Jurnal Pendidikan dan Pengajaran Guru Sekolah Dasar JPPGuseda

Volume 8 Issue 3 Year 2025 Pages 161-171
ISSN 2623-0941 | e–ISSN 2623-0232
https://jppguseda-fkip.unpak.ac.id
DOI: 10.55215/jppguseda.v8i3.15

Development of Interactive Multimedia Based on Culturally Responsive Teaching on Sound Materials to Improve the Creative Thinking Skills of Elementary School Students

Purnama[1], Deddy Sofyan[1], Yuyun Elizabeth Patras[1], Sitta Romadona Hardiyanto[2]
purnamasdnpkn@gmail.com, deddysofyan79753@gmail.com, yuyunpatras64@gmail.com, sittaromadona@gmail.com

[1]*Postgraduate School, Universitas Pakuan, Bogor, Indonesia*
[2]*Lime Wood Primary School, Erith, United Kingdom*

*Correspondence to: *Purnama*
Universitas Pakuan
Jl. Pakuan, Tegallega. Kecamatan Bogor Tengah, Kota Bogor. Jawa Barat 16143
email: purnamasdnpkn@gmail.com

Abstract: This study aims to produce an interactive multimedia product based on Culturally Responsive Teaching (CRT) to enhance the creative thinking skills of elementary school students. The multimedia is designed to improve indicators of creative thinking skills, including fluency, flexibility, originality, and elaboration, while also bringing students closer to the traditional musical culture of West Java by integrating technology and cultural elements into social science learning. This research employs the R&D method using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) and follows a One-Group Pretest-Posttest Design. The research findings indicate the development of interactive multimedia characterized by the integration of traditional musical instruments as learning objects in the social science sound topic. The average feasibility score from media experts, material experts, and language experts was 94.74, which falls under the "highly feasible" category for educational media. The average N-Gain score was 0.6251, categorized as "moderate to high," and the N-Gain percentage was 62.51%, indicating that the CRT-based interactive multimedia is "fairly effective" in enhancing creative thinking skills. The paired sample t-test results ($t = -29.577$; $p < 0.05$) show a significant difference, suggesting a meaningful improvement in creative thinking skills. Thus, the interactive multimedia successfully integrates CRT into social science learning and proves to be both appropriate and effective. The results of this study are expected to serve as an alternative solution for social science instructional media while also promoting the preservation of West Java's traditional musical heritage.

Keywords: creative thinking skills; culturally responsive teaching; elementary school students; interactive multimedia; local wisdom

Article info: Submitted October 1, 2025 | Revised November 18, 2025 | Accepted November 29, 2025

Recommended citation: Purnama, P., Patras, Y. E., & Hardiyanto, S. R. (2025). Development of interactive multimedia based on culturally responsive teaching on sound materials to improve the creative thinking skills of elementary school students. *Jurnal Pendidikan dan Pengajaran Guru Sekolah Dasar (JPPGuseda)*, *8*(3), 161–171. https://doi.org/10.55215/jppguseda.v8i3.15

Introduction

Students' high creative thinking ability can affect various skills and abilities that students have (Sidabutar, 2021), just as students' high creative thinking ability will make it easier for students to express their ideas and ideas in writing. High creative thinking skills make students have high learning achievements (Manurung, 2021). The benefits of developing creative abilities are diverse, from improved academic achievement and better self-expression to the development of an entrepreneurial mindset and as the world of education progresses, it is crucial to prioritize the development of creative abilities in primary school students. By embracing creativity as an integral part of education, we can shape a generation of individuals who are ready to face the complexities of the world, solve problems, and contribute to positive change (Qulboyeva, 2023).

Previous research explains that game-based interactive multimedia can also increase creativity in physical education, encourage the digitization of education, and increase student engagement (Nuraini & Rezaki, 2023). In addition, it has been proven that interactive audio-visual learning media, especially those that incorporate problem-based learning, can enhance higher-level thinking skills, including creativity, by providing an engaging and contextually relevant learning experience (Ginting et al., 2024). Apps like Lectora Inspire and Padlet have been shown to be very effective tools for improving creative thinking skills (A. Sari et al., 2023; Ulum et al., 2023).

It is proven that interactive media created with platforms like Adobe Flash can improve critical and creative thinking skills. This is in line with the demands of 21st century education and Industrial Revolution 4.0 (Nabila et al., 2023.; Sundapa et al., 2022). Interactive teaching has also been associated with more creative students in physical classrooms. This shows that this medium can improve problem-solving and creative thinking skills (Siahaan & Simamora, 2023). Finally, it has been proven that the use of interactive learning media, such as PhET simulations, can improve students' creative thinking skills. It also supports the use of interactive technology in educational settings to encourage creativity (Dani et al., 2022). Overall, these studies collectively emphasize that interactive multimedia is an effective tool for enhancing creative thinking skills and providing diverse and engaging learning experiences. It meets the changing needs of contemporary education.

