
Evaluating the Influence of Students' Sense of Community and Self-Efficacy on Higher-Order Thinking Skills in Blended Learning Environments

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ABSTRACT

This study aimed to determine the effect of students' sense of community and self-efficacy on their higher-order thinking skills (HOTS). The samples were students from class X MIPA 1 and X MIPA 2, totaling 66 science students at SMAN 1 Terbanggi Besar. The research design used was a post-test only design. Based on research using a single linear regression test, there was no effect of sense of community on HOTS, with a correlation value of 0.184 and a coefficient of determination of 0.034, indicating that sense of community contributed only 3.4% to HOTS. Similarly, there was no effect of self-efficacy on HOTS, with a correlation value of 0.148 and a coefficient of determination of 0.022, indicating that self-efficacy contributed only 2.2% to HOTS. A multiple regression test also showed no effect of sense of community and self-efficacy on HOTS, with a correlation value of 0.173 and a coefficient of determination of 0.030, indicating that sense of community and self-efficacy together contributed only 3.0% to HOTS. It can be concluded that there is no significant effect of sense of community and self-efficacy on HOTS when using WhatsApp-assisted blended learning.

Keywords : blended learning, high school students, regression test, WhatsApp application

I. Introduction

The improvement of resource quality in a rapidly developing social environment within the global community is greatly influenced by education. The 21st century is marked by significant changes in various fields through rapidly advancing technology and information, known as the Fourth Industrial Revolution. According to Rohida (2018), the Fourth Industrial Revolution can impact and enhance human resource competence and quality with digital technology to create smart factories, one of which is through the Internet of Things (IoT). Additionally, the Fourth Industrial Revolution affects education and plays an important role in adapting to the era's developments and science and technology.

The teaching of Physics is not only aimed at mastering physics knowledge but also at enabling students to acquire scientific process skills and higher-order thinking skills (HOTS) to solve problems and apply them in daily life. This aligns with the characteristics of 21st-century skills, as identified by the Partnership for 21st Century Skills, which states that 21st-century learners must develop competitive skills focused on HOTS development (Basuki *et al.*, 2014). Physics education must continually evolve with a high-quality education system to ensure the learning objectives are well-achieved and continually improved.

HOTS need to be enhanced in learning with the expectation that students will actively participate, making physics learning more engaging and enjoyable. However, according to a study by PISA in 2016, which routinely evaluates students' learning achievements in Science and Mathematics, Indonesia ranked 62nd out of 70 countries. The study indicated that Indonesian students' weakness lies in their inability to handle problems requiring critical thinking, creativity, and higher-order thinking skills (OECD, 2016). This position highlights ongoing issues within the education system in Indonesia.

Society 5.0, according to Wuriyanto (2019), is a social change encompassing individual levels, interactions, community organizations, society, culture, civilization, and global aspects. The focus of researchers in the Society 5.0 era is on the sense of community and self-efficacy. According to Zimmerman (2000), self-efficacy influence the motivation to improve students' learning methods and their learning outcomes. The low self-confidence level among students is closely related to the classroom learning process. If left unchecked, students may become less inclined to think independently and rely more on others during the learning process (Novtiar and Aripin, 2017). High SE, high ambition, and determination towards goals see difficult tasks as challenges to be solved. Self-efficacy is crucial for students in solving problems in Mathematics and Science (Subaidi, 2016).

McMillan and Chavis (1986) describe the sense of community as a feeling of belonging and being part of a community, feeling valued within it, and caring for each other, leading to a belief in togetherness within the community. Many researchers have studied sense of community because it is believed to influence work enthusiasm and mutual dependence among members in both work and

learning. For instance, Kloos *et al.* (2012) found that sense of community is a shared perception among members based on interdependent information among individuals.

Several studies on sense of community by Luo, Zhang, and Qi (2017) indicate that sense of community has a positive influence, while Yilmaz (2016) found that sense of community among students positively but not significantly affects learning outcomes. However, it is not yet known whether sense of community influences HOTS. There is considerable research on self-efficacy, but there is still debate about its impact on learning outcomes. Based on these issues, there is a need to determine whether there is a relationship or influence of sense of community and self-efficacy on HOTS.

