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Contextual Teaching and Learning Model: Explosion Box Media on Learning Activity in Elementary School Students' IPAS Subjects

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ABSTRACT

Fourth graders' low learning engagement in elementary schools can hinder learning, especially in Natural and Social Sciences (IPAS) subjects that require contextual understanding. We need innovative learning techniques and media to engage pupils. Thus, this study examines how the Contextual Teaching and Learning (CTL) methodology and Explosion Box media affect fourth graders' IPAS learning in elementary school. This study uses a quantitative approach with a quasi-experimental design in a nonequivalent control group posttest-only format. The sample consisted of 40 students divided into experimental and control classes at elementary school 3 Way Galih. Learning activity data were collected using a validated and reliable questionnaire. Data analysis was carried out using an independent sample t-test. The results showed a significant difference in learning activity between the experimental and control groups, with a Sig. (2-tailed) value = 0.000 < 0.05 and a t-count value of 4.965 > t-table 1.685. These results show that the CTL model with Explosion Box media boosts student learning. This medium creates an interactive, contextual, and engaging learning environment, encouraging student participation. Effective learning model recommendations come from this research. IPAS teachers can use the CTL model and Explosion Box media to motivate, engage, and contextualize elementary school pupils, supporting holistic educational goals.

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1. INTRODUCTION

Basic education, particularly in elementary schools, is a crucial foundation for developing students' cognitive, affective, and psychomotor skills (Abbasi et al., 2023). The 21st-century educational paradigm demands a shift from teacher-centered learning to student-centered learning, which emphasizes the development of critical thinking, collaboration, communication, and creativity (the 4Cs) (Alam, 2023; Dada et al., 2023; Patel-Junankar, 2017). Creating meaningful learning, where new information connects

to students' experiences, knowledge, and real-life contexts, is the essence of this transformation (Luthfiyah et al., 2025; Zebua, 2025).

Natural and Social Sciences (IPAS) at the elementary school level is unique because it integrates two previously separate disciplines (IPA and IPS) (Chasanah & Wiyani, 2024; Surul & Septiliana, 2023). This integration aims to help students understand how natural and social events are related to each other (Hanif et al., 2024). This is in line with the cognitive development of elementary school-aged children, who are at the concrete operational stage. Therefore, IPAS learning should not only focus on memorizing concepts but also on students' ability to apply them in real-life contexts (Nisa et al., 2025).

Despite its noble goals, the implementation of IPAS learning in the field still faces several significant challenges (Hayat et al., 2023; Komariah et al., 2023; Kusuma, 2025). Several initial studies and observations indicate several fundamental problems, namely (1) Material Abstraction: Many science materials, especially scientific concepts such as ecosystems, energy, or life cycles, are often presented abstractly and textually only through textbooks or lecture methods. This issue causes elementary school students, whose thinking patterns are still concrete, to have difficulty understanding and internalizing these concepts. (2) Low Learning Activity: Limited variations in learning methods and media often cause students to feel bored and less motivated in following the lesson. Learning becomes one-way learning, where students only play a passive role as listeners, so that their learning activities, such as asking questions, discussing, exploring, or collaborating, are low. (3) Lack of Contextual Connection: Learning is often detached from the context of students' real lives. The concepts learned feel foreign and irrelevant, so students fail to see the practical function of science in their lives. As a result, the understanding gained is temporary and not deep.

These challenges directly contribute to poor student learning outcomes and low student interest in IPAS. We need learning interventions that not only alter teacher delivery methods but also revamp the learning environment to make it more contextual, interactive, and enjoyable. One philosophically and pedagogically relevant approach to addressing these challenges is the Contextual Teaching and Learning (CTL) Model (Riza et al., 2024). CTL is a learning concept that helps teachers connect subject matter to students' real-world situations, encouraging students to make connections between their existing knowledge and its application in everyday life (Kaharu et al., 2023; Mallika, 2024).

