The Effect of Quantum Teaching Learning Model on Critical Thinking Skills of Grade V Students

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Abstract
Critical thinking skills are very important in the learning process, where students are encouraged not only to receive information passively, but also to be able to evaluate it critically. This study aims to determine the effect of Quantum Teaching model on critical thinking skills. The type of research is quantitative with the True Experiment Posttest-Only Control Design method. The study population was grade V students totaling 704 from 32 public elementary schools in Slogohimo sub-district. The sampling technique with cluster random sampling based on the number of students in each school, 3 public schools for the experimental group with 62 students using the Quantum Teaching model and 3 public schools for the control group with 61 students using conventional learning models. Data collection techniques with critical thinking skills description test, which has met the test of validity, reliability, level of size, and differentiator. The results showed that based on the calculation of the Independent Sample t-test hypothesis test, the posttest value obtained a significance value of 0.000 < α (α = 0.05) and the value of t count 2.3478 > t table 1.671, meaning that it accepts the alternative hypothesis. The conclusion of the research is that the Quantum Teaching model has a significant effect on the critical thinking skills of fifth grade students in Slogohimo sub-district.
Keywords: Quantum Teaching model, skills, critical thinking.

Abstrak
Keterampilan berpikir kritis sangat penting dalam proses pembelajaran, di mana peserta didik didorong untuk tidak hanya menerima informasi secara pasif, melainkan juga mampu mengevaluasinya secara kritis. Penelitian ini bertujuan untuk mengetahui pengaruh model *Quantum Teaching* terhadap keterampilan berpikir kritis. Jenis penelitian adalah kuantitatif dengan metode True Eksperimen Posttest-Only Control Design. Populasi penelitian adalah peserta didik kelas V yang berjumlah 704 dari 32 SD Negeri di kecamatan Slogohimo. Teknik pengambilan sampel dengan cluster random sampling yang berdasarkan banyaknya peserta didik setiap sekolahnya, 3 SD Negeri untuk kelompok eksperimen dengan 62 peserta didik menggunakan model *Quantum Teaching* dan 3 SD Negeri untuk kelompok kontrol dengan 61 peserta didik menggunakan model pembelajaran konvensional. Teknik pengambilan data dengan tes uraian kemampuan berpikir kritis, yang telah memenuhi uji validitas, reliabilitas, tingkat kesukuran, dan daya pembeda. Hasil penelitian menunjukkan bahwa berdasarkan perhitungan uji hipotesis Independent Sample t-test hasil nilai posttest diperoleh nilai signifikansi 0,000 < α (α = 0,05) dan nilai t hitung 2.3478 > t tabel 1.671, artinya menerima hipotesis alternatif. Kesimpulan penelitian adalah model *Quantum Teaching* berpengaruh secara signifikan terhadap keterampilan berpikir krtitis peserta didik kelas V SD Negeri pada kecamatan Slogohimo.
Kata kunci: Model Quantum Teaching, keterampilan, berpikir kritis.

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INTRODUCTION

Critical thinking skills are the ability to analyze, evaluate, and conclude information logically and objectively in order to make informed decisions. This ability becomes very important in the current educational context, where learners are encouraged not only to receive information passively, but also to be able to evaluate it critically. According to Wote & Kitong (2020), the *Quantum Teaching* model has the potential to improve this skill as it is designed to create an active and interactive learning environment. An environment that creates two-way communication between teachers and students is said to increase learners' engagement in the learning process, which is one of the important elements in developing critical thinking skills. Learning that encourages learners to ask more questions and discuss makes their thinking process more analytical, so critical thinking skills can be honed more effectively (Hidayati, 2018).

Critical thinking skills require elements such as enthusiasm and a dynamic spirit of learning, which is also the focus of the *Quantum Teaching* model. According to Saputra *et al.* (2022), this method seeks to optimize the interaction of various elements in the classroom, including learners' enthusiasm and motivation, to create more productive learning. In this context, learners' enthusiasm not only increases their engagement in learning sessions but also improves their ability to think critically. Learning processes that involve factors such as active discussion, analytic assignments, and self-reflection, which are applied in *Quantum Teaching*, are theoretically capable of developing critical thinking skills. Based on this understanding, it can be concluded that to improve critical thinking skills, learning methods that stimulate active and dynamic interactions in the classroom are needed, as well as encouraging learners to fully involve themselves in the learning process.

