The Effect of The Use of Contextual Teaching and Learning (CTL) Learning Model on The Cognitive Value of Students of Elementary School

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Abstract: This study aims to evaluate the impact of the CTL model on cognitive and learning activities of fifth-grade students at SDN 16 Banda Aceh, particularly when their cognitive scores in heat transfer topics in science do not reach the minimum threshold (KKM) of 76. This quantitative research uses a one-shot case study design with measurement and observation sheets as instruments. The analysis shows that the average student score before using the CTL model was 80.76 with 72.73% classical completeness, and after using the CTL model, it was 76.33 with 69% classical completeness. Hypothesis testing indicated t count > t table (2.49 > 1.69), thus H1 is accepted. Average cognitive scores were C1 = 22, C2 = 27, and C3 = 31. The instructor's task average score was 4.74 (very good), and student learning experiences were 85% very good, 9% good, and 6% acceptable. The results indicate that the CTL model positively affects individual cognitive outcomes with an average score of 80.76. However, it does not significantly impact the percentage of classical completeness, which remained at 72.73%, below the required 80%. The CTL model enhances teacher and student learning experiences, making students more engaged and enthusiastic as the learning connects directly to their lives.

Keywords: Cognitive value; Contextual teaching and learning model; The effect

Introduction

Education has a role vital to improve the quality and quantity of the source of the power of human resource (HR). Updates in the world of education that is carried out in a planned, purposeful, and sustainable, can mem shape generations of winning are ready to compete with the tight competition globally (Sumar 2015). Education is an aspect of life that is very fundamental for the development of the nation (Lili-Mardhatillah., 2020).

One of the problems that faced the world of education Indonesia is the weakness of the process of learning. The spearhead of education is learning and teaching. which suggests that the the process of working together between educators and students to take advantage of all the potential that is owned by the students both from within yourself (interests, talents, and etc.) as well as from the outside students themselves (environment, facilities, etc.) in achieving specific learning goals. Learned to ar, which is a thing that does not integral to education has been used as a culture in Indonesia. It is becoming a prerequisite of developing a culture of Science Knowledge and Technology (Science and Technology) (Poude et al., 2011).

In the process of learning to teach can be defined as the activities that make cognitive and motor changes through interaction. Learning can also be interpreted as

a process of changing behavior in terms of psychology. Various aspects cause individual differences, either directly or indirectly, including; cognitive (knowledge), affective (attitude), and psychomotor (skills). In essence, teaching and learning activities are a process of interaction or reciprocal relationship between educators and students in learning units. Educators as one of the components in the learning process, will play an important role. Educators are a central component in learning, not just as material presenters (Mardhatillah et al., 2019).

The process of learning to teach has a meaning and understanding that is more extensive than pa da understanding of teaching. Implied the unity of the activities which are not separated between students and educators, which established the unity of interactive education in the process it. In line with these reviews, some skills that should be owned by the students that the skills to think, to skills social and skills practically. These three skills that can be developed in a situation of learning that is interactive between educators with students and among fellow students (Purbasari et al., 2013).

Type of skills of students who have been mentioned has ties closely with the cognitive value of students. The cognitive domain consists of verbal information, intellectual skills, motor skills, attitudes and cognitive tactics. The cognitive realm is essential because it includes mental (brain) activities, namely the abilities possessed by a student (Nadlir., 2017). Measurement of the cognitive domain can be done using several tests that have been developed (Abidin., 2012).

Natural Science (IPA) is a science that results from human activities in the form of organized knowledge, ideas and concepts about the natural environment, which is obtained from experience through a series of scientific process processes in the form of investigation, preparation and testing of ideas (Su'udiah et al., 2016). The system learning conventional will affect learning outcomes so that results are expected educators of students will not be optimal (Laila et al., 2016).

The learning model that is usually used by educators at SDN 16 Banda Aceh in teaching IPA in the classroom is the conventional model. In this model, the educator explains, and students listen, they are given questions and assignments. This is what became the cause of lack of knowledge of students towards learning IPA. If this situation continues without a solution, it is feared that over time it will reduce the ability and quality of student learning scores (Halimah., 2018).

