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The Influence of the Quantum Learning Teaching Model on Learning Outcomes Moderated by Learning Motivation (Experimental Study at SMAN 1 Lohbener)

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ABSTRACT

The Quantum Learning Learning Model is a learning model that emphasizes the involvement of all aspects, interaction between teachers and students, thus creating a pleasant learning environment. The learning outcomes in class X at SMAN I Lohbener are quite good, but there are some students who still get low learning outcomes. Motivation to learn is al quite good, it's just that every child definitely has a different learning style, this is one of the things that fosters motiva to learn. The aim of this research is to analyze whether there are differences in learning outcomes and learning motivation between classes that we the quantum learning learning model (experimental class) and those that use the discovery learning method (control class). And to analyze whether learning motivation can strengthen or weaken learning outcomes. To find out learning outcomes, they will be tested with objective tests and to find out student motivation to learn, they will be given a questionnaire, and will be supported by documentation to find out the situatic SMAN 1 Lohbener). The results of the research show that there is a sificant difference in the learning outcomes in class And for learning motivation, there is also a significant difference between the posttest lear outcomes between the experimental class and the cool class, namely with a significant value of 0.000. Meanwhile, the Sobel test got a score of 0.716, which indicates that motivation does not moderate learning outcomes.

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INTRODUCTION

In the learning process, student learning outcomes serve as a measure of success in the field of education. Learning outcomes can be defined as the results achieved as a consequence of the activities carried out. These outcomes are closely linked to the learning activities. There are various levels of learning outcomes that students can attain. When student learning outcomes are good and optimal, it indicates that the learning objectives have been achieved. According to Bloom (in Kosilah & Septian, 2020, p. 1142). However, in reality, many students still achieve low learning outcomes, as can be reflected in the educational report data below.

Tabel 1. Education Report on Literacy and Numeracy for 2023

Indicator	Education Level	Year 2021		Year 2022	
		Presentase	Kategori	Presentase	Kategori
Students' Literacy Skills	SD/MI/ Sederajat	53,42%	Moderate	61,53%	Moderate
	SMP/MTs/ Sederajat	51,37%	Moderate	59,00%	Moderate
	SMA/SMK/ MA/Sederajat	53,85%	Moderate	49,26%	Moderate
Kemampuan Numerasi Murid	SD/MI/ Sederajat	30,66%	Poor	46,67%	Moderate
	SMP/MTs/ Sederajat	36,84%	Poor	40,63%	Moderate
	SMA/SMK/ MA/Sederajat	35,16%	Poor	41,14%	Moderate

Source: Processed from the 2023 Education Report Data (2)

Table 1 presents the 2023 education report, which is derived from data from 2021 and 2022. This education report includes several indicators that reflect the evaluation of the education system. One of these indicators presents student learning outcomes, particularly in literacy and numeracy. The literacy skills of high school students (or equivalent) in 2021 were at 53.85%, while in 2022, this figure dropped to 49.26%. This indicates that learning outcomes need to be improved, as the data shows unsatisfactory results in the literacy skills indicator.

Table 2. List of PAS 1 2023 Scores for Class X, SMAN 1 Lohbener

Class	Score Range				
	0-20	21-40	41-60	61-80	81-100
X-A	1	16	19		
X-B	1	9	25		
X-C	1	9	26		
X-D		12	22		
X-E	2	12	21		
X-F		11	25		
X-G		5	31		
X-H	1	15	19		

Source: Economics Teacher of Class X, SMAN 1 Lohbener

Table 2 shows the Semester Final Assessment (PAS) for 2023, which was conducted in December 2023. It can be seen from the table that the students have not yet reached the Minimum Completion Criteria (KKM), which is set at a score of 75. This score is based on the multiple-choice questions and does not include other components of the assessment. In fact, some students scored below 20. Given this, there is a need to further improve the learning outcomes of the economics students in Class X at SMAN 1 Lohbener

One of the learning models that uses a humanistic approach to enhance learning motivation, thereby improving learning outcomes, is the Quantum Learning model. The Quantum Learning model promotes the concept of enjoyable learning, which aligns with the humanistic approach. Several studies (3), (4), (5), and (6) mention that Quantum Learning is one of the models that falls under the humanistic approach.

Based on the description of the problems above, as well as supported by the findings from previous studies, empirical data, and the research gap, the researcher is interested in conducting a deeper investigation into the application of the Quantum Learning model. From several previous studies, none have examined the Quantum Learning model in relation to learning outcomes moderated by learning motivation. Therefore, the researcher will take the title of the study 'The Effect of the Quantum Learning Model on Learning Outcomes Moderated by Learning Motivation.