The seven main components of CTL—Constructivism, Inquiry, Questioning, Learning Community, Modeling, Reflection, and Authentic Assessment—provide a robust framework for encouraging students to actively construct their knowledge (Constructivism) (Khaldun, 2020; Ratnaningsih & Triwahyuni, 2025), ensuring the material is relevant to students' lived contexts and experiences (Learning Community), and fostering student enthusiasm and engagement in the learning process. The implementation of CTL has been shown to have a positive impact on science learning outcomes (Aliyyah et al., 2020), but its effectiveness often depends heavily on the media used to bridge abstract concepts with students' concrete contexts.

To maximize the impact of CTL, learning media are needed that can accommodate the concrete characteristics of elementary school children and facilitate its components, especially in the visualization and interaction aspects (Sari et al., 2024; Trimurtini et al., 2020). Explosion Box is a visual-kinesthetic media that is traditionally known as a handicraft or gift media but has extraordinary pedagogical potential (Fatmawati et al., 2024; Khoiriyah et al., 2025; Wati et al., 2023). When opened, the box will "explode" or open its layers, revealing various information, images, texts, and summaries of the material neatly arranged on each side of the fold (Marludia et al., 2020; Nasriya et al., 2021; Sipnaturi & Farida, 2020). The advantages of the explosion box as a IPAS learning media that supports CTL include (1) its ability to transform abstract IPAS concepts into tangible objects that can be touched and manipulated (concrete), which is very appropriate for the cognitive development stage of elementary school students. Its interactive and captivating nature can overcome student boredom. (2) Each layer of the box can represent a different component of an ecosystem, cycle, or other science material, allowing students to connect parts of the material into a contextual visual whole. (3) The process of making an explosion box (either as a finished media or because of a student project) encourages creativity and collaboration (in line with the learning community component in CTL). (4) This media has been proven to improve conceptual understanding, learning outcomes, and student motivation in IPAS lessons.

By combining the conceptual power of the CTL Model with the visual-kinesthetic power of the Explosion Box media, it is hoped that there will be a synergistic increase in student learning activities in IPAS subjects. The focus on "learning activities" here is crucial because activities are a direct indicator of student engagement, which is a primary prerequisite for meaningful learning and improved learning outcomes.

A preliminary study by the author found that IPAS learning at Elementary School 3 Way Galih showed that some students still tended to be passive in participating in learning activities. Teachers have attempted to use various methods, but most of them are still conventional and have not fully engaged students in critical thinking and collaborative activities. Such an approach has resulted in low student activity, both in asking questions and in discussing and expressing opinions. By implementing the CTL model assisted by the Explosion Box media, it is hoped that students can be more actively involved in the learning process because they are invited to observe, ask questions, explore, and reflect on knowledge independently or in groups.

The innovation of this article lies in the specific synergy between the Contextual Teaching and Learning (CTL) Model and the Explosion Box learning media for elementary school IPAS subjects, with a measurement focus emphasized on improving student learning activities. Although these components have been studied separately, no research has explicitly tested the effectiveness of this combination as a unified learning intervention, particularly within the context of an integrated IPAS curriculum.

Most previous research involving CTL and/or Explosion Box has focused primarily on cognitive outcomes (Khoiriyah et al., 2025; Nurhayani et al., 2024; Wati et al., 2023). While learning outcomes are important outcomes, learning activities are a more fundamental process indicator and directly indicate the level of student engagement,

active participation, and motivation during the intervention. This article positions improvements in student learning activities as the primary and direct impact variable of the intervention, rather than merely a supporting variable. This more detailed and process-oriented focus analyzes how the combination of CTL and Explosion Box concretely encourages students to be more active in asking questions, exploring, collaborating, and presenting their IPAS material in class. This in-depth analysis of learning activities provides practitioners with richer insights into the mechanisms of successful intervention.

This study is the first (or one of the first) to intentionally and systematically integrate the CTL framework (with its seven components) with the Explosion Box media. The Explosion Box here does not merely function as a passive visualization tool but is designed as a contextualization tool that supports the core components of CTL (such as inquiry and learning community) in elementary school science classes (Fatmawati et al., 2024; Nasriya et al., 2021; Sipnaturi & Farida, 2020). This synergy bridges the gap between the context-centered pedagogical approach (CTL) and a highly concrete and interactive medium (Explosion Box). This study specifically focuses on the effectiveness of the CTL-Explosion Box Model in the context of integrated IPAS materials. Explosion Box media is adapted to present content that combines both domains (for example, the impact of social activities on ecosystems or the utilization of natural resources in a social context). Testing on IPAS shows a higher relevance in overcoming students' difficulties in seeing the holistic relationship between science and social science in their daily lives. By focusing on the synergy of models and media, emphasizing process variables (learning activities), and the context of the integrated science curriculum, this study is expected to contribute innovative and tested pedagogical recommendations to improve the quality of learning in elementary schools.