II. Method

This research is a correlational study using two types of variables: independent and dependent variables. The independent variables in this study are sense of community (X_1) and self-efficacy (X_2). The dependent variable is higher-order thinking skills (HOTS) (Y). Two classes were used as samples, both of which received the same treatment. Both classes engaged in blended learning activities using WhatsApp, followed by a post-test on HOTS and the completion of sense of community and self-efficacy scales at the end of the learning sessions. This was done to determine if there was a positive and significant influence of sense of community and self-efficacy on the students' higher-order thinking skills. To clearly illustrate the relationship between the two variables, a conceptual framework is presented in Figure 1.

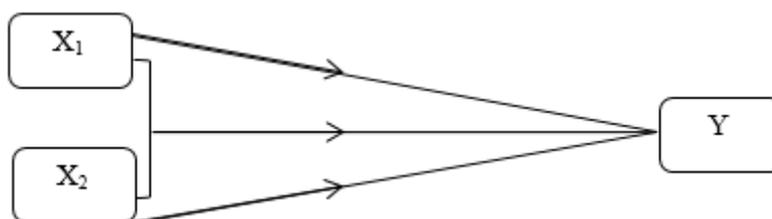


Figure 1. Research paradigm

The subjects of this research were selected using cluster random sampling, where both classes participated in learning activities using WhatsApp-assisted

instructional media. The samples were from Grade 10 Science 1 and Grade 10 Science 2, totaling 66 students from SMAN 1 Terbanggi Besar, Lampung. The influence of sense of community and self-efficacy on the students' HOTS was assessed through the self-perceived Sense of community and SE scales and evaluated based on the students' learning outcomes.

Data were collected using scales for sense of community and self-efficacy, as well as a post-test on HOTS covering Newton's Law of Gravity. The HOTS test consisted of 15 multiple-choice questions with reasoning. The HOTS cognitive level questions (C4-C6) were based on Kamila, Suana, and Maharta (2018) with a reliability coefficient ($\alpha = 0.89$). The sense of community scale included 21 items adapted from Roberts (1995), Rovai (2002), and Rovai, Wighting, and Lucking (2004) with a reliability coefficient ($\alpha = 0.870$). The self-efficacy scale consisted of 21 items adapted from Lin and Tsai (2015) with a reliability coefficient ($\alpha = 0.903$).

The data analysis techniques employed in this study encompassed prerequisite tests and hypothesis testing procedures to ensure the robustness and validity of the findings. Initially, prerequisite tests were conducted to verify the assumptions underlying the statistical methods used. These included the normality test, specifically the Kolmogorov-Smirnov test, linearity test, and multicollinearity test. The linearity test was carried out to assess the linear relationship between the independent and dependent variables, using scatter plots and the Pearson correlation coefficient. The multicollinearity test was conducted using the Variance Inflation Factor (VIF) and Tolerance values, with VIF values greater than 10 indicating significant multicollinearity.

Hypothesis testing was undertaken using several statistical methods. The product moment correlation test, specifically Pearson's correlation, was used to measure the strength and direction of the linear relationship between pairs of continuous variables. The coefficient of determination (R-squared) test quantified the proportion of variance in the dependent variable explained by the independent variables. Simple linear regression analysis was used to explore the relationship between a single independent variable and a dependent variable, evaluating the regression coefficient, t-statistics, and p-values. Multiple linear regression analysis examined the influence of multiple independent variables on a single dependent

variable, assessing the combined effect of all predictors while controlling for the influence of each variable.

Employing a suite of comprehensive data analysis techniques allowed for an exceptionally rigorous examination of the research hypotheses, thereby yielding results that are both robust and reliable. The methodological rigor was evident at each stage of the analytical process, commencing with the prerequisite testing. This initial phase ensured that all assumptions underlying the subsequent analyses were thoroughly verified and met, thus laying a solid foundation for the integrity of the findings. Following this foundational step, an array of statistical procedures was meticulously applied, with each technique selected to illuminate different facets of the data. Descriptive statistics provided a detailed overview of the data's central tendencies and dispersion, while inferential statistics facilitated the drawing of generalizable conclusions from the sample to the broader population. The use of correlation analysis elucidated the strength and direction of relationships among the variables, thereby offering preliminary insights into potential associations.