This study aims to determine the differences in learning outcomes between students who learn using the Quantum Learning model and those who learn using the conventional model, to identify the differences in student motivation between those who learn using the Quantum Learning model and those who learn using the conventional model, and to examine how learning motivation moderates the effect of the Quantum Learning model on learning outcomes.

LITERATURE REVIEW

HUMANISTIC LEARNING THEORY

Humanistic psychology emerged as a reaction against psychoanalysis, which had a pessimistic view of humans, and the rejection of behaviorism, which claimed that psychology should be based solely on what is observed in the laboratory. In contrast, humanistic psychology emphasizes two important aspects: the perspective of the therapist and that of the client (7).

Abraham Maslow is regarded as the father of humanistic psychology for his theory of the hierarchy of human needs, which emphasizes the high expectations for humans, as the inner potential within individuals can be optimized (8). The humanistic approach argues that learning is not only aimed at enhancing cognitive quality but also involves affective and psychomotor aspects. This approach stresses the importance of involving feelings or emotions, as well as effective communication, in the learning process. According to David Mills and Stanley Scher (in Rachmahana, 2008).

One of the humanistic figures, Arthur Combs, stated that learning occurs when it has meaning for the individual. Then, Abraham Maslow, with his theory of the hierarchy of needs, suggests that humans are essentially motivated to fulfill their life needs. Education is believed to encourage individuals to utilize their human potential, understand others, develop their capabilities, and lead towards self-actualization (10).

In (Islamic) education, humanistic views regard humans as creatures of God who possess certain innate qualities that should be developed to their fullest and optimal potential (11)."

hus, this humanistic learning theory is a type of learning that provides students with freedom in the learning process, creating an enjoyable learning experience, with the teacher acting as a supporter to help students develop their inherent potential. The Quantum Learning model promotes the concept of enjoyable learning, which aligns with the humanistic approach. It is hoped that students will make progress through this learning process.

QUANTUM LEARNING MODEL

A learning model is a consistent explanation of the learning process from start to finish, presented by an educator. This learning model serves as a framework for the application of approaches, methods, and teaching techniques (12). In Quantum Learning, the emphasis is on student participation in learning, by providing ample opportunities for students so that the learning process becomes enjoyable. Active student participation in learning can be realized through group work, especially in discussions and activities that involve discussing the content of the lesson (13).

Quantum Learning is a set of teaching methods and philosophies that have proven to be effective for all groups and can be applied to any subject. The term 'quantum' itself refers to an interaction that transforms energy into light. Quantum education transforms various types of interactions during the learning process. Quantum Learning originated from a learning method that provides suggestion (suggestology), which is the result of experiments by Dr. Georgi Lozanov and later popularized by Bobbi DePorter (14).

The Quantum Learning model emphasizes the involvement of all aspects, with interaction occurring between the teacher and students, creating a pleasant learning environment. A comfortable environment can significantly influence students' motivation to learn and affect the learning process. This learning model promotes freedom, ensuring there is no pressure on students. Environmental arrangement is a key characteristic of this model. The environment is organized in such a way as to provide a comfortable learning experience for students. While each component of Quantum Learning may not be immediately visible, the interaction between different aspects fosters effective learning. Enjoyable learning is the key, which Girivirya describes as 'a happy brain.' A happy brain leads to improved higher-order thinking skills and brain plasticity (12).

LEARNING OUTCOME

Learning Outcomes are the skills acquired by students after the learning process (Sudjana in Wicaksono & Iswan, 2019). According to Oemar Hamalik (in Ahmadiyanto, 2016), learning outcomes refer to changes in behavior that occur when someone learns, such as from not knowing to knowing, or from not understanding to understanding. According to Suprijono (in Henniwati, 2021), learning outcomes are comprehensive behavioral changes, not just changes in one aspect of human potential. According to Dimyati and Mudjiono, learning outcomes can be viewed from two perspectives: from the student's side and from the teacher's side. From the student's perspective, learning outcomes are reflected in their mental development compared to before the learning process. For the teacher, learning outcomes signify the achievement of learning objectives (18).

According to Bloom's Taxonomy theory, learning outcomes are divided into three domains: cognitive, affective, and psychomotor. Bloom's Taxonomy is a hierarchical structure that identifies thinking abilities from low to high levels. Benjamin Bloom and his colleagues published this taxonomy in 1956 (Dian, 2021).

