

## Improving Science Learning Process and Outcomes in Elementary Schools Through Contextual Teaching & Learning

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**Abstract:** Science learning is a means for students to learn about the natural surroundings to develop an understanding of science concepts that are contextual to their daily lives. For this reason, this study aimed to examine the application of the contextual teaching & learning (CTL) to improve the process and learning outcomes of science learning in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi. The approach used is qualitative, with a class action research type. The results show that the CTL learning model learning process changes student learning activities, interactions, and teacher teaching activities. Changes in the learning process led to increased student learning outcomes. Teaching materials, learning media, and worksheets that are designed with contextual settings bring significant changes to student learning activities and have an impact on their better understanding. This study concludes that implementing the CTL learning model can improve the process and outcomes of science learning in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi.

**Keywords:** contextual learning; elementary schools; science learning

**Abstrak:** Pembelajaran IPA merupakan sarana bagi siswa untuk belajar tentang alam sekitar untuk mengembangkan pemahaman konsep IPA yang kontekstual dengan kehidupan sehari-hari. Namun pembelajaran IPA di sekolah dasar masih berorientasi pada pendalaman materi, tidak optimal dalam mengkontekstualisasikan materi, bahkan cenderung mengarahkan siswa untuk belajar dengan hafalan. Untuk itu penelitian ini bertujuan mengkaji penerapan Contextual Teaching & Learning (CTL) untuk meningkatkan proses dan hasil belajar materi IPA di kelas 5 UPT SD Negeri 287 Pinrang Sulawesi Selatan. Pendekatan yang digunakan adalah kualitatif, dengan jenis penelitian tindakan kelas. Hasil penelitian menunjukkan bahwa proses pembelajaran model pembelajaran CTL mengubah aktivitas belajar siswa, interaksi, dan aktivitas mengajar guru. Perubahan proses pembelajaran menyebabkan peningkatan hasil belajar siswa. Bahan ajar, media pembelajaran, dan LKS yang dirancang dengan latar kontekstual membawa perubahan yang signifikan terhadap aktivitas belajar siswa dan berdampak pada pemahaman mereka yang lebih baik. Penelitian ini menyimpulkan bahwa penerapan model pembelajaran CTL dapat meningkatkan proses dan hasil belajar IPA di kelas 5 UPT SD Negeri 287 Pinrang Sulawesi Selatan.

**Kata kunci:** pembelajaran IPA; pembelajaran kontekstual; sekolah dasar

### INTRODUCTION

Science learning in elementary schools is a curricular program that aims to develop the competence of students' attitudes, knowledge, and skills as a basis for and strengthening understanding of natural phenomena. Therefore science learning in elementary schools should be closer to investigating the natural environment, solving problems, and developing skills and decision-making. In line with this, there is an essential nature of science, namely the dimension of the scientific process (scientific method) where, in essence, students learning science do not know to memorize concepts. Still, they learn to discover through the scientific process by doing hands-on and mind-on activities based on scientific methods (Susilowati 2014). Thus, students can understand, experience, and find answers to problems about natural phenomena they encounter daily. This is also under the spirit of the 2013 Curriculum, that learning science is

developed scientifically, which emphasizes more aspects of the scientific process that demands the ability of teachers to teach science based on science (Kemendikbud 2014). Referring to this concept, science learning must be student-centered, providing opportunities for students to develop ideas, discuss with other students, and compare their ideas with scientific concepts through observations and experiments.

In addition, science is also one of the subjects in elementary school that studies the concept of nature and has broad links with human life (Surahman 2017). Science learning plays an essential role in the educational process and technological development. In addition, science learning is a means for students to learn about themselves and the nature around them and further develop their understanding of everyday life. To carry out an effective science learning process in elementary schools, it is better to pay attention to (1) thinking processes; (2) creativity, all students must have the opportunity to do various creativity; (3) student experience; (4) concept formation, in essence, the concept is owned (Sulthon 2017). In addition, science learning should encourage students to find out through a series of learning processes and activities, not through being told actions. One alternative to facilitating such learning is through contextual learning designs (Pahrudin, Agus dan Pratiwi 2019). Through this design, students are used to constructing their knowledge based on real-world contexts that are meaningful to them. In practice, such learning familiarizes students with conducting research activities, observing, experimenting, and gathering information from various sources of knowledge.

