		LD1117AV33 3.3v Reg @ 1.2A	1	0.395	$0.40	11.85
120	R	1/4 W Resistor 5%	100 Ohm 5% MCF 0.25W	4	0.013	$0.05	1.56
600	R	1/4 W Resistor 5%	330 Ohm 5% MCF 0.25W	20	0.013	$0.26	7.80
600	R	1/4 W Resistor 5%	1.0kOhm 5% MCF 0.25W	20	0.013	$0.26	7.80
60	R	1/4 W Resistor 5%	10kOhm 5% MCF 0.25W	2	0.013	$0.03	0.78
60	R	1/4 W Resistor 5%	47kOhm 5% MCF 0.25W	2	0.013	$0.03	0.78
60	R	1/4 W Resistor 5%	100kOhm 5% MCF 0.25W	2	0.013	$0.03	0.78
30	R		10K POT	1	0.500	$0.50	15.00
120	S		Tactile Push Button Switches	4	$0.050	$0.20	6.00
30	T		Bread Board	1	3.750	3.75	112.50
180	C	805Y104M500A5.0	Cap 0.1uf @ 50v	6	0.017	$0.10	3.06
60	C	10uF to 100uF	cap 10uF	2	0.053	$0.11	3.18
60	T		22ga hook-up wire "M-M" Jumpers	2	0.443	$0.89	26.59
30	T		3x5 ziplock bag	1	0.011	$0.01	0.33
30	T		Project Container	1	0.400	$0.40	12.00
60	T	Black mc23782-	Anti-Static Mat - Black or Pink foam to hold parts	2	0.02	$0.04	1.20
60	T		Cable Ties, thin or Rubberband #64	2	0.03	0.06	1.80
60	T		Solder Proto Board 5cm*7cm	2	0.140	$0.28	8.40
300	V	15108 OP	LED, Red, 5mm T-13/4 -mpja.com	10	0.02	0.20	6.00
60	V	15309 OP	LED, Yellow, 5mm T-13/4	2	0.02	0.04	1.20
60	V	15308 OP	LED, Green, 5mm T-13/4	2	0.02	0.04	1.20
60	V		LED, Blue, 5mm T-13/4	2	0.04	0.08	2.40
60	V		LED, White, 5mm T-13/4	2	0.03	0.06	1.80

TABLE I
2108 FAU HACK-A-THON PARTS LIST

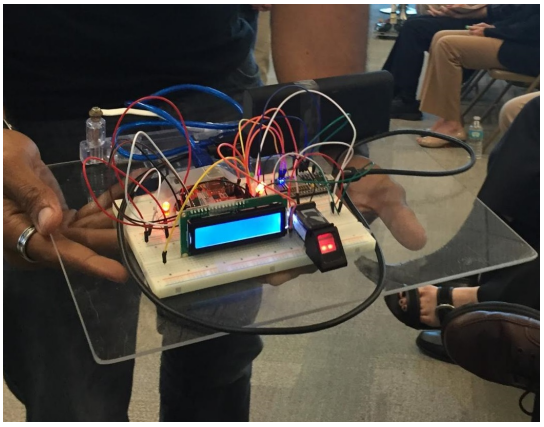

Fig. 5. 2016 Access Control using a Fingerprint Scanner

G. 2017: IOT Sensors using the Raspberry Pi 2 with Arduino Nano

The following year, participants combined the Raspberry Pi with an Arduino Nano to create sophisticated IoT sensors and subsystems. Projects featured a baby minder that reported temperature data online, a mailbox minder that alerted users to new mail, Figure 6, and a Luggage Security Minder that notified users when luggage moved out of a designated range, Figure 7.

Fig. 6. 2017 Mailbox Minder

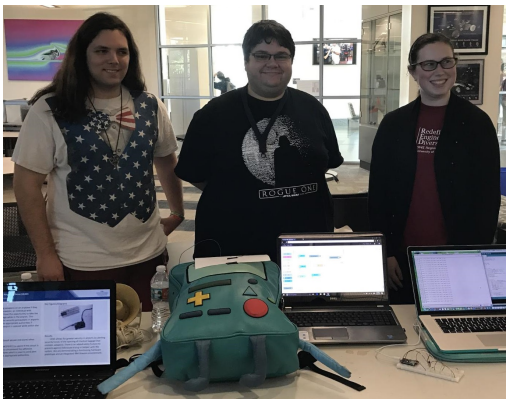

Fig. 7. 2017 Luggage Security Minder

H. 2018: TJBot AI and IOT interactions using the Raspberry Pi 3 and ESP8266

In 2018, the focus was on integrating AI with IoT through the use of IBM Watson, the Raspberry Pi 3, and the ESP8266 WiFi module. Participants assembled a TJBot [6] from hard-board using a CO2 laser cutter, creating interactive robots like Dr. TJ the psychologist, Dr. TJBot the ER doctor, and TJ Butler, a friendly companion, Figure 1. These projects highlighted the application of AI in robotics, enhancing the interactive experience by teaching participants to construct hardware and data sets for their knowledge databases, Figures 8 and 9.