The classification of Bloom's Taxonomy (in Ihwan Mahmudi et al., 2022, p. 3508) is as follows:

Cognitive Domain

The cognitive domain includes behaviors that emphasize intellectual aspects such as knowledge, understanding, and thinking skills. Bloom divided the cognitive domain into six categories: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Affective Domain

The affective domain includes behaviors that emphasize feelings and emotions, such as interest, attitudes, appreciation, and adaptation. The affective domain consists of the following categories: receiving, responding, valuing, organizing, and value characterization.

Psychomotor Domain

The psychomotor domain focuses on behaviors that emphasize motor skills. This domain is related to physical performance aspects. The psychomotor domain, according to Bloom's domain, includes the following: perception, readiness, guided response, mechanism, complex overt response, adaptation, and creation (organization).

LEARNING MOTIVATION

Motivation comes from the word "motive," which refers to the force within a person that drives them to do something. Motivation cannot be directly felt, but it can be understood as an action, a form of stimulation, or something that leads to a particular behavior. Motivation is what drives an individual or group to do or not do something (Rianto in Laka et al., 2020, p. 70).

Motivation is a psychological process that explains human behavior. It is the force that pushes someone to do something in order to achieve a goal (22). Motivation functions to encourage effort and to achieve the desired results.

Motivation strengthens students' desire to learn (23). Motivation is one of the internal factors that greatly influences student learning outcomes. The higher the motivation, the greater the learning success, which affects the improvement of students' academic achievements (24). Learning motivation can arise from intrinsic factors, such as the desire or wish to succeed, the ease of meeting the need to learn, or hope for a certain goal. External factors include rewards, a conducive learning environment, and engaging learning activities. The essence of learning motivation is both internal and external impulses for students to learn and change their behavior, generally accompanied by several indicators or supporting factors.

Motivation and learning are interconnected. According to the author, learning is about changing behavior in a more positive direction. Motivation, on the other hand, is an inner drive that moves someone to do something. Motivation occurs when there is a desire to do something in order to achieve a goal. According to experts, the goal here is something outside the person, which enables someone to work harder and focus more on their activities. Therefore, learning motivation is the internal and external drive for students to learn, resulting in behavior.

INDEPENDENDT CURRRICULUM

According to the Law of the Republic of Indonesia Number 20 of 2003**, the curriculum is a set of plans and arrangements regarding the objectives, content, learning materials, and methods used as guidelines for organizing learning activities to achieve specific educational goals.

According to data collected by the Curriculum and Learning Center (Puskurjar) under the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) in 2023, nearly 70% of educational institutions in Indonesia have implemented the "Kurikulum Merdeka" (Independent Curriculum). The Independent Curriculum is a curriculum with diverse intrcurricular learning that optimizes content, allowing students enough time to deepen concepts and strengthen skills. Teachers have the freedom to choose different teaching tools, allowing teaching to be adjusted according to students' learning needs and interests (25).

The Independent Curriculum, as a learning recovery option launched by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), has outlined policies for the development of the Independent Curriculum. As an alternative solution to address the learning crisis from 2022 to 2024 due to COVID-19, educational units acknowledge the option of adopting the Independent Curriculum policy. The Ministry of Education will review this curriculum in 2024 based on evaluations during the recovery period (26). The implementation of the Independent Curriculum is not simultaneous and large-scale. Kemendikbudristek has set policies allowing schools to implement the curriculum according to their level of readiness.

METHODOLOGY

This study will use a quasi-experimental research design with quantitative data analysis. The research is conducted at SMAN 1 Lohbener, located at Jl. Raya Utara Lohbener, Lohbener, Kec. Lohbener, Kab. Indramayu, West Java Province. The study will be conducted in February 2024.

In this study, the independent variable or the influencing factor is the Quantum Learning model. The dependent variable in this study is student learning outcomes. The moderating variable in this research is

student motivation. The relationship between the Quantum Learning model and learning outcomes will be stronger if student motivation is high, and weaker if student motivation is low. The population in this study consists of grade X students from eight classes at SMAN 1 Lohbener in the 2023/2024 academic year, totaling 283 students. The sample for the study on learning outcomes moderated by student motivation includes class X IPS 1 and X IPS 2 from SMAN 1 Lohbener in the 2023/2024 academic year.

The technique for selecting the experimental and control classes in this study was purposive sampling. In this research, the primary data was obtained from respondents, which are the students who serve as the research sample. The secondary data in this study consists of documents related to the research subject or other documents that can support the research process. The data collection methods used in this study are as follows: tests, questionnaires, observations, and documentation. To test the instruments, the researcher used the following steps: validity test, reliability test, discrimination power test, and difficulty level test. In this study, the instruments to be tested for validity are the learning outcome tests and the student motivation questionnaires. The validity test uses the Product Moment correlation formula as follows:

$$r_{xy} = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{\{n\sum X^2 - (\sum X)^2\}\{n\sum Y^2 - (\sum Y)^2\}}}\text{sam}$$

Reliability relates to the level of consistency and stability of the data or findings. The formula that can be used to measure reliability is the KR-20 formula (Kuder-Richardson Formula 20).

$$r_i = \frac{k}{(k-1)} = \left\{\frac{s_t^2 - \sum p_i q_i}{s_t^2}\right\}$$

The discrimination power of a question refers to the ability of a question to distinguish between high-achieving (high-ability) students and low-achieving (low-ability) students.