2. METHOD

This research is classified as a quantitative study with a quasi-experimental approach. This approach was chosen because the research was conducted under natural conditions in schools, where the subjects (students) were naturally grouped into existing classes, so random assignment into experimental and control groups was not possible. The quasi-experimental design used was a Nonequivalent Control Group Posttest-Only Design. This design involves two groups, the experimental group and the control group, and neither group was randomly selected. Both groups were given different treatments, and measurements were taken only after the treatment (posttest) to measure the impact of the treatment on the dependent variable. The design scheme of this research can be described as follows in Table 1.

Table 1. Nonequivalent Control Group Posttest-Only Research Design

Group	Treatment	Posttest
Experiment	X	O_2
Control	–	O_4

The population in this study was all fourth-grade students at Elementary School 3 Way Galih, consisting of 40 students divided into two classes. The subjects in this study

were fourth-grade students of Elementary School 3 Way Galih. The sampling method used was non-probability sampling with a saturated sampling technique, where all members of the population were sampled. Class IV A was selected as the experimental class implementing the CTL model assisted by the Explosion Box media, while Class IV B served as the control class following conventional learning. The sample selection was carried out using a purposive sampling technique, considering classes with relatively balanced characteristics and initial abilities to select classes.

The research instrument is a measuring tool used to obtain data according to the variables studied. In this study, the instrument used was a student learning activity questionnaire, which functions to measure the level of student activity in IPAS learning on energy transformation. Furthermore, the questionnaire content was validated and approved by learning experts to ensure it met the research objectives. In this study, data was collected through a posttest administered after the learning treatment. The experimental class received instruction using the CTL model assisted by the Explosion Box media, while the control class used the conventional learning model. The posttest results were used to determine differences in learning engagement between the two classes after the treatment.

To ensure the instrument's effectiveness in measuring the dependent variable, student learning engagement, a validity test was conducted using the Pearson product moment correlation formula to determine the extent to which each statement item measured the intended aspect of learning engagement. The instrument was used to measure the independent variable, the Contextual Teaching and Learning (CTL) model, Assisted by the Explosion Box Media. Reliability testing was conducted using Cronbach's Alpha formula to determine internal consistency between statement items.

The instrument was declared valid if the calculated r value was greater than the table r value at a significance level of 5% and reliable if the alpha coefficient value was greater than 0.6. Therefore, only valid and reliable items were used in the study to measure student learning engagement. The data analysis techniques used included prerequisite tests, namely the normality test and the homogeneity test. If these two tests are met, the hypothesis will be tested using parametric statistics, namely the independent sample t-test. The purpose of this t-test is to compare the meanings of two independent groups (two independent samples) to determine whether the meanings of the two groups are different or not.

The decision in this study was based on the results of data analysis using statistical tests. The null hypothesis (H_0) and alternative hypothesis (H_a) were determined as follows: H_0 states that there is no effect of the Contextual Teaching and Learning (CTL) learning model assisted by Explosion Box media on students' learning activity in the fourth grade of the IPAS subject at Elementary School 3 Way Galih, while H_a states that there is an effect of the Contextual Teaching and Learning (CTL) learning model assisted by Explosion Box media on students' learning activity in the fourth grade of the IPAS subject at Elementary School 3 Way Galih. Hypothesis testing was conducted using an independent t-test (independent sample t-test) because this study compared two groups that were not randomly selected (experimental class and control class) with

posttest-only measurements. The decision-making criteria state that if the Sig. (p-value) is less than 0.05, then H_0 will be rejected and H_a will be accepted, indicating a significant effect of the CTL learning model assisted by Explosion Box media on students' learning activity. On the other hand, if Sig. (p-value) ≥ 0.05, then H_0 is accepted, which means there is no significant influence between the two learning models on students' learning activeness.