However, the ideal science learning still needs to take place wholly in learning classes at the elementary school level. One of them occurred at UPT SD Negeri 287 Pinrang, South Sulawesi. The learning process and student learning outcomes still need to be closer to the ideal conditions for learning science in elementary school. The results of the observations show that there are several areas for improvement in the science learning process. Namely the need for more optimality in connecting material with real situations of students in the learning process, not giving real examples according to what students encounter every day, and not exploring students' previous experiences and knowledge related to the material. This problem needs to be followed up immediately by improving the learning process, hoping that learning outcomes will also be encouraged to increase. Based on the literature review, one of the alternative efforts to improve the science learning process is contextual teaching learning (CTL).

CTL is a learning process that facilitates teaching materials and activities that are close to the real world; develops critical thinking, problem-solving, and creativity in student learning materials/activities; connects knowledge with various applications in the daily life of students; and facilitates learning by doing (Ambrose, Davis, and Ziegler 2013; Baker, Hop, and Karandjeff 2009; Berns and Erickson 2001). In CTL, learning occurs when students need the information to understand better the real-world context related to the material being studied so that learning activities prioritize facilitating answering questions/research/investigations conducted by students, and the context is directed to the real world encountered in students' daily lives. So that learning becomes meaningful (Aydin-Ceran 2022). The contextual approach helps teachers connect to content that students learn academically with real-world situations that students usually experience. It inspires students to combine knowledge and their lives (Davtyan 2014). CTL emphasizes using concepts and process skills in real-world contexts relevant to students of various dimensions. This approach motivates students to build relationships between knowledge and its application to their real lives (Glynn and Winter 2004).

In the context of learning science in elementary schools, several previous studies have examined the implementation of the CTL model for learning in elementary schools. Several studies have concluded that applying the CTL learning model to science subjects can improve student learning outcomes (Rahmaniati and Samsudin 2023). In addition, a study shows that using the CTL learning model to learn science in elementary school can increase student motivation (Marta et al. 2020). Then other research also shows that applying the CTL model to learning science can improve student learning activities (Muthoharoh, Mardiaty, and Zahroul Fitriyah 2020). Based on the problems and literature review, the researchers took the initiative to conduct

classroom action research, namely improving science learning process and outcomes in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi. The formulation of the research problem: 1) How is implementing the CTL learning model in improving the learning process in grade 5 UPT SD Negeri 287 Pinrang? 2) How can applying the CTL learning model improve student learning outcomes in grade 5 UPT SD Negeri 287 Pinrang?.

## METHOD

The research was conducted in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi, with subjects 24 students. The research design is the Classroom Action Research model developed by Elliot (Elliott 2001). Learning improvement is designed in two cycles, and each cycle consists of several stages: 1) planning; 2) implementation; 3) observation; and 4) reflection.

The implementation of class action in this research is by applying the steps (syntax) of CTL learning, namely: 1) developing students' thinking to carry out more meaningful learning activities; 2) carrying out inquiry activities for all topics taught; 3) develop curiosity through questions; 4) creating learning communities, such as through group discussion activities, question and answer; 5) present examples of learning through illustrations, models, and even actual media; 6) accustom children to reflect on every learning activity that has been carried out; 7) Conduct an objective assessment, namely assessing the actual abilities of each student.

The research data collected was in the form of student learning and teacher teaching activities which were taken using observation sheets. In addition, data on student learning outcomes were taken through student learning outcomes tests using cognitive test instruments in the form of multiple-choice questions. The data were then analyzed by descriptive qualitative.

## RESULT AND DISCUSSION

### Results

Implementation of the Contextual Teaching and Learning (CTL) in this study can be seen in several learning components. Teaching materials, learning media, and worksheets that are designed with contextual settings and CTL learning steps or syntax have been implemented, namely: 1) developing students' thinking to carry out more meaningful learning activities; 2) carrying out inquiry activities for all topics taught; 3) developing curiosity through questions; 4) creating learning communities, such as through group discussion activities, question and answer; 5) present examples of learning through illustrations, models, and even actual media; 6) accustom children to reflect on every learning activity that has been carried out; 7) Conduct an objective assessment, namely assessing the actual abilities of each student.