For this reason, there are several alternatives to deal with this in order to increase students' cognitive scores on the heat transfer material. Some of these alternatives provide a variety of activities that have implications for a variety of student learning experiences. One of them is by using the Contextual Teaching and Learning (CTL) learning model.

To address the low value of cognitive students in science learning heat transfer materials, one of which is with translating learning model Contextual Teaching and Learning (CTL). The learning model Contextual Teaching and Learning (CTL) is a model of learning that helps educators link between the material teaching with everyday life situations students. This learning model encourages students to make connections between the knowledge they have and the application of this knowledge in their lives as family and community members.

The learning model Contextual Teaching and Learning (CTL) have several advantages. First, learning becomes more meaningful and real, which means that students are required to capture the relationship between a learning experience at school h with real life. Second, learning is also more productive and able to foster concept reinforcement in students because the Contextual Teaching and Learning (CTL) learning method adheres to the flow of constructivism, which assumes students can find and build their knowledge. Through the philosophical foundation of constructivism, students are expected to learn through a state of "experiencing" not "memorizing".

The contribution of the Contextual Teaching and Learning (CTL) learning model to increasing the cognitive value of science is when students compose projects or find interesting problems when they make choices and accept responsibility when they seek information and draw conclusions, when they actively choose, composing, arranging, touch, plan, investigate, question and make a decision, when they associate with the academic content in the context of the situation. Method of learning of this, it is assumed that k ethics students already pleased with situations conducive learning the cognitive desired value will be easily obtained by students as evidence that they have understood the lesson. This is in line with the opinion of Ellyana (2009: 35) which states that "The application of contextual learning will greatly help educators to connect subject matter with real-world situations and motivate students to form relationships between knowledge and apply it in everyday life as family members. and society".

The CTL learning model provides exposure to heat transfer material that is relevant in everyday life in the student's environment which can indirectly develop 21st century 4C skills, namely, Critical, creative, communication and collaboration. By involving real learning and problems or issues that are circulating, especially in heat transfer material, it invites students to think critically in order to get relevant solutions and concepts. The concept of CTL learning also requires

students to be able to provide creative solutions to the situations they face. Students will also indirectly be encouraged to communicate actively and constructive cooperation in order to achieve the goal of solving the problem at hand. This is in line with the opinion of (Novit, Virijai, and Asrizal 2023) Contextual Teaching and Learning (CTL) learning model is one of the solutions to solving problems to be more real and the CTL model will link science lessons with students' daily lives.

In addition to developing critical skills, the application of CTL models to students can also develop natural skills related to heat transfer material. Students will indirectly observe how heat moves through conduction, convection, and radiation. This conceptual understanding will be useful in their daily lives later. This is in line with the opinion of (Lagun Siang et al. 2020) Explaining that learning using CTL learning models is higher than science learning outcomes in groups of students who learn using other learning models. In addition, learning with the CTL model is more effective in improving students' science learning outcomes.

The Contextual Teaching and Learning (CTL) model has numerous advantages that make it an effective method for improving the quality of education. CTL contextualizes learning by linking the material with real-life situations, making learning more relevant and meaningful for students (Bhure et al. 2021; Priyadi 2021; Tari and Rosana 2019). When students can see the direct connection between what they learn in the classroom and the world around them, they are more motivated and interested in learning (Hasbi et al. 2022; Rizanti, Burhan, and Saputra 2021; Trimurtini et al. 2020).

CTL encourages active student engagement in the learning process(Hendri and Muhammadi 2023; Kaharu et al. 2023; Kristidhika et al. 2020; Pangemanan 2020). This model emphasizes experiential learning, where students are not just passive recipients of information but active participants in learning activities. For instance, through group discussions, projects, and hands-on activities, students can develop a deeper understanding of the subject matter. This aligns with constructivist theory, which posits that effective learning occurs when students actively construct their own knowledge. (Roza, Rafli, and Rahmat 2023; Sakinah and Ningsih 2022; Untari, Susanto, and Astuti 2022).

CTL develops critical thinking and problem-solving skills. In this model, students are often faced with situations that require them to think critically and creatively. They are encouraged to explore various solutions and make decisions based on thorough analysis. These skills are crucial in preparing students to face real-world challenges, where the ability to think critically and solve problems is key to success (Damanik et al. 2020; Ningsih, Ernawati, and Wiharja 2019; Ruwaidah 2022).

