Quantum Teaching Learning Model Assisted Interactive Media: Does it affect Students' Higher Order Thinking Skill?

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Abstrak

Kurikulum Merdeka Belajar menuntut siswa SMK untuk terampil dalam memiliki keterampilan berpikir tingkat tinggi sehingga dibutuhkan suatu model, metode, dan strategi mengajar yang tepat bagi guru. Model pembelajaran yang kurang tepat berdampak pada kemampuan berpikir siswa yang rendah. Penelitian ini bertujuan menganalisis pengaruh model pembelajaran quantum teaching terhadap kemampuan berpikir tingkat tinggi siswa. Penelitian ini menggunakan metode penelitian kuantitatif dengan jenis penelitian kuasi eksperimen dan desain penelitian two-group-pretest-posttest. Sampel penelitian ini berjumlah 40 orang siswa. Sampel kedua kelas dipilih secara acak dengan teknik cluster random sampling. Metode yang digunakan dalam mengumpulkan data yaitu tes kemampuan berpikir tingkat tinggi. Instrument yang digunakan dalam mengumpulkan data yaitu tes berupa soal uraian. Teknik yang digunakan untuk menganalisis data yaitu statistic inferensia. Hasil analisis data yaitu terdapat pengaruh signifikan pada penggunaaan model quantum teaching berbantuan media interaktif terhadap kemampuan berpikir tingkat tinggi siswa. Disimpulkan bahwa penggunaaan model quantum teaching berbantuan media interaktif dapat meningkatkan kemampuan berpikir tingkat tinggi pada siswa.

Kata kunci: Quantum Teaching, Berpikir Tingkat Tinggi, Media Interaktif.

Abstract

The Freedom to Learn curriculum requires vocational students to have high-order thinking skills, so a model, method, and teaching strategy are needed for teachers. Inappropriate learning models have an impact on students' low thinking abilities. This study aims to analyze the effect of the quantum teaching-learning model on students' higher-order thinking skills. This study uses a quantitative research method with a quasi-experimental research type and a two-group-pretest-posttest research design. The sample of this research is 40 students. The representatives from both classes were randomly selected using the cluster random sampling technique. The method used in collecting data tests higher-order thinking skills. The instrument used in collecting data is a test in the form of description questions. The technique used to analyze the information is statistical inference. The data analysis results show a significant effect of using the quantum teaching model assisted by interactive media on students' higher-order thinking abilities. It was concluded that using the quantum teaching model assisted by interactive media can improve students' higher-order thinking skills.

Keywords: Quantum Teaching, High Order Thinking Skill. Interactive Media.

1. INTRODUCTION

The Merdeka Belajar is a new Minister of Education and Culture's policy that has been implemented in school since the end of 2019. Merdeka Belajar aims to give educators and students flexibility in carrying out learning activities, of course, this must be accompanied by the desire of each educational actor to improve competence. The internet of things that developed in the industrial era 4.0 has penetrated various areas of people's lives, one of which is in the field of education (Lestiyani, 2020; N. Siregar et al., 2020; Zaenab, 2021) . There are four main policies in independent learning, namely the USBN was replaced with an Assessment Examination from each school, the National Examination was replaced with a Minimum Competency Assessment, the RPP was shortened to one page, and the PPDB zone was made more flexible (Mardiana & Umiarso, 2020; Mazid et al., 2021). There are many challenges that must be faced in the process of implementing the Merdeka Belajar

policy, such as learning systems that are out of the comfort zone, few references to the new curriculum (Merdeka Belajar), teaching skills and minimum facilities and the quality of teachers who master this policy (Arifin, S., & Muslim, 2020; Astini, 2022; Widiyono et al., 2021). On the other hand, Merdeka Belajar has many advantages, namely the implementation of Independent Learning does not have space and time limitations in learning and can learn from direct experience in the field, so teachers often use project-based learning methods (Putri et al., 2021; Vahlepi, 2022; Yudianto et al., 2022). The purpose of the learning process is to apply hard skills and soft skills so that when students graduate they are ready to enter the world of work. This practice is the goal of vocational high school (SMK) education (Nurtanto, M., & Sofyan, 2015; Suwanto, 2016; Wibowo, 2016).