### *Results of Improved Learning Cycle I*

#### *(1) Student Activity*

The change after the CTL learning model was applied to cycle I was a change in student learning activities about conduction heat transfer. This increase can be seen when the teacher shows the learning media "Papan Peristiwa Konduksi" and students begin to be able to get information from the learning media and start associating it with phenomena that occur in students' daily lives. So that the understanding gained by students will last a long time because students learn while understanding and relating it to the natural conditions of students. With students starting to get their information through learning media, they have begun to think critically, even though only a few do this.

Changes that occur next are in the learning interactions seen in working together in groups when conduction heat transfer experiments. The teacher presents concrete media objects to carry out investigations, so the teacher can present real-world situations in class and encourage students

to connect existing knowledge with application in student life. Even though only a few students dared to convey the results of their discussion, besides that when the teacher asked questions related to learning media, only a few students were able to answer these questions even though they had to be guided first by the teacher. So contextual activities are only seen in group activities for individual contextual activities yet to be seen.

The following change is the condition or atmosphere of learning in the classroom. This condition can be seen when students focus on following step-by-step, various learning activities about conduction heat transfer. Students are pretty calm in conducting experiments, and students can follow the steps demonstrated by the teacher in conducting experiments so that students can work well with groups. In addition, students have also begun to pay attention to other groups in presenting the results of their discussions. When students start to get bored in the learning process, the teacher gives ice breaking to build a fun learning atmosphere and rebuild student enthusiasm for learning. Changes in the excellent learning process occur as follows: 1) students begin to be able to analyze so that they get information through learning media; 2) Students begin to dare to convey the results of their discussions and 3) Students begin to be able to answer questions posed by the teacher even though they have to be guided.

### *(2) Teacher Activity*

The changes after the CTL learning model were applied in cycle I in teacher-teaching activities. This can be seen when the teacher starts showing the learning media "Papan Peristiwa Konduksi" while exploring students' experiences and relating them to phenomena that occur in students' daily lives. In addition, the teacher provides teaching materials that contain examples of conduction heat transfer events that students in their daily lives commonly encounter. The teacher also provides worksheets that guide students in carrying out simple experimental projects with their groups.

However, based on the results of reflection, there are still several factors that cause the maximum learning process not to be achieved in cycle I, including 1) The contextual learning process is still weak; 2) class mastery still needs to be improved so that increased learning can be more optimal; 3) there were some students who had not been able to get information through the conduction event board learning media; 4) only a few students dare to answer the teacher's questions.

### *(3) Learning Outcomes*

Analysis of the results of the learning tests showed that the lowest score was 50 and the highest score was 100, with an average value of 77.5; thus, the learning outcomes achieved by students in cycle I were different. Before the teacher applied the CTL learning model, the percentage of completeness scores was only 12.5%. After using the CTL learning model in cycle I, out of 24 students, 15 students, or 62.5%, got a score of  $\geq 75$ , so it was said to be complete.

## **Results of Improved Learning Cycle II**

### *(1) Student Activity*

Several changes have occurred in the students learning activities about convection heat transfer. This increase can be seen when the teacher shows the learning media "Papan Peristiwa Konveksi" and students get information from it and then relate it to phenomena that occur in students' daily lives. Thus students learn while understanding and relating to the natural conditions of students. When students get their information through learning media, they begin thinking critically to make learning more meaningful. The following change is in the learning interactions seen in contextual activities in the form of student activities finding information through learning media and explaining examples of convection heat transfer events in their daily lives orally. With these activities, students are facilitated to dare to appear in front of the class. Contextual conditioning is also seen when students tell orally about convection events often found at home in front of their group mates. Then students conduct convection heat transfer experiments using

concrete objects such as candles, matches, and spoons. These activities are carried out to prove simple convection events that often occur in their daily lives.

### *(2) Teacher Activity*

Changes in the way of teaching teachers in Cycle II appeared when the teacher increased the implementation of learning steps in lesson plans. In Cycle II, the teacher increases their contextual activities in groups and individually. Changes in the learning process that occur include: 1) the teacher facilitates students to be able to find information through learning media to increase students' critical thinking by associating phenomena that occur in students' daily lives; 2) the teacher facilitates students to carry out contextual activities so that they are seen as significant in individual and group activities; 3) the teacher facilitates students to dare to explain orally examples of convection heat transfer events based on students' experiences in everyday life; 4) the teacher facilitates students to be able to answer questions given by the teacher regarding the material studied contextually.