The culmination of these efforts was the application of regression analysis, a sophisticated statistical tool that enabled a deeper exploration of the predictive relationships among the studied variables. By modeling the dependencies and controlling for various confounding factors, regression analysis provided nuanced insights into the dynamics at play. This comprehensive approach ensured not only the robustness of the results but also their reliability and validity. In sum, each methodological step, from the initial prerequisite testing through to the detailed regression analysis, was integral to achieving a thorough and multifaceted understanding of the intricate relationships among the studied variables. This systematic and layered approach underscores the strength of the findings and their contribution to the existing body of knowledge.

III. Result and Discussion

Based on the research conducted at SMAN 1 Terbanggi Besar with a sample size of 66 students, the frequency distribution data for the sense of community variable is presented as shown in Figure 2.

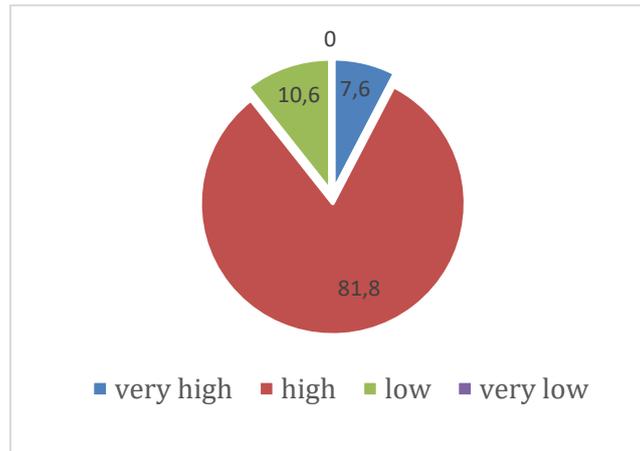


Figure 2. Distribution data of sense of community

As shown in Figure 2, the largest percentage of students' sense of community is 81.8%, which falls into the high category, with a range of scores from 66 to 85 out of the total number of students. Additionally, 10.6% of students have a sense of community in the low category, with lower score ranges. Only 7.6% of students exhibit a very high sense of community, with scores near the maximum. There are no students reporting a very low sense of community. This data indicates that the majority of students at SMAN 1 Terbanggi Besar have a strong sense of community, although a small portion feel less connected to the school community.

The distribution data for the self-efficacy variable is presented in Figure 3. As shown in Figure 3, the largest percentage of students' self-efficacy is 76%, which falls into the high category, with a range of scores from 66 to 85 out of the total number of students. Additionally, 14% of students have self-efficacy in the very high category, indicating scores near the maximum. A smaller portion, 10% of students, exhibit self-efficacy in the low category, with lower score ranges. There are no students reporting very low self-efficacy. This data indicates that the majority of students at SMAN 1 Terbanggi Besar have high self-efficacy, with some demonstrating exceptionally high levels, while a small portion feel less confident in their self-efficacy.

