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The Effect of ICT-Assisted Contextual Teaching and Learning on Learning Outcomes of Elementary School Students

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Abstract: The purpose of this study was to analyze the effect of the ICT-assisted Contextual Teaching and Learning model on the science learning outcomes of sixth-grade elementary school students. This study uses an experimental research method (true Experiment Design). The research design used is The Randomized Pretest-Posttest Control Group Design. The sampling technique is purposive sampling. The research instrument was in the form of a description test—data analysis technique with data description, normality test and homogeneity test, t-test and N-Gain. The results showed that the learning outcomes in the experimental class using the ICT-assisted Contextual Teaching and Learning model were 85.14% compared to the control class at 29.64%. In Conclusion, the use of models and media can improve student learning outcomes.

Keywords: Effect, ICT, contextual teaching and learning, learning outcomes

1. Introduction

In choosing a model, it should be able to invite students to learn actively. When students are passive or only receive lessons from the teacher, there is a tendency to quickly forget the studies given (Hasanah, 2018). To remember what has been taught, students must process it or understand it. Students learn only 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see and hear, 70% of what is said, and 90% of what is said and done (Sedova et al., 2019). This shows many lectures teach, and the level of student understanding is only 20%. But on the other hand, if students are asked to study actively, their level of knowledge of students can reach around 90%. In addition, using media or learning tools, especially ICT, is expected to improve student learning outcomes more optimally.

In addition, the use of media or learning devices is also expected to improve learning outcomes. Masruro & Gunansyah (2018) state that learning media are all types that can convey messages from a source to obtain a conducive learning environment where the recipient can carry out the learning process effectively and efficiently. In addition, learning media is also helpful for stimulating students to think critically, hone their imagination, and be better at developing their attitudes to produce creativity and innovative work.

Haryanto & Arty (2019) stated that a Contextual Teaching and Learning (CTL) method is carried out in a natural learning process. CTL has applied learning concepts that help teachers to correlate the subject matter with students' real-world lives. So it can motivate students to connect knowledge and its implementation in the social world. Kiswati et al. (2017) in their research stated that learning using the CTL model was able to improve student motivation and learning outcomes well.

According to Hawkridge (2022), information technology is the means and infrastructure (hardware, software, and user) systems and methods for obtaining, transmitting, processing, interpreting, storing, organizing, and using data meaningfully. According to McKeown in Sunyoto (2010), information technology refers to all forms of technology used to create, store, transform, and use information in all its forms.

Science learning in elementary schools emphasizes direct giving to develop competencies to explore and understand the natural surroundings scientifically to provide convenience for students to carry out active learning activities to achieve learning objectives (Kusumawati & Maruti, 2006).

Science learning in elementary schools has not been optimal, which causes low science learning outcomes in some schools. The results of learning observations indicate that the science learning process is still monotonous and teacher-

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centred and has not used an active learning model. Instead, the teacher uses the lecture method, question and answer, and practice questions when teaching science learning.

The selection of appropriate learning models and learning media will affect the learning process so that the goals can be achieved easily, which will increase student learning outcomes. The type of learning model used in this research is the contextual teaching and learning (CTL) learning model and the ICT-assisted jigsaw cooperative learning model on the science learning outcomes of sixth-grade elementary school students in Mijen District, Demak Regency.

The purpose of this study is to analyze the effect of the ICT-assisted Contextual Teaching and Learning (CTL) learning model on the science learning outcomes of sixth-grade elementary school students.

2. Literature Review

Contextual Teaching and Learning (CTL) is a teaching and learning strategy that aims to help students develop their own knowledge through creative active participation in the learning process rather than memorization. Students can master three things with the aid of contextual learning, knowledge being one of them (Salmaini et al., 2020). His thoughts in developing concepts, definitions, hypotheses, and facts are considered knowledge. The knowledge in question here is a cognitive skill. The benefit of the CTL learning model is that the instructor is not in charge of choosing the knowledge depending on the needs of the students (Hasibuan, 2014). Learning is less boring and more enjoyable and to form productive groups in the same time can formation of positive cooperative attitudes between individuals and groups. Besides, Students that participate in contextual learning are better able to think critically and creatively. Regular reasoning skills such as methodical assessment, problem-solving, decision-making, belief-giving, assumption-analysis, and scientific search are all parts of critical thinking.

