ABDIMAS
Jurnal Pengabdian kepada Masyarakat
https://journal.unnes.ac.id/journals/abdimas/

Empowering Vocational Educators in Kulon Progo: IoT and Digital Transformation Training for Enhanced Teaching Skills

Anni Karimatul Fauziyyah*, Alif Subardono, Nur Rohman Rosyid, Ronald Adrian, Unan Yusmaniar Oktiawati, Tika Erna Putri, Ardhi Wicaksono Santoso, Yuris Mulya Saputra

Universitas Gadjah Mada, Indonesia
*Corresponding Author: anni.karimatul.f@ugm.ac.id

Abstract
The IoT (Internet of Things) and Digital Transformation - Skill For All (SFA) training for vocational school teachers in Kulon Progo is an information technology training program. The SFA training addresses the skills gap by offering knowledge and skills necessary to work with IoT devices using IoT Kits from the Network Technology and Application lab, which is evolving in the digital transformation era. This training provides a solid foundation for managing IoT devices, which are highly relevant to today's industry needs. Configuring, managing, and programming IoT devices is essential in the digital age. By participating in this training, vocational school teachers in Kulon Progo can acquire practical skills directly applicable to their curriculum, helping students understand IoT concepts more deeply and practically. The IoT (Internet of Things) and Digital Transformation - Skill For All (SFA) training is designed to provide a comprehensive understanding of networking basics and how to configure and manage IoT Kits devices.

Keywords: *IoT(Internet of Things), Digital Transformation, Skill For All (SFA),Vocational School*

INTRODUCTION

In the rapidly evolving landscape of Industry 4.0, the integration of cutting-edge technologies such as the Internet of Things (IoT) and digital transformation initiatives has become essential across sectors, including vocational education. As digital tools and interconnected devices transform industrial and economic environments, educators must equip students with the skills needed to thrive in this dynamic ecosystem. Vocational educators, in particular, play a pivotal role in preparing future professionals to navigate and harness these advancements.

Singh (2024) highlights how digital twins unlock new opportunities while presenting unique challenges in this rapidly transforming era. The need for a highly skilled workforce capable of leveraging such advancements has never been more critical. Islam (2022) underscores the importance of equipping students with essential competencies for the modern job market, emphasizing skills related to automation, IoT, cloud computing, and data-driven problem-solving. As the demand for IoT expertise grows, educational programs have adapted, incorporating hands-on, STEM-based learning experiences to prepare future Professionals emphasize that emerging IoT courses are vital, offering practical applications such as using Arduino systems to teach the integration of hardware and software. The digital transformation extends beyond industry and education to sectors like agriculture. Studies illustrate how IoT and blockchain technologies enhance the resilience of agricultural supply chains in Indonesia, a critical step given the sector's economic impact and the challenges highlighted by COVID-19 pandemic.

Digitalization can streamline logistics and improve coordination, which is particularly relevant in Indonesia's geographically dispersed context. To address the demands of Industry 4.0 (Václav Kaczmarczyk, 2024), it is crucial to prepare vocational educators to teach these concepts effectively, equipping students with the technical proficiency needed to navigate the complexities of this interconnected world. As educators adapt to this digital shift, comprehensive training in IoT and digital

transformation becomes imperative, fostering an education system that meets the needs of an evolving industrial landscape paradigm.

Despite these advancements, many educational institutions, particularly in regions such as Kulon Progo Regency, face challenges in implementing IoT education. The lack of trained teachers and adequate resources hinders the effective delivery of IoT concepts in schools. According to Darmawan Sutanto, Chairman of MGMP ICT Se-Kulon Progo, most teachers are self-taught, leading to inadequate and unstructured material being presented to students. Some schools only teach IoT with limited exposure, such as basic computer connections, due to a lack of access to IoT devices and comprehensive training.

Recognizing this gap, the Internet Engineering Technology Study Program at DTEDI SV UGM has taken significant steps to support vocational educators in Kulon Progo. As a certified Cisco Academy, the program has integrated Cisco's standardized curriculum for Computer Networks and IoT courses, delivered by competent, Cisco-certified trainers. This community service initiative aims to empower vocational school teachers by providing practical training on IoT devices and digital transformation materials. By collaborating with MGMP members, the program seeks to enhance teaching methodologies, enabling teachers to deliver structured and impactful IoT education to their students.

