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Overview of LabVIEW as a Graphical Programming Tool for Developing Industrial Technology Proficiency

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Abstract

The purpose of this session is to expose participants with technical and vocational educational backgrounds to LabVIEW graphics programming software. In technical and industrial domains like biotechnology, aircraft, and telecommunications, LabVIEW is a commonly used system development tool. Hands-on practice and a demonstrative approach are used in the in-person instruction. LabVIEW's foundations, industrial applications, and hardware and software integration are all covered in the curriculum. The training results show that participants have a better understanding of visual programming and its possible uses in the business. This program is a component of a larger strategy to promote Industry 4.0 aligned technological literacy.

***Keywords**: LabVIEW, graphical programming, vocational training, Industry 4.0, testing systems, technology literacy*

1. INTRODUCTION

In the era of the Fourth Industrial Revolution, advancements in digital technology have transformed various aspects of life, including the industrial and educational sectors. Skills in technology and programming are now an urgent necessity, particularly in vocational education and the technical workforce. The industrial sector requires human resources who not only understand theory but can also apply knowledge in the form of technical skills relevant to on-the-job requirements. One of the most widely used software tools in the technical and industrial fields is LabVIEW (Laboratory Virtual Instrument Engineering Workbench). LabVIEW is a graphical programming platform designed to simplify the design of instrumentation and automation systems. With its block diagram-based interface, LabVIEW enables users to efficiently develop technical applications such as monitoring, measurement, control, and data acquisition. Its widespread use across various industries, such as manufacturing, automotive, energy, and research, makes LabVIEW one of the most sought-after technical skills today. In vocational education, mastering LabVIEW provides a significant advantage for graduates as it enhances their readiness to enter the workforce. Therefore, integrating LabVIEW into the technical education curriculum is a crucial strategy for producing competent and skilled workers capable of tackling the challenges of the Fourth Industrial Revolution [1].

LabVIEW is a graphical programming environment designed to accelerate the testing, measurement, and development of instrumentation and control systems [2]. Unfortunately, at the vocational secondary education level and even in technical higher education, understanding of software such as LabVIEW is still limited [3]. The majority of students are more familiar with text-based programming languages such as C++ or Python, but are less familiar with visual programming, which is often more efficient in prototyping and rapid implementation of measurement or control systems. This is the background to the community service activities we carry out.

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This training is intended to bridge the technology gap between the world of education and industry needs [4]. By introducing LabVIEW to vocational school students, teachers, or engineering students, it is hoped that they will acquire additional skills that are in line with the needs of modern industries, such as automation, telecommunications, and energy. LabVIEW has been used by various global companies such as NASA, Siemens, Boeing, as well as domestic institutions like PINDAD and BMKG. Additionally, LabVIEW offers high flexibility for integration with other software such as MATLAB, Python, and SolidWorks, and can be connected to cloud services like AWS and Azure. This makes it relevant in the context of project-based education and applied research. This initiative is part of the university's efforts to expand public access to industrial technology [5][6].

2. METHOD

The LabVIEW training was conducted in the form of face-to-face meetings that were demonstrative and hands-on. The activities took place in a computer lab with internet connection support and educational licenses from NI (National Instruments). Participants consisted of vocational school teachers, engineering students, and final year vocational school students with backgrounds in electrical engineering, automation, and telecommunications.

The training began with an introduction to the basic concepts of LabVIEW, including a brief history, system architecture, and real-world application examples. The instructor explained how LabVIEW is used to design temperature monitoring systems, motor control systems, and automated testing systems in the manufacturing industry. Additionally, participants were shown the block diagram structure and front panel in the LabVIEW interface.

The next session focused on hands-on practice. Participants were guided in designing simple applications, such as a virtual sensor data reading system and displaying measurement results in graphical form. Participants also attempted to create while loops, conditional structures, and basic input-output parameter settings. The exercises were conducted progressively, from beginner level to creating control logic simulations.