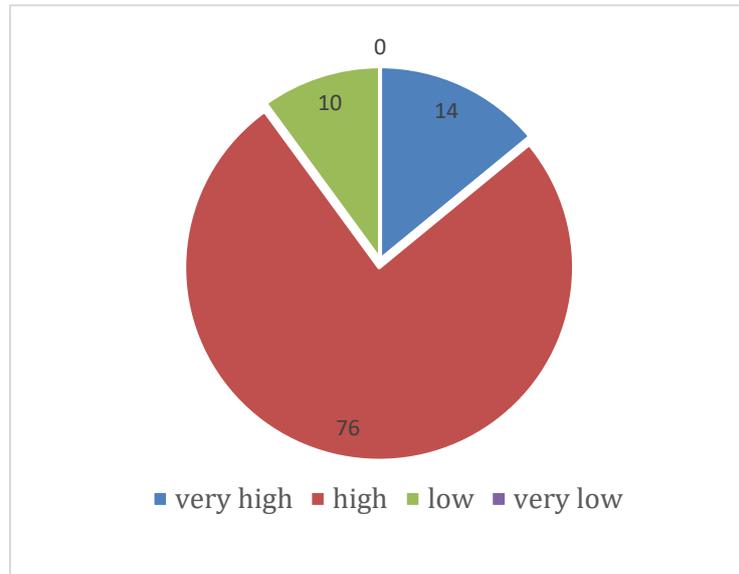


Figure 3. Distribution data of self-efficacy

The distribution data for the HOTS variable is presented in Figure 4. As shown in Figure 4, the largest percentage of students' HOTS is 34.9%, which falls into the very low category, with a range of scores from 40 to 55 out of the total number of students. Additionally, 31.8% of students fall into the very high category, indicating a significant portion with strong HOTS. Meanwhile, 13.6% of students exhibit HOTS in the high category, 12.1% in the low category, and 7.6% in the moderate category. This data indicates a diverse range of HOTS levels among the students at SMAN 1 Terbanggi Besar, with a notable portion performing at both the very high and very low ends of the spectrum.

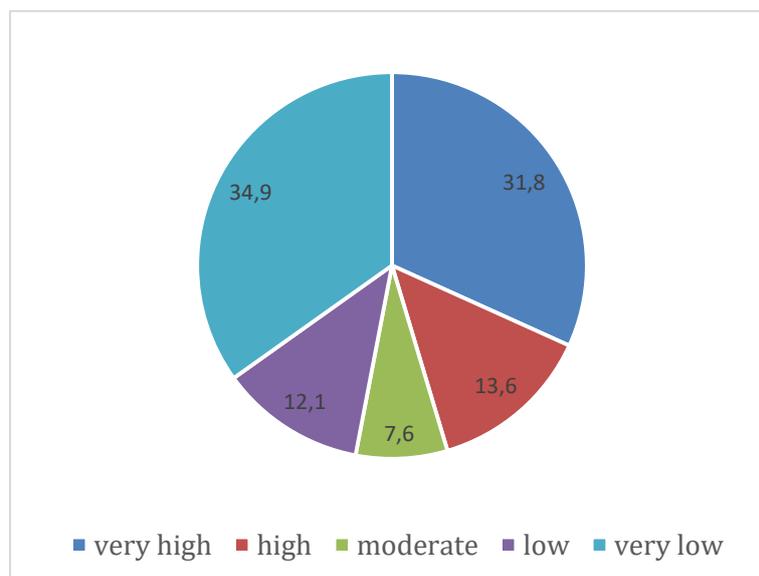


Figure 4. Distribution data of HOTS

Before testing the hypotheses to determine the influence of sense of community and self-efficacy on HOTS, prerequisite tests were conducted, including the normality test, linearity test, and multicollinearity test. The normality test results for sense of community, self-efficacy, and HOTS, based on the Asymp. Sig values from the instruments for Sense of community, self-efficacy, and HOTS, showed values greater than 0.05, indicating that the data is normally distributed. The linearity test results for Sense of community, self-efficacy, and HOTS showed that the Asymp. Sig values for HOTS*self-efficacy and HOTS*sense of community were greater than 0.05, indicating that the data is not linear. The multicollinearity test results for Sense of community, self-efficacy, and HOTS showed that if the tolerance value is greater than 0.10 and the VIF is less than 10.0, there is no multicollinearity in the data. The following table presents the results of the normality test, linearity test, and multicollinearity test.

Table 1. Result of normality test

Variable	Asymp. Sig	Interpretation
Unstandardized residual	0.338	Normal

Table 2. Results of linearity test

Variable	F	Asymp. Sig	Interpretation
HOTS*self-efficacy	0.987	0.505	Nonlinear
HOTS*sense of community	0.822	0.687	Nonlinear

Table 3. Results of multicollinearity test

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	36.799	19.109		1.926	.059		
Sense of community	.308	.344	.133	.896	.374	.694	1.441
Self-efficacy	.140	.283	.073	.493	.624	.694	1.441

Based on the results of these tests, the multiple linear regression test can be conducted. The Simple Linear Regression Test was performed using SPSS 21.0 to determine whether there is an influence of sense of community and self-efficacy on HOTS. The results can be seen in Table 4. Points 1 and 2 present the results of the simple linear regression tests, while point 3 presents the results of the multiple linear regression test to examine the combined influence of sense of community and self-efficacy on HOTS.