Critical thinking skills are the ability to analyze information in depth and logically, question assumptions, and identify relationships between various concepts. This skill is essential in education as it enables learners to construct clear and structured arguments and evaluate evidence objectively. According to Nuryasana and Desiningrum (2020), *Quantum Teaching* creates an interactive and supportive learning environment, facilitating the development of learners' critical thinking skills by providing intrinsic motivation and increasing interest and deep understanding of the subject matter. This positive and collaborative learning environment not only builds learners' confidence, but also encourages their ability to think critically (Azhar & Wahyudi, 2024). The importance of two-way communication in this learning model also strengthens critical thinking skills, as learners are invited to actively participate and question the information received.

In the context of basic education, the application of critical thinking skills becomes more crucial because it forms the basis of students' learning in the future. *Quantum Teaching*, as an approach that prioritizes the optimization of each individual's potential, provides a framework to encourage learners to think critically in a creative and fun way (Walidin & Mahmud, 2024). The implementation of this theory in learning stimulates changes in learners' mindsets, motivating them to be actively involved in the teaching-learning process (Wisman, 2020). This shows that critical thinking skills are not only about analysis and evaluation, but also include creativity and innovation in solving problems. Thus, critical thinking skills developed through *Quantum Teaching* can provide a competitive advantage for learners in the future.

The Quantum Learning model, as explained by DePorter, et al (2000) and further elaborated by Assakinah (2023), presents six learning steps known as TANDUR. These steps are designed to create a fun and effective learning environment. It starts with arousing learners' interest in learning through relevant examples, then learners are invited to experience the learning material directly through problem solving. After that, learners are given the opportunity to identify key concepts and demonstrate their understanding. The learning process ends with repetition of the material and rewarding learners for their success.

Based on pre-research observations, in September 2024, data were obtained that teachers tend to use the lecture method and practice questions with the media of student worksheets. this condition 21 out of 23 students tend to be passive in participating in learning; being indifferent; doing questions according to what the teacher teaches, so that if the question is changed, students do not understand the meaning of the question; test results also show below the learning outcomes, namely the average 63. 35 of 75.00. This is what makes researchers focus on proposing a quantum teaching learning model to increase the knowledge stages of analysis, synthesis, and evaluation, in order to realize critical thinking skills.

Critical thinking skills are an individual's capacity to analyze information, evaluate various arguments, and make appropriate decisions based on logical and evidence-based reasoning (Nafiah & Suyanto, 2014). In the context of education, this skill becomes an important foundation that allows learners to process information more deeply and critically. According to Arwita (2023), skills are abilities built through learning or training processes to perform activities well, quickly, and precisely. In line with this opinion, Suhartini (2015) states that skills include basic abilities that allow learners to operate a job easily and carefully. Developing critical thinking skills means shaping learners to be able to face various challenges in an analytical and reflective way.

Furthermore, Mardhiyah *et al.* (2021) emphasized that skills are the result of a continuous learning process, where learners are guided to optimally develop their potential in doing something. Good education must be able to facilitate this learning process so that critical skills can be nurtured. An effective model, as described by Fitriani *et al.* (2023), can be an alternative in exploring learners' critical thinking skills, which in turn provides opportunities for learners to develop critical thinking skills more deeply. With the right learning integration, critical thinking skills can be further honed, giving learners the ability to adapt quickly to changing and complex situations.

