

International Journal of Research in Community Service e-ISSN: 2746-3281 p-ISSN: 2746-3273

Vol. 6, No. 2, pp. 91-96, 2025

Enhancing Data Visualization Competencies Through Power BI Training Winalia Agwil^{1*}, Etis Sunandi², Jose Rizal³, Fachri Faisal⁴, Sigit Nugroho⁵, Sri Syuhada Putri⁶, Hermalia⁷

1.2.3.4.5.6.7 Undergraduate Program in Statistics, University of Bengkulu, Indonesia

*Corresponding author email: winaliaagwil@unib.ac.id

Abstract

Vocational High School (SMK) aims to prepare students with the skills and knowledge required to meet industry demands. Recognizing the importance of data analysis and visualization in the workforce, this community service focuses on enhancing these competencies among SMKN 04 Kota Bengkulu students, particularly those in the Software Engineering program. A community service program was conducted to train students in utilizing Power BI for real-time and interactive data visualization. The training program included preparatory surveys, module development, and practical workshops. Students actively participated, demonstrating a greater interest and understanding of data visualization concepts. Evaluation results showed that 89% of participants found the training beneficial, and 84% mastered Power BI's visualization techniques. The outcomes highlight the program's effectiveness in equipping students with industry-relevant skills, emphasizing the need for similar initiatives targeting broader student groups. This project bridges the gap between vocational education and the digital economy's demands.

Keywords: Power BI, visualization, vocational education, software engineering

1. Introduction

Vocational High Schools (SMK) are formal educational institutions that provide vocational training at the secondary education level, continuing junior high school education (SMP, MTs, or equivalent forms, as stated in Law Number 20 of 2003). Graduates of SMK are expected to become workforce-ready human resources equipped to meet the demands of the business and industrial sectors (DUDI). To fulfill this role, they must possess comprehensive knowledge, practical skills, and professional attitudes.

Sekolah Menengah Kejuruan Negeri 04 Kota Bengkulu is an A-grade accredited vocational school offering various expertise programs, including Software or Computer Engineering (Rekayasa Perangkat Lunak, RPL). This program is particularly relevant in today's era of rapid technological advancement. Graduates from this program are in high demand in computing fields such as programming, system analysis, web engineering, and beyond (Mawartika et al., 2023). Acquiring data processing and visualization skills is crucial to prepare SMK students specializing in software engineering for the workforce, particularly in informatics. These competencies not only enhance employability but also enable students to contribute to the success of data-driven businesses and industries.

Recognizing this need, lecturers from the Undergraduate Program in Statistics, Universitas Bengkulu conducted a community service program. The "Realtime and Interactive Visualization Training Using Power BI Software," activity aimed to equip students with practical skills in data visualization. Power BI, widely used professionally for its user-friendly features and visually appealing outputs, is an ideal tool for enhancing business development. This program targeted SMKN 04 Kota Bengkulu students, specifically those enrolled in the software engineering expertise program.

2. Literature Review

2.1. Education and Skills of Vocational Students

Article 31, Paragraph 1 of the 1945 Constitution states, "Every citizen has the right to education." This affirms every individual's right to appropriate education to improve their quality of life. Education is a conscious and planned effort to create an environment and learning process in which students actively develop their potential to possess

spiritual and religious strength, self-control, intelligence, noble character, and the skills necessary for themselves, society, the nation, and the state within the framework of the National Education System.

The curriculum itself is a key component influencing the quality of learning and student outcomes. According to Law No. 20/2003 on the National Education System, the curriculum is defined as a set of plans and arrangements concerning objectives, content, teaching materials, and methods used as guidelines for organizing learning activities to achieve national education goals. This implies that, from a curriculum perspective, there are differences in the objectives, content, teaching materials, and methods employed in the organization of education to attain these goals (Aldo, 2020). One strategy to improve the quality of education is to enhance students' skills, one of which is proficiency in using data visualization software. Skills in visualization software play a significant role in the development of students' conceptual understanding and creativity (Hutagalung et al., 2023).

Several foundational theories provide a solid base for developing data visualization skills through software. Information visualization theory emphasizes the importance of effective visual representations to help understand complex data. According to Edward Tufte, an expert in the field of information visualization, a good visualization must adhere to principles such as clarity, accuracy, and effective information density (Tufte, 1983). In today's digital era, data visualization skills are crucial for vocational students to understand, analyze, and present data in an effective and easily understandable manner.