The formula is as follows:

$$D = \frac{BA - BB}{JA - JB} = PA - PB$$

The difficulty index is denoted by the symbol (P), which stands for "proportion." The formula is as follows:

$$P = \frac{B}{JS}$$

The data analysis technique used involves calculating the N-Gain.

$$\langle g \rangle = \%\langle G \rangle / \%\langle G \rangle_{max} = \frac{(\%\langle Sf \rangle - \%\langle Si \rangle)}{(100 - \%\langle Si \rangle)}$$

The prerequisite tests conducted are for calculating normality and homogeneity. To calculate homogeneity, the Hartley test or F-test will be used, while normality will be tested using the Kolmogorov-Smirnov formula. The calculations will be performed with the help of SPSS version 27.

The formula for homogeneity used is as follows (27).

$$F(max) = \frac{Variansi\ terbesar}{Variansi\ terkecil}$$

Next, normality is calculated using the Kolmogorov-Smirnov formula as follows (Nazir in Maryani, 2010):

$$D = | Fn(\bar{x}) - Fo(\bar{x}) |$$

The hypothesis test is conducted using SPSS version 27. In testing the hypothesis in this study, a Z-test is used when the data is homogeneous and normally distributed. If the data is not homogeneous or not normally distributed, the Mann-Whitney test is used. The following is the formula for the Z-test (27).

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{S\bar{X}1 - \bar{X}2}$$

RESULTS

After conducting the research, the data is collected, processed, and analyzed using the Statistical Product and Service Solutions (SPSS) version 27 software, and conclusions are drawn from the research findings. The research data includes the results of the objective tests on the topic of Market and Price Formation during the learning process, as well as the motivation questionnaire results for both the experimental and control classes. The following data were obtained:

Objective Test Results

1. Initial Ability Results *(Pretest)*

A pretest was conducted in both the control and experimental classes to assess the initial abilities of students in class X-B (control group) and X-H (experimental group) at SMAN 1 Lohbener. Below are the results of the pretest that was administered. Before any treatment (pretest), the total number of students was 72, consisting of 36 students in the experimental group (X-H) and 36 students in the control group (X-B). In the experimental group, the lowest score was 17, the highest score was 83, and the average score was 56. In the control group, the lowest score was 8, the highest score was 100, and the average score was 61.

2. Final Ability Results *(Posttest)*

A post-test was conducted to assess students' learning outcomes after the intervention, which involved applying the Quantum Learning model in the experimental class and the Discovery Learning model in the control class. Below are the students' learning outcomes after the intervention (post-test).

The data shows that in the experimental class, the lowest score was 33, the highest score was 100, and the average score was 80. In the control class, the lowest score was 33, the highest score was 100, and the average score was 77.

Results of the Learning Motivation Quesionnaire

The N-Gain scores obtained from 36 respondents showed an average score of 56.5%, with a minimum score of 0% and a maximum score of 100%. For the control class (Discovery Learning), the N-Gain scores from 36 respondents had an average score of 28.7%, with a minimum score of 0% and a maximum score of 100%.

Thus, the use of the Quantum Learning model in the experimental class resulted in an N-Gain score of 56.5%, which is categorized as moderately effective. Meanwhile, the control class, which used the Discovery Learning model, obtained an N-Gain score of 28.7%, categorized as ineffective.

It can be concluded that the use of the Quantum Learning method is moderately effective in improving learning outcomes in the subject of Economics, specifically on the topic of Market and Price Formation, for 10th-grade students at SMAN 1 Lohbener in the 2024 academic year. On the other hand, the use of the Discovery Learning method was ineffective in improving learning outcomes in the same subject and topic for 10th-grade students at SMAN 1 Lohbener in the 2024 academic year.