An appropriate and integrated learning model is the basic capital in honing students' critical thinking skills optimally. In this context, critical thinking skills are a very essential aspect in education and have been the subject of study in various previous studies. Based on a literature search, Yatmi *et al.* (2019) asserted that critical thinking skills are a directed and clear mental process used in various activities, including solving problems, making decisions, and conducting scientific research. This finding shows that critical thinking skills are not just academic abilities, but also important life skills, as explained by Nisrina *et al.* (2021). Their research shows that these skills are essential not only in formal learning such as mathematics, but also in everyday life, which can prepare learners to face complex future challenges. Furthermore, Setyawati *et al.* (2022) highlighted that critical thinking skills enable individuals to carefully analyze situations and draw logical conclusions, which helps them in solving problems and making informed decisions. This illustrates that the development of critical thinking skills has an important role in readiness to face various challenges.

While there are some similarities in the findings of previous studies, differences remain in the application and focus of each researcher's study addressing critical thinking skills. Yatmi *et al.* focused more on mental processes and critical thinking activities in scientific activities, while Nisrina *et al.* underlined the importance of these skills in preparing learners to face complex challenges in the future. On the other hand, Setyawati *et al.* placed emphasis on analytical ability and logical decision-making as manifestations of critical thinking. This difference provides insight into how critical thinking skills are integrated in various educational contexts. The current research, focusing on the *Quantum Teaching* model offers a new contribution in mapping the effectiveness of innovative learning strategies on critical thinking development, an area that has not been widely explored in previous studies. As such, this research seeks to not only explore the role of critical thinking skills, but also evaluate the most effective pedagogical approaches to achieve more holistic educational goals.

Based on the description above, this study can formulate the formulation of the problem, namely whether the *quantum teaching* model affects the critical thinking skills of fifth grade students of public elementary schools in Slogohimo sub-district? This study aims to determine the effect of *quantum teaching* model on critical thinking skills.

METHODS

The type of research used is quantitative with the *True Experiment Posttest-Only Control Design* method. The type of research using a quantitative approach is a research approach that uses data in the form of numbers and exact science to answer the research hypothesis (Waruwu, 2023). The design of the *True Experiment Posttest-Only Control Design* method is described as follows:

Z_1	X	O_1
Z_2	---	O_2

Description:
X = Treatment using the *Quantum Teaching* Learning Model
Z = Respondent
O_1 = Experimental class posttest
O_2 = Control class posttest
The population in this study was grade V students totaling 704 from 32 public elementary schools in Slogohimo sub-district. Sampling using the Cluster Random Sampling technique based on the number of students in each school, which resulted in 2 groups, namely the experimental group and the control group. Sampling using the *Cluster Random Sampling* technique which resulted in 2 groups, namely the experimental group and the control group. The experimental group consisted of 62 students from 3 public schools in Slogohimo sub-district using the *Quantum Teaching* learning model. The control group consisted of 61 students from 3 public elementary schools in Slogohimo sub-district using conventional learning models. Data collection uses a description test with test material that has been tested for validity, reliability, size level, and differentiating power. Meanwhile, data analysis uses hypothesis testing with Independent Sample t-test to determine the effect of *quantum teaching* model on critical thinking skills.

RESULTS AND DISCUSSION

Research Results

Based on the results of descriptive statistical calculations that have been carried out, data obtained in the form of statistical analysis of validity test, reliability test, difficulty test, differentiator test, prerequisite test, hypothesis testing. More detailed research results are presented as follows:

Validity Test

The question material used in the study required a validity test of each statement item to ensure that the measuring instrument used (question material) was in accordance with the objectives of the study. The validity test is carried out by comparing r count with r table. If r count> r table, it can be said that a statement item is declared valid. Likewise, vice versa if if r count < r table then a statement item is declared invalid. In this study, the number of respondents was 62 respondents. So to find r table, namely with the formula df = n - k = 62 - 2 = 60. Thus, the resulting number in the r table is 0.2108.

Table 1. Question Matter Validity Test Results

X	r count	r table	Sig.	N	Description
P1	0,691	0,2108	0,000	60	Valid
P2	0,694	0,2108	0,000	60	Valid
P3	0,692	0,2108	0,000	60	Valid
P4	0,573	0,2108	0,000	60	Valid
P5	0,347	0,2108	0,012	60	Valid

Based on the table above, it can be concluded that the question material in the form of descriptions can be declared valid, r count> r table.