Fig. 8. 2018: Building TJBots

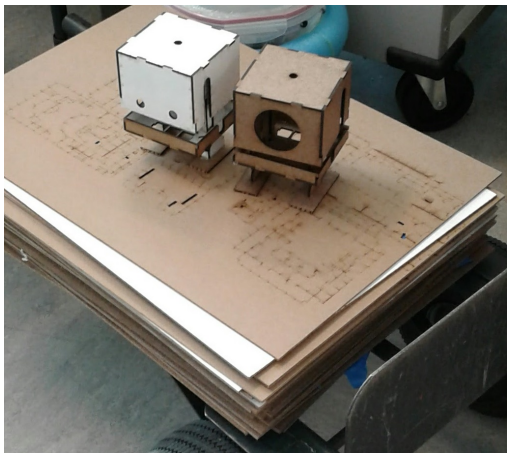

Fig. 9. 2018: Laser Cut TJBots

I. 2019: An International FAU Hack-a-Thon Event: IOT Medical Devices based on the ESP32 & Sensors

2019 marked an international collaboration with the GATES Institute of Technology, Andhra Pradesh, India, where teams from both locations used the ESP32 WROOM processor to create IoT projects under thirty dollars each. The U.S. theme focused on Medical Devices [7], while the India theme centered on personal safety devices mainly for women. Notable projects included a Survey Data Recording Helmet for Utility Personnel, a Smart Health Watch, and a Smart Bandage that alerted users when a change was needed Figures 10, 11, and 12.

J. 2020 AI, Computer Vision and Machine Learning using the ESP32-Cam for image recognition and web platforms

In 2020, the ESP32 Cam's integrated camera and IoT capabilities were utilized to develop projects that extended into computer vision and machine learning. These included the "Eye See" project for vision-impaired individuals, featuring object and depth perception, Figure 13. , the "Mood Trainer" which helped developmentally disabled individuals recognize facial expressions using visual effects, Figure 14, and the

Fig. 10. 2019 Survey Data Recording Helmet

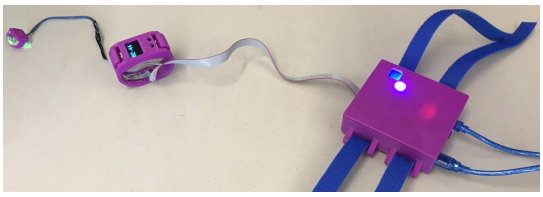

Fig. 11. 2019 Smart Watch

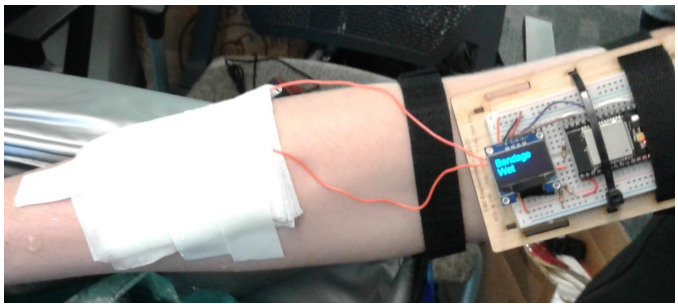

Fig. 12. 2019 Smart Bandage

"Color Trainer" designed to assist colorblind individuals in distinguishing colors, developed by a high school team Figure 15.

K. 24-Hour Hack-a-Thon

During this intensive session, teams apply their skills and knowledge in a continuous, real-world scenario. They develop their projects from concept to prototype under tight deadlines, fostering an environment that simulates real engineering challenges. This round-the-clock development phase is critical for innovation and problem-solving. Figures 16 & 17