Education essentially lies in learning that emphasizes the process of thinking skills and the quality of education is assessed not only from planning and learning development, but also from the quality of the implementation process (Gradini, 2019; Retnawati et al., 2018; Setiawan & Royani, 2013). To achieve the goals of SMK, SMK students are focused on learning based on thinking skills that lead to critical, creative and independent thinking skills so that they become competent workforce candidates and are able to compete in the global labor market (Hanafi & Sumitro, 2020; Puspaningtyas, 2019). SMK learning in the 21st century is expected to integrate the 4Cs competencies (communication, collaboration, critical thinking skills, and creative thinking skills), proposed by the Partnership of 21st century skills, which are oriented towards High Order Thinking Skills (HOTS) in learning implementation plans (RPP), process and assessment/evaluation (Afandi et al., 2018; Saragih et al., 2021; S. P. Sari & Siregar, 2020).

This research is motivated by the results of observations that have been carried out at SMK UBP Nurul Islam in class X Multimedia. There are many findings with the condition of the teacher's learning process that still uses the lecture and question and answer method, students only get information then record and memorize. So that it causes students to be passive, less responsive in receiving information, lacking a sense of motivation in learning with the discussion model, unable to express opinions about problems, and not happy in receiving questions that require thinking skills, especially High-level thinking skills (HOTS). In practice, HOTS-oriented learning requires the role of the teacher who does not explain much, but stimulates questions that bring out the originality of students' thoughts such as inferential questions (questions that are answered immediately), interpretation questions (questions that give meaning), transfer questions (questions that broaden knowledge), and hypothetical questions (questions that direct predictions to draw conclusions) (Ariyana et al., 2018; D. M. Sari et al., 2018; I. P. Sari, 2015). Then, coupled with efforts by teachers who are capable and creative in processing learning in the classroom, one of which is by using a media-assisted learning model. In recent years many models of constructivism have been developed, in which students no longer receive their knowledge from the teacher, but build and develop their own knowledge. With this constructivism learning model, it is hoped that students will no longer just memorize, but also understand the concept of the material itself (Putri et al., 2021; Siang et al., 2020). One of the learning models offered is the Quantum Teaching learning model. Quantum Teaching is a learning model that invites students to play an active role in learning and using the basic knowledge students have to develop their knowledge and acquire new knowledge. Through learning with the Quantum Teaching model, students will be invited to learn in a more comfortable and enjoyable atmosphere, so that students will be more flexible in seeking new experiences in learning (DePorter et al., 2010; N. F. Sari, 2017). Quantum learning facilitates students to turn all opportunities into learning and make it a successful experience only through students thinking about it, and taking responsibility for it. To make the learning process with the quantum teaching model truly as dynamic as possible, it is necessary to go through the stages of Enroll, Experience,

Label, Demonstrate, Review and Celebrate (Khozaei et al., 2022; Yeni et al., 2021). In Indonesia, this learning stage is often known as the quantum teaching framework "*Tumbuhkan*/Grow, *Amati* /Observe, *Namai*/Name, *Demonstrasi*/Demonstrate, *Ulangi*/download/Repeat, dan *Rayakan*/Celebrate (*TANDUR*)" (Akbar & Pramukantoro, 2014; Saputra et al., 2021). Several previous researchers related to the research to be carried out stated that the use of the interactive multimedia-assisted quantum teaching learning model greatly influenced students' writing skills (I. P. Sari, 2015). Another study, namely the use of the quantum teaching learning model assisted by audiovisual media influences the motivation and learning outcomes of basic accounting for vocational students (Wardani et al., 2019). Coupled with research on the application of quantum teaching through CAI (Computer Assisted Instruction) media, it has resulted in an increase in engineering mechanics learning outcomes for SMK students (Kusniawati & Sabariman, 2018). So it can be concluded that the use of the quantum teaching learning model with the help of interactive media greatly influences the achievement of learning objectives. Utilizing technology in the classroom has many advantages for students to increase motivation, more student-centered learning and more active involvement in learning, resulting in higher-order thinking skills and better memory (Han et al., 2020; R. A. Siregar, 2020).

Interactive means there is two-way communication and users can respond directly. By using interactive media, students can be motivated to learn, because they can listen to audio, watch videos or see text, animation and graphics simultaneously (Atmazaki et al., 2021; Muflihah, M., & Aziz, 2018). If interactive media is well designed, learning will be more effective because students will receive continuous feedback. In addition, this also helps students to achieve the expected competencies, especially for HOTS thinking (Mursid, 2017; Yuliati & Lestari, 2018). The urgency of this research is to see whether there is an influence of the quantum teaching learning model on students' higher order thinking skills assisted by interactive media. In previous studies, no one had examined the logic gate material for class X SMK computer system subjects using interactive media, namely Proteus 8. Therefore, researchers were interested in conducting this research to see whether the quantum teaching learning model succeeded in increasing students' thinking skills into the realm of HOTS. By analyzing the results of students' HOTS questions answers, researchers will be able to determine how much influence the quantum teaching learning model has on students' high-level thinking abilities, especially on logic gates material, so this research is very important to do.