The concept of contextual teaching and learning enables students to connect their knowledge to its practical application in their lives as family and community members while also assisting teachers in connecting the subject being taught to students' real-world experiences (Yuwandra & Arnawa, 2020). Contextual learning models can be integrated with other learning models, such as discovery, process skills, experiments, demonstrations, conversations, and others; they are not exclusive.

In order to correctly utilise the contextual method, teachers must possess the qualities such as innovation, creativity, dynamicism, effectiveness, and efficiency. Since students are now the primary focus of learning activities and the instructor only serves as a facilitator and motivator, there are many different techniques, resources, and media that can be used to improve students' excitement for learning (Tari & Rosana, 2019).

Using communication and information technology (ICT) is one of the ways that learning sources or media can be combined with contextual learning (CTL). Learning that is centred on the idea of computer and multimedia learning is known as ICT-based learning. Information and communication technology-based education is currently expanding quickly and has spread throughout many locations (Valtonen et al., 2015). The use of ICT in the classroom encourages students to visualise abstract concepts, can help them better understand the subject that is being taught, and enables for productive interactions between teachers and students (Nordin & Yunus, 2021). Certain materials can at least be delivered in a more entertaining manner. Because it aids students in comprehending the subject being taught, ICT-based learning media play a crucial part in the learning process. Information and communication technologies must be used by teachers for students' learning and growth.

Students can raise their academic accomplishment by utilising learning material. Due to the fact that using learning resources can increase students' motivation to learn and hence improve learning outcomes, students are able to develop their classroom activities (Khaldun 2020).

3. Methodology

3.1 Research Design

Quantitative research is experimental or conducted under controlled conditions with strict oversight, whether it takes the form of functional or factorial design. This research uses using quasi-experimental method. Quasi-experimental research is the most comprehensive quantitative research approach and fulfils all the requirements for testing causal relationships. Arifin (2020), state quasi-experimental research method is defined as a research method used to find the effect of specific treatments on others under controlled conditions. A study method known as a quasi-experiment uses at least two sample groups: an experimental sample group that receives treatment and a control group made up of another sample group.

This study uses experimental research methods. Quasi-experimental research is research that examines causal relationships. This type of research is a true experiment with a pretest and posttest control group design (Maciejewski, 2020). Descriptive statistics using the mean, median, maximum, minimum, and standard deviation values were used to analyse the data using SPSS. According to respondents' responses to each variable measuring indicator, descriptive statistical analysis aims to describe or describe data. The statistical T-Test, a sort of parametric statistical examine, was then employed to test the data for significance and relevance in one or more sample groups.

3.2 Respondents

The population taken in this study were all sixth-grade students of the Gunung Merbabu Cluster Elementary School in Mijen District, Demak Regency, consisting of 9 elementary schools and 245 students. The data is sourced from the Korwil Dikbud office, Mijen District, Demak Regency. The sample in this experimental study was class VI Public Elementary School No.1 Rejosari, with a total of 22 students in the experimental class. Class VI Public Elementary School No. 2 Rejosari, with 24 students as the control class.

The data collection technique used by the researcher in this study is a test technique in the form of a question test and a non-test method in the form of observation. The instrument used in this study was a test to obtain data about student learning outcomes. The researcher uses a written test in the form of a description of 15 questions. Observation sheets are used to observe learning activities carried out by teachers and students in the classroom. Observations are made during the learning process.

4. Findings

The description of the data is the research data. This data was obtained from the pretest and posttest scores in each class in the study. Data on the initial ability of learning outcomes were obtained from the pretest scores, and the level of student learning outcomes after the learning treatment was obtained from the posttest scores. The research data were obtained in the experimental class with the ICT-assisted Contextual Teaching and Learning (CTL) model and the control class. Table 1 describes the pretest and posttest value data for each class.

Table 1 - Description of value data.

	Pretest ICT Assisted CTL Class	Postest ICT Assisted CTL Class	Pretest Control Class	Postest Control Class
Number of respondents	22	22	24	24
mean	34.91	90.36	35.79	55.46
median	35.00	90.00	37.00	56.00
Mode	35	90[a]	35	50[a]
Std. Deviation	4.937	6.543	6.345	4.908
Minimum	27	78	20	45
Maximum	45	100	52	62

Multiple modes exist. The smallest value is shown in the experimental class with the ICT-assisted Contextual Teaching and Learning (CTL) model with a sample of 22 students at Public Elementary School No. 1 Rejosari, obtained an average pretest score of 34.91, a minimum value of 27 and a maximum value of 45. While the average post-test score of 90.36 with a minimum value of 78 and a maximum value of 100.