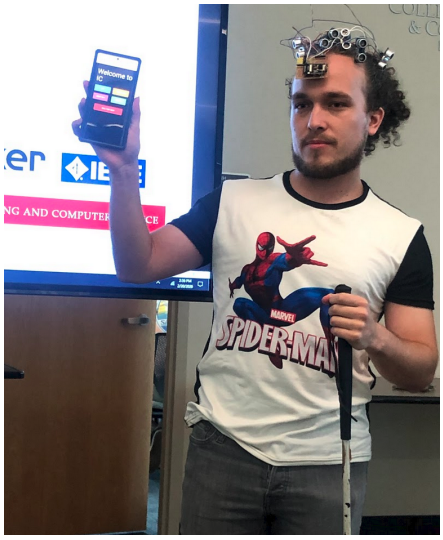

Fig. 13. 2020 Eye See

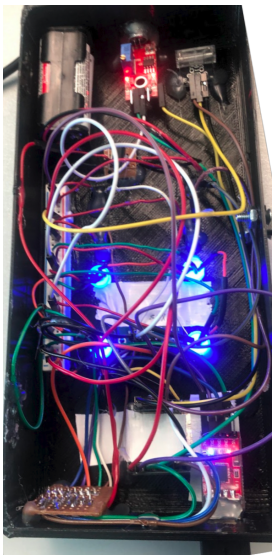

Fig. 14. 2020 Mood Trainer

Fig. 15. 2020 Color Trainer

Fig. 16. Dr. Jaramillo worked with a team well after 1 A.M.

Fig. 17. A participant during a recharge cycle

L. Post-Event Review

After the 24-hour session, teams present their projects to a panel of judges comprised of industry VIPs, faculty, and staff. This presentation is not just a technical showcase but also a test of their ability to communicate complex ideas effectively. The top projects are recognized, providing motivation and a sense of achievement to the participants.

M. Continuous Engagement

Full participation throughout the 24 hours is essential. Only critical personal issues are considered valid for breaks, as continuous engagement is vital for the immersive experience the Hack-a-Thon aims to provide.

VIII. Behind the Scenes

A. Planning

The planning for the FAU Hack-a-Thon begins four months in advance, coordinated by the Project Design Team. This team rigorously reviews the latest available hardware and software to ensure these can be deployed reliably and inexpensively. Since 2019, all participants have received a comprehensive project kit, which includes all necessary components to build their IoT devices. The Hack-a-Thon is strategically scheduled during the college's annual Engineering Week, making it one of the highlight events.

B. Kit Building

After the project themes and technologies are finalized, the necessary parts are ordered. In 2020, delivery delays caused by the Chinese New Year and the onset of COVID-19 presented significant challenges; however, the parts were received just in time to assemble the kits. (2020 February: COVID-19 was not yet an issue in the US). The assembly process involves thousands of components sorted and packed into kits by teaching assistants (TAs) and volunteers, Figure 18, 19. Figure 20, These kits are essential for the hands-on learning experience and are used not only in the Hack-a-Thon but also in related classes and labs throughout the academic year. [8]–[10].

Fig. 18. Parts Kit Preparation: Jumper Wires

Fig. 19. Parts Kit Preparation: LEDs

Fig. 20. Parts Kit Preparation: TAs and Volunteers Building Kits

C. Food and Logistics

To keep participants focused and energized during the intense training sessions and the 24-hour event, a variety of meals and snacks are provided. Offering food on-site helps maintain a high level of engagement and keeps participants localized, minimizing distractions and fostering a collaborative atmosphere. Special attention is also given to creating spaces where participants can 'recharge' mentally and physically, ensuring they remain productive throughout the event.

D. Event Execution

During the Hack-a-Thon, the organization and flow of the event are closely managed to ensure a smooth experience for all involved. This includes coordinating with IT support to handle any technical issues that arise, managing logistics to accommodate the needs of a diverse group of participants, and ensuring that all safety protocols are followed. The culmination of the event involves judging by a panel of industry VIPs, faculty, and staff, who assess the projects based on innovation, functionality, and presentation.

IX. Future Papers: Pedagogy and Experiential Successes

Future research papers exploring the pedagogical and experiential successes of the FAU Hack-a-Thons promise to offer valuable insights into effective educational practices within the field of engineering. These studies will delve into the nuances of the learning process as experienced during the Hack-a-Thons, examining the impacts of such immersive educational models on participants' career trajectories.

In addition to analyzing the structure and immediate outcomes of the Hack-a-Thons, future research will include conducting surveys among participants. These surveys will gather detailed feedback on the ways in which the Hack-a-Thon has impacted their careers or further education, similar to the survey designed earlier. This feedback will be crucial for understanding the long-term benefits and areas for improvement in the Hack-a-Thon model.

Researchers will also explore how the Hack-a-Thon model can be adapted and evolved to meet emerging technological challenges. This will involve studying the integration of new technologies and methodologies to ensure that future iterations remain at the cutting edge of educational innovation.

Furthermore, the potential to expand this model to other disciplines and institutions will be examined, proposing ways in which similar models could be implemented in different educational contexts to broaden the impact of experiential learning across various fields of study.

Ultimately, these papers will seek to enrich our understanding of how practical, hands-on experiences like the FAU Hack-a-Thons can shape future engineers and innovators. This research will contribute significantly to the discourse on workforce development and the role of higher education in fostering an adaptable, skilled, and innovative engineering workforce.

