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Development of Technoprenuer Education and Training Model through Internet of Things (IoT) Based Smart Transportation System Application for UPI Students

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ABSTRACT

Technology-based entrepreneurial (Technoprenuer) trainings aim at increasing the interest of students and university graduates to become Technoprenuer actors as part of reducing the number of educated unemployment rate. On the other hand, based on the continuously development of transportation technology, smart transportation utilizing the Internet of Things (IoT) is expected to help many parties in the field of supervision and enforcementas as well as the community as it can improve safety and reduce the level of accidents on the road. Therefore, this training provided material on technoprenership and IoT implementation to gain those two benefits. The training was held for 2 weeks, 2 days of which were synchronous and the rest were asynchronous. The trainees consisted of 15 UPI students and they were expected to be able to build prototypes in the end of the training. As the result, 60% of the participants were able to realize their business ideas until the prototype stage.

Keywords: *Technopreneur, IoT, Transportation*

1. INTRODUCTION

Based on data from the Central Statistics Agency (BPS), as of February 2021, the number of unemployed university graduates reached 5.98 percent of the total labor force of around 8.7 million people. Although the percentage is lower compared to August 2020 which was 7.35 percent, and the figure is already below the national unemployment average of 7.02 percent, it still has a significant number of graduates from universities. The high unemployment rate is caused by the economic crisis resulted from the Covid-19 pandemic. This number continuously grows as the universities yearly graduate thousands of undergraduates however not all of them can be accommodated in the world of work. The problem of educated unemployment when compared to non-educated one is actually more complex than educated unemployment because non-educated job seekers are willing to work in the non-formal sector, while educated

job seekers with the provision of knowledge they have seek to work in the formal sector to get a high salary and prestige in society **(Rinto Yulhan, 2014)**.

The creation of entrepreneurs is an alternative solution to various problems in society such as poverty and social inequality, increasing unemployment of the productive age, and depletion of energy supply reserves, all of which demand creative and innovative actions. The entrepreneurial spirit is not only limited to academic intelligence and product production skills but also a dynamic spirit in capturing challenges and risks and then turning them into opportunities and growth potentials **(Soegoto, 2009)**. PKM activity is one means to realize economic growth locally, regionally, as well as internationally **(B Hasan, 2019)**.

Technopreneurship is a process of the synergy of strong abilities in mastering technology and a thorough understanding of the concept of entrepreneurship **(Sosrowinarsidiono, 2010)**. Another opinion about technopreneurship is the process in an organization that prioritizes innovation and continuously finds the main problems of the organization, solves its problems, and implements ways of solving problems to increase competitiveness in the global market **(Okorie, 2014)**.

The transportation system has now begun to use a sophisticated system, with the use of applications that can help the community in using land, sea, and air transportation modes **(Arman, 2019).** Exploiting intelligent transportation system, people can order tickets or anything related to transportation through their respective devices. There are also many conveniences obtained by the community, for example knowing when a bus, ship or train departs. With an intelligent transportation system, all systems can be connected so that transportation orders can be made through their respective devices **(Khasawneh,2020)**.

An intelligent Transportation System (ITS) is a technology, infrastructure, and service used for operations, services, and control of transportation used to transport passengers and goods **(Crainic eal. 2009)**. It is a transportation system that is connected by a medium, namely the internet so data from all transportation systems can be monitored remotely. Smart transportation can help the government overcoming congestion and the intelligent transportation system can also be connected to other systems such as banks **(Rahayu, 2019)**.

In this study, all stages of ITS were applied. At the data collection stage, vehicle data is obtained by placing nodes equipped with sensors on each lane of the road. Data capture is done in real-time every minute. The data that has been obtained is processed into information about the severity of congestion based on PKJI (2014). Then the information that has been stored will be disseminated using the site media. However, this study provides a medium for disseminating information only to relevant institutions.

ITS has various benefits. ITS has been proven to reduce congestion by 40% and fuel consumption by 10%. The decrease in fuel consumption affects the health condition of the environment. The amount of carbon dioxide decreased by 22% or about 9,600 tons per day. This proves that ITS is very good to implement **(Ezell 2010).**

2. METHOD

The methods and stages used in the Technoprenuer Education and Training Model Development activities through the Internet of Things (IoT) Based Smart Transportation System Application for UPI Students can be explained in Table 1.

Table 1. Stages of training program implementation

Stages	Explanation
Introduction	Preliminary study and FGD of PKM entrepreneurship program
	Analysis of student needs
Initiation and Innovation	Needs response approach
	Innovation of IoT-based entrepreneurial training model
Implementation	Training and mentoring of the PKM Entrepreneurship program
	Training and mentoring strategies and innovations
Monitoring and Evaluation	Monitoring and evaluation of IoT-based entrepreneurial training activities
	Evaluation of the entrepreneurship PKM training program
PKM Program Follow-up	The follow-up to the entrepreneurial PKM program
	Making an IoT-based entrepreneurial model a development

The target audience of community service activities through the Development of Technoprenuer Education and Training Models through the Internet of Things (IoT) Based Smart Transportation System Application for UPI Students were students who had not had experience, or lack competence in initiating and innovating their business, as well as student entrepreneurs who had had entrepreneurial experience but had not been equipped with touch and product innovation in the field of technology creative industries, both hardware and software technology. In addition, it was also targeted to coach prospective young entrepreneurs who are members of the student entrepreneurial community engaged in various fields of Industrial Automation Engineering and Robotics business. In addition to conducting training, this program also carried out an intensive mentoring process for business activists from UPI students. Students were targeted in this program as they can create creative and innovative works in the field of technology-based entrepreneurship that can provide opportunities to create young entrepreneurs **(B Hasan, 2021)**.