Based on the data description, a bar chart is made to clarify the increase in the pretest and post-test scores for each class:

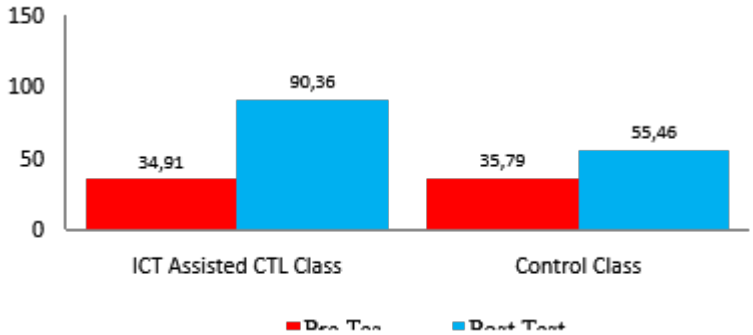

Fig. 1 - Data description chart.

Based on Figure 1 shows that there is a difference in the average pretest and post-test scores in each class. The difference in the average is the most in the class with the Contextual Teaching and Learning (CTL) learning model, while the lowest is in the control class.

The results of the Shapiro-Wilk test for normality tests in the control and experimental classes can be seen in Table 2.

Table 2 - Normality test.

	Class	Shapiro-Wilk		
		Statistic	df	Sig.
Pretest Score	ICT Assisted CTL Class	.959	22	.463
	Control Class	.912	24	.140
Postest score	ICT Assisted CTL Class	.960	22	.486
	Control Class	.938	24	.147

Table 2, obtained From the it is that the significance value of the ICT-assisted CTL class is 0.463, and the control class is 0.140. For the posttest value, the significance of the ICT-assisted CTL class is 0.486, and the control class is 0.147. Based on the results of these data, if the sig value for all classes > 0.05, then all data are normally distributed. So it can be concluded that the pretest value data for the experimental and control classes are normally distributed. Therefore, the results of the t-test for the hypothesis are:

Table 3 - Group statistics.

	Class	N	Mean	Std. Deviation	Std. Error Mean
Science Learning Outcomes	ICT Assisted CTL Class	22	90.36	6.543	1.395
	Control Class	24	55.46	4.908	1.002

Based on Table 3, the statistical output group shows that 1) for the ICT-assisted Contextual Teaching and Learning (CTL) experimental class, as many as 22 students, and in the control class, as many as 24 students and 2) the average value of post-test scores of students in the ICT-assisted Contextual Teaching and Learning (CTL) experimental class is 90.36 and the control class is 55.46.

Furthermore, it is necessary to interpret the second table, the independent sample test, to prove the difference is significant. The results of the independent sample test show in Table 4.

Table 4 - t-test.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Learning Outcomes	Equal variances assumed	1.827	.183	20.579	44	.000	34.905	1.696	31.487	38.324
	Equal variances not assumed			20.324	38.818	.000	34.905	1.717	31.431	38.380

Based on the hypothesis t-test, the t-count value is 20,579 while the t-table with df = 44 is 2.0154 then t-count > t-table or 20.579 > 2.0154, so H0 is rejected, and Ha is accepted. It means that there is an increase in science learning outcomes in grade VI elementary school students using the ICT-Assisted Contextual Teaching Learning (CTL) learning model.

5. Discussion

The results of research on learning science with the ICT-assisted Contextual Teaching and Learning (CTL) learning model and conventional learning show the t-test of hypothesis 2 shows the t-count value of 20.579 while the t table with df = 44 is 2.0154 then t-count > t-table or 20.579 > 2.0154, so H0 is rejected and Ha is accepted. This means that there is an increase in science learning outcomes in grade VI elementary school students using the ICT-Assisted Contextual Teaching Learning (CTL) learning model.