Various studies have also been carried out in developing interactive multimedia in elementary schools such as the development of interactive multimedia based on Articulate Storyline 3 (Rachmawati et al., 2023), interactive multimedia based on Contextual Teaching Learning (Khoirunisa et al., 2023), interactive multimedia based on Android (Utami et al., 2023; Hamdani et al., 2022), interactive multimedia based on Google Slides (Monica & Pramudiani, 2022), interactive multimedia based on Lectora Inspire (Wibowo, 2022), interactive multimedia based on Science Literacy (Hafis et al., 2022), interactive multimedia based on local wisdom of Madura (Siswoyo et al., 2023), interactive multimedia Based on local wisdom (Fadilah et al., 2020), Inquiry-based interactive multimedia (Wulandari et al., 2020), Ethnomathematics-based interactive multimedia (Ahmad et al., 2021), Website-based interactive multimedia (Rahmawati & Hidayati, 2022).

The Culturally Responsive Teaching (CRT) approach is a learning approach that aims to enhance students' cultural identity and create a safe and engaging learning environment (Justi et al., 2023). CRT is also important in the development of students' creative thinking skills, as well as Juliani et al., (2024) explaining that applying the CRT approach in learning can improve students' creative thinking skills. Another study explained that problem-based learning (PBL) based on Culturally Responsive Teaching (CRT) helps students become more creative, active, and collaborative during the science learning process (Kurniasari et al., 2024).

In the 21st century, the cultural crisis is increasingly real, the challenge of maintaining traditional culture, one of which is the culture of traditional musical instruments, is very important. According to the results of his research Rianto (2021), it is revealed that concern or awareness of traditional musical instruments is very minimal, this is also due to the lack of learning media that introduces traditional musical instruments to students. Mukti et al., (2023) also explained the results of his research in one of the elementary schools in Blora regency, that the introduction of traditional musical instruments has been carried out since grade IV, but the main obstacle is the low interest of students in getting to know traditional Indonesian musical instruments, so learning media that can stimulate interest in traditional musical instruments is also needed. The lack of interest of students in getting to know and learning traditional musical instruments can also be overcome by using the development of interesting learning media, although it cannot replace the true essence of traditional musical instruments (Anila & Adri, 2022; Saputra et al., 2023). Low awareness of traditional musical instruments can also be overcome by using the Culturally Responsive Teaching (CRT) approach that develops 21st century skills and creates meaningful learning related to students' culture so that multicultural learning can take place and can develop character and cognitive values (Patras et al., 2023).

This research creates an innovative learning media that integrates technology with the culture of traditional musical instruments typical of West Java in the learning of Social Science material of sound wave phenomena to improve the creative thinking skills of elementary school students. In contrast to other interactive multimedia, this multimedia makes traditional musical instrument culture an object in learning sound wave phenomena material by paying attention to the development of students' creative thinking skills by emphasizing four indicators of creative thinking skills including fluency, flexibility, originality and elaboration. The novelty of this research is how the development of interactive multimedia based on Culturally Responsive Teaching on sound materials can improve creative thinking skills.

This research is important because creative thinking skills are needed by students in facing the 21st century, while on the other hand, elementary school students do not have awareness of traditional musical instruments typical of West Java. This indicates a cultural crisis that requires contextual learning to solve it. Previous research has created interactive multimedia, but none have specifically integrated the CRT approach, in this case a traditional musical instrument typical of West Java in the social science subject, sound concept material to improve creative thinking skills. The novelty of this research can be seen from the development of interactive multimedia which is not only used to introduce West Javanese musical instruments as a learning object of social science, but also explicitly aimed at developing creative thinking skills, namely fluency, flexibility, originality and elaboration.

The above statement generates several research questions. To collect data to meet the needs of this research, the research questions were arranged as follows: What are the characteristics of interactive multimedia based on Culturally Responsive Teaching in sound concept materials that can improve the creative

thinking skills of elementary school students? What is the feasibility of interactive multimedia based on Culturally Responsive Teaching on sound concept materials that can improve the creative thinking skills of elementary school students? How to improve students' creative thinking skills after learning with interactive multimedia based on Culturally Responsive Teaching on sound concept materials in elementary schools? Therefore, the purpose of this research is to produce interactive multimedia based on Culturally Responsive Teaching on sound concept materials that can improve the creative thinking skills of elementary school students.

Methods

This research uses the Research and Development (R&D) method which is in line with using the ADDIE model. ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate. ADDIE is a systematic research model (Gall et al., 2003). Branch (2009) designed to develop products, one of the products it can make is a learning medium. In this study, variations were also carried out at the implementation stage or product test using The One-Group Pretest-Posttest Design (Fraenkel et al., 2009).

The data processed in this study are pre-test and post-test data on creative thinking ability from 27 5th grade students at SDN Pakuan, Bogor City. The data was taken using test instruments in the form of 12 description questions with reference to sound concept materials that integrated with traditional musical instruments typical of West Java and indicators of creative thinking ability (fluency, flexibility, originality, and elaboration). The instrument has been tested for validity and realism. It is seen that all question items are declared valid because they have a Sig value of < 0.05. Then among the 12 questions that were validated, there were ten questions that had a Significance level of 0.01, namely question numbers 1, 3, 4, 5, 6, 7, 8, 9, 10, 12 which means very valid. Based on the results of the reliability test, Cronbach's Alpha value was 0.915, which made the creative thinking ability test instrument in the very high category.