Through hands-on experience and access to hardware IoT kits, this training initiative will help bridge the gap between industry needs and traditional educational practices. It will equip educators with the necessary technical and pedagogical skills, fostering an education system that aligns with the demands of an interconnected and rapidly transforming industrial paradigm. By empowering teachers, the program aims to prepare students for a future where digital proficiency is paramount, ensuring that Kulon Progo's vocational education system is well-positioned for the era of Industry 4.0.

METHODS

The implementation of community service involves MGMP SMK member teachers across Kulonprogo who are in the Computer, Electrical, Computer and Multimedia Network Engineering expertise program. The method used for the service is SWOT analysis to ensure that this service program is on target. The SWOT analysis carried out in this service can be seen in Table 1. This SWOT analysis provides a comprehensive framework for leveraging strengths, capitalizing on opportunities, addressing weaknesses, and mitigating threats in the implementation of the community service program. The activity will be carried out in 3 stages, namely Preparation, Implementation and Evaluation of Usefulness after 2 Months. The method of implementing the activity described in the form of a table is aligned with the problems and output targets

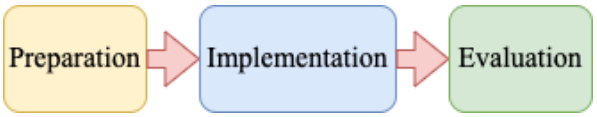

Fig. 1. Stages of PkM implementation

Table 1. SWOT Analysis

Internal Factors	External Factors
Strengths (S)	**Opportunities (O)**
1. Certified as a Cisco Academy, providing access to a globally recognized curriculum 2. Competent and certified trainers with expertise in Computer Networks and IoT.	High demand for skilled IoT and networking professionals in the job market Opportunity to strengthen partnerships with local vocational schools and educational institutions

3. Established collaboration with MGMP members, ensuring targeted and effective training delivery	Rising interest among teachers and students in digital transformation and IoT technologies
Weaknesses (W)	**Threats (T)**
1. Limited resources to scale training sessions to reach a broader audience	Rapid technological advancements requiring frequent curriculum updates
2. Dependence on external funding and resources for community service activities	Competition from other institutions offering similar training and certifications
3. Potential gaps in continuity if trainers or key staff are unavailable	Unpredictable challenges such as economic downturns or global crises

The strategy of implementing the activity is shown in Table 2. Preparation Stage, at this stage all PkM activities are prepared from the preparation of Proposals, Module Making, and Preparation of Devices to be used. In the Implementation Stage, the implementation will be carried out at the FRC Kulonprogo Vocational School Campus UGM.

Table 2. The strategy of implementing PkM

Agreed issues	**Implementation method**
1. How to use IoT packet tracer software	Cisco academy skill for all and packet tracer training
2. How to use IoT Kits prototype	IoT Kits usage training
3. How to program IoT Kits devices	Programming Language Training for IoT Kits
4. How integrating IoT and Digital Transformation materials into vocational learning	Discussion of curriculum guidance and learning plans

Table 3. Tools and materials for training

Tools and materials	**name**
IoT Simulation	Cisco Packet
IoT Kits Devices	IoT Kits
Computer IoT Module	Cisco SFA

RESULTS AND DISCUSSION

SFA training will be held for 3 (three) days. On the first 2 (two) days of training, materials are given in accordance with the Cisco Networking Academy - Skill For All (SFA) curriculum. And on the 3rd (last) day, the Cisco Networking Academy - Skill For All (SFA) Final Exam will be held. Each participant will be given 3x opportunities to repeat the exam if they do not pass the first opportunity.

Fig. 2. IoT Kits

At the evaluation stage, it is carried out after 2 months of implementation by identifying the benefits that partners feel from this activity and whether there is a follow-up plan that needs to be done to improve this PkM activity in the future. The implementation of the PkM Program will be held on Monday and Tuesday, July 15-16, 2024 at FRC SV UGM. The participants who attended were 13 teachers who were members of the MGMP Teacher of SMK Kulonprogo. The activity began with an Opening by the Head of the Internet Engineering Technology Study Program SV UGM, then the head of PkM and Trainer.

Fig. 3. The implementation of the Workshop

In this PkM activity, the students were given hands-on experience holding and configuring IoT Kits devices directly. The implementation of the Workshop began with the implementation of a Pretest for participants to see the initial abilities they had and what knowledge they had understood before the workshop material was given. Then at the end of the post test activity the participants to see the extent of understanding and gaining insight after the training was given. The material provided is related to IoT expertise: create a process flowchart, add IoT Devices in Packet Tracer, Basic Python Programming, Blinking lED, Connect devices to monitor network, create a simple network.

