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STUDENT WELL-BEING IN THE VARK-BASED PjBL MODEL FOR BIOLOGY LEARNING

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ABSTRAK: This study aims to analyze the effect of the Project-Based Learning (PjBL) model, adapted to the VARK learning styles, on student well-being in biology learning, particularly in the context of digestive system material. The research used a quantitative quasi-experimental design with control and experimental groups. Results indicated that the average Student Well-Being score for the control group was 48.3%, while for the experimental group, it reached 51.7%. These findings highlight that implementing the VARK-based PjBL model can improve student well-being and contribute to better learning outcomes by accommodating diverse learning styles and reducing learning-related anxiety. Furthermore, the model promotes collaborative learning and meaningful engagement, leading to a more supportive and enjoyable educational experience. The study recommends the adoption of innovative teaching methods that prioritize student well-being and engagement to create a more effective and enjoyable learning environment.
Keywords: *student well-being, project-based learning, VARK learning styles.*

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INTRODUCTION

Biology learning, particularly on the topic of the digestive system, often encounters significant challenges due to the high complexity of the material. Understanding the interactions between various organs and their functions within the digestive system requires a deep level of comprehension, which students frequently struggle to achieve. These difficulties hinder their ability to construct new knowledge and negatively impact their academic performance. Inadequate understanding of the digestive system can have long-lasting effects, as it is a foundational topic in biology. As Radiusman (2020) and Azizah (2021) observed, students often fail to connect new information with their prior knowledge, resulting in fragmented understanding. This fragmentation can impede their ability to grasp more complex concepts in later stages of their education. Furthermore, Buyung (2022) and Rinjani (2022) emphasized the importance of prior knowledge in supporting meaningful learning, suggesting that gaps in students' foundational understanding can exacerbate difficulties in mastering this topic.

The abstract nature of digestive system concepts, such as the functions of enzymes, organ interactions, and the complex processes involved in nutrient absorption, further complicates the learning process. Students often find it

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challenging to visualize and contextualize these concepts, which reduces their ability to engage with the material. Traditional, teacher-centered instructional methods, which often emphasize memorization over understanding, can lead to passive learning and a decline in student interest. As a result, many students experience low motivation and heightened anxiety, which can negatively affect both their academic performance and overall well-being (Solihah, 2017). Addressing these challenges is crucial because understanding the digestive system serves as a foundation for learning other biological concepts. Fostering deeper comprehension and engagement in this topic can improve students' learning outcomes while nurturing their confidence and curiosity in science. Consequently, there is a growing need for innovative, student-centered teaching methods that enhance both academic success and emotional well-being.

An effective solution to these challenges lies in the implementation of the Project-Based Learning (PjBL) model. Unlike conventional teaching methods, PjBL engages students in authentic, meaningful projects that connect theoretical knowledge with real-world applications (Habibah, 2024). This hands-on approach promotes active learning, reduces anxiety associated with traditional learning methods, and makes the learning process more enjoyable and relevant to students. Additionally, tailoring project activities to students' individual learning preferences can enhance the effectiveness of PjBL.

To understand students' diverse learning preferences, the VARK (Visual, Aural, Read/Write, Kinesthetic) learning styles framework offers valuable insights into how different students process information (Rohmah, 2024). When educators align their teaching strategies with students' preferred learning styles, they increase the likelihood of students grasping complex concepts more effectively. For instance, visual learners may benefit from diagrams and videos, while auditory learners excel in discussions and lectures. Kinesthetic learners thrive in hands-on activities, such as building models or conducting experiments, which are integral to the PjBL approach.

Research indicates that aligning teaching methods with learning preferences can significantly improve both comprehension and student well-being during the learning process. Williams et al. (2017) highlighted that learning models like PjBL, which incorporate VARK principles, provide a personalized and engaging learning experience. This tailored approach not only enhances academic success but also nurtures students' emotional well-being, fostering a more supportive and enjoyable learning environment. Previous studies have shown the effectiveness of Project-Based Learning (PjBL) in addressing the challenges faced by students in understanding complex topics. According to Habibah (2024), PjBL provides an engaging and interactive framework that encourages students to apply their knowledge to real-world problems. This hands-on approach fosters critical thinking, collaboration, and problem-solving skills, which are essential for mastering complex biological concepts like the digestive system.

Furthermore, several studies have examined the integration of VARK learning styles with PjBL to enhance student engagement and comprehension. Rohmah (2024) argued that when students' learning preferences are considered, the PjBL model becomes more effective in facilitating knowledge retention and

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improving learning outcomes. By addressing individual learning styles, the PjBL model offers personalized learning experiences that make it easier for students to understand and apply complex concepts. In particular, VARK-based PjBL has been found to reduce the cognitive load on students, helping them engage with the material in ways that suit their preferred learning style. This approach not only improves academic performance but also reduces anxiety and stress, contributing to better overall well-being (Fredrickson, 2001).