2. METHODS

This research is a quantitative study that uses data in the form of numbers from generalized results from a representative sample as a means of finding information about what we want to know (Lam et al., 2022). The type of method used is the type of experimental method with a quasi-experimental research design (pseudo research) – Two Group Pre Test- Post Test Design which can be seen in Table 1.

Table 1. Design – Two Group Pre Test- Post Test Design

Group	Pretest	Treatment	Post Test
Experiment	O_1	X_1	O_2
Control	O_1	X_2	O_2

Notes:
O_1	= pretest	X_1	= treated class
O_2	= posttest	X_2	= untreated class

The population in this study were all classes from X Multimedia (MM) of Islamic Boarding School-Based Excellence Vocational Schools (UBP) Nurul Islam with the sampling technique used, namely group random sampling (Cluster Random Sampling). Random results for two classes, namely class X MM 1 with a total of 20 students and X MM 3 with a total of 20 students. Then the students who entered the experimental group class were determined by lottery. Students who get odd numbers (numbers 1, 3, 5, and so on) and control group classes from even numbers (numbers 2, 4, 6 and so on) from the two classes. The experimental group was the group class that was given treatment, namely by using the quantum teaching learning model assisted by Proteus 8 interactive media within 1 month with weekly meetings of 2 hours x 45 minutes so that the research process was carried out in 4 meetings (8 hours x 45 minutes). The data collection technique was carried out by means of a test using the instrument of a high-level thinking ability test in the form of a description question (Essay). The following is Table 2 concerning indicators of the 4Cs aspect of essay questions to achieve HOTS (Afandi et al., 2018; Septikasari & Frasandy, 2018a) and Table 3 regarding the category of assessment of higher-order thinking skills (Damaianti et al., 2020; Mahanal, 2019).

The results of data analysis include pre-research and post-research data processing. Pre-research data analysis included the validation results of the Learning Implementation Plan (RPP), validation of the higher-level thinking ability test (HOTS) and analysis of the test results. While the post-research data analysis is the analysis of data acquisition pretest-posttest HOTS questions. Analysis of the higher order thinking skills test instrument (HOTS) by testing the validity of the description questions and reliability tests. Then after that, it was tested on the control class and the experimental class both questions held at the pretest and posttest. Then the results are carried out by analyzing prerequisite tests, namely the normality test, homogeneity test, and ending with an analysis of hypothesis testing using a significance test (T-Test).

Table 2. Indicators of 4Cs aspect essay questions to achieve HOTS thinking skills

No.	Aspects of 4Cs	Indicators	Number of Items
1	Communication (Serve/ represent/ communicate)	Convey ideas Listen for ideas	1
2	Collaboration	Appreciate the idea Take responsibility for the task	1
3	Critical Thinking Skill	Identify arguments Searching for information Analyze it Comparing arguments Consider the arguments Summarize information based on the results of the consideration. Develop further arguments.	1
4	Creative Thinking Skill	Finding creative ideas/ideas Develop ideas / creative ideas Design ideas / ideas creatively Producing designs Implement the product Evaluate the results of activities	1

No.	Aspects of 4Cs	Indicators	Number of Items
		Construct problem solving steps.	
		Review information	
		Presenting solutions	
		Evaluate solutions	
		Total	4

Table 3. Category Level of Students' Higher Order Thinking Ability

Score	Category
$80 < N \leq 100$	Very good
$60 < N \leq 80$	Well
$40 < N \leq 60$	Pretty good
$20 < N \leq 40$	Not good
$0 < N \leq 20$	Not good/bad

3. RESULTS AND DISCUSSION

Results

The instrument is said to be valid if it meets the specified criteria and is approved by an expert validator in their field. There are three validators who play a role in this study, namely expert validators in the field of education (assessors of research tools/instruments related to the world of education), material validators (evaluators regarding test questions/material that will be made research), and language validators (evaluators regarding grammar used in the instrument).

