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Application of Mathematical Concepts in the Health Sector through Data Analysis Learning Using Microsoft Excel for Senior High School Students at SMA Pasundan Majalaya

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Abstract

This community service program aims to strengthen students' numeracy, digital literacy, and health literacy through the application of mathematical concepts in health data analysis using Microsoft Excel. The activity was conducted at SMA Pasundan Majalaya and involved senior high school students as participants. The program was designed in the form of socialization and hands-on training sessions, including basic arithmetic operations, simple data analysis, logical functions, data visualization techniques, and simple regression analysis applied to health-related data. The implementation employed a participatory learning approach to support students' understanding and engagement in the learning process. The results indicate an improvement in students' ability to process, analyze, and interpret health data using Microsoft Excel. This program demonstrates that contextual and application-based mathematics learning can effectively enhance students' analytical skills and awareness of the role of mathematics in real-world health contexts.

Keywords: mathematics education, health data analysis, Microsoft exel, community service.

1. Introduction

Twenty-first century education requires students to possess critical, analytical, and information literacy skills to cope with the rapid development of information, particularly in the field of health. Health literacy refers to an individual's ability to access, understand, evaluate, and effectively use health-related information in order to make appropriate decisions regarding personal and environmental health (Batubara et al., 2020). A high level of health literacy has been shown to be positively correlated with awareness of healthy lifestyles and more accurate decision-making in disease prevention (Roiefah et al., 2021). However, several studies in Indonesia indicate that health literacy among adolescents remains relatively low, particularly in their ability to interpret health data and evaluate the validity of health information obtained from the internet or social media (Ditiaharman et al., 2022). This condition highlights the urgent need to strengthen adolescents' health literacy as an integral part of formal education at the secondary school level.

On the other hand, mathematics particularly statistics and data analysis plays a crucial role as a foundational tool for understanding and processing health data in a scientific manner (Martha & Martha, 2024). Through statistics, students can learn how to collect, process, interpret, and present health-related data such as body mass index (BMI), physical activity patterns, dietary intake, and disease trends within the community (Woltenberg, 2021). Nevertheless,

mathematics instruction in schools is often abstract and insufficiently connected to real-life contexts, leading students to perceive mathematics as difficult and irrelevant to everyday life (Suryani & Fauziah, 2023). To address this issue, a more contextual and application-oriented learning approach is required.

One potential medium for bridging mathematical theory with real-world contexts is Microsoft Excel. Excel provides a wide range of data analysis and visualization features, including mean, median, standard deviation functions, pivot tables, and charts, which enable users to process health data in a relatively simple yet informative manner (Tumalum et al., 2024). Empirical studies have demonstrated that the use of Microsoft Excel in mathematics learning can enhance conceptual understanding, increase students' learning motivation, and improve their ability to connect theoretical knowledge with practical applications through data-based activities (Muslim & Mayasari, 2025). Furthermore, research conducted at the elementary school level has shown that Excel training leads to a significant increase in students' pre-test and post-test scores in data processing and mathematical analysis skills (Suryati et al., 2021).

These conditions are highly relevant to the situation at SMA Pasundan Majalaya, where students have learned basic statistical concepts but are not yet accustomed to applying them to real health-related data. Their Excel skills remain limited to basic functions and have not been directed toward health data analysis or result interpretation. Therefore, an intervention in the form of training and applied learning is needed to enable students to work with simple health data using Excel and to critically interpret the outcomes of their analyses.

Through a community service program entitled "Application of Mathematical Concepts in the Health Sector through Data Analysis Learning Using Microsoft Excel for Senior High School Students at SMA Pasundan Majalaya," a structured training program on data analysis and visualization using Microsoft Excel will be conducted for partner senior high school students. The activity is designed as a full-day interactive workshop. It is expected that students will not only acquire technical data analysis skills but also enhance their numeracy, digital, and health literacy in an integrated manner. Through this project-based and contextual learning approach, students are expected to perceive mathematics not merely as abstract formulas, but as a meaningful tool for understanding and maintaining personal and environmental health. This program emphasizes interdisciplinary, real-world problem-based learning.

2. Materials and Methods

2.1. Materials

The object of the activity was senior high school students of SMA Pasundan Majalaya who participated in the training program. The activity was conducted at SMA Pasundan Majalaya as the partner institution. The data and information used in this program included simple health-related data examples, learning modules, and instructional materials related to mathematical concepts and data analysis. The tools used to support data analysis and learning activities included laptop or desktop computers, Microsoft Excel software, presentation media, and training modules prepared by the facilitators.

2.2. Methods

The methods applied in this program were carried out through several sequential stages arranged systematically. The first stage was a socialization session aimed at introducing Department of Mathematics within the Faculty of Mathematics and Natural Sciences and providing students with an understanding of the role of mathematics in solving real-world problems, particularly in the health sector.

The second stage was the training implementation, which was divided into several sessions. The initial training session focused on an introduction to Microsoft Excel and basic arithmetic operations. This was followed by a session on simple data analysis using logical functions, including IF, SUMIF, COUNTIF, and AVERAGEIF. The next session covered data visualization techniques using bar charts, line charts, and pie charts tailored to data characteristics. The final session addressed simple regression analysis to analyze relationships between variables in health data.