3. RESULTS AND DISCUSSION

Results

Research data was collected through a posttest (questionnaire and observation) of student learning engagement administered after the learning treatment was completed in both classes. This measurement aimed to determine the level of student learning engagement after participating in the learning process with different models. The experimental class received instruction using the Contextual Teaching and Learning (CTL) model with the aid of Explosion Box media, while the control class used conventional learning. Table 2 below presents the results of the posttest measurement of student learning engagement in both classes.

Table 1. Posttest Results of Control and Experimental Classes

Statistic	Experiment Posttest	Posttest Control
N (Activity)	-	-
Mean	73.75	60.25
Std. Error of Mean	1,692	2,129
95% Confidence Interval for Mean		
Lower Bound	70.21	55.79
Upper Bound	77.29	64.71
5% Trimmed Mean	73.72	60.11
Median	73.00	60.00
Variance	57,250	90,618
Std. Deviation	7,566	9,519
Minimum	60	42
Maximum	88	81
Range	28	39
Interquartile Range	10	12
Skewness	85	219
Std. Error of Skewness	512	512
Kurtosis	-229	118
Std. Error of Kurtosis	992	992

The control class had a 39-point range for student involvement scores, from 42 to 81. This score is higher than the experimental class, indicating more engagement variation in the control class. The interquartile range (IQR) of 12 demonstrates that control class data is more spread out than experimental class data. The data distribution is slightly skewed to the right (positive skew) with a standard error of 0.512, showing that low-

engagement pupils are reducing the mean. A kurtosis of 0.118 and a standard error of 0.992 imply a near-normal distribution. Despite higher engagement variation, the distribution pattern is normal and not excessive.

Overall, the descriptive results reveal that control class students were less engaged than experimental class students. This shows that the experimental class's learning method engages students. This study employed a nonequivalent control group posttest-only design to collect data following learning therapy. The control class received conventional learning, while the experimental class received Contextual Teaching and Learning (CTL) using Explosion Box media.

The descriptive analysis showed that the experimental class had a 73.75 posttest score for learning engagement, while the control class had 60.25. These averages show that the experimental class was more engaged in learning than the control class. Thus, the Contextual Teaching and Learning (CTL) learning methodology using Explosion Box media improves IPAS student engagement. To confirm that the data met statistical analysis assumptions, normality and homogeneity tests were performed before testing the hypotheses with the t-test. The normal test results are in Table 3.

Table 3. Normality Test

Class	Normality Test	Statistic	df	Sign.
Experiment Posttest	Kolmogorov-Smirnov	89	20	.200
	Shapiro-Wilk	977	20	897
Posttest Control	Kolmogorov-Smirnov	73	20	.200
	Shapiro-Wilk	991	20	999

Building upon Table 3, the results of the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk tests indicate that the significance value for the experimental class is 0.200 and for the control class is also 0.200. Both values are greater than the 0.05 significance level, thus concluding that the posttest data in the experimental and control classes are normally distributed. Thus, the data from both classes meet the assumption of normality, making it appropriate to conduct a homogeneity test to determine whether the variances of the two classes are homogeneous. The results of the homogeneity test are presented in Table 4.

Table 4. Results of Homogeneity Test

Source of Variation	Levene Statistic	df1	df2	Sig.
Based on Mean	751	1	38	391
Based on Median	809	1	38	374
Based on Median and with adjusted df	809	1	36,311	374
Based on Trimmed Mean	754	1	38	391

Table 4 shows that Levene's homogeneity of variance test yielded a mean significance value of 0.391. This result is above the 0.05 significance level, indicating that posttest data on activeness in the experimental and control classes is homogeneous.

Thus, parametric statistics, such as an independent sample t-test to compare the average posttest results across the experimental and control classes, can test the hypothesis because the research data is homogeneous. Table 5 shows the hypothesis test results from SPSS 25 for Windows.