X. Summary and Results

The FAU Hack-a-Thons effectively equip participants with essential hardware and software skills over three intensive

weekly sessions. These preparatory sessions set the stage for the culminating 24-hour Hack-a-Thon event, where participants apply what they've learned in a real-world, pressure-filled environment. This event not only tests their technical skills but also their ability to work collaboratively under tight deadlines.

More than sixty percent of participants successfully complete their projects during the Hack-a-Thon. These projects are then showcased in a concluding session where participants present their work to a panel of industry experts, faculty, and staff. This presentation is not merely a demonstration of technical proficiency but also an opportunity for participants to articulate their vision and the practical applications of their projects.

The top-performing projects are recognized and awarded, fostering a sense of achievement among the participants. Feedback indicates that the experience and exposure gained during the Hack-a-Thon significantly enhance participants' resumes. Many alumni report that their involvement in the Hack-a-Thon has been a talking point during job interviews, often giving them an edge in competitive job markets. Additionally, some exceptional project teams have been invited to join the FAU Tech Runway Business Incubator, providing a pathway to further develop their projects into viable startups.

Overall, the Hack-a-Thon has proven to be a valuable platform for nurturing future engineers and innovators. It not only challenges participants to think critically and solve problems creatively but also prepares them for the dynamics of the modern workplace. This aligns with our ongoing goal to bridge the gap between academic learning and industry demands, ensuring that our graduates are well-prepared to contribute effectively from the moment they enter the professional world.

APPENDIX

Event Planning Checklist

- Choose project theme
- Select date & reserve location
- Advertise event & sign-up link
- Invite VIPs
- Fund raise for parts and event

Project Base Design

- Create parts list
- Prototype base design
- Order parts
- Build kits

Project Software

- Select applications
- Develop lesson plans

Develop Lesson Plans Support Team

- Select / Invite
- Train

Project Sessions

- Supply Food
- End each session with a short quiz
- Confirm attendance

1. Introduction & Team Forming
   - Scope and expectations
   - Support team introduction
   - Sign-up on support website(s)
   - Running code or compiler
2. Software and Hardware Introduction
   - Hardware build
     - Demonstrate how to:
       - Communicate with the IoT device
       - Make the sensors, IO and displays work
   - Software Build
     - Demonstrate how to:
       - Compile code or app
       - Communicate with code or app
3. Advance Topics Session
   - Final Training session
   - Confirm teams have completed assignment and tasks

The Hack-a-Thon

- Kickoff meeting
- Introduce support team
- Assign rooms and open venue
- Supply food and snacks
- Team presentations and judging
- Awards ceremony
  - Popular: top three
  - Judges: top three
  - Special recognition
- Closing ceremony and cleanup

FAU Hack-a-Thon Participant Feedback Survey (sample)

Introduction: Thank you for participating in the FAU Hack-a-Thon. We are eager to learn about the impact this experience has had on your career and educational pursuits. Please take a few minutes to complete this survey. Your responses will remain confidential and will be used to improve future events.

resume*

1) Basic Information
   - Name: [Optional]
   - Year of Participation in Hack-a-Thon:
   - Current Occupation or Field of Study:
2) Career and Educational Impact
   a) How relevant was the Hack-a-Thon experience to your current role or studies?
      - Not relevant
      - Slightly relevant
      - Moderately relevant
      - Very relevant
      - Extremely relevant

   b) Did the Hack-a-Thon help you in acquiring a job or internship? If yes, please describe how.

- Yes
- No

c) Have you applied the skills learned during the Hack-a-Thon in your current job or studies?
- Yes
- No

3) Skill Development
   a) Which skills developed during the Hack-a-Thon have been most useful to you? (Select all that apply)
      - Programming
      - Teamwork and collaboration
      - Problem-solving
      - Project management
      - Presentation and communication
      - Other (Please specify) [Text Box]
   b) How effective was the mentorship during the Hack-a-Thon in helping you develop these skills?
      - Not effective
      - Slightly effective
      - Moderately effective
      - Very effective
      - Extremely effective
4) Networking and Professional Connections
   a) Did you establish any professional contacts during the Hack-a-Thon that have been beneficial to your career?
      - Yes
      - No
   b) If yes, in what way have these contacts been beneficial? [Text Box]
5) Overall Experience
   a) How would you rate your overall experience at the FAU Hack-a-Thon?
      - Poor
      - Fair
      - Good
      - Very Good
      - Excellent
   b) What was the most valuable aspect of the Hack-a-Thon for you? [Text Box]
   c) What improvements would you suggest for future Hack-a-Thons? [Text Box]
6) Please share any other feedback or comments you have about your Hack-a-Thon experience: [Text Box]

Conclusion: Thank you for taking the time to complete this survey. Your feedback is invaluable and will help us continue to enhance the Hack-a-Thon experience for future participants.

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