Table 4. Results of Simple Linear Regression and Multiple Linear Regression

No	Variable	R	R ²	F	Asymp. Sig
1	HOTS*sense of community	0.156	0.024	1.593	.211 ^b
2	HOTS*self-efficacy	0.148	0.022	.434	.236 ^b
3	HOTS*sense of community, self-efficacy	0.173	0.030	.977	.382 ^b

The results of the study show that based on hypothesis testing, a correlation value of 0.156 and a significance value of 0.211 > 0.05 were obtained, indicating no influence between sense of community and students' HOTS. This means that the increase in students' HOTS is not influenced by their sense of community, with an R-squared coefficient of determination of 0.024, indicating that the contribution of the independent variable to the dependent variable is only 2.4%. This can be interpreted that the sense of community does not affect the increase in HOTS. The research hypothesis is not proven because the analysis results show no significant influence.

According to Luo, Zhang, and Qi (2017), in online learning, a sense of community positively contributes to the formation of students' sense of togetherness and insignificantly strengthens the sense of membership, thereby improving learning outcomes. Interview results with three students revealed that online group learning does not significantly affect them because the sense of togetherness is lacking, and only a few students complete the tasks. Additionally, using WhatsApp, students are still passive in expressing their ideas.

The research results indicate that hypothesis testing yielded a correlation value of 0.148 and a significance value of $0.236 > 0.05$, showing no positive influence between self-efficacy and students' HOTS. This means that the increase in students' HOTS is not influenced by their self-efficacy, with an R-squared coefficient of determination of 0.022, indicating that the independent variable's contribution to the dependent variable is only 2.2%. Thus, it can be interpreted that the sense of community does not affect HOTS, and the remaining 97.8% is influenced by other factors not studied by the researchers, such as personality, socio-cognitive factors, environmental factors, and individual conditions. The research hypothesis is not proven because the results show no significant relationship. The lack of influence of self-efficacy on HOTS may be due to difficulties in observing each student's self-efficacy in an online setting. Interviews with students revealed that they understand and comprehend better in face-to-face settings and feel hesitant when expressing their opinions or answering questions from the teacher during online classes, requiring help from their peers.

In line with the research by Yilmaz (2016), titled "Knowledge Sharing Behaviors in E-Learning Community: Exploring the Role of Academic Self-Efficacy and Sense of Community," it was revealed that the sense of community positively but insignificantly affects students' learning outcomes. This is seen through their connection with the community, perception of learning in the community, and social status. According to interview information, the lack of correlation between the sense of community and HOTS may be due to students' dislike of group learning in online classes, where only some group members complete the given tasks. This is also supported by Ahriana's (2016) research, which found no significant positive relationship between self-efficacy and the physics learning outcomes of Grade 11 science students.

Hypothesis testing on the three variables yielded a correlation value of 0.173 and a significance value of $0.382 > 0.05$, indicating no influence between sense of community, self-efficacy, and students' HOTS. This means that the increase in students' HOTS is not influenced by their sense of community and self-efficacy, with an R-squared coefficient of determination of 0.030, indicating that the independent variables' contribution to the dependent variable is 3.0%. Thus, it

can be interpreted that the sense of community and self-efficacy have a 3.0% influence on HOTS, with the remaining 97% influenced by other factors such as personality, socio-cognitive factors, environmental factors, and individual conditions. The results are consistent with other studies that examined the sense of community and self-efficacy, stating that there is no significant relationship between these factors and learning outcomes (Yilmaz, 2016). The low influence of sense of community and self-efficacy on students' HOTS might be due to the fact that these factors are affective domains, while HOTS is a cognitive domain. Assessing students' competencies in the affective domain involves evaluating attitudes and interests, which is qualitative, while assessing cognitive competencies involves learning outcomes, which is quantitative.

Researchers like Krathwohl, Bloom, and Masia (1964) classified affective assessment into five categories: receiving, responding, valuing, organizing, and characterizing. These classifications are managed by the right brain and acquired through imitation, whereas cognitive assessments, involving knowledge, logic, and language, are managed by the left brain and acquired through learning. This distinction highlights that affective assessment is qualitative and cannot be easily combined with cognitive assessment. This explains why students' HOTS is not influenced by their sense of community and self-efficacy, as these traits are managed by different brain functions and acquired differently. Students with good character may not necessarily have high HOTS, and vice versa.