Table 5. T-Test Results

Levene's Test (Homogeneity)	t-Test (Mean Difference)					
F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**
751	391	4,965	38	0	13,500	2,719

The results of the hypothesis test above, the calculated t-value was 4.965 with a mean difference of 13.500. The degrees of freedom (df) were calculated using the formula (n_1 + n_2) – 2 = (20 + 20) – 2 = 38, resulting in a t-table value of 1.685. The results of the Independent Sample T-Test showed that the Sig. (2-tailed) value was 0.000 < 0.05, and the calculated t-value (4.965) was > t-table (1.685). Therefore, H_0 was rejected and H_a was accepted.

Discussion

This study aimed to determine the level of student learning engagement after participating in a learning process using different models, namely comparing an experimental class using the Contextual Teaching and Learning (CTL) model with the aid of Explosion Box media and a control class using conventional learning. Data collection was conducted through a posttest (questionnaire and observation) administered after the learning treatment was completed in both classes.

Descriptive Analysis of Learning Engagement

The descriptive analysis results indicated a substantial disparity in the level of learning engagement between the two groups. The experimental class had a significantly higher average posttest score of 73.75, compared to the control class, which only achieved 60.25. This average difference of 13.500 indicates that students in the experimental class were collectively more engaged in learning than students in the control class. The control class data had a score range of 39 (from 42 to 81) and an interquartile range (IQR) of 12. This variation was greater than that of the experimental class (range 28, IQR 10). The greater variation in the control class indicates a wider difference in engagement among students. Furthermore, the data distribution for the control class is slightly skewed to the right (positive skew) with a value of 0.219. This result indicates that there are a significant number of students with low engagement levels, thus skewing the mean. However, the kurtosis value of 0.118 indicates that the data distribution is close to normal and not overly skewed. Overall, these descriptive findings conclude that students in the control class are less engaged in learning than students in the experimental class. This result provides an initial indication that the learning method implemented in the experimental class, namely CTL with the

Explosion Box media, successfully increased student engagement (Nabilla & Nora, 2022; Sambonu & Hardi, 2024).

Hypothesis Testing (T-Test)

Hypothesis testing was conducted to determine the significance of the difference in average learning engagement between the two classes. Based on the significance value: The obtained Sig. value (2-tailed) is 0.000. Since 0.000 < 0.05, H_0 is rejected and H_a is accepted. Based on the comparison of t-count and t-table, the t-count value (4.965) is greater than the t-table (1.685). Therefore, H_0 is rejected and H_a is accepted. The acceptance of H_a statistically shows that there is a significant difference in the average learning engagement between classes using the CTL model with Explosion Box media and classes using conventional learning.

The findings of this study definitively demonstrate that the Contextual Teaching and Learning (CTL) model using the Explosion Box media is effective in increasing student learning engagement (especially in IPAS subjects) compared to conventional methods. This increased engagement can be interpreted as a successful synergy between (1) the CTL model and (2) the use of Explosion Box media: This model encourages students to relate the subject matter to the context of their real experiences, making the material more relevant and meaningful. This relevance directly increases students' motivation and desire to actively engage. (2) the Explosion Box media: This media serves as an innovative, interactive, and visually engaging learning tool. Unique and tactile media such as the Explosion Box are likely able to break the boredom that often arises in conventional learning, thereby encouraging deeper student participation and exploration, which is measured as increased engagement (Nabilla & Nora, 2022). Therefore, this study provides strong recommendations for educators to integrate contextual learning models and utilize engaging, creative media to maximize student participation and active engagement in the classroom.

The research results prove that the application of the Contextual Teaching and Learning (CTL) learning model assisted by the Explosion Box media significantly influenced the increase in student learning activity. This is because the experimental class received different treatment, namely by using the CTL model combined with the Explosion Box media. The CTL learning model encourages students to relate learning material to real experiences, so they more easily understand the concepts being learned. Through exploration activities and group discussions, students become more active in expressing opinions, asking questions, and working together to complete assignments. Furthermore, the use of the Explosion Box media can attract students' attention and learning interest due to its creative and interactive display (Chandra et al., 2024; Muliani et al., 2024; Nurhayani et al., 2024). This media helps students understand the IPAS material visually and concretely, so that learning becomes more meaningful and enjoyable. This aligns with the opinion that the CTL model helps improve students' understanding of related geographical and environmental concepts (Arisanty et al., 2017). Through this approach, students can see a direct connection between the theories learned in class and the phenomena they experience daily around them (Sambonu &

Hardi, 2024). Furthermore, this approach emphasizes student involvement in discovering material, linking it to real-life situations, and encouraging application in everyday life. CTL is considered suitable for elementary school students because it integrates real-world contexts into the learning process (Riza et al., 2024).