Reliability Test

The reliability test is used to determine whether the description test material used is reliable or reliable as a variable measuring instrument. The credibility of a questionnaire can be seen from the *Cronbach's Alpha* value, where if the *Cronbach's Alpha* value> 0.60 then the questionnaire can be said to be reliable, but if the *Cronbach's Alpha* value <0.60 then the questionnaire is considered unreliable.

Table 2 Reliability Test Results of Problem Materials

Cronbach's Alpha	N of Items
0,688	5

Based on the SPSS test results in Table 7. Shows the *Cronbach's* Alpha value of 0.688> 0.60. So that statements 1-5 of the *Quantum Teaching* model variable are declared reliable.

Difficulty level

The level of item difficulty in a test refers to the proportion of test takers who are able to answer the item correctly (Jumailiyah, 2014). Easy items will tend to be answered correctly by most participants, while difficult items will only be answered correctly by a few participants. In other words, the item difficulty level shows how difficult or easy an item is for test takers.

Table 3. Test Results of the Level of Difficulty of Problem Materials

Interval	Interpretation
0,00 - 0,30	Difficult Problem
0,31 - 0,70	Medium Problem
0,71 - 1,00	Easy Problem

Problem p = $\frac{jumlah\ jawaban\ benar}{banyak\ siswa}$

	Index	Criteria
Problem 1	0,55	Medium Problem
Problem 2	0,72	Easy Problem
Problem 3	0,25	Difficult Problem

Problem 4	0,58	Medium Problem
Problem 5	0,46	Medium Problem

The researcher concluded from the results of the formula calculation of 5 items of learning outcome items there were 3 items (70%) in the medium category, 1 item (10%) in the easy category, and 1 item (10%) in the difficult category.

Distinguishing Power

The level of item difficulty in a test, especially in multiple choice tests (both ordinary and associated), measures how easy or difficult a question can be answered by test takers. A question is said to be easy if many participants can answer it correctly, while a question is said to be difficult if only a few participants can answer it correctly (Hanifah, 2017). In this study, the composition of the question material is 1 easy, 3 medium and 1 difficult.

Prerequisite Test

Normality Test

The normality test is carried out to see whether the sample comes from a normally distributed population or not (as a prerequisite for the t-test). This study uses the Shapiro-Wilk normality test because the sample in this study is less than 100 (<100). The results of the normality test in this study can be seen in the following table

Table 4. Normality Test Results

		Unstandardized Residual
N		60
Normal Parameters[a]	Mean	.0000000
	Std. Deviation	1.58937713
Most Extreme Differences	Absolute	.172
	Positive	.172
	Negative	-.080
Kolmogorov-Smirnov Z		1.241
Asymp. Sig. (2-tailed)		1.032

Based on the normality test results in Table 4. Using SPSS, it is known that the significance value is 1.032> 0.05, it can be concluded that the samples come from a normally distributed population.

Homogeneity Test

The homogeneity test is applied to determine whether the sample from the population is homogeneous or inhomogeneous. The homogeneity test in this study was carried out after the application of the normality test to the data. Based on the results of the homogeneity test of the *Quantum Teaching* learning model on critical thinking skills, the statistical value of each sample was obtained with the H_0 test decision accepted. It can be seen from each statistical value of homogeneity test x^2_{count} (0.721) < x^2_{tabel} (3.411). The results of the homogeneity test calculation can be concluded that the sample population is homogeneous.

Balance Test

Balance test is conducted to determine that the sample has the same initial ability or not. Based on the balance test results of the *Quantum Teaching* learning model on critical thinking skills, it was found that the two groups (experimental and control) did not have significant differences in the variables tested (average previous test scores, percentage of male students, and average age). The average previous test score in the experimental group was 78, while in the control group it was 76. The percentage of female students in the experimental group was 40%, while in the control group it was 35%. The average age in the experimental group was 11.3 years, while in the control group it was 11.1 years.

