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The Effect of Using Local Wisdom-Based Science Modules, Learning Readiness, And Intrinsic Motivation on Understanding Science Materials in Elementary Schools

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Abstract

This study aims to examine the direct and indirect effects of using science modules based on local wisdom, Intrinsic Motivation, and Learning Readiness on Understanding Science Materials in Elementary Schools. The local wisdom approach in the science module is expected to increase the relevance and connection of the material to students' daily lives while learning readiness and intrinsic motivation are considered important factors in the learning process. This study used a quantitative method. This study was conducted at State Elementary School 3 Pancor in class IV consisting of 3 classes as the population. the sample in this study was class IV B which was taken randomly using the lottery method. Data were collected through questionnaires that measured students' perceptions of science modules, learning readiness levels, and intrinsic motivation while understanding science materials using tests. The results of the analysis showed that the use of local wisdom-based science modules had a significant positive effect on the understanding of science materials. Learning readiness and intrinsic motivation also showed a significant positive effect on science comprehension. In addition, intrinsic motivation was found to mediate the effect of using local wisdom-based science modules and learning readiness on understanding science materials.

Keywords: *Local Wisdom, Based Science Modules, Learning Readiness, Intrinsic Motivation*

INTRODUCTION

Science learning at the elementary level is not just about learning facts about the universe, but more than that, it forms the foundation of children's critical and scientific analytical thinking. (Duschl & Osborne, 2022). Therefore, science learning should be designed in such a way that it can explore students' initial understanding. A fun and interactive approach is essential here. Simple experiments, demonstrations, and creative projects can build a strong foundation for future understanding of more complex science concepts. It is important to remember that the main goal of science learning in elementary school is to build solid conceptual understanding. (Hasnunidah et al., 2019; Kara & Kingir, 2022). Learning science is often perceived as a daunting challenge by many students. This phenomenon has become a concern for most researchers to conduct studies conducted by (Radoff et al., 2019) concluded that learning science is scary but if managed well it will be fun. Other research conducted by (Gilbert et al., 2020) revealed that science is not scary if teaching uses the right media and methods with the characteristics of children. The selection of media, methods, and classroom management is important in building students' learning motivation.

High motivation allows students to be more diligent in exploring complex concepts in learning. (Widyastuti, 2024). Intrinsic motivation refers to the internal drive to do something because of personal interest or satisfaction, not because of external pressure or reward (Bagis, F., Adawiyah, W. R., et al., 2024). The utilization of learning media will have an impact on improving the quality of learning and student motivation to learn (Lau et al., 2014; Kusuma et al., 2022). (Kusuma et al., 2022; Lau et al., 2014).

The utilization of learning media will have an impact on improving the quality of learning and student motivation to learn (Lau et al., 2014; Kusuma et al., 2022). (Kusuma et al., 2022; Lau et al., 2014). They will be more likely to ask questions, seek additional information, and conduct their experiments to deepen their

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understanding. Science demands critical and analytical thinking skills (Foster & Lemus, 2015; Jamil et al., 2024). Motivation encourages students to solve problems, analyze data, and make evidence-based conclusions (Azizah et al., 2021; Khairani et al., 2020). (Khairani et al., 2020; Nur'Azizah et al., 2021). This is not only useful in science lessons but also in everyday life. By increasing motivation, students can overcome challenges in understanding complex concepts, improve academic performance, and develop critical thinking skills. Teachers, parents, and the learning environment all play an important role in motivating students. With the right strategies, learning science can be an enjoyable and fulfilling experience, opening doors for future discoveries and innovations.

Effective science learning is not just about understanding scientific concepts (Daniah, 2020; Dewi & Ibrahim, 2019; Yosef Firman Narut & Kanisius Supardi, 2019)but also about appreciating and recognizing the local knowledge that already exists in local cultures and traditions (Kholidah et al., 2023; Zahro & Maulida, 2023). (Kholidah et al., 2023; Zahro & Maulida, 2023). The incorporation of local wisdom into science learning provides a valuable opportunity to connect two often separate worlds: modern science and traditional knowledge. Every culture has a unique knowledge of the universe that has evolved over centuries. This includes an understanding of medicinal plants, sustainable farming methods, knowledge of the local environment, and more. Recognizing this wisdom as a valuable source of knowledge is the first step in integrating it into science learning. Integrating science learning content with daily life can influence the development of conceptual understanding and make students more science literate. (Chu et al., 2008; Kortam et al., 2018; Sulaiman et al., 2024). It is important to bridge the gap between science concepts learned in the classroom and the real world out there. Connecting science learning with practical applications in everyday life can help children see the relevance and importance of science in their lives. Most science learning in primary education does not involve students' prior knowledge gained from their environment and culture.