The use of the Contextual Teaching and Learning (CTL) model supported by the Explosion Box media has been proven to significantly increase student learning engagement. This success is evident in increased student engagement in the learning process, both in asking questions, answering questions, discussing, and working together in groups. The engaging and interactive Explosion Box media helps students understand IPAS material in a more concrete and enjoyable way (Alifiana et al., 2025). Student-centered learning activities make it easier for them to connect the subject matter to real-life experiences, in accordance with the principles of contextual learning (Dada et al., 2023).

Furthermore, the use of the Explosion Box-assisted CTL model also increases student motivation and confidence, as they actively participate in discovering concepts and solving problems. This creates a more lively, interactive, and collaborative learning environment. The Explosion Box-assisted Contextual Teaching and Learning (CTL) model also incorporates interactive and collaborative elements that can stimulate student motivation. Through learning activities linked to real-life contexts, students become more actively engaged and enthusiastic about participating in the learning process. This model not only focuses on achieving learning outcomes but also fosters responsibility, discipline, curiosity, and the ability to collaborate among students through various exploration activities and group discussions. Thus, the implementation of the Explosion Box-assisted CTL model creates a fun and meaningful learning environment and encourages optimal student engagement.

Thus, the application of the CTL model assisted by the Explosion Box media has proven effective in increasing student learning activity and creating a more meaningful and enjoyable IPAS learning process. These findings indicate that learning that links material to real-life contexts and is supported by interesting media can encourage students to participate more actively in learning activities. Furthermore, the use of the Explosion Box media provides a visual and interactive learning experience that helps students understand concepts concretely. Therefore, the application of the CTL model with creative media, such as the Explosion Box, can be an innovative alternative for teachers to increase the activity and quality of learning in elementary schools.

4. CONCLUSION

The Contextual Teaching and Learning (CTL) learning model assisted by Explosion Box media has a positive and significant effect on increasing student learning activity in the Natural and Social Sciences (IPAS) subject of grade IV at SD Negeri 3 Way Galih. This is evidenced by the average value of student learning activity in the experimental class of 73.75, which is higher than the control class of 60.25. The results of the independent samples t-test show a Sig. (2-tailed) value = 0.000 < 0.05 and t-count (4.965) > t-table (1.685), so the null hypothesis (H_0) is rejected and the alternative

hypothesis (H_a) is accepted. This means that there is a significant difference in learning activity between classes using the CTL model assisted by Explosion Box media and classes using conventional learning.

The Explosion Box media has been proven to help students understand material contextually, create a fun learning atmosphere, and encourage active participation through exploration, discussion, and reflection activities in accordance with CTL components such as constructivism, inquiry, and modeling. These findings support the importance of learning innovation in elementary schools to address the low student activeness in IPAS learning, which has tended to be teacher-centered. Thus, CTL-based learning assisted by the Explosion Box can be an effective alternative in creating a meaningful, active, collaborative, and contextual learning process, in line with the spirit of the Independent Curriculum.

As a suggestion, it is hoped that teachers and schools can continue to develop the Contextual Teaching and Learning (CTL) learning model with more varied innovations, such as combining it with interactive learning media and integrating the latest digital technology. This study has shown that the application of the CTL model combined with the Explosion Box media has proven effective in increasing student learning activity in the subject of IPAS. Therefore, teachers and schools are expected to develop and implement CTL-based learning innovations with various other forms of creative media so that student activity, conceptual understanding, and learning experiences can be more optimal and sustainable. For future researchers, it is recommended to explore various other innovations in the application of the CTL model, especially those involving digital media, augmented reality, or interactive educational games, so that their effectiveness can be compared in increasing student activity and learning outcomes in the context of different subjects and levels of education.

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