Furthermore, in software development, user interface theory is also an important foundation. Good user interface design principles, such as readability, consistency, and intuitive layout, can enhance the user experience in interpreting data visualizations (Shneiderman & Plaisant, 2010). Grasping basic computer science concepts, particularly in data processing and graphical representation, is also essential. Knowledge of data visualization algorithms, data structures, and visualization techniques such as graphs, charts, and heatmaps can provide a strong foundation for developing data visualization skills in software (Munzner, 2014).

2.2. Power BI

Power BI is a data analysis platform developed by Microsoft Corporation (Microsoft, 2022). Continuously evolving, Power BI is maintained and updated by the development team at Microsoft, making it a key product within the company's portfolio of services and applications. Designed to help users transform data into valuable insights, Power BI offers a comprehensive set of features for data integration, analysis, and visualization from multiple sources.

Power BI provides numerous advantages for data analysis. First, it enables users to create visually appealing and informative data visualizations. Users can easily create various visualization types, such as graphs, maps, and dynamic tables, to present data clearly and engagingly. In addition, Power BI is equipped with advanced analytical tools that facilitate in-depth data exploration, trend identification, and even predictions based on historical data. These capabilities offer valuable insights to support decision-making and strategic planning.

Moreover, Power BI enhances team collaboration through its reporting and visualization features. Teams can effortlessly share analysis results and insights with colleagues and collaborate in real time on data presentations. This functionality promotes efficient teamwork and productivity within organizations. Power BI also integrates seamlessly with other Microsoft applications and services while supporting connectivity to a wide range of external data sources. These integrations make it easy for users to access and combine data from multiple platforms, thereby broadening the scope of analysis and improving the accuracy of insights (Microsoft, 2022).

Power BI stands out for its key features that help users manage and analyze data effectively. First, it allows users to consolidate data from multiple sources, including databases, Excel files, and cloud services, into one centralized data model (Microsoft, 2022). This centralization enables users to manage their data without platform constraints. Additionally, Power BI offers interactive visualizations that help users create dynamic and compelling data presentations. With a wide array of graph types and maps available, users can easily explore data and gain deeper insights into emerging patterns and trends.

The platform's advanced analysis tools also provide significant value. Users can perform detailed analyses using features like DAX calculations, predictive model building, and integration with programming languages such as R and Python (Microsoft, 2022). This allows users to extract more detailed and relevant insights from their data. Power BI also simplifies team collaboration by allowing users to share reports, visualizations, and datasets with team members while managing access control for each user. This promotes efficient data analysis and collaboration.

Finally, Power BI offers extensive integration with Microsoft applications like Office 365 and Dynamics 365, along with easy-to-configure connections to external data sources (Microsoft, 2022). This allows users to access and analyze data from various sources, increasing the platform's versatility. With a combination of powerful features and extensive integration options, Power BI has emerged as one of the leading data analysis platforms in the market today.

3. Materials and Methods

3.1. Materials

The materials used in this study include the following:

- 1) Target audience: Students from SMKN 04 Kota Bengkulu, particularly those in the Software Engineering program.
- 2) Location: The training sessions were conducted at SMKN 04 Kota Bengkulu, an A-accredited school offering various vocational programs.
- 3) Data and Information: Pre-training survey data, including students' initial knowledge of data visualization and their understanding of its importance. Post-training evaluation data, including participant feedback and practical work results using Power BI.
- 4) Software: Microsoft Power BI for data visualization training.
- 5) Training Modules: Custom handbooks on Power BI designed by the community service team.
- 6) Survey Tools: Questionnaires to evaluate student understanding before and after training.

3.2. Methods

This community service activity utilizes a classroom education approach. The training method has stages, namely preparation, implementation, and evaluation. The stages carried out are:

- 1) Preparation Stage
 - The preparation stage involves the following activities:
 - a. Initial survey will be done by coordinating with teachers and laboratory assistants at the destination school.
 - b. Team coordination and licensing, namely by communicating with the school where the activity will be carried out to ask permission from the headmaster of SMKN 04 Bengkulu City to carry out the activity.
 - c. Proposing community service activities.
 - d. Team coordination with LPPM Bengkulu University.
 - e. Preparation of activity plans and schedules and division of work duties of team members.
- 2) Stages of Implementation

This activity will be carried out in stages:

- a. Making and duplicating "real-time and interactive visualization with PowerBI software" modules
- b. Coordinating the schedule and material plan with class teachers and the headmaster.
- c. Statistical literacy education effectively and efficiently.
- d. Training on the use of PowerBI software.
- 3) Evaluation Stages

This evaluation stage is carried out by the activity implementer. The following are some criteria as indicators of goal achievement:

- a. Implementation of the entire activity plan (100% implemented).
- b. Diligence in participating in the material delivery activities as seen from the percentage of participants who attended (at least 100% attendance).
- c. Participants' curiosity and understanding in participating in the activities (100% of participants participated in the activities until the end).
- d. Evaluation questionnaires and suggestions from participants in the form of statements of satisfaction from participants.