Prerequisite Test
Normality Test
Normality Test of Objective Test Data

Table of Normality Test for Objective Test Data

Class		Statistic	df	Sig	Description
Student Learning Outcome	Experimental Pretest	0,137	36	0,085	Normally Distributed
	Experimental Posttest	0,150	36	0,038	Not Normally Distributed
	Control Pretest	0,200	36	0,001	Not Normally Distributed
	Control Posttest	0,215	36	0,001	Not Normally Distributed

From the table, it can be seen that the pretest data for the experimental class is normally distributed because the significance value is greater than 0.05 (0.085 > 0.05). However, the posttest data for the experimental class has a significance value of 0.038 (0.038 < 0.05), indicating that the data is not normally distributed. For the control class, both the pretest and posttest data have a significance value of 0.001, which is less than 0.05 (0.001 < 0.05), indicating that the data is not normally distributed. Therefore, non-parametric statistical tests will be conducted.

Table 2. Normality Test of Student Motivation Questionnaire Data

Class		Statistic	df	Sig	Description
Student Learning Outcome	Experimental Pretest	0,094	36	0,200	Normally Distributed
	Experimental Posttest	0,173	36	0,008	Not Normally Distributed
	Control Pretest	0,099	36	0,200	Normally Distributed
	Control Posttest	0,086	36	0,200	Normally Distributed

From the table, it can be seen that the pretest data for the experimental class is normally distributed because the significance value is greater than 0.05 (0.200 > 0.05). However, the posttest data for the experimental class has a significance value of 0.008 (0.008 < 0.05), indicating that the data is not normally distributed. For the control class, both the pretest and posttest data have a significance value of 0.200, which is greater than 0.05 (0.200 > 0.05), indicating that the data is normally distributed. Therefore, non-parametric statistical tests will be conducted.

Normality Test of the Learning Model Questionnaire Data

Table of Normality Test for Student Motivation Questionnaire Data

Class		Statistic	df	Sig	Description
Hasil Belajar Siswa	Pretest Eksperimen	0,105	36	0,200	Berdistribusi Normal
	Posttest Eksperimen	0,155	36	0,029	Berdistribusi Tidak Normal
	Pretest Kontrol	0,100	36	0,200	Berdistribusi Normal
	Posttest Kontrol	0,139	36	0,077	Berdistribusi Normal

From the table, it can be seen that the pretest data for the experimental class is normally distributed because the significance value is greater than 0.05 (0.200 > 0.05). However, the posttest data for the experimental class has a significance value of 0.029 (0.029 < 0.05), indicating that the data is not normally distributed. For the control class, the pretest data has a significance value of 0.200 (0.200 > 0.05), indicating that the data is normally distributed, while the posttest data has a significance value of 0.077 (0.077 > 0.05), indicating that the data is also normally distributed. Therefore, non-parametric statistical tests will be performed.

Hyiphothesis Formulation

1. Test of Mean Difference (T-Test) for Motivation Results

   Basis for Decision Making:

Ranks

	Kelas	N	Mean Rank	Sum of Ranks
Pretest	Eksperimen	36	38.94	1402.00
	Kontrol	36	34.06	1226.00
	Total	72		
Postest	Eksperimen	36	45.31	1631.00
	Kontrol	36	27.69	997.00
	Total	72		

a. If the sig. value (2-tailed) < 0.05, there is a significant difference between the results of group 1 and group 2.
b. If the sig. value (2-tailed) > 0.05, there is no significant difference between the results of group 1 and group 2.

SPSS Output Results for T-Test of Learning Outcomes

Test Statistics[a]		
	Pretest	Postest
Mann-Whitney U	560.000	331.000
Wilcoxon W	1226.000	997.000
Z	-.993	-3.576
Asymp. Sig. (2-tailed)	.321	.000
a. Grouping Variable: Kelas		

a. From the table, it can be seen that the significance value for the pretest results is 0.321, which is greater than 0.05. Therefore, it can be concluded that there is no significant difference in the pretest learning outcomes between the experimental and control classes.
b. From the table, it can be seen that the significance value for the posttest results is 0.000, which is smaller than 0.05. Therefore, it can be concluded that there is a significant difference in the posttest learning outcomes between the experimental and control classes. Thus, the hypothesis stating that "There is a difference in learning outcomes between students who learn using the Quantum Learning model and those who learn using the Discovery Learning method" can be accepted.

2. Uji N

Basic For Decision Making :

a. a. If the sig. value (2-tailed) < 0.05, there is a significant difference between the results of group 1 and group 2.
b. If the sig. value (2-tailed) > 0.05, there is no significant difference between the results of group 1 and group 2.