CTL strengthens cooperation and social skills. Through group and collaborative activities, students learn to work together with their peers, appreciate differences, and develop effective communication skills. These experiences not only help them academically but also in everyday life, where teamwork and communication abilities are essential aspects (Mira 2024; Rahman et al. 2023; Wibowo and Pradana 2022).

Finally, CTL helps teachers create a more dynamic and flexible learning environment. Teachers using the CTL model can integrate various learning strategies and media, making the learning process more varied and engaging. Additionally, CTL encourages teachers to continuously innovate and adapt their teaching methods to meet the needs and interests of students. Thus, CTL benefits not only students but also supports the professional development of teachers. (Afni 2020; Akbar 2022; Setiawati 2021)

This study introduces a novel exploration of the Contextual Teaching and Learning (CTL) model's impact on elementary students' cognitive values, particularly within the specific context of science education focused on heat transfer (Haerazi, Prayati, and Vikasari 2019; Soleha et al. 2021; Syamsuddin and Utami 2021). Unlike traditional teaching methods, the CTL model integrates real-world contexts into the learning process, aiming to make learning more relevant and engaging for students. By applying a one-shot case study design, this research uniquely evaluates both individual cognitive outcomes and classical completeness benchmarks. The study's findings offer fresh insights into the effectiveness of CTL in enhancing cognitive skills, providing a detailed analysis of its influence on student performance in a specific scientific domain, thereby contributing to the broader field of educational methodologies and their practical applications in primary education (Lestari et al. 2023; Yudha et al. 2019).

Based on the facts that occurred in the field, researchers Berke wanted late to make changes in science teaching so that the students happy to follow the expected value of cognitive learning so students increases. The success of the science learning process can be measured from the value of learning outcomes, especially the cognitive value achieved by students. Success can be seen from the students' persistence, persistence, and joy in participating in learning.

Method

The success of scientific research cannot be separated from the methods used in the research. The

research method used for the VA class students of SDN 16 Banda Aceh was an experimental method with a one-shot case study research design. The experimental method is research that aims to determine whether there is a result of something imposed on the subject.

The research consists of one dependent variable is the value of cognitive students in science subjects were given treatment in the form of a model of contextual teaching and Learning (CTL). Teknik data collection in use by researchers in this study is testing and observation. As in instruments are studied in use are cognitive test value and observation letter activities of teachers and students in learning activities. The test instrument aims to measure students' cognitive scores. The test given is an objective test in the form of multiple-choice totalling 20 items. The test sheet is in the form of questions given to students to obtain data to find out how the results of cognitive scores after using the contextual teaching and learning (CTL) learning model. Observations are made to obtain data and see the behavior of students and teachers (researchers) during the learning process. In the observation activities using observation sheets of student activities and teacher activities, observation sheets of teacher performance were carried out by class VA peers and homerooms.

The data analysis technique is a method used to prove a hypothesis. The data analysis technique was used to determine the extent of the tendency of the contextual teaching and learning (CTL) learning model to the cognitive scores of the VA class students of SDN 16 Banda Aceh. The collected data is then analyzed using the t-test and z-test statistics so that relevant conclusions can be drawn on the matter to be studied.

Data analysis techniques activities of teachers and students is done by using the value of the percentage average are guided on the distribution of votes observation, see Table 1.

Table 1. Observation Assessment Distribution

Percentage of Achievement (%)	Information
81 -100	Very good
61 – 80	Good
41 – 60	Enough
21 – 40	No good
0 – 39	Not very good

Percentage calculation is intended to determine the status of something that is a percentage and is presented as a percentage. Besides, the percentage results can also be interpreted in the form of a sentence, such as a percentage category in the observation assessment distribution table above.

Result and Discussion

Research is carried out in SDN 16 Banda Aceh, with the purpose to know effect learning model Contextual Teaching and Learning (CTL) against cognitive value and activity of VA-grade students of SDN 16 Banda Aceh on the heat transfer material. The implementation of this research applies the CTL learning model, namely by designing learning devices according to the CTL steps. The whole pace of learning that is delivered to students contains a step or syntactic CTL.