The average learning outcome on the posttest scores for ICT-assisted Contextual Teaching and Learning (CTL) is 90.36, and the control class is 55.46. From these results, there is a difference of 34.90. This proves that ICT-assisted Contextual Teaching and Learning (CTL) improves student learning outcomes. This is because, through the ICT-assisted Contextual Teaching and Learning (CTL) model, fun learning and appropriate media can increase student motivation

and learning outcomes. Contextual Teaching and Learning (CTL) is a concept that helps teachers relate subject content to real-world situations and motivates students to make connections between knowledge or its application in their lives as family members (Dewi & Primayana, 2019).

According to Shamsuddin et al. (2021) information technology refers to all forms of technology used to create, store, change, and use information in all its forms. According to Hersh (2017), there is a classification of ICT utilization into three types, namely 1) ICT as an educational media (tool) that is only as a complement to clarify the descriptions presented, 2) ICT as a source, namely as a source of information and seeking information, 3) ICT as a learning system.

Based on the N-Gain test of 0.8514, it means that the ICT-assisted Contextual Teaching and Learning (CTL) experimental class experienced an increase in learning outcomes in the high category because the N-Gain % value was 85.14, which was interpreted as bringing the Contextual Teaching and Learning (CTL) learning model) ICT-assisted is quite effective in being used to improve student learning outcomes in animal breeding materials for students in elementary schools in grade VI elementary school students.

According also gives a similar opinion to Octavia (2020), which states that the contextual learning model is a learning strategy that emphasizes the prospect of full student involvement to be able to find the material being studied and relate it to real-life situations to encourage students to be able to apply it in their lives. The contextual learning model is a learning concept that helps teachers relate the material being taught to students' real-world situations and encourages students to connect their knowledge and its application in their lives as family and community members. The contextual learning process occurs naturally through student work and experience activities, not knowledge transfer from teacher to student. Contextual learning emphasizes a high level of divergent (creative) thinking.

Lam et al. (2012) reveals that the advantage of the contextual model is that learning becomes more meaningful and accurate. That is, students are required to be able to capture the relationship between learning experiences at school and real life. This is very important because by being able to correlate the material found in real life, not only for students will the material function functionally, but the material learned will be firmly embedded in students' memory so that it will not be easily forgotten.

The results of this study are following research conducted by Ziden et al. (2011), indicate that 1) there are differences in science learning outcomes between students who take ICT-assisted contextual learning and students who take conventional learning in class IX students of Denpasar National Junior High School, 2) there is an interaction effect between learning models and learning motivation on science learning outcomes, 3) in students who have high learning motivation, there are differences in science learning outcomes between students who take part in learning; contextual learning assisted by ICT media and students who take conventional learning, and 4) In students who have low learning motivation, there are differences in science learning outcomes between students who participate in contextual assisted learning ICT media and students who follow conventional learning in class IX students of Denpasar National Junior High School. Thus, it can be concluded that the ICT-assisted Contextual Teaching and Learning (CTL) learning model significantly affects student learning outcomes in science subjects compared to conventional learning models.

The results of research, expert opinions, and relevant research show that the ICT-assisted Contextual Teaching and Learning (CTL) model effectively improves science learning outcomes in sixth-grade elementary school students. The ICT-assisted Contextual Teaching and Learning (CTL) model is more effectively used to improve science learning outcomes than conventional learning. This means that hypothesis 2 states that there is a significant influence on applying the ICT-assisted Contextual Teaching and Learning (CTL) learning model on the science learning outcomes of sixth-grade elementary school students in Mijen District, Demak Regency, is proven.

6. Conclusions and Recommendations

The ICT-assisted Contextual Teaching and Learning (CTL) learning model significantly affects the science learning outcomes of sixth-grade elementary school students in Mijen District, Demak Regency. This is based on the results of the t-test with a t-count value of 20.579 while t-table with df = 44 of 2.0154 then t-count > t-table or 20.579 > 2.0154, so H0 is rejected, and Ha is accepted. This means that there is an increase in science learning outcomes in grade VI elementary school students using the ICT-Assisted Contextual Teaching Learning (CTL) learning model.

The application of Contextual Teaching Learning (CTL) learning is very important to be applied in the learning process because it is in accordance with education in the context of the 21st century. In today's education, students must be more responsive to changing times.

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Conflict of Interest

The authors declare no conflicts of interest.

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