Hasil Output SPSS Uji T Test Hasil Motivasi

Ranks				
	Class	N	Mean Rank	Sum of Ranks
Postest	Eksperimen	36	45.10	1623.50
	Kontrol	36	27.90	1004.50
	Total	72		
Postest	Eksperimen	36	46.94	1690.00
	Kontrol	36	26.06	938.00
	Total	72		

Test Statistics[a]		
	Postest	Postest
Mann-Whitney U	338.500	272.000
Wilcoxon W	1004.500	938.000
Z	-3.494	-4.242
Asymp. Sig. (2-tailed)	.000	.000
a. Grouping Variable: Class		

a. From the table, it can be seen that the significance value for the pretest results is 0.000, which is smaller than 0.05. Therefore, it can be concluded that there is a significant difference in the pretest motivation results between the experimental and control classes.
b. From the table, it can be seen that the significance value for the posttest results is 0.000, which is smaller than 0.05. Therefore, it can be concluded that there is a significant difference in the posttest motivation results between the experimental and control classes. Thus, the hypothesis stating that "There is a difference in motivation between students who learn using the Quantum Learning model and those who learn using the Discovery Learning model" can be accepted.

3. Motivation as a Moderator of Learning Outcomes

Model 1: The Quantum Learning Model and Learning Outcomes

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	35.844	29.742		1.205	.236
	Model Pembelajaran Quantum Learning	.423	.387	.184	1.091	.283

a. Dependent Variable: Hasil Belajar

The table above shows a significance value of 0.283 (Sig > 0.05), indicating that initially, the Quantum Learning model does not have a significant effect on learning outcomes. (H_0 is accepted).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	63.364	6.759		9.375	.000
	Model Pembelajaran Quantum Learning	.191	.088	.353	2.182	.036
	Hasil Belajar	.036	.038	.154	.955	.347

a. Dependent Variable: Motivasi Belajar

Variabel	*Unstandardized*	Std.error
Quantum Learning Model and Learning Outcomes	0,423(a)	0,387(sa)
Learning Outcomes and Learning Motivation	0,036(b)	0,038(sb)

Input:			Test statistic:	Std. Error:	*p*-value:
a	0.423	Sobel test:	0.71588952	0.02127144	0.47405957
b	0.036	Aroian test:	0.5888627	0.02586002	0.55595338
s_a	0.387	Goodman test:	0.99082254	0.01536905	0.32177224
s_b	0.038	Reset all	Calculate		

Sobel Test Calculation Results

Quantum Learning Model		Test Statistic	*P-Value*	Conclusion
A	0,423	**0,716**	**0,474**	**No Significant Effect**
B	0,036			
Sa	0,387			
Sb	0,038			

The Quantum Learning learning media through student motivation has no significant effect on student learning outcomes. Therefore, it can be concluded that motivation does not moderate learning outcomes.

DISCUSSION

The Effect of the Quantum Learning Model on Learning Outcomes

The Quantum Learning (QL) model is an instructional model designed to enhance student engagement and motivation in learning. QL emphasizes the use of various teaching methods and techniques, such as group discussions, simulations, and educational games.

The research results indicate that there is no significant difference in the learning outcomes between the experimental group and the control group after participating in the learning process. This means that the Quantum Learning (QL) model does not have a significant impact on student learning outcomes in

Economics at SMAN 1 Lohbener.

This study only implemented the Quantum Learning (QL) model over 3 meetings. Therefore, the author believes that a longer duration is needed to observe the effectiveness of the QL model on learning outcomes. This is because the relatively short duration of the study may not have been sufficient to observe significant changes in student learning outcomes.

Over a longer period, students would have more opportunities to become accustomed to the new teaching method, apply the knowledge they have gained, and demonstrate more noticeable improvements in their learning outcomes. Additionally, a longer study duration could provide more comprehensive and accurate data regarding the impact of the Quantum Learning (QL) model, making the results more representative and reliable. Therefore, to measure the effectiveness of the QL learning model more thoroughly, further research with a longer duration and more continuous observation is needed.

Based on the author's observations, students at SMAN 1 Lohbener have heterogeneous characteristics in terms of learning styles, motivation, and learning abilities. This is an important consideration because the Quantum Learning (QL) model may not be effective for all students. In such a heterogeneous context, some students may feel more comfortable and capable of learning with the QL model, while others may face challenges in accepting or understanding the concepts taught through this approach.

Therefore, it is important for educators to consider the diversity in students' learning styles and adjust their teaching approaches to meet individual needs. Additionally, using a variety of teaching strategies that can accommodate these differences is key to improving overall learning effectiveness. Thus, research and the implementation of the Quantum Learning (QL) model should be tailored to the heterogeneous characteristics of students in order to achieve optimal outcomes.