In addition, other supporting data came from structured interviews with a list of questions to teachers and students after learning using multimedia to see the response of teachers and students to interactive multimedia, validation questionnaires of media experts, languages, materials and practicality questionnaires from teachers and students to assess interactive multimedia so that it can be implemented and assess the ease of use of interactive multimedia when used.

This research began with the collection of data on interactive multimedia needs by distributing questionnaires to grade 5 teachers and an initial pretest for students to see their creative thinking skills and awareness of traditional musical instruments typical of West Java. Then the researcher analyzes the results of the initial data and studies the material and determines the learning objectives. Furthermore, the researcher designed and developed interactive multimedia based on the direction of media, materials and language experts as well as limited tests and practicality by teachers. Interactive multimedia was then widely implemented to 5th grade students, but previously pre-test and post-test instruments were given first after the implementation of interactive multimedia. Finally, after the post-test, the data was analyzed using the N-gain test and the Paired Sample t-Test to see the effectiveness of CRT-based interactive multimedia in improving creative thinking skills and whether there was a significant difference between the pre-test score and the post-test value of students' creative thinking skills.

Qualitative data analysis is processed based on Miles and Huberman techniques described by Rijali (2018) data collection, data presentation, making conclusions/drawing conclusions and data reduction. Quantitative data were processed to see the feasibility of interactive multimedia and the improvement of creative thinking skills with the validity test of media experts, material experts, linguists and media practicality tests by teachers and students as well as the N-Gain test to determine the improvement of creative thinking skills of elementary school students.

Result and Discussion

The findings of CRT-based interactive multimedia development research were obtained from interviews and multimedia needs questionnaires to teachers and students. The results of questionnaires and interviews show that teachers have used technology in learning, but are still limited to power point technology and learning videos. Students also reinforced that learning has used technology but has never used interactive multimedia that integrates traditional musical instrument culture in its learning. The characteristics of students are also illustrated that 96.1% of the students surveyed have smartphones and are also used for studying. The results of the survey on awareness to students also showed that of the six traditional musical instruments typical of West Java that were shown, only one angklung musical instrument was very familiar to students with 78.5% of students answering correctly.

The results of the pre-survey of students' creative thinking skills with test questions that became the basis for the development of CRT-based interactive multimedia were tested on 51 grade V elementary school students in Bogor City.

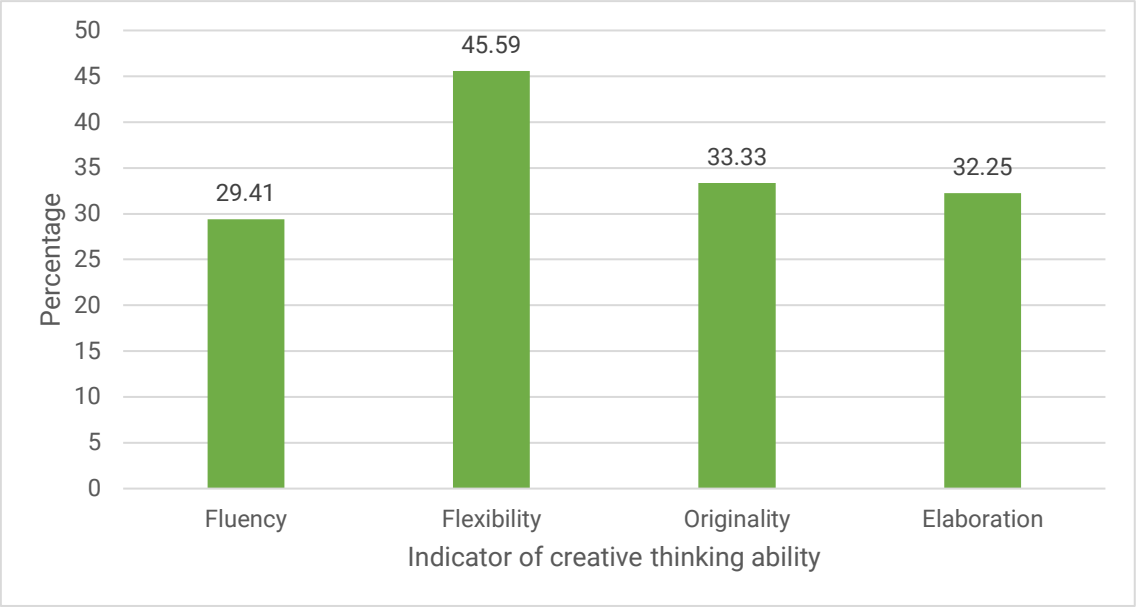

Figure 1. Results of Preliminary Data on Creative Thinking Skills of Grade V Students

The creative thinking ability of 51 students by referring to four indicators showed