4. Results and Discussion

This community service activity (PkM), conducted in the form of visualization training using Power BI, aims to enhance the insight and competence of SMK Negeri 4 Kota Bengkulu students. The focus is on statistical data processing, particularly in data visualization. The PkM activities began with a preparation stage, during this time, information about the challenges SMK Negeri 4 Bengkulu City students faced in data visualization was collected. This involved direct discussions and interviews. The outcome of this stage was a Power BI training module compiled by the PkM team.



Figure 1: Power BI Training Module

The next stage is the implementation phase. This phase involved data analysis training using Power BI, conducted at SMK Negeri 4 Bengkulu City on August 20, 2024. During this phase, the material compiled in the training module was delivered to the students.



Figure 2: Power BI Training Mentoring Process

In general, the training activities were successful. Participants demonstrated high enthusiasm throughout the session, as evidenced by their positive interaction with the PkM team. The students actively engaged by asking a wide range of questions, both related to data and the visualization charts. Additionally, participants showed great enthusiasm in answering questions posed by the PkM team.



Figure 3: Students of SMKN 4 Bengkulu City working on a data visualization project

Figure 4 shows some examples of visualization work created by students using Power BI. It is evident that the students were able to effectively follow the series of training activities conducted by the PkM team. These samples demonstrate their ability to apply the skills and knowledge gained during the training to create meaningful and accurate visualizations.



Figure 4: Student work at SMKN 4 Bengkulu City

After the training activities were completed, the PkM team conducted a brief quiz related to the training material. Students who answered correctly were rewarded with door prizes as a form of appreciation for their active participation and seriousness throughout the training.



Figure 5: Q&A Session

Based on Figure 6, it can be observed that the students had never received Power BI training before. According to the questionnaire results, 89% of the students found the training valuable for improving their competence, while 84% of the students reported that they understood and had mastered the use of graphs in Power BI.



Figure 6: Evaluation of training implementation

5. Conclusions

This activity has provided valuable insights to participants regarding data, data visualization, and Power BI software. The students participated with enthusiasm and diligence throughout the training. However, it is recommended that this activity be extended to other classes within the school to ensure that more students gain additional expertise beyond their core subjects. This would help broaden their skill set and improve their data analysis and visualization competence.

6. Acknowledgments

We would like to thank all those who have helped provide valuable suggestions for improving the quality of this paper. Our gratitude to the Faculty of Mathematics and Natural Sciences for community service funding "Pengabdian Berbasis Iptek FMIPA Tahun 2024" No. 3086/UN30.12/HK/2024.

References

- Aldo, A. (2020). Making Autocad learning modules in software application subjects and building interior design at SMK Negeri 3 Yogyakarta. *Journal of Civil Engineering Education*, 2(1), 37-51.
- Hutagalung, J., Sonata, F., Kusnasari, S., Kustini, R., & Hutahayan, A. R. (2023). Animation training using Macromedia Flash 8 application to improve students' visualization skills. *JCES (Journal of Character Education Society)*, 6(3), 575-586.

Law No. 20 of 2003 concerning the National Education System.

Mawartika, Y. E. B., Amalia, V., Yanto, R., & Kuswandhie, R. (2023). Workshop on UKK preparation and introduction to job prospects for RPL graduates at SMKN Rawas Ulu. *Journal of Pustaka Mitra (Access Center for Studies Serving the Community)*, 3(3), 126-130.

Microsoft Corporation. (2022). Microsoft Power BI. Retrieved March 22, 2024, from https://powerbi.microsoft.com/

Munzner, T. (2014). Visualization analysis and design. CRC Press.

Republic of Indonesia. (1945). Constitution article 31 paragraph 1. Jakarta.

Shneiderman, B., & Plaisant, C. (2010). Designing the user interface: Strategies for effective human-computer interaction (5th ed.). Addison-Wesley.

Tufte, E. R. (1983). The visual display of quantitative information. Graphics Press.