The use of local wisdom-based science modules is one approach that is expected to increase student engagement and understanding. This module not only teaches science concepts but also integrates local culture and knowledge that is relevant to students. The incorporation of local wisdom into science learning also helps students build a deeper connection with their environment. As they learn about traditional farming practices or the use of local medicinal plants, they also learn to appreciate the biodiversity around them and the importance of protecting the environment for future generations. When students learn about local wisdom and relate it to science concepts, they are also invited to question and analyze both types of knowledge. This encourages critical thinking about the relationship between culture and science and builds a deeper appreciation of the complexity of human knowledge. Thus, this study aims to investigate the direct and indirect consequences of using local wisdom-based science modules, Intrinsic Motivation, and Learning Readiness on Understanding Science Materials in Elementary Schools.

METHOD

This study uses quantitative methods. In general, quantitative analysis is an investigative process that uses numbers and statistical analysis to test the relationship between variables. (Creswell, 2009). What is very important to do in quantitative research is the data collection stage to see whether the variables are related to one another (Qomari, 1009). This research was conducted at State Elementary School 3 Pancor which consists of 3 classes. Sample selection was done randomly via a lottery approach combined with a basic random sampling strategy. The sample in this study were students of class IV B which amounted to 22 students.

This study includes 4 factors, specifically student perceptions of local wisdom-based science modules as independent variables (X_1), student learning readiness as an independent variable (X_2), intrinsic motivation as a moderator or mediating variable (M), and understanding of science material as the dependent variable (Y).

Tests and questionnaires are the tools used. Surveys are used to measure how students perceive local wisdom-based science modules, student learning readiness, and intrinsic motivation, while tests were used to measure understanding of science materials. The questionnaire used consisted of 15 declarative items with four possible outcomes Agree, Disagree, Strongly Disagree, and Agree on a closed Likert scale.

Moreover, student perceptions of local wisdom-based science modules, student learning readiness, and intrinsic motivation are classified into 5 categories of variable tendencies: high, sufficient, low, extremely low, high, and very low. The classification of trends with the provisions in the table that follows:

Tabel 1. Variable tendency categories

Score interval	Category
X ≥ Mi + 1.8 (SDI)	Very high
Mi + 0.6 (SDI) ≤ X < Mi + 1.8 (SDI)	High
Mi - 0.6 (SDI) ≤ X < Mi + 0.6 (SDI)	Medium
Mi - 1.8 (SDI) ≤ X < Mi - 0.6 (SDI)	Low
X < (Mi - 1.8 (SDI))	Very low

Source: (Azwar, 2015)

The variable tendency is determined after the two highest and lowest scores are known, then the ideal average (Mi) and ideal Standard Deviation (SDi) are obtained as follows:

Number of statements = 15

Highest score = 15 x 4 = 60

Lowest score = 15 x 1 = 15

Ideal Mean (Mi) = 1/2 (highest score + lowest score)

$$= \frac{60+15}{2}$$

$$= \frac{75}{2} = 37{,}5$$

Ideal SD (SDi) = 1/6 (highest score - lowest score)

$$= \frac{60-15}{6}$$

$$= \frac{45}{6} = 7{,}5$$

Based on these calculations, the value intervals in each trend category are as follows:

Table 2. Category Tendency Distribution of perceived module use, learning readiness, and Intrinsic motivation

Score interval	Category
X ≥ 51	Very high
42 ≤ X < 51	High
33 ≤ X < 42	Medium
24 ≤ X < 33	Low
X < 24	Very low

The test instrument used was a description question consisting of 10 items with the greatest score of 100 and the lowest of 0. Data were analyzed with statistics using the Amos 24.0 program. The first stage of testing is classical assumption testing, specifically, the normalcy test and multicollinearity test. If the assumptions are met, hypothesis testing is then using path analysis in the process. The following is the path diagram:

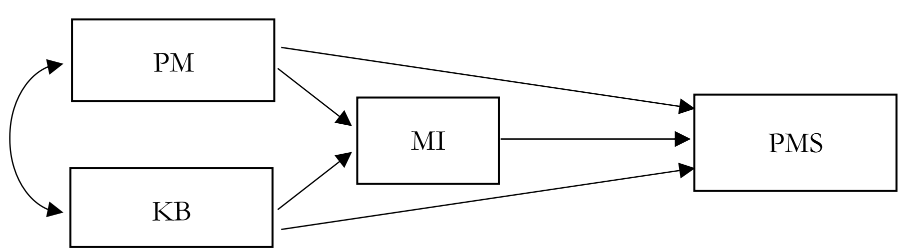

Figure 1. Path Diagram

Description:

PM: Module Perception

KB: Study Habits

MI: Intrinsic Motivation

PMS: Understanding Science Materials

RESULTS AND DISCUSSION

The study's findings provide an answer to the previously posed problem formulation. The table that follows displays findings from the examination of descriptive data:

Table 3. Description of research data

Apek	Lowest score	Highest score	Average	Standard Deviation
Module Perception	28	45	37,68	5,56
Study Habits	27	45	36,86	5,29
Intrinsic Motivation	28	44	35,45	4,74
Understanding of Science Materials	53	83	70,36	9,04

Table 3 above demonstrates that the mean score of pupils' perceptions of local wisdom-based science modules is 37.86; the average score of learning habits is 36.86 and the average score of students' intrinsic motivation is 35.45 all three are in the medium category. The average understanding of the Sasin material is above the KKM, which is 70.36. Students' perceptions of local wisdom-based science modules have an average rating of 37.86, which is in the moderate category. This demonstrates that learners have a fairly positive view of the module adapted to local wisdom. The local wisdom-based science module may provide a relevant and familiar context for students, thus helping them connect the subject matter with the surrounding environment and culture. However, there is still room for improvement to make students' perceptions even more positive, perhaps through the addition of more interactive content or improving the quality of existing materials. The average score of students' learning habits was 36.86, also within the modest range. This demonstrates that students' study habits are already quite good, but there are still some aspects that can be improved. Good study habits are very important to support students' academic success. Students' intrinsic motivation shows an average score of 35.45, which is in the moderate category. Intrinsic motivation is the drive that comes from within students to learn and understand the material because they feel interested, not because of external pressures such as grades or awards. The average student's understanding of the material is 70.36, which is above the Minimum Completion Criteria (KKM). This is a positive indicator that although students' perceptions, study habits, and intrinsic motivation are in the moderate category, they are still able to achieve a good understanding of the material taught.

Thus although perceptions of local wisdom-based science modules, learning habits, and students' intrinsic motivation are in the moderate category, the learning outcomes show that students can achieve a good understanding of the material. To achieve more optimal results, it is important to continuously improve the quality of the learning module, develop more effective study habits, and foster students' intrinsic motivation. A more personalized and innovative approach to teaching could be the key to achieving this.

Analysis of Prerequisite Test Results

Checking to determine if the prerequisites for the additional test have been met is the first step that needs to be done before starting any hypothesis testing. The data must meet two prerequisites: it must not exist in multicollinearity and it must be regularly distributed.

Table 4. ***Assessment of normality (Group number 1)***

Variable	min	max	skew	c.r.	kurtosis	c.r.
PM	27,000	45,000	-,208	-,398	-,982	-,940
KB	28,000	45,000	-,175	-,335	-1,451	-1,389
MI	28,000	44,000	,311	,596	-1,008	-,965
PMS	53,000	83,000	-,427	-,818	-,793	-,759
Multivariate					-1,194	-,404

From the Amos output As can be seen above, when seen multivariately, c,r have values below 2.58. and the value of skewness in all variables is less than 2.58 when viewed univariately. A skewness value close to zero indicates that the distribution of the data is normal. In this context, all variables analyzed showed skewness values less than 2.58. This means that the univariate distribution of each variable (perception of local wisdom-based science modules, learning habits, intrinsic motivation, and understanding of science materials) is close to normal distribution. A c.r (critical ratio) worth that is lower than 2.58 indicates that the data fulfill the assumption of multivariate normalcy. In this case, the c.r value for the combination of variables perception of local wisdom-based science modules, learning habits, intrinsic motivation, and understanding of science materials is also less than 2.58, indicating that the data is multivariate normally distributed.

Table 5. ***Sample Correlations (Group number 1)***

	PM	KB	MI	PMS
PM	1,000			
KB	-,052	1,000		
MI	,177	-,237	1,000	
PMS	,344	,118	-,092	1,000

Condition number = 2,378

From Table 4. above, It is evident that each variable's correlation coefficient, namely student perceptions of local wisdom-based science modules; learning habits; intrinsic motivation, and understanding of science material is less than 0.9, it can be said that there is no multicollinearity. The absence of multicollinearity increases the reliability of the model and provides more confidence in evaluating the result of each independent variable on the dependent variable.

Hypothesis Test Results

Path analysis using the Amos 24.00 application is used for hypothesis testing once the traditional presumptions or necessary examinations are satisfied. Check the quality of the analysis of the path model first, before deciphering the results from Amos. The path analysis image that was produced looks like this.