### *(3) Learning Outcomes*

Changes in student learning outcomes can be seen in the results of increased student evaluation tests. In Cycle I, the learning completeness was only 62.5%. After applying the CTL learning model in Cycle II, 21 students had reached  $\geq 75$ , so it could be said to be complete. Analysis of the study test results shows that the lowest score is 70, and the highest is 100, with an average score of 90.

## **Discussion**

The teacher's efforts to implement the CTL steps (syntax) have gone well in class, even though they have to undergo a series of improvement processes in the second cycle. This exemplary implementation is reflected in the various aspects of learning that have shown the characteristics of CTL. The contextual attributes of the teaching materials are visible. Namely, the teacher provides teaching materials containing examples of Perpindahan Kalor events commonly encountered by students daily. In addition, it can be seen in the worksheet, which has contextual characteristics. For example, the worksheet contains activities that relate the material to the actual conditions of students so that students are expected to be able to write down and tell examples of events that students have seen by showing events of conduction and convection heat transfer in everyday life. In addition, students also practice conduction and convection heat transfer events in a simple experimental project, for example, heat induction and convection experiments. Through experimental projects, students are directed to observe a conduction and convection heat transfer process, conclude a new concept and knowledge about this natural phenomenon, and relate it to phenomena they encounter daily at home. Likewise, the media has contextual characteristics, namely, containing images of conduction and convection heat transfer that are often experienced by students daily. Then students are also given evaluation questions about conduction and convection heat transfer in everyday life. Finally, the teacher explains the material by providing examples such as heat transfer material in everyday life by induction and convection.

Using a CTL-based worksheet can facilitate the learning process and help students understand the material more easily. This is in line with the results of previous research that the learning process with the CTL approach implemented in Student Activity Sheets can help students more easily understand the subject matter (Fauziah and Nurita 2019). Likewise in teaching materials, teaching materials set with the CTL approach help students understand concepts (Dewi and Primayana 2019; Lestari, Sutiarsa, and Sugilar 2022). Overall, the implementation of CTL learning can facilitate teaching materials and activities that are close to the real world; develop critical thinking, problem-solving, and creativity in student learning materials/activities; connect

knowledge with various applications in the daily life of students; and facilitate learning by doing (Ambrose et al. 2013; Baker, Hop, et al. 2009; Berns and Erickson 2001).

The processes and activities that have been going on are also in line with Davtyan's explanation that instruction based on contextual learning strategies should be structured to encourage five basic forms of learning: Relating, Experiencing, Applying, Cooperation, and Transfer (REACT) (Davtyan 2014). *Relating* is a learning process experienced by students in the context of life experiences and connecting the material being studied with that experience. In this case, the teacher uses the strategy of connecting new perceptions with something familiar to students, from the side of students who connect the daily events they experience with the subject matter being studied. *Experiencing* is a student learning process in the context of exploratory experiences. The learning process in students will potentially occur faster when students experience themselves using equipment and materials and carry out active research on their own. For example, conducting relevant experimental projects will demonstrate that the natural phenomena they encounter are phenomena that can be explained scientifically. This step helps them practice actions directly related to real-life phenomena with the concepts or knowledge being studied. *Applying* is learning concepts and information in practical and meaningful situations. Through a series of learning activities, students are expected to be able to apply a concept that is being studied to their real-world experiences, especially in daily problem-solving activities. In this case, the teacher can add explanations and motivate students by orienting a problem that is realistic and relevant to students' lives. *Cooperation* is a learning process experienced by students in the context of sharing, responding, and communicating with other students. This is an essential strategy in CTL. Working in groups helps students share everyday experiences relevant to the concepts being studied, solve problems, understand the concepts and relate them to the real world. *Transfer* is a learning process in the context of utilizing prior knowledge that already exists or is owned by students through their daily experiences. At this stage, the teacher helps students explore their experiences, relate them to new scientific concepts or knowledge and then helps students to apply them to new situations and contexts or problems in everyday life.