In the final session, participants were introduced to the potential for integrating LabVIEW with other software and hardware, such as using data from Arduino sensors, connecting to Excel, and exporting data to cloud storage. The facilitator emphasized the importance of applied technology literacy as part of the

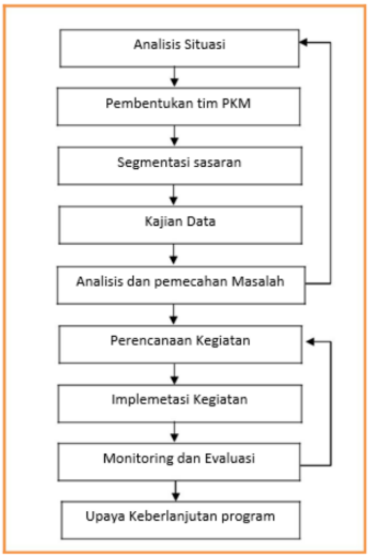

Figure 1. PkM Methodology

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3. RESULT AND DISCUSSION

The training had a positive impact on improving participants' skills. Based on the results of questionnaires and group discussions, 85% of participants stated that this training provided them with new experiences in the world of programming. They found LabVIEW easy to use because it is visual, and very helpful for understanding the basic principles of measurement and system control.

Figure 2. Discussion by Presenters

Participants mentioned that the most interesting exercise was when they were able to design a simple application that immediately displayed data in real-time graphs. This provided a better understanding of the input-output process in electronic systems. Some participants were also interested in exploring the integration of LabVIEW with Arduino hardware for their final projects.

The most notable advantage of LabVIEW, as perceived by participants, is its ability to design systems quickly without having to write extensive code. This is particularly suitable for participants with a non-programming technical background. However, some participants also noted a learning curve when understanding looping concepts and logical conditions in block diagrams, especially for those unfamiliar with basic programming logic.

The main challenge in the training was the limited time for exploration and the number of available computers. To address this, participants were provided with links to official documentation, project examples, and access to the LabVIEW community for further exploration. The facilitator also recommended using the free LabVIEW Community Edition for educational and personal exploration purposes.

4. CONCLUSION

This community service activity proves that introducing LabVIEW as a visual programming tool can be an effective solution in improving participants' competencies in the field of industrial technology. Through a hands-on approach, participants gain concrete experience in designing graphics-based monitoring and control systems, which are highly relevant to the needs of today's industry.

LabVIEW opens up great opportunities for application in vocational education, applied research, and small-to-medium industrial projects. Its ability to integrate with various hardware and software platforms makes it a flexible and highly useful tool. This training also raises

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participants' awareness of the importance of cross-technology and collaborative skills in data-based system development.

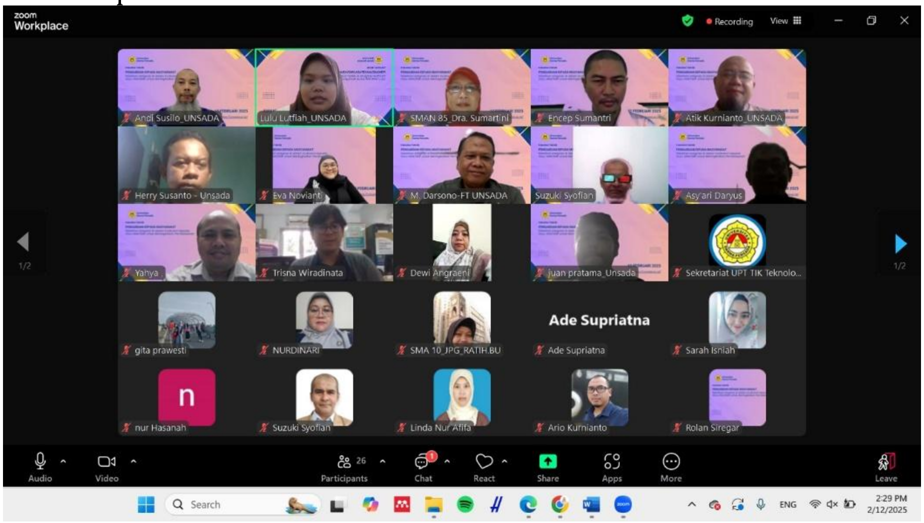

Figure 3. Group photo with PKM participants

It is hoped that this activity will be the first step towards the development of advanced training programs such as physical sensor integration, signal processing, and the development of IoT-based interfaces using LabVIEW. Broader collaboration between the education sector and industry needs to be continuously strengthened so that engineering graduates are truly ready to face the challenges of the industrial revolution and digital transformation.

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