Survey results indicate that students generally enjoy face-to-face and online learning using WhatsApp because it makes learning more varied, engaging, and less monotonous. The blended learning model using WhatsApp had never been applied to other subjects, making students highly interested during the lessons. Using WhatsApp for learning allows students to exchange information, discuss phenomena and questions provided by the teacher, and feel more comfortable and free because their classmates are peers they meet daily. During face-to-face sessions, students independently and collaboratively design experiments on Newton's Law of Gravity. Online discussions help students verify the information obtained during face-to-face learning by answering post-session questions, requiring them to be active both individually and in groups. The end-of-session

survey showed that students enjoyed using WhatsApp for learning because it was engaging.

The blended learning model using WhatsApp encourages students to be active in face-to-face and online classes, such as expressing opinions, asking questions, and discussing in WhatsApp groups. Students found WhatsApp helpful because it is economical; they can use chat packages even without an internet package. Additionally, WhatsApp is widely accessible, notifications are readily visible, and all students can access information within the online class.

However, interviews revealed some drawbacks of using WhatsApp for blended learning. Students were less focused due to other notifications besides online class chats. Responses could be copied from other groups, and students often struggled to understand instructions given only through text. Other challenges included a lack of cooperation within groups, as students couldn't monitor each other's work from a distance, leaving only responsible members to complete tasks. Overall, the study concludes that sense of community and self-efficacy do not significantly affect students' HOTS, either individually or collectively. The researcher has not yet analyzed whether other factors, such as personality, socio-cognitive factors, environmental factors, and individual conditions, influence students' HOTS.

IV. Closing

Based on the comprehensive analysis of the research results and the subsequent discussion, it can be conclusively determined that there is no significant influence of the sense of community on higher-order thinking skills (HOTS) in the context of physics learning facilitated by WhatsApp-assisted blended learning. Similarly, self-efficacy does not exhibit a notable impact on HOTS, nor does the combined influence of the sense of community and self-efficacy yield significant effects on these advanced cognitive skills. This study provides valuable insights into the dynamics of affective factors within educational settings, particularly within the framework of blended learning environments. The findings suggest that affective dimensions, such as a sense of community—defined as the feeling of belonging and connectedness among students—and self-efficacy, which

refers to an individual's belief in their capability to succeed in specific tasks, do not substantially contribute to the enhancement of students' higher-order thinking skills. These skills, which include critical thinking, problem-solving, and the ability to analyze and synthesize information, are predominantly cognitive in nature.

The implication of these results is significant for educational practitioners and researchers focusing on blended learning methodologies. It highlights the possibility that while affective factors are crucial for other aspects of learning and student engagement, they might not be sufficient on their own to drive improvements in higher-order cognitive skills. This finding underscores the necessity for educators to explore and integrate other pedagogical strategies and instructional designs that specifically target cognitive skill development. Furthermore, the study prompts a reevaluation of the roles that community and self-belief play in educational outcomes within digital and blended learning environments. It suggests that, although fostering a strong sense of community and enhancing self-efficacy are important for creating a supportive and motivating learning atmosphere, additional or alternative approaches may be required to effectively develop students' higher-order thinking skills.

In conclusion, this research contributes to the ongoing discourse on the interplay between affective and cognitive factors in education. It challenges the assumption that affective factors alone can significantly enhance cognitive outcomes and calls for a more nuanced understanding of the mechanisms that underpin the development of higher-order thinking skills in technologically mediated learning settings. The authors suggest that future researchers further explore the influence of the sense of community and self-efficacy on students' HOTS using the WhatsApp-assisted blended learning model. Additionally, it is recommended to consider the challenges and factors encountered during the research that may have affected the significance of the results. Future research should also examine other factors that might influence students' HOTS, such as personality, socio-cognitive factors, environmental factors, and individual conditions. By addressing and overcoming these challenges, future studies are

expected to provide deeper insights and more effective solutions for enhancing students' HOTS in various learning contexts.

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