According to the author, the teachers in the experimental group did not have adequate training in implementing the Quantum Learning (QL) model. This is a relevant factor in evaluating the effectiveness of the model. When teachers lack sufficient understanding or the necessary skills to implement a specific teaching model, the likelihood of its optimal application is reduced. Adequate training would equip teachers with a deeper understanding of the concepts and strategies related to the QL model, as well as provide them with practical skills to integrate the model into daily teaching. Without proper training, teachers may face difficulties in planning, executing, and evaluating lessons using the QL model, which in turn could reduce its effectiveness. Therefore, investing in teacher training and professional development is crucial to ensuring that the QL model can be applied effectively and provide optimal benefits for the learning process.

Based on the author's observations, the Economics subject material in class XI at SMAN 1 Lohbener is classified as complex and abstract. This may make the QL (Questioning and Learning) teaching model less effective in helping students understand the subject matter.

The Influence of the Quantum Learning Teaching Model on Learning Motivation

The Quantum Learning (QL) teaching model is one of the instructional models designed to enhance student engagement and motivation in learning. QL emphasizes the use of various learning methods and techniques, such as group discussions, simulations, and educational games.

The research findings show a significant difference in student learning motivation between the experimental group and the control group after participating in the lessons. This indicates that the Quantum Learning (QL) teaching model has a significant impact on students' learning motivation in the Economics subject at SMAN 1 Lohbener.

Quantum Learning utilizes a variety of learning methods and techniques, such as group discussions, simulations, and educational games. This approach makes learning more engaging and enjoyable for students, thereby enhancing their learning motivation. These methods not only help students better understand the concepts being taught but also provide them with opportunities to actively participate in the learning process. Group discussions allow students to share their ideas and perspectives, thereby broadening their understanding through collaboration with peers. Meanwhile, simulations and educational games offer immersive and interactive learning experiences, helping students practice the skills they have learned in relevant and engaging contexts. Thus, the use of diverse learning methods and techniques in the QL model not only improves students' comprehension but also stimulates their interest and motivation in the learning process. Quantum Learning emphasizes active student involvement in the teaching and learning process. This approach helps students feel more valued and respected, which in turn boosts their learning motivation. By providing opportunities for students to actively engage in learning—whether through discussions, collaborative projects, or role-playing activities—teachers send a strong message that students' opinions and contributions are appreciated and essential in the learning process. This not only enhances students' sense of ownership over their learning but also builds their confidence in expressing ideas and participating in class discussions. When students feel valued and respected within the learning environment, they are more likely to be motivated to participate actively, learn diligently, and achieve better results. Therefore, active student involvement in the QL teaching model not only contributes to improving their understanding but also strengthens their intrinsic motivation to learn.

The research findings indicate a significant difference in student learning motivation between the experimental group and the control group after participating in the lessons. This means that the Quantum Learning (QL) teaching model has a significant impact on students' learning motivation in the Economics subject at SMAN 1 Lohbener.

The Influence of the Quantum Learning Teaching Model on Learning Outcomes with Motivation as a Moderating Variable The Quantum Learning (QL) teaching model is an instructional approach designed to enhance student engagement and motivation in learning. QL emphasizes the use of various learning methods and techniques, such as group discussions, simulations, and educational games.

The research findings indicate that there is no significant effect of the Quantum Learning (QL) teaching model on student learning outcomes with motivation as a moderating variable in the Economics subject.

This study only implemented the Quantum Learning (QL) teaching model over 3 meetings. A longer period may be needed to observe the effectiveness of the QL teaching model on learning outcomes with motivation as a moderating factor. The short duration of this study may not have been sufficient to observe significant changes in student learning outcomes and the impact of motivation on the effectiveness of the teaching model. Motivation can be a key factor in determining how effective a teaching model is in improving student learning outcomes.

Therefore, a longer-term study would provide a better opportunity to identify the relationship between learning motivation and the effectiveness of the Quantum Learning (QL) teaching model. Additionally, extending the observation period could offer a deeper understanding of how the interaction between student motivation and the implementation of the QL teaching model affects their learning outcomes. Hence, future research with a longer duration could provide more comprehensive insights into how learning motivation moderates the effects of the QL teaching model on student learning outcomes. Students at SMAN 1 Lohbener generally have high learning motivation in the Economics subject. This may result in the Quantum Learning (QL) teaching model not having a significant impact on student learning outcomes, whether for students with high or low learning motivation. High motivation tends to encourage students to actively engage in learning and seek a deeper understanding of the subject matter. In this context, the QL teaching model may not add significant value because students already possess strong intrinsic motivation to learn. On the other hand, for students with low learning motivation, although the QL teaching model offers a different and engaging approach, the lack of intrinsic motivation may hinder them from fully utilizing the learning potential it offers.