While previous studies have examined the effectiveness of PjBL and VARK learning styles independently, there is limited research that integrates both approaches. This study aims to bridge this gap by combining the PjBL model with the VARK learning styles framework. The objective is to explore how this integrated approach can improve students' understanding of the digestive system while simultaneously promoting their well-being. By addressing both academic outcomes and emotional well-being, the study seeks to provide innovative pedagogical strategies that can create a more supportive and effective learning environment

METHOD

The research method used in this study is quantitative, with a quasi-experimental design using a static pretest-posttest control group design. In this design, a pretest is used to measure the initial condition of student well-being before the intervention. After the intervention, which involves the PjBL model integrated with VARK learning styles, students are given a posttest to compare their well-being before and after the intervention.

The student well-being questionnaire used in this study is adopted from the Well-being Process Questionnaire (WPQ) by Williams et al. (2017). The WPQ consists of 44 items with three main indicators: ICRSLE, Social Support (ISEL), and Cognitive Problems, using a Likert scale. The researchers chose this questionnaire because it is structured and detailed, covering aspects of well-being and statements related to cognitive processes during learning. The questionnaire includes six aspects: (1) stressors (ICRSLE items); (2) social support (ISEL items); (3) positive attitudes (optimism, self-esteem, self-efficacy); (4) negative coping (blaming self, wishful thinking); (5) positive coping (problem-solving, seeking social support); (6) conscientiousness (single question).

RESULT AND DISCUSSION

The science learning process at Junior High School prior to the research was still conventional, where the method used tended to be teacher-centered. Students received information passively through lectures and readings without much involvement in interaction or in-depth exploration. In an effort to enhance the learning experience, this research implemented the PjBL model while considering the VARK learning styles. Each student was grouped based on their learning style using the VARK questionnaire (version 8.01). Based on the questionnaire results, the data showed that students with VARK learning styles were divided as follows. The detailed breakdown of this data can be seen in Figure 1:

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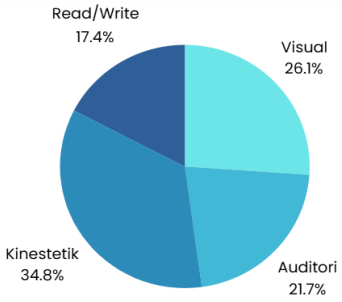

Figure 1. Student Learning Style Data

Based on the following data, in the experimental class, it was found that students with VARK learning styles were divided as follows: 26.09% of students were categorized as visual learners, 21.74% as auditory learners, 17.39% as read/write learners, and 34.78% as kinesthetic learners. This data shows the diversity of learning styles in the class and serves as a foundation for designing learning activities that meet the individual needs of each student. Each group based on learning styles was further divided into subgroups to enhance collaboration and understanding. For the visual group, students were divided into teams to create posters and 3D models. The auditory group was divided into two teams: one group created podcasts, and the other made videos explaining the digestive system. Meanwhile, the read/write group compiled a handbook in small teams focused on the theme of healthy living, and the kinesthetic group conducted experiments and role-played the roles of digestive organs. This division not only encouraged teamwork but also allowed students to delve deeper into the material comprehensively.

In the control class, project-based learning was implemented using a conventional approach that did not consider the diversity of students' VARK learning styles. In this context, all students were directed to create one type of project: a 3D model representing the digestive system process. All students followed the same instructions without role assignments based on their learning styles. This resulted in a lack of variation in the learning process, where students who preferred visual, auditory, read/write, or kinesthetic methods could not fully participate in the most effective way for them. This method showed that although students succeeded in creating a 3D model, they missed the opportunity to explore and understand the material more deeply through various methods that suited their learning styles. Thus, this conventional project-based learning approach could limit students' potential in mastering concepts and developing collaborative skills.

The well-being dimensions used in this study include three aspects: the dimension of students' lives (ICRSLE version), support for issues (ISLE), and cognitive problems. These three aspects consist of statements that are either favorable or unfavorable. Subjects were asked to respond to the statements by choosing one of the available answers, which had a graded value. The data presentation was determined by the total score and the average score, which were then used to classify the data into three categories: high, medium, and low. The group statistics of well-being for the control and experimental groups can be seen in Table 1.

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Table 1. Group Statistics of Well-Being for Control and Experimental Classes

Kelas	N	Mean	Std. Deviation	Std. Error Mean
Kelas Kontrol	46	191.37	25.261	3.724
Kelas Eksperimen	46	204.63	28.845	4.253

Based on the "Group Statistics" output table above, it is known that the total number of Well-Being data for the Control and Experimental groups is 46 students. The average score (Mean) for the control group is 191.137, while for the experimental group, it is 204.63. Statistically, it can be concluded that there is a difference in the average well-being scores between the control and experimental groups. To further determine whether this difference is statistically significant, we will now interpret the following "Independent Sample Test' output can be seen in Tabel 2.