This research also shows various changes in the learning process about conduction and convection heat transfer in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi. For example, changes in student learning activities, this increase can be seen when the teacher shows the learning media "Papan Peristiwa Konveksi". Students get information from the learning media and associate it with phenomena that occur in students daily lives so that the understanding gained by students will last. With students getting their information through learning media, they begin to think critically to make learning more meaningful. The learning process takes place naturally in the form of student work activities and student observations that are required to be active, not just passing on knowledge from the teacher to students. Thus learning outcomes are expected to be more meaningful for students to solve problems, think critically, make observations and draw conclusions (Marta et al. 2020). It was further explained that CTL learning facilitates students to absorb lessons and capture meaning in the academic material they receive. They can associate new information with their knowledge and experience (Ginting 2016). This also aligns with the explanation that contextualizing science learning needs to involve utilizing students' prior knowledge and everyday experiences as catalysts for understanding challenging and meaningful science concepts (Rivet and Krajcik 2008).

Changes also occurred in student learning interactions after the implementation of CTL, which was seen in students finding information through learning media and then explaining orally by linking examples of conduction and convection heat transfer events in everyday life. Contextual activity is also seen when students tell orally about convection events often found at home in front of their group mates. In addition, it also appears when students carry out conduction and convection heat transfer experiments in groups to prove simple convection events that often occur in students' daily lives. Various forms of interaction with fellow students, teachers, media, and experimental activities have the potential to absorb information faster and last longer in

students' memory. This is in line with the assertion that CTL helps students connect with internal and external contexts, 1) namely starting with the knowledge they have or past experiences, 2) continuing with learning experiences in the classroom or the current situation, 3) re-associating them with everyday problems with diverse learning interaction experiences. These experiences result in a more profound understanding so that students are more likely to maintain competence for a more extended time and can apply their knowledge to solve everyday problems in the future (Berns and Erickson 2001). Contextualized learning has been theorized to help students understand complex scientific ideas because the meaningful use of a problem or situation provides students with a cognitive framework that connects their experiences with new knowledge. In this case, the cognitive framework acts like a structure where abstract ideas can be connected with prior understanding and fixed in long-term memory (Rivet and Krajcik 2008).

Various changes in the implementation of CTL show actual practice that contextual learning facilitates students to 1) develop basic knowledge (understanding specific ideas or concepts), 2) application (ability to involve this information in action), 3) integration (understanding the relationship between the knowledge learned), the human dimension (understanding the need to 4) interact with and understand oneself or others), and 5) promoting learning that involves student participation at every stage. CTL was identified as a strategy that encourages active student involvement, improving the learning process and developing scientific thinking skills (Baker, Hope, and Karandjeff 2009). He also emphasized that CTL is a means to improve student performance by increasing interest and motivation, developing skills and mastery of information, increasing connectivity with peers, and accommodating various ways of learning activities (Baker, Hope, et al. 2009). Other references assert that CTL can stimulate students' brains to develop patterns and create meaning by connecting sensory experiences and stimuli with new knowledge through real-life applications (Baker, Hope, et al. 2009).

Various changes in the learning process, both from the side of the teacher, students and learning activities as described above, lead to increased student learning outcomes. Previous research concluded that applying the CTL to science learning can improve student learning outcomes (Nadhiroh and Efendi 2023; Rahmaniati and Samsudin 2023).

## CONCLUSION AND SUGGESTIONS

Based on the results of learning improvement, it was concluded that to improve the learning process and student learning activities in science learning, CTL is one of the relevant alternatives. The results of this study indicate changes and improvements during the learning process, such as in student learning activities, learning interactions that occur and the way teachers teach. The process of improving science learning which has an impact on improving the learning process and student learning activities can ultimately improve student learning outcomes in grade 5 UPT SD Negeri 287 Pinrang, South Sulawesi.

The implication is that in science learning in elementary schools, a paradigm shift is needed from science as a concept that must be learned by rote to a concept that needs to be understood by linking phenomena and students' daily experiences. One is through CTL, which facilitates students' attention to think about "why do I need to study science? why is it useful? where is it useful for me?" This understanding needs to be instilled so that children can use science to make sense of life, see science as a tool in transferring it to situations they face in life, and have the characteristics of developing 21st-century skills (Aydin-Ceran 2022). So it is necessary to reconstruct the curriculum and practice of learning science in elementary schools, which aims to close the gap between science and real life through the best and implementable methods and strategies based on real-life contexts.

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