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QUANTUM TEACHING MATERIALS TO IMPROVE COGNITIVE LEARNING OUTCOMES ASSISTED BY CHOOSING NUMBERS ON STATIC ELECTRICITY MATERIAL

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ABSTRACT

Science is a complex science whose learning implementation involves the active role of students in the classroom. However, the phenomenon that occurs in schools is that students are less active and have difficulty understanding physics concepts. This is because there are still many teachers who apply conventional learning so that students find it difficult to understand physics concepts which then affect student learning outcomes. In this case, innovation is needed in carrying out learning in the classroom in the form of applying a learning model. This study aims to examine the results of the application of Quantum Teaching learning aided by Choose Number on students' cognitive learning outcomes. The subjects in this study were students of class IX MTs Darul Hikmah Pekanbaru. This type of research is Quasy Experimental Design with Posttest-Only Control Design research design conducted in two classes, namely experimental class and control class. Data analysis techniques used are descriptive analysis techniques and inferential analysis. Cognitive learning outcomes research instruments using objective tests. Based on the results of the research analyzed descriptively, the average cognitive learning outcomes of students increased after applying Quantum Teaching learning aided by Choose Number. The results of the study were analyzed inferentially using the t test with the independent sample t test technique obtained the following results Sig. (2-tailed) of 0.00 which means significance (p) <0.05 so that there are significant differences in students' cognitive learning outcomes after the application of the Quantum Teaching learning model assisted by Choose Number on static electricity material. Quantum Teaching learning assisted by Choose Number is recommended as an alternative learning model that can be applied by teachers in learning science and physics. physics or in other learning. This is because, the Quantum Teaching learning model assisted by Choose Number can increase the activeness of students, can increase the activity of students with groups, and can improve the cognitive learning outcomes of students.

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1. INTRODUCTION

Science is a complex science, because it has interconnected parts.The expected science learning is active learning, where students play an active role in the classroom when learning takes place. However, the phenomenon that occurs in schools is that students are less active and find it difficult to understand concepts in science, especially physical science (Djamion, 2022). According to the observations made by researchers during the PLP at MTs Darul Hikmah Pekanbaru, teachers rarely conduct experiments or learning activities that involve physical science in a way that makes it difficult for students to understand and fails to emphasize the benefits of the knowledge they gain for their everyday lives. Teachers also tend to only provide direct material without first providing apperception and motivation. This was also expressed by (Cahyaningrum et al., 2019) in his research, which stated that a large number of teachers continue to use traditional teaching methods in physics science classes, which causes students to frequently struggle to understand physics concepts and consequently has an indirect impact on student learning outcomes.

The skills that kids pick up after participating in educational activities are known as learning outcomes (Suprapti, 2021). The three categories of learning outcomes are cognitive, emotional, and psychomotor. Knowledge-based learning outcomes fall under the first category. The six intellectual learning objectives that comprise the cognitive domain are remembering, comprehending, applying, analyzing, evaluating, and creating (Anugraheni, 2017). Teachers need to be creative in how they implement learning in the classroom if they want to achieve successful learning. One way to innovate could be to use the applied learning paradigm. A learning model is a strategy or framework that serves as a roadmap for organizing lessons in the classroom or during tutorials. It also helps identify the resources that should be used, such as curriculum, computers, movies, books, and other materials, to support students in achieving their learning goals (Oktaviana, T.C & Sari, 2017). After reviewing the current issues, researchers conclude that the Quantum Teaching learning model with Choose Number assistance is one of the suitable learning models.

A multisensory, multicultural, and brain-compatible package comprising precise guidelines for developing efficient learning environments, formulating curricula, distributing content, and supporting the teaching and learning process is the Quantum Teaching learning model, which is utilized in presentation design for learning (DePorter, 2010). In order to establish an effective learning environment, quantum teaching stresses comfortable and pleasant surroundings. This is done by utilizing pre-existing aspects and the learning environment through interactions that take place in the classroom (Nasution & Simamora, 2021). Six steps Grow, Experience, Name, Demonstrate, Repeat, and Celebrate are represented in the phrase "TANDUR" in Quantum Teaching, according to Miftahul A'la (Margalena, 2020). Students are immersed in a pleasant learning environment thanks to the Quantum Teaching learning methodology. Using the AMBAK (What Benefits Me) technique in learning design, teachers can engage learners more effectively with the support of quantum teaching. Students will be more interested in learning if they are aware of the advantages that education offers them.