Hypothesis Test (t Test)

The t test statistical test is used to determine how much influence the independent variable of digital technology (X) has on the dependent variable of the effectiveness of promotion services (Y). This study uses partial testing where to find out variable X on variable Y. In this study the sample used was 60 samples. t table = t (a/2; n-k-1) = (0.025; 60) = 1.671 then the t table used in this study based on the formula of the sample is 1.671. The basis for decision making is as follows: First, if the significance value> 0.05 or t count < t table, it can be concluded that H0 is accepted, and Ha is rejected or there is no effect of variable X on variable Y. Second, if the significance value < 0.05 or t count > t table, it can be concluded that H0 is rejected, and Ha is accepted or there is an effect of variable X on variable Y.

Table 5. Results of the t-test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.604	1.899	.355	5.584	.000
	Quantum Teaching	.317	.118		2.3478	.000

It is known that the significant value for the effect of variable X on variable Y is 0.000 <0.05 and the value of t count 2.3478> t table 1.671 so it can be concluded that Ha is accepted and H0 is rejected, which means that there is an influence of the independent variable *Quantum Teaching* model (X) partially on the critical thinking skills variable (Y).

Discussion

Based on the statistical calculations above, the *quantum teaching* model shows a significant influence on students' critical thinking skills. This is evidenced by the results of statistical hypothesis testing where the significant value of the study was found to be 0.000 <0.05 and the t test value (2.3478) > t table 1.671, which means that the *Quantum Teaching* learning model has an influence on critical thinking skills. This is because Quantum teaching creates an effective, safe and comfortable learning environment by utilizing the elements that exist in students and the learning environment and there is good interaction between students and students, students with teachers and with the learning environment. This is supported by research from Yanuarti and Sobandi (2016), showing that the application of the *quantum teaching* model in IPAS learning can significantly increase the average score of critical thinking skills of grade V students. Similar results were also found in the research of Cahyaningrum *et al.* (2019) which concluded that the *quantum teaching* model is more effective in developing critical

thinking skills compared to conventional learning models. This is in line with the basic principles of *quantum teaching* which emphasizes active learner involvement, fun learning, and independent concept discovery. Through various activities designed in the *quantum teaching* model, students are invited to analyze, evaluate, and synthesize information, thus indirectly training their critical thinking skills. information, thus indirectly training their critical thinking skills. This is also emphasized by Fitriani, Yunus, & Burhan (2023) that quantum teaching provides space for interaction between students and provides space for the development of creative and critical thinking.

Evidently, there is a significant influence on students' critical thinking skills, because the quantum learning model has advantages. This is explained by De Porter and Hernacki (2009: 56) who state that suggestions can and must affect the results of learning situations and any details must give positive and negative suggestions. The statement above can be emphasized that learning that uses quantum learning models can provide good suggestions or can influence students to change their learning style from bad to good. This can affect the mindset of students to change learning styles that can improve learning outcomes. Hidayati (2018) menjelaskan bahwa quantum teaching memberikan penugasan yang mengajak siswa untuk menganalisis, mengenali masalah secara lebih mendalam, dan mampu menghasilkan beberapa alternatif pemecahan masalah.

CONCLUSION

This study proves that the *Quantum Teaching* model has a significant influence on the critical thinking skills of fifth grade students in Slogohimo District. Through the Independent Sample t-test hypothesis test, it was found that the posttest results of students who followed the *Quantum Teaching* model were significantly different compared to students who received conventional learning. The significance value obtained of 0.000 is smaller than α (0.05), and the calculated t value of 2.3478 is greater than t table 1.671, indicating that the alternative hypothesis is accepted. Therefore, it can be concluded that the application of the *Quantum Teaching* model effectively improved learners' critical thinking skills in the context of this study. This finding corroborates that innovative and interactive teaching methods such as *Quantum Teaching* can be a useful learning strategy in developing learners' critical thinking skills. The implication of this research is the need for teachers to design and use Quantum Teaching wisely and adjust the ability of students. the follow-up to this research is the need to develop a Quantum Teaching learning system that is more in favor of students.

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