Therefore, in the context of students with high learning motivation, the Quantum Learning (QL) teaching model may not result in a significant improvement in learning outcomes, while for students with low learning motivation, the main challenge may not lie in the teaching model itself, but in enhancing overall learning motivation. Thus, understanding the level of student learning motivation at SMAN 1 Lohbener is crucial in evaluating the impact of the QL teaching model on their learning outcomes.

This study shows that there is no significant effect of the Quantum Learning (QL) teaching model on student learning outcomes with motivation as a moderating variable in the Economics subject at SMAN 1 Lohbener.

The Influence of the Difference in Post-Test Motivation Scores Between the Experimental and Control Groups

Learning motivation is an important factor that can influence student learning outcomes. Students with high learning motivation are generally more diligent and focused in their studies, which makes them more likely to achieve better learning results.

The research findings indicate a significant difference in post-test motivation scores between the experimental and control groups. This means that the teaching method used in the experimental class was proven effective in improving student learning motivation.

The teaching method used in the experimental class was more engaging and enjoyable for students compared to the method used in the control class. This likely made students more motivated to learn. When students find learning to be interesting and enjoyable, they are more likely to be actively involved in the learning process. Interactive, collaborative, and challenging methods, such as those used in the experimental class, often spark students' interest and encourage them to participate more actively. In contrast, when learning feels monotonous or less engaging, as may occur in the control class, students can lose interest and motivation to learn.

Therefore, the differences in teaching methods between the experimental and control classes can significantly contribute to the differences in student motivation and learning outcomes. Students who experience engaging and enjoyable learning are likely to be more motivated to pay attention in class, seek deeper understanding, and achieve better learning outcomes. Thus, it is important to recognize the crucial role of aspects such as interest and enjoyment in learning, and to consider using teaching methods that can stimulate students' interest and motivation in the learning process.

This study shows that there is a significant difference in post-test motivation scores between the experimental and control groups. This indicates that the teaching method used in the experimental class was effective in improving student learning motivation.

The Influence of the Difference in Pre-Test Learning Outcomes Between the Experimental and Control Groups

Learning outcomes are an important indicator for measuring the success of the teaching and learning process. Teachers and schools constantly strive to improve student learning outcomes through various means, one of which is by implementing new and innovative teaching methods.

The research findings indicate that there is no significant difference in post-test learning outcomes between the experimental and control groups. This means that the teaching method used in the experimental class was not proven effective in improving student learning outcomes. Although the teaching method in the experimental class was considered more engaging and enjoyable for students, it did not result in a significant improvement in their academic performance. This finding highlights the importance of not only considering aspects such as student motivation and interest in the learning process, but also ensuring that the teaching methods used are effective in enhancing student understanding and academic performance.

The discrepancy between expectations and findings in this study suggests that there are other factors that may influence student learning outcomes, beyond the type of teaching method applied. For example, factors such as the quality of instruction, teacher support and guidance, as well as an adequate learning environment, may also play a role in student academic achievement. Therefore, while engaging and enjoyable teaching methods can motivate students, their impact on student learning outcomes may depend on various other contextual factors.

This study shows that there is no significant difference in post-test learning outcomes between the experimental and control groups. This indicates that the new teaching method used in the experimental class was not proven effective in improving student learning outcomes.

CONCLUSION

Based on the research conducted, it can be concluded that the influence of learning outcomes and motivation at SMAN 1 Lohbener is as follows: in the study, the N-Gain Score in the experimental class (using the Quantum Learning model) was higher than the N-Gain Score in the control class (using the Discovery Learning method). Specifically, the experimental class achieved an N-Gain Score of 56.5%, which is categorized as moderately effective. Meanwhile, the control class, which used the Discovery Learning method, achieved an N-Gain Score of 28.7%, which is categorized as ineffective.

The learning outcomes and motivation were analyzed using the Mann-Whitney test. For learning outcomes, the significance value was 0.000, which is smaller than 0.05, indicating a significant difference between the experimental and control groups. Therefore, in this study, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected. Similarly, for motivation, the significance value was also 0.000, which is smaller than 0.05. Like the learning outcomes, this shows a significant difference in learning motivation between the experimental and control groups. Thus, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected.

To determine whether learning motivation moderates learning outcomes, the Sobel test was conducted. Based on the results of the Sobel test, the calculated t-value (0.716) is smaller than the t-table value (1.69), indicating that motivation does not moderate student learning outcomes.

Based on the results above, it is necessary to evaluate strategies for improving student learning outcomes in Economics for class X at SMAN 1 Lohbener. Therefore, it is not only the factor of learning motivation that will enhance outcomes, but also other factors that were not investigated in this study.

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