It is anticipated that the Quantum Teaching model will help to enhance the still-relatively-low cognitive learning outcomes and foster active learning. This is consistent with research that uses the Quantum Teaching approach to teach mathematics (Anwar Chairil, Syahyuzar, 2019). The effects of using the Quantum Teaching learning model on biology learning outcomes are examined by (Yahya, 2017), the application of the model in Chemistry learning is examined by (Siahaan et al., 2021), the Quantum Teaching model is applied to physics lessons by (Margalena, 2020), and (Djamion, 2020) who conducted research. The utilization of media in the classroom that can grab students' attention can help boost student activity levels in addition to the Quantum Teaching learning style. Choose Number media is one type of available media. Choose Number is an innovative game inspired by lottery games that allows students to select a number or letter and reveal the contents behind it. It is a great way to get students interested in learning and is one of the games that can be used as learning aids to get them excited about answering questions and doing tasks in the learning process (Safitri et al., 2018).

Static electricity is one of the topics covered in physics science courses. It is covered in class IX, semester I, and is divided into a number of subtopics, such as different kinds of electric charges, electroscopes, electrostatic forces, electric fields, electric potential, and electricity in nerves. One of the physics materials with numerous phenomena that students cannot directly examine is static electricity (Mukti et al., 2020). According to the findings of the researcher interviews, science teachers at MTs Darul Hikmah solely use rubbing pens for their static electricity material experiments; thus, pupils do not need to hunt for any data. Students find physical science subjects challenging, as evidenced by the fact that static electricity in physics is still viewed as a scary lesson, that many formulas need to be memorized, that students do not find the material useful when taught by teachers, that students struggle with calculation, and that students struggle to understand the concepts taught in physics (Yolanda, 2021).

Drawing from the background information and research title provided, the researcher can formulate the following problem: To what extent do class IX students' MTs Darul Hikmah Pekanbaru's cognitive learning outcomes on static electricity material change after applying the Quantum Teaching learning model with Choose Number's assistance, and whether using the Choose Number-assisted Quantum Teaching learning paradigm significantly affects the cognitive learning outcomes of class IX MTs Darul Hikmah Pekanbaru pupils on static electricity content.

2. METHOD

The participants in this study were MTs Darul Hikmah Pekanbaru students in class IX. This study was conducted in the odd semester of 2023–2024. This kind of study is known as quasi-experimental design. Posttest-Only Control Design is the design that was employed (Hardani et al., 2020), and it is explained as follows in Table 1.

Table 1. Posttest-only control design research design

	Treatment	Posttest
(Experiment)	X	O2
(Control)		O4

This research was conducted in two classes, namely the experimental class and the control class which had three stages, namely the preparation stage, the implementation stage, the data processing stage and the preparation of the report. The data needed in this study are primary data in the form of Posttest results of cognitive learning outcomes and secondary data, namely the results of daily tests of optics and light material that have been tested for normality and homogeneity tests to determine the sample. The data collection technique used is the test technique. Data analysis techniques used are descriptive analysis techniques and inferential analysis. Cognitive learning outcomes research instruments using objective tests.

3. RESULTS AND DISCUSSION

3.1. Analyzing Descriptively

Table 2 displays the descriptive data analysis of student learning outcomes for each category on static electricity material in experimental courses using the Choose Number-assisted Quantum Teaching learning model and in control classrooms using traditional learning models.

Table 2. Interpretation of students' cognitive learning outcomes

Percentage (%)	**Category**	**Experiment Class**		**Control Class**	
		%	**Number of students**	**%**	**Number of students**
81-100	Very good	40,7	11	0	-
61-80	Good	55,6	15	10,7	3
41-60	Fair	3,7	1	71,4	20
21-40	Less	0	-	17,9	5
0-20	Very poor	0	-	0	0
Average cognitive learning outcomes		79 %		52 %	
Category		Good		Less	

Table 2 shows that the experimental class outperformed the control group in terms of cognitive learning outcomes. Students in the experimental class who used the Quantum Teaching learning model with Choose Number assistance had an average cognitive learning outcome of 79% in the good category, whereas students in the control group who used the conventional learning model had an average cognitive learning outcome of 52% in the sufficient category. There is a 27% percentage difference in the two classes. The experimental class had 27 students. Of the cognitive learning outcomes, 11 students scored 40.7% in very good categories, 15 students scored 55.5% in good categories, 1 student scored 3.7% in sufficient categories, and no student scored at all in categories less and very less. Although there were 28 students in the control class, no one received cognitive learning outcomes in the very good category; instead, 3 students (10.7%) received good category cognitive learning outcomes, 20 students (71.4%) received sufficient category cognitive learning outcomes, 5 students (17.9%) received less category cognitive learning outcomes, and no student received very poor category cognitive learning outcomes.