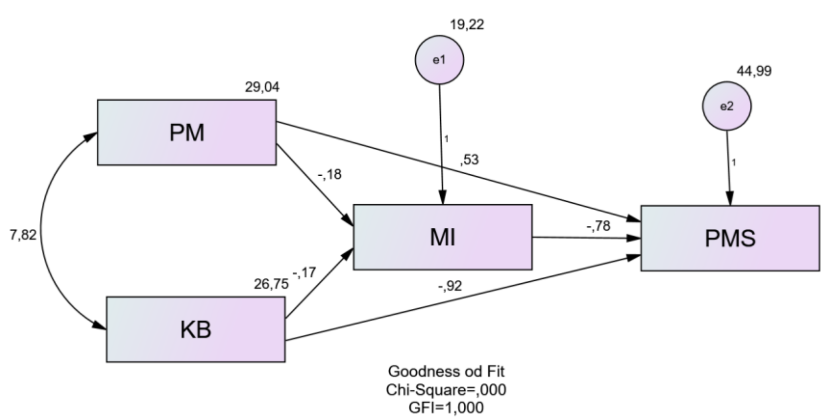

Figure 2. Path Analysis Output

Based on the output presented, the Chi-Square value of 0.000 and GFI of 1.000 indicate proves the path diagram model's suitability according to the Goodness of Fit Statistics standards. The Chi-Square value of 0.000 indicates that the distinction between the covariance matrix that was observed and that estimated by the model is insignificant, which is usually an indication of good model fit, although care needs to be taken with this interpretation because the Chi-Square can be sensitive to sample size. The GFI value of 1.000 shows that the observed data fits the model pretty well. Thus, In summary, the suggested model of a path diagram satisfies the fit quality data requirements, indicating that the model overall fits the observed data. This provides more confidence in the interpretation of the results and the use of the model for prediction or inference purposes.

Table 6. ***Regression Weights: (Group number 1 - Default model)***

			Estimate	S.E.	C.R.	P	Label
MI	<---	PM	-,181	,185	-,977	,029	par_1
MI	<---	KB	-,171	,193	-,887	,035	par_2
PMS	<---	MI	-,776	,334	-2,325	,020	par_3
PMS	<---	PM	,526	,289	1,818	,039	par_4
PMS	<---	KB	-,924	,300	-3,076	,002	par_5

It is evident from the output above that 1) The p-value = 0.029 <0.05, which implies that students' perception of science based on local wisdom modules has a significant direct effect regarding pupils' intrinsic motivation. This suggests that when pupils feel positively about of the module used, their intrinsic motivation to learn also increases. Modules that are relevant to local wisdom are likely to provide a more meaningful context for students, thus increasing their interest and desire to understand the material more deeply; 2) The p-value = 0.035 < 0.05 means that students' learning habits have a direct and significant effect on their intrinsic motivation. This indicates that students who have good study habits tend to have higher intrinsic motivation. Structured and effective study habits can make students feel more confident and motivated in their gaining knowledge process; 3) The p-value = 0.020 < 0.05 implies that students' Internal motivation exerts a substantial and direct influence on their understanding of science materials; 4) The p-value = 0.039 < 0.05 means that students' perception of local wisdom-based science modules has a direct and significant effect on their understanding of science materials. Modules designed with local wisdom in mind may help students relate science concepts to their daily experiences, thus facilitating understanding; and 5) The p-value = 0.002 < 0.05 means that students' learning habits possess a direct and noteworthy impact on their understanding of science materials. Students who have good study habits tend to have a better understanding of the material taught. Good study habits help students to organize information better and master important concepts in science. Several Research has been done to see the impact of modules according to local wisdom on students' motivation and academic performance outcomes with the conclusion that modules based on local wisdom have a favorable and noteworthy impact on the motivation of students and their academic performance. (Almuharomah et al., 2019; Riza et al., 2020; Widayanti et al., 2022).

Table 7. ***Correlations: (Group number 1 - Default model)***

	Estimate
PM <--> KB	,181

Based on the output in the table above, the estimation value is 0.181 ≤ 0.2, in other words, there is a mutual the relationship between learning habits of students and students perceptions of wisdom-based science modules with a percentage above 18. From this analysis, it can be concluded that perceptions of locally sourced wisdom science modules and learning habits have a significant influence on students' intrinsic motivation. Intrinsic motivation, in turn, has a significant effect on the understanding of science materials. In addition, both perceptions of local wisdom-based science modules and learning habits also have a direct effect on the understanding of science materials. This suggests the importance of using locally relevant modules and developing good study habits to improve students' intrinsic motivation and science comprehension.