The results and analysis of the lesson plan data were validated by three validators, namely two expert validators in the field of education and one linguist validator with very valid results for validation of lesson plans by expert validators in the field of education and valid for validation of lesson plans from linguists. Then, the results of the data analysis validation of the HOTS essay test instrument were carried out by two subject matter expert validators and one linguist validator. Get very valid results on material validation and valid on language validation. The complete data can be seen in Table 4.

Table 4. Instrument Validation Results

No	Instrument	Validator	Score	Category
1	RPP	Education Expert	92.04%	Very Valid
		Linguist	75%	Valid
2.	Tes Esai HOTS	Material Expert	89.06%	Very Valid
		Linguist	81.2%	Valid

After the instrument was validated by the expert, the researcher tested it on a class of 25 students in class X MM 2 (besides the experimental and control classes) and produced an analysis according to Table 5.

Base on Table 5, after being declared valid and reliable, the instrument is ready to be used as research material. the high-order thinking skills of vocational students are considered complete if students are in the high-order thinking category of at least "pretty good/good enough", the result is show in the data as show in Figure 1.

Table 5. Results of HOTS Test Test Analysis

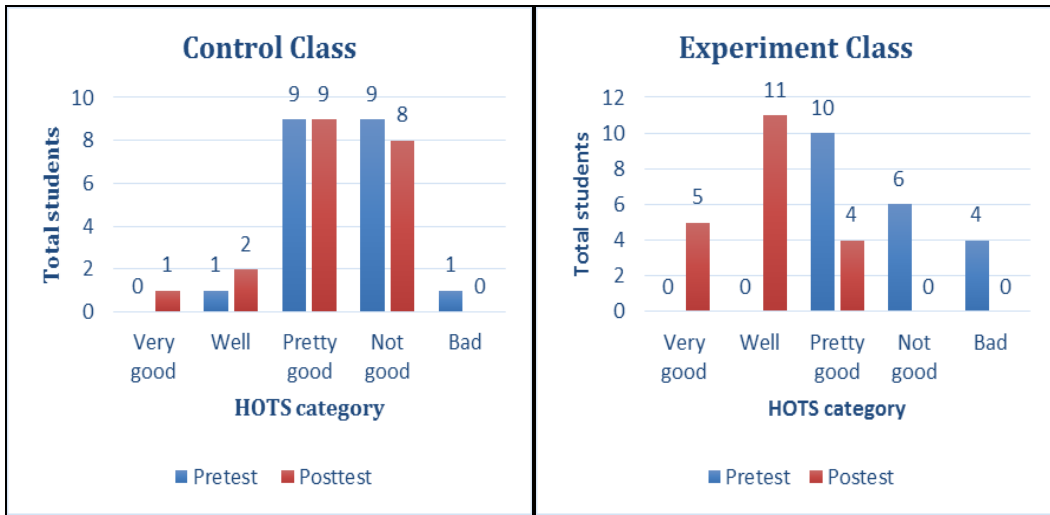| HOTS Test Test Analysis	Results	Category
Results of Question Validity	$r_{count} = 0.8581 > r_{table} = 0.413$	Valid
Reliability Results	$r_{count} = 0.7 > r_{table} = 0.413$	Reliable

Figure 1. Description of Pretest Posttest Results for Control Class and Experimental Class

The pretest of the control class is the same as the pretest of the experimental class and for the posttest of the control class. The percentage of Higher Order Thinking Skills is show in Table 6

Table 6. Percentage of Completeness of Higher Order Thinking Skills of Vocational High School Students

No	Class	Completeness Presentation	
		Pretest (%)	Posttest (%)
1	Control Class	50%	80%
2	Experiment Class	50%	100%

Base on Table 6 states that, the distance between the percentage of completeness is only 20%. There was a slight difference but in the control class the highest number were in the "pretty good/good enough" category while in the experimental class the highest number of students were in the "good" category.

Followed by the research prerequisite test, namely the normality test using the Kolmogorov-Smirnov method test and homogeneity test which aims to find out whether the object under study has a homogeneous variant or not. Research prerequisite test data can be seen in Tables 7, Table 8, and Table 9.