Student Test Data at SDN 16 Banda Aceh

The results of the cognitive score test for students of SDN 16 Banda Aceh are presented in the form of a score if the students' answers are correct, they are given a score of 5, and if incorrect they are given a score of 0. The number of questions given to students is 20 questions. SDN 16 Banda Aceh set KKM for science subjects by 76 and the percentage of classical completeness 80% for class V. The r average students 'cognitive value reached 80.76 of 33 students set was using CTL; it indicates that the learning model CTL affects students' cognitive abilities individually to be better. However, based on the results of the student grade analysis, it can be concluded that CTL does not affect the percentage of classical completeness in the VA class, in this case only the percentage value of completeness is 72.73%. This is because only 24 students were declared to have completed learning from 33 students.

Based on the analysis of the normality test of the student's cognitive scores above, it can be concluded that the data is normally distributed. Furthermore, testing the hypothesis using the t-test (t-test). The hypothesis test used in this research is the t-test 1 sample with one tail test (right side test) because the null hypothesis (Ho) reads " smaller or equal to (≤)" and Ha or H 1 reads " greater (>)". Based on data analysis at the significant level α = 0.05, from the t-test table t (33) (0.05) = 1, 692. Therefore t count > t table, namely (2.49> 1.69) then H 1 is accepted and it can be concluded that there is a positive effect of the CTL learning model on the cognitive value of grade V students of SDN 16 Banda Aceh.

Cognitive Value of SDN 16 Banda Aceh Students

K Capacity of k cognitive a student's ability to understand concepts already learned and measured by an item following the indicator. A matter of ordinary restricted by the level domain of cognitive Bloom is level domain knowledge (C1), comprehension (C2), applications (C3), analysis (C4), the synthesis of (C5) and evaluation (C6). However, in this study, Bloom's cognitive domain is only limited to C1, C2 and C3 only, this is because the research only measures students'

conceptual understanding, for each cognitive domain in each question understanding the complete concept is presented in Table 2.

Table 2. Cognitive Abilities of SDN 16 Banda Aceh Students

Data	Cognitive Realm		
	C1	C2	C3
Number of Questions	6	6	8
Minimum Value	10	20	10
Maximum Value	30	30	40
Average	22	27	31
Range	20	10	30

Students 'cognitive scores are part of learning outcomes, based on data analysis showing that students' cognitive abilities can be influenced by the right model, namely the CTL model applied to science subjects at SDN 16 Banda Aceh. This is due to the interest and interest of students in taking lessons with the CTL model. Learning equipped with teaching materials can make it easier for students to master the concepts presented by the teacher.

Based on data in Table 2 men show that the success of the student's views from every realm of cognitive taxonomy of Bloom in the realm of knowledge (C1) reached an average of about 20 from 6 domains knowledge (4 questions with the correct answer). In the realm of understanding, the average score reached 27 out of 6 questions in the domain of understanding and the realm of application, it reached an average of 31 out of 8 questions. These data show that students' cognitive abilities can be improved through the CTL model and the CTL model to influence students to continue learning.

The results of hypothesis testing indicate that the application of learning with the CTL model is more effective in improving student learning outcomes (cognitive). Learning with the CTL model applied to the VA class at SDN 16 Banda Aceh involves students to practice their ability to master the concepts that have been taught to be able to solve problems in these concepts. Following the learning carried out, namely through learning the CTL model, students are allowed to find as much knowledge as possible either in conducting experiments or with experiences found in everyday life so that this makes students' analytical skills increase higher than other abilities.

Students' cognitive abilities are also inseparable from the influence of the teacher in teaching. Creative teachers can make students motivated and quickly understand the concepts being taught. The teacher must be able to choose the right model and adapt it to the material being taught. Teachers must pay attention to the suitability of learning activities with model steps so that learning is more meaningful.

Teacher and Student Activities in Learning

The teaching and learning process runs smoothly if the teacher masters the class and learning materials. The learning process takes place following the steps of the CTL model so that students become more active and learn contextually. The results of the analysis of teacher and student activities using the CTL model are as follows:

Before learning takes place, the teacher first designs a lesson plan (RPP), guided by the CTL model steps and then validates the expert. The teacher carries out the learning process based on the plan that has been stated in the lesson plan; the learning steps are according to the CTL model steps, this is done so that students receive the material being taught more quickly.