Table 8. ***Standardized Regression Weights: (Group number 1 - Default model)***

			Estimate
MI	<---	PM	,210
MI	<---	KB	,191
PMS	<---	MI	,407

			Estimate
PMS	<---	PM	,321
PMS	<---	KB	,541

The output table above illustrates how much of an impact each variable has, specifically 1) The result of perception of local knowledge-based science education model on intrinsic motivation is 21%; 2) the effect of learning habits on internal motivation is 19%; 3) the effect of intrinsic motivation on understanding science material is 40%; 4) the effect of understanding science material on the perception If the science education paradigm based on local wisdom is 32%; and 5) learning habits on the perception If the science learning paradigm based on local wisdom is 54%. The relationship between perception, learning habits, intrinsic motivation, and understanding of science material shows that these factors influence each other in the context of science education based on local wisdom. Positive perceptions of the learning model can increase intrinsic motivation, which in turn increases understanding of the science material. Good study habits also play an important role in influencing students' motivation and perception. Therefore, educators need to pay attention to and optimize all these factors to achieve maximum learning outcomes.

Table 9. ***Standardized Indirect Effects (Group number 1 - Default model)***

	KB	PM	MI
MI	,000	,000	,000
PMS	,078	,086	,000

The output above shows that the perception of applying locally grounded wisdom-based science modules through intrinsic motivation shows an indirect effect of 0.086 on understanding science material and the habit of learning through intrinsic motivation has indirect results from 0.078 on understanding science material. To see whether it is significant or not, it is displayed in Table 10 below.

Table 10. ***Standardized Indirect Effects - Two-Tailed Significance (BC) (Group number 1 - Default model)***

	KB	PM	MI
MI	...	...	...
PMS	,044	,024	...

The table above shows that the perception of applying locally grounded wisdom-based science modules through intrinsic motivation shows an indirect effect of 0.044 less significant than the 0.05 limit, the results show that intrinsic motivation can act as a mediator the perception of applying locally grounded wisdom-based science modules on understanding science material. However, the resultant indirect impact of learning habits through intrinsic motivation on understanding science given that the material is 0.024 less significant than the 0.05 threshold, it may be said that intrinsic motivation can act as a mediator. learning habits on understanding science material. This study examines the indirect effect of perceptions of applying locally grounded wisdom-based science modules and learning habits on understanding science materials through intrinsic motivation. The results of the analysis show that intrinsic motivation acts as a mediator in both relationships. Intrinsic motivation can mediate the relationship between variables. (Glynn et al., 2009; Ryan & Deci, 2000).

The incorporation of indigenous knowledge in science modules helps link scientific concepts with students' daily lives, making learning more meaningful and relevant. (Alifia Nabila et al., 2023; Haka et al., 2020; Setiawan et al., 2017). Curriculums that adopt this approach can be more engaging for students as they see the direct relevance between what they are learning and their environment. Curriculums that encourage the use of local wisdom-based projects can increase student engagement. For example, projects involving the study of local ecosystems, and the use of natural materials or traditional technologies can enrich students' learning experience. Teachers can adopt interactive teaching methods that utilize local wisdom-based modules, such as group discussions, hands-on experiments, and out-of-class learning. These methods can increase student interest and participation.

This study was conducted with various limitations in the process, because it was conducted on a limited sample, both in terms of the number of students and geographical coverage. This may affect the generalizability of the results to a wider population. In addition, the instruments used to measure learning readiness, intrinsic motivation, and understanding of science materials may have limitations in terms of reliability and validity and the measurement of students' perceptions of local wisdom-based science modules and intrinsic motivation is often subjective and may be influenced by other external factors.

CONCLUSION

The investigation's findings and analysis of this study provide a conclusion that Both direct and indirect influences exist on the relationship of all variables. It is determined based on the findings of the investigation and conversation that 1) Students' perception of local wisdom-based science modules has a significant direct influence on students' intrinsic motivation; 2) The study practices of students have a direct and substantial impact on their intrinsic motivation; 3) Students' intrinsic motivation has a direct and significant effect on the understanding of science materials; 4) Students' perceptions of local wisdom-based science modules have a direct and significant effect on their understanding of science materials; 5) Students' study habits have a direct and significant effect on understanding science materials; 6) Perceptions of applying locally grounded wisdom-based science modules through intrinsic motivation show an indirect effect, this means that intrinsic motivation can mediate perceptions of applying locally grounded wisdom-based science modules on understanding science materials; and 7) there is an indirect effect of study habits through intrinsic motivation on understanding science materials, which means that intrinsic motivation can mediate study habits on understanding science materials.

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