It is possible to conclude that applying the Quantum Teaching learning model in conjunction with Choose Number on static electricity material can help students achieve better cognitive learning results, based on the average cognitive learning outcomes that the students obtained. This is consistent with studies by (Suwartini & & Caswita, 2023), whose findings showed that using the Quantum Teaching learning approach in class VIII E SMP Negeri 20 Tasikmalaya improved students' cognitive learning outcomes.

The percentage of each level of each cognitive domain varies between the experimental and control classes, according to data on students' cognitive learning outcomes. Figure 1 presents an analysis of the cognitive learning outcomes in the experimental and control groups.

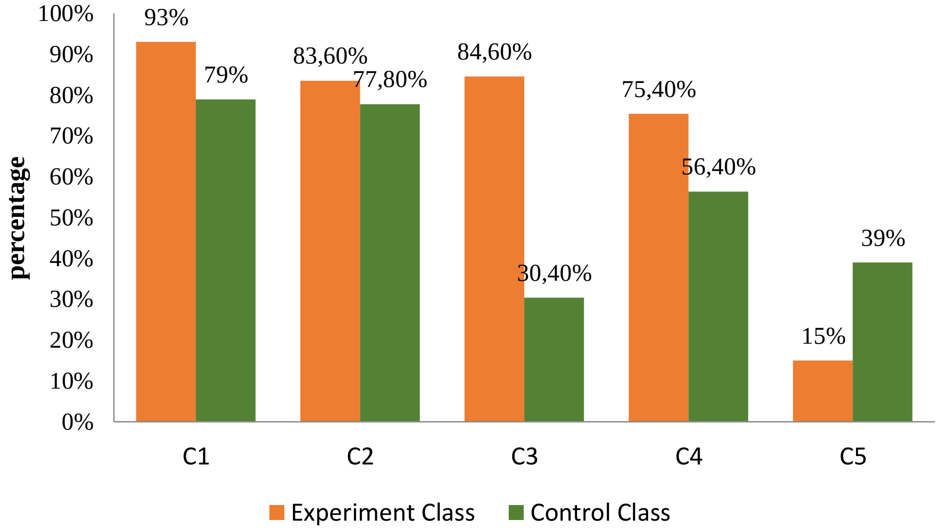

Figure 1. Shows an analysis of the comparison diagram for cognitive learning results.

Figure 1 illustrates how the use of Choose Number in conjunction with the Quantum Teaching learning paradigm impacts science learning results related to physics at multiple cognitive domain levels. Students in the experimental class attained a larger percentage of learning outcomes than those in the control class at the C1, C2, C3, and C4 cognitive domain levels. Although the control class's learning results at the C5 cognitive domain level received a higher percentage than those of the experimental class. Mentioning, labeling, matching, naming, providing examples, mimicking, and pairing are all part of the C1 cognitive domain (remembering). Figure 2 illustrates that the experimental class achieved a percentage of 93% for the level of cognitive domain C1, whereas the control class received a percentage of 79%. This demonstrates that the experimental class is superior to the control class because in quantum education, there are two Tumbuhkan steps: students conducting experiments and students working on the LKPD, which allows students to mention terms in the static electricity material. Additionally, students complete Choose Number questions, which help students improve their memory.

Classifying, describing, choosing, explaining, expressing, recognizing, exhibiting, finding, producing reports, expressing, creating reviews, and informing are all part of the C2 cognitive domain (understanding). Figure 2 shows that the experimental class's level in the C2 cognitive domain received a percentage of 83.6%, whereas the control class's percentage was 77.8%. This indicates that the experimental class outperforms the control group because, in quantum teaching, there are three steps: the Tumbuhkan step involves students conducting experiments, the Namai step involves them working on LKPD and Demonstrations, and the Choose Number step helps them understand concepts better. Applying is part of the C3 cognitive domain. It includes practicing, operating, explaining, creating interpretations, creating plans, creating timetables, drawing, problem-solving, and using. Figure 2 illustrates that the experimental class achieved a percentage of 84.6% for the C3 cognitive domain, whereas the control group received a percentage of 30.4%. The fact that the experimental class outperforms the control class is demonstrated by the fact that the Quantum Teaching learning model includes Tumbuhkan steps, such as students conducting experiments, Namai steps, working on LKPD, and demonstration. In addition, students work on Choose Number, which includes calculation questions to help students become more proficient with formulas.