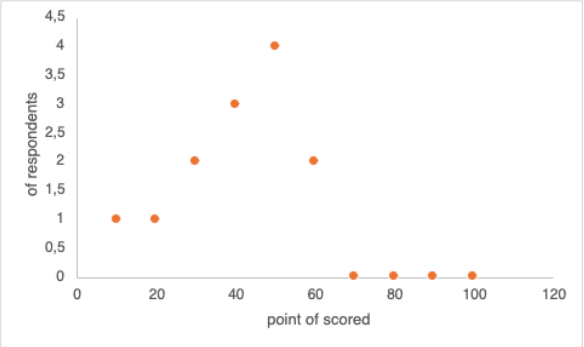

Fig. 4. Insight Pretest

The number of Pre and Posttest questions is 10 questions. The following are the results of the comparison of Pretest and Posttest scores conducted to 13 participants who participated in this Workshop activity.

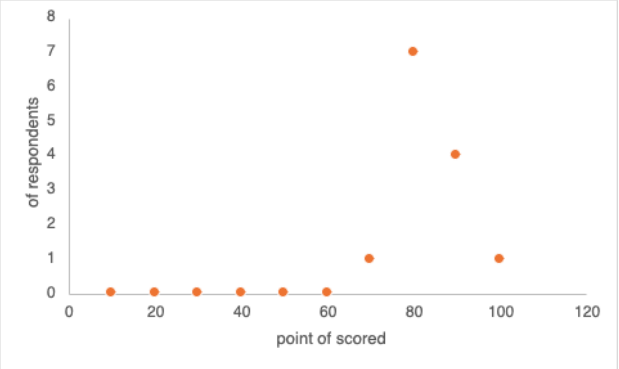

Fig. 5. Insight Posttest

Good improvement results and extraordinary feedback from participants show that this activity has a very positive impact on improving the ability of participants who usually only use software in understanding IoT Kits and their configurations and with this activity can utilize and implement directly to IoT Kits hardware devices so as to provide a new experience by directly hands on IoT Physical Devices.

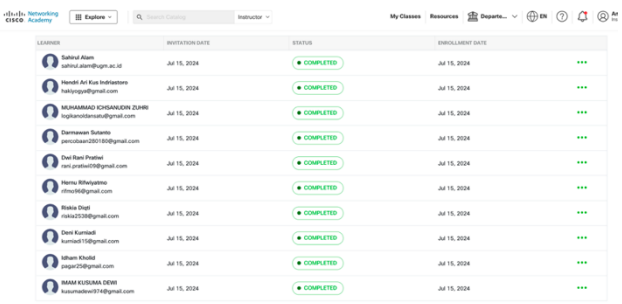

Fig. 6. Complete result

CONCLUSION

The implementation of the Workshop "Empowering Vocational Educators in Kulon Progo: IoT and Digital Transformation Training for Enhanced Teaching Skills" went well and as expected, with increased competence and new experience for participants in using IoT Kits devices. From the results of the Pre and Posttest also obtained quite significant results with an increase in knowledge of almost 100.1%, this is quite encouraging, meaning that what is being pursued and expected to run well and become an additional competency and knowledge for Vocational Teachers throughout Kulonprogo. The workshop activities in the Community Service Program (PkM) can be duplicated to other vocational schools in Yogyakarta in general.

REFERENCES

Singh, B. &. (2024). Exploring diverse use cases of digital twins projecting digital transformation: Unlocking potential, addressing challenges and viable solutions. Digital Twins for Smart Cities and Villages, 631-655.

Islam, M. A. (2022). Industry 4.0: Skill set for employability. Social Sciences & Humanities Open Volume 6, Issue 1, 100280.

Buchert, L. (1995). The Concept of Education for All: What Has Happened after Jomtien? International Review of Education, 41(6), 537-549.

Collaguazo, A. V. (2023). An activity-based approach for the early identification and resolution of problems in the development of IoT systems in academic projects. Internet of Things Volume 24, 100929.

Keefe, D. H. (2024). Digitalization for agricultural supply chains resilience: Perspectives from Indonesia as an ASEAN member. The Asian Journal of Shipping and Logistics Available .

Václav Kaczmarczyk, O. B. (2024). Analysis of requirements for teaching Industry 4.0 topics at universities. IFAC-PapersOnLine Volume , 293-298.