The learning process emphasized participatory and practice-oriented activities, where participants were guided step by step through demonstrations, hands-on exercises, and discussions. This sequential method was intended to ensure that participants were able to understand and apply mathematical concepts and data analysis techniques systematically using Microsoft Excel.

3. Results and Discussion

The implementation of this community service program began with an opening session attended by all participants from SMA Pasundan Majalaya, representatives of the teaching staff, and the entire organizing committee (including lecturers and students) from Universitas Kebangsaan Republik Indonesia (UKRI), Department of Midwifery of Poltekkes Kemenkes Bandung, and Department of Data Science of Universitas Indraprasta PGRI.

Figure 1: Opening Session

This community service activity consisted of two main sessions, namely a socialization session and a training session. The socialization session was attended by 95 students. Of this number, 20 students proceeded to the Microsoft Excel training session. However, three participants withdrew due to urgent matters, resulting in a total of 17 students who completed the entire training series, from the pre-test and training session to the post-test. The remaining students who did not participate in the training session were facilitated with basic health check-ups for health data collection, followed by a seminar on adolescent health.

Figure 2: Seminar on Adolescent Health

The initial stage of the activity was conducted through a socialization session aimed at introducing the Department of Mathematics within the Faculty of Mathematics and Natural Sciences at Universitas Kebangsaan Republik Indonesia (UKRI). This activity focused on providing students with a comprehensive understanding of the essential role of mathematics as a fundamental basis for solving various real-world problems. The socialization session was designed in a participatory manner by actively involving students through discussions, question-and-answer sessions, and feedback, in order to deepen their understanding of the application of mathematical concepts across various contexts.

Figure 3: Socialization Department of Mathematics, FMIPA UKRI

Following the socialization activity, the program continued with the delivery of material in the first session entitled "Introduction to Microsoft Excel and Basic Arithmetic Operations." The training began with an explanation of the interface and basic functions of Microsoft Excel. Subsequently, participants were guided to understand and apply basic arithmetic operations, including addition, subtraction, multiplication, and division, which serve as the foundation for mathematical computation processes. The material in this session was delivered by Indah Mauludina Hasanah, a student of Mathematics Department.

Figure 4: Training on the Introduction to Microsoft Excel and Basic Arithmetic

The subsequent stage of the activity consisted of the delivery of material in the second session, which addressed the topic of Simple Data Analysis and Logical Functions. This session emphasized data processing through the use of logical functions in Microsoft Excel. Participants were provided with both conceptual understanding and hands-on practice in applying the IF, SUMIF, COUNTIF, and AVERAGEIF functions to perform condition-based data analysis, both in mathematical case studies and in various other practical applications. The material in this session was delivered by Ms. Nenden Siti Nurkholipah, S.Si., M.Mat., a lecturer in the of Mathematics Department..

Figure 5: Training on Simple Data Analysis and Logical Functions

The subsequent activity continued with the delivery of material on Data Visualization Techniques, which also served as the closing session of the training series. In this session, participants learned various types of charts, including bar charts, line charts, and pie charts, along with the principles for their use according to the characteristics of the data. This module aimed to equip participants with the skills to present data in an effective, informative, and communicative manner. The material in this session was delivered by Ms. Rizki Apriva Hidayana, S.Mat., M.Mat., a lecturer and the Head of Mathematics Department..

Figure 6: Data Visualization and Communication Techniques

The final material in the training series addressed Regression Analysis as a method for processing health data. In this session, participants were introduced to the basic concepts of regression analysis and its application in analyzing relationships among variables in health data. The discussion focused on the use of simple regression analysis to identify patterns, trends, and cause-and-effect relationships within the data, so that it can be used as a basis for data-driven decision-making. Through this material, participants were expected to understand and apply regression analysis in a simple manner for the processing and interpretation of health data. The material in this session was delivered by Ms. Dr. Wulan Anggraeni, M.Si., a lecturer and the Head of the Data Science Department of Universitas Indraprasta PGRI.

Figure 7: Training on Regression Analysis as a Method for Processing Health Data

The entire series of training activities was officially concluded with a documentation session in the form of a group photo involving the presenters, the organizing committee, and the participants as the closing of the activity.

Figure 8: Event Closing Session

4. Conclussion

The community service program on the application of mathematical concepts in health data analysis using Microsoft Excel was successfully implemented at SMA Pasundan Majalaya. The training activities enabled students to understand and apply basic mathematical operations, logical functions, data visualization techniques, and simple regression analysis in the context of health data. The results of the training activities indicate an improvement in students' analytical skills and their ability to interpret data meaningfully.

This program shows that integrating mathematics learning with real-world health applications and digital tools such as Microsoft Excel can enhance students' learning motivation and data literacy. Therefore, similar programs are recommended to be implemented on a wider scale as an alternative approach to contextual mathematics learning, particularly to support students' readiness in facing data-driven challenges in everyday life.

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