The coaching program in this activity had the following steps: preparation, identification of the entrepreneur being fostered, adjusting the coaching model to the business it fostered, as well as the application and evaluation of activities.

3. RESULTS AND DISCUSSION

The training's participants were 10 students from the Industrial Automation and Robotics Engineering Education study program and 5 students from the Electrical Engineering study program. The training materials were delivered on June 29 and July 6, and carried out for 8 hours per day. Lecturing and question-and-answer methods were used to deliver material to trainees. The training took place in the Industrial Electronics laboratory of FPTK UPI. In addition to materials on technopreneurship, participants were also equipped with materials about IoT. Participants were equipped with IoT kits to practice the materials they had obtained. The IoT kit consisted of an ESP32 microcontroller, GPS, relay module, LM35 temperature sensor, and iTag. The trainers gave a tutorial on designing an IoT kit that had been given to participants to be assembled into a "Keyless system with GPS tracker".

3.1 Presentation of materials

On June 29, after the completion of the opening, the trainers gave material to the participants. The material presented was divided into 2 sessions, namely technopreneurship theory sessions and technical sessions on IoT. Group photo between participants and organizers shown in Figure 1.

Figure 1. Opening of Training

The material presented to the participants covered the development of IoT implementation in the transportation system, procedures for calculating the IoT system cost budget plan, the basic basis of the IoT system, and the design workshop "Keyless system with GPS tracker".

Figure 2. Delivery of training materials

Participants were divided into 5 groups, and each group consisted of 3 participants. They were given one week to prepare a business model to be developed. In the period from June 30 to July 5, participants received material asynchronously. Material presentation using lecture methode is shown in Figure 2.

3.2 Monitoring and Evaluation

This stage was held on July 6, in which each group presented an IoT-based business idea. Of the 5 groups, only 3 groups were able to complete their business ideas. Each group had to present their project in front off class as shown in Figure 3.

Figure 3. Participants present their business ideas

The three business ideas presented were as follows:

1. IoT-based car fire warning system
   The system can notify the coordinate of the location of a burning car to the local fire service. The coordinate is sent through the Telegram application. The coordinate is written in the form of a URL to make it easier for firefighters to directly open google maps to find out the location of the burning car. The system uses UV and temperature sensors to detect fires. The prototipe of the system is shown in Figure 4.

2. Vehicle control and monitor
   This system can turn on and off a vehicle using the push button on the iTag. In addition, this system sends coordinate in real time to the Blynk application, so that motorbike owners can monitor in real-time the position of their vehicles.

3. Gasoline agile warning system
   This system can estimate the use of gasoline, so that vehicle users will not experience running out of gas in the middle of a trip. If gasoline is expected to run out, then this system will send the nearest gas station's coordinate.

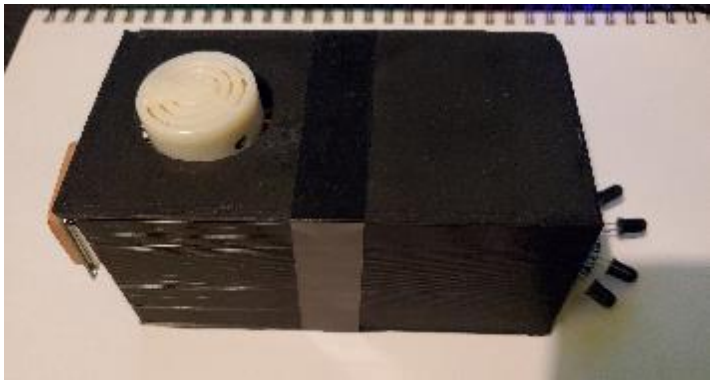

Figure 4. Prototype of a fire warning system in IoT-based cars

As many as 60% of the participants were able to present their business ideas well. After evaluating the rest 40% of the participants who could not complete their business ideas, several problems were found that prevented the participants from completing their business ideas:

1. Incomprehension of the material presented
   This happened because the participants experienced material lags which were caused by the time it took to install the ESP32 library on the Arduino IDE depending on internet speed. The file size of the ESP32 library reached 300MB.
2. Participants came from outside Bandung
   From June 30 to July 5, participants who lived around Bandung took the time to work on business ideas at the Industrial Electronics laboratory. Moreover, they were guided directly by the trainers. Meanwhile, the participants who came from outside Bandung during the period provided by the trainers had never once worked on a business idea in the laboratory, so they had difficulty developing business ideas.
3. Students were too focus on working on the product
   The majority of students who participated in this training did not have much experience in developing a product. Therefore the trainees spent time to complete their product. This caused the canvas business for these products to be neglected and not completed optimally.

After all groups presented their project, group photo of the participants that were able to present their project as well as the organizers was taken as shown in Figure 5.

Figure 5. Closing of Training

4. CONCLUSIONS

As many as 60% of the trainees were able to realize their business ideas up to the prototype stage. It is hoped that in the future the groups that reaches this stage will be able to develop their business ideas up to the tools worthy of being sold in the market. To increase the success rate, the committee should prepare fast internet access.

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