Table 2. Independent Sample t-Test for Well-Being

Assumption	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	1.23	0.27	-2.346	90	0.021	-13.261
Equal variances not assumed			-2.346	88.461	0.021	-13.261

The results of the independent sample t-test show an analysis of the average comparison of the Well-Being variable between the two groups. The Levene's test for equality of variances produced an F value of 1.230 with a significance value (Sig.) of 0.270, indicating that the variances between the groups are homogeneous (since $p > 0.05$). The obtained t-value is -2.346 with 90 degrees of freedom (df) and a significance value (2-tailed) of 0.021. This suggests that there is a significant difference between the average Well-Being of the two groups, as the p-value is less than 0.05. The mean difference between the two groups is -13.261, with a standard error of difference of 5.653. The 95% confidence interval for this mean difference ranges from -24.492 to -2.030, indicating that the difference is statistically significant and shows that the first group has a lower level of Well-Being compared to the second group. These results indicate that there is a significant difference in the Well-Being variable between the two groups tested. For a clearer view of the results, please refer to the following graph, hich can be seen in Figure 2.

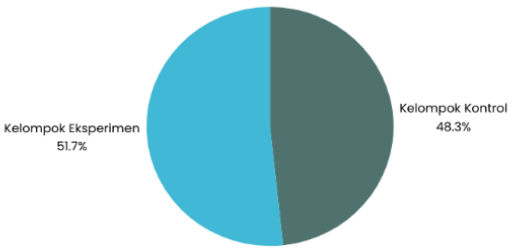

Figure 2. Overview of Student Well-Being

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Based on the calculation results for the Student Well-being measurement criteria, the data shows that the average Student Well-being score for the control group is 191.137, or 48.3%, while for the experimental group it is 204.63, or 51.7%. This data indicates that more than half of the average Student Well-being scores are higher in the experimental class, which used the PjBL model based on VARK learning styles. According to Noble (2008), higher well-being is associated with improved academic outcomes. With a high level of well-being, student performance in school improves. This is particularly evident from student statements that they feel comfortable when at school. Despite having many tasks to complete, they approach them with a positive attitude. Good relationships with peers also contribute to these positive feelings. Finally, the various activities students engage in are considered enjoyable experiences.

This condition highlights the importance of a learning approach that considers students' needs and learning styles. The project-based learning model (PjBL) implemented in the experimental class not only increased student engagement but also created an environment that supported positive social interaction. Students felt more motivated and inspired to learn when they could collaborate with peers on relevant and engaging projects. Additionally, the emphasis on VARK learning styles allowed students to explore learning methods that aligned with their preferences. When students feel that the teaching methods align with their learning styles, anxiety levels decrease, and their confidence increases, which can contribute to their overall well-being.

Thus, the improvement in Student Well-being is reflected in the development of students' character and social skills. Positive experiences at school can shape their attitude toward education as a whole, making them more prepared to face future challenges. This can present a challenge for educators in the future to continue developing innovative teaching methods that consider students' well-being, so that positive learning outcomes can be maintained and improved.

SIMPULAN

Based on the data analysis and discussion presented, it can be concluded that the average Student Well-being score for the control group was 48.3%, while for the experimental group, it was 51.7%. This indicates that biology learning often faces high complexity challenges, which can hinder students' understanding. A lack of conceptual understanding not only affects mastery of the material but also impacts students' well-being during the learning process. To address these challenges, it is crucial for educators to implement effective teaching models, such as Project-Based Learning (PjBL) tailored to students' learning styles using the VARK approach. The research findings show that the experimental group, which implemented the VARK-based PjBL model, achieved a higher average Student Well-being score compared to the control group. Improved well-being contributes to students' academic performance, fosters a positive learning environment, and enhances engagement and motivation. Thus, the development of innovative teaching methods that focus on student well-being is essential for achieving better learning outcomes and creating enjoyable learning experiences.

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RECOMMENDATION

This study provides valuable insights into the integration of the Project-Based Learning (PjBL) model with VARK learning styles to enhance student well-being and academic performance in biology learning. However, several suggestions are proposed for future research and practical applications to extend the findings of this study. Future research could explore additional learning styles or frameworks beyond VARK to accommodate a broader range of student preferences and behaviors, ensuring a more inclusive approach to addressing individual learning needs. Conducting longitudinal studies to measure the long-term effects of the VARK-based PjBL model on student well-being and academic achievement would provide deeper insights into its sustainability and effectiveness over time. Expanding the application of the model to broader subject areas or interdisciplinary projects would also help evaluate its versatility in various educational contexts. Additionally, emphasizing professional development for educators is crucial to ensure effective implementation of PjBL and VARK strategies. Designing training programs that equip teachers with the skills to manage diverse learning styles and project-based activities could significantly enhance their application. Addressing challenges such as limited resources, time constraints, and varying levels of teacher preparedness is also essential for improving the practical implementation of the VARK-based PjBL model.

Moreover, incorporating student feedback into the learning process could provide valuable data for refining the model, while future studies could analyze the role of student engagement and satisfaction in achieving optimal results. Lastly, focusing on diverse student populations, including those with special needs, would help determine how the model can be adapted to meet the needs of all learners effectively. In conclusion, while this study demonstrates the potential of integrating the PjBL model with VARK learning styles to enhance student well-being, addressing its limitations and challenges through future research will optimize the model for broader educational applications.

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