The activities in the C4 cognitive domain (analyze) include inventorying, testing, inventorying, calculating, classifying, determining, comparing, and distinguishing. The level of cognitive domain C4 in the experimental class received a percentage of 75.4%, but the control class received a percentage of 56.4%, as shown in Figure 2. This demonstrates that the experimental class outperforms the control class because in quantum teaching, students conduct experiments as part of the Tumbuhkan step. They then work on LKPD and analyze the experiment data as part of the Namai step. Additionally, students use Choose Number media, which contains questions about analyzing images and helps to strengthen their analytical skills. The C5 cognitive domain (evaluation) includes judging, gathering information or arguments, justifying decisions, drawing comparisons, justifying defenses, estimating, and forecasting. The level of cognitive domain C5 in the experimental class received a percentage of 15%, whereas the control class received a percentage of 39%, as shown in Figure 2. According to the students' answer sheets from the experimental and control groups, some students are still having difficulty figuring out the reason or cause of the phenomenon that is described in the problem. This is because the Quantum Teaching steps do not connect the material to real-world situations, and in addition, the Choose Number questions do not cover HOT (High Order Thinking) questions.

3.2. Inferential Analysis

This study used inferential analysis, which included hypothesis testing, homogeneity testing, and normality testing. The significance of the experimental class was 0.138, while that of the control class was 0.074, according to the findings of the normalcy test of the students' posttest scores performed using the Kolmogorov Smirnov test technique. This demonstrates that the two classes are regularly distributed in line with (Sugiyono, 2022) normality test criteria, which state that data is normally distributed if the significance of $P \geq 0.05$. A significance of 0.386 was found in the homogeneity test results of the students' posttest scores, indicating that the data was homogeneously distributed. This is consistent with (Sugiyono, 2022) homogeneity test requirements, which state that data is homogeneously distributed if the significance of $P \geq 0.05$.

Using independent sample t-test procedures and parametric methodologies, hypothesis testing was done. Table 3 shows the outcomes of the hypothesis testing. Table 2 indicates that the significance (p) is less than 0.05, with a Sig. (2-tailed) result of 0.00. According to (Sugiyono, 2022)(2022: 300–302) criteria for hypothesis testing, H0 is rejected and H1 is accepted if the significance of $P < 0.05$. These criteria indicate that there is a significant difference in the cognitive learning outcomes of students between the control class in static electricity class IX, which uses conventional learning, and the experimental class, which uses the Quantum Teaching learning model aided by Choose Number.

Table 3. Hypothesis test results

		Levene's Test for Equality of Variances	T-test for Mean equality		
		F	t	Sig.(2-tailed)	Std. Error Difference
Cognitive learning outcomes	Equal variances are assumed	,763	11,373	,00	2,290
	Equal variances are not assumed		11,326	,00	2,299

The average cognitive learning outcomes of the experimental class are higher than those of the control class, and there is a significant difference in learning outcomes between the two groups of students, according to descriptive and inferential data analysis. It is therefore possible to learn physics science using the Quantum Teaching learning style with Choose Number's assistance.

4. CONCLUSION

Based on the research that has been done, the results of descriptive analysis are obtained, namely the cognitive learning outcomes of students on static electricity material in classes that apply the Quantum Teaching learning model assisted by Choose Number are higher with a good category than classes that apply conventional learning models. The learning outcomes of students at the C1, C2, C3, and C4 cognitive domain levels are better in the class that applies the Quantum Teaching learning model assisted by Choose Number. Class that applied the Quantum Teaching learning model assisted by Choose Number, but the learning outcomes of students at the C5 cognitive domain level are better in classes that apply conventional learning models. While the results of inferential analysis are that there is a significant difference in the cognitive learning outcomes of students on static electricity material between classes that apply the Quantum Teaching learning model assisted by Choose Number. Static electricity material between classes that apply the Quantum Teaching assisted by Choose Number with a class that applies a conventional learning model. Applying a conventional learning model. Based on the results of descriptive analysis and inferential analysis, it can be concluded that the Quantum Teaching learning model assisted by Choose Number can improve the cognitive learning outcomes of students on static electricity material.

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