When the teacher teaches with the lesson plans that have been provided, the learning process is observed by the subject teacher in the research school. This is done so that learning is really following the plan that has been designed in the lesson plan.

The teacher's activities in carrying out learning seem to be following the steps of the CTL model designed in the RPP so that the total score reaches 90 with an average of 4.74 and is included in the very good criteria. This shows that the teaching and learning process is going well and there are no obstacles at all, the teacher has prepared the learning carefully.

Teacher activity in implementing the CTL model, as seen in Figure 4.1, that there is the highest score of 5, this data shows that the teacher's activity is maximal, and also because in one aspect of observation there is only one observation indicator. However, based on the observation data, it shows that teachers are active and creative in managing to learn.

The teacher is creative in managing the class, learning as demanded in the 2013 curriculum, that learning must be two-way, the teacher as a facilitator and must be able to provoke students to learn. Teacher preparation in teaching following this lesson plan will affect student activities so that students become active, enthusiastic in learning—student enthusiasm in learning so that it can affect students' cognitive abilities.

Along with the teacher's activities that have shown to be perfect, namely with very good criteria, students also show their activities where in general all students show their activeness. Students' enthusiasm is very high in learning because it is through the CTL model, which is linking the material with their natural surroundings

Student learning activities as a whole have been very active in learning; this is because they are learning with the CTL model in science subjects. Student learning activities reached 85% of the 33 students on very good

criteria, 9% on good criteria and 6% on sufficient criteria. These results prove that the CTL model can make students more active and enthusiastic because learning is directly related to the nature of students.

Based on the data analysis, it can be concluded that the application of the CTL model in science subjects can optimize the learning process which has an impact on improving students' cognitive abilities of student learning activeness. The results of this study are a measure of the successful application of the model in learning.

Based on the results of the research, the results of the analysis of teacher and student activities show that the learning that takes place reflects cooperative learning, namely student-centred learning, student activity in this learning is more dominant than the teacher who only acts as a facilitator. At first, there are obstacles and problems faced in the implementation learning disabled in, so that no air PBM early as they should.

It's showed an increase in percentage and the average value to activities of teachers and students, also showed that the learning meaningful for students. One of the criteria for making learning meaningful is to involve students actively and creatively in developing their imaginative powers to think and find their learning outcomes through creative tricks built by the teacher. Therefore, a teacher needs to reflect on the actions taken.

Education outside the classroom refers to experience and environmental education, which greatly affects the intelligence of students. So, the CTL model is a learning activity outside the classroom and has a fun nature, where through this activity it is allowed to express one's potential, as well as channel human needs to interact with nature and fellow humans in an outdoor atmosphere so that it can also increase value. Spiritual students towards the creation of God Almighty.

Conclusion

This study aims to evaluate the impact of the CTL model on cognitive and learning activities of fifth-grade students at SDN 16 Banda Aceh, particularly when their cognitive scores in heat transfer topics in science do not reach the minimum threshold (KKM) of 76. This quantitative research uses a one-shot case study design with measurement and observation sheets as instruments. The analysis shows that the average student score before using the CTL model was 80.76 with 72.73% classical completeness, and after using the CTL model, it was 76.33 with 69% classical completeness. Hypothesis testing indicated t count > t table (2.49 > 1.69), thus H1 is accepted. Average cognitive scores were C1 = 22, C2 = 27, and C3 = 31. The instructor's task average score was 4.74 (very good), and

student learning experiences were 85% very good, 9% good, and 6% acceptable. The results indicate that the CTL model positively affects individual cognitive outcomes with an average score of 80.76.

However, it does not significantly impact the percentage of classical completeness, which remained at 72.73%, below the required 80%. Nevertheless, the CTL model enhances teacher and student learning experiences, making students more engaged and enthusiastic as the learning connects directly to their lives. Therefore, while the CTL model can provide a positive boost to individual cognitive outcomes, further improvement is needed in terms of achieving the desired classical completeness to ensure more comprehensive learning success.

Author Contributions
There were several people who played a role in completing this research. The first author provided the concept, main ideas and necessary materials, while the other authors were responsible for designing and organizing the research methods. All authors shared the responsibility of data collection, data tabulation and analysis, review process, and article writing.

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