Table 7. Pretest Normality Test Results

Class	D_{count}	D_{table}	Category
Experiment	0.148	0.301	Normal Distributed Data
Control	0.181	0.301	Normal Distributed Data

Table 8. Posttest Normality Test Results

Class	D_{count}	D_{table}	Category
Experiment	0.149	0.301	Normal Distributed Data
Control	0.199	0.301	Normal Distributed Data

Table 9. Pretest Homogeneity Test Results

Class	Variant	F_{count}	F_{table}	Category
Experiment	149.200	1.148	2.17	Have the same variant (homogeneous)
Control	171.211			

Assessment of students' higher-order thinking skills was measured using a higher-order thinking ability test instrument (HOTS) by giving pretest questions as a measure of students' initial abilities before receiving treatment, then starting to be given a treatment, namely introduction of material, and giving posttest questions used as a measure final ability of students after receiving treatment. It ends with a significance test (T-Test) which aims to prove the results of whether there is an influence of the interactive media-assisted learning model on the high-level thinking skills of SMK students. The results of the T-test get the results H_0 rejected, in full it can be seen in Table 10.

Table 10. Significance Test Results (T-Test)

Data	t_{count}	t_{table}	The conclusion
Pretest value	2.6736	2.1009	Ho rejected
Posttest value			

Based on the information in Table 10 show, t_{count}= 2.6736 > t_{table} = 2.1009 and conclusions are drawn through the T-Test study rules, it can be concluded that Ho is rejected or there is a significant influence on the use of the quantum teaching model assisted by interactive media on thinking ability high level of SMK students.

Discussion

These findings prove that the use of the quantum teaching model assisted by interactive media has an effect on the high-level thinking skills of SMK students. In this study, integrating the 4Cs competencies (communication, collaboration, critical thinking skills, and creative thinking skills), proposed by the Partnership of 21st century skills in the 21st century, is oriented towards the use of High Order Thinking Skill (HOTS) questions (Khoiri et al., 2021; Novatania & Kamaludin, 2021).

This finding is in accordance with previous research which highlighted the use of learning models as an effort in determining student learning success (Zuhra, 2020). Quantum Teaching is believed to be a learning model that can develop students' higher-order thinking skills. Coupled with the use of media in learning, it can be trusted in arousing enthusiasm and learning motivation for students (Hartini et al., 2018; Sari, N. P. E., Putra, I. K. A., & Kristiantari, 2019). This research can be reviewed in detail on each competency. First, communication competence is a competence to appreciate or convey ideas possessed to other students both orally and in writing, and being able to listen to the ideas of other students/groups. Second, Collaboration is the ability to appreciate the ideas of other students/groups and then when they have assignments, they will act responsibly, and be able to discuss, cooperate and collaborate with other students. Third, critical thinking is seen from

the way students are able to solve a problem. Fourth, creative thinking is seen from how to find creative ideas to present a solution for solving the right problem (Septikasari & Frasandy, 2018b; Wibowo, 2016).

In the research that has been done, they get good responses to the essay questions given in the experimental class posttest. After getting treatment using the quantum teaching learning model with interactive media, it makes students develop in increasing higher-order thinking skills. This can be seen from the comparison of the percentage of completeness of the pretest posttest results of both the experimental class itself and compared to the control class. However, it cannot be denied that there are some students who have not achieved higher-order thinking skills in the experimental class, which is usually because in learning these students do not fully know the direction of learning so that clear directions are needed by the educator in giving instructions. Coupled with the lack of teacher interaction and closeness because the implementation of this model requires students to be independent, from finding to providing solutions to their own problems so that a teacher is needed to ask questions that lead to the students' thoughts (Amuntu, 2016; Astuti et al., 2019). It can be concluded that teachers need to know students' learning needs in fulfilling learning facilities and play a full role as facilitators so that learning becomes effective (Purwaningsih, 2016; Rahmawati & Suryadi, 2019). The implication of this research is to describe that the use of the quantum teaching learning model with interactive media is very influential in increasing the higher order thinking skills (HOTS) of SMK students. The study analyzed students' ability to answer questions in the form of HOTS questions. These results are very useful for educators as knowledge and also as reference material and references in innovating in everyday learning in the classroom, especially in improving students' thinking skills. This research still has limitations, one of which is in implementing learning material in one institution only, so it is hoped that other researchers can deepen the review/discussion and broaden the discussion topics related to the implementation of learning like this research.

4. CONCLUSION

In this study, it can be concluded that the implementation of the interactive media-assisted learning model, namely Proteus 8 in the logic gate material, has an effect on the high-level thinking skills of SMK students. This study obtained results that could be described in the answers to students' HOTS questions. The experimental class obtained answers from students who scored high and were in the "good" category compared to students in the control class who were mostly in the "good enough" category. So that the application of the quantum teaching learning model with the help of interactive media is very suitable for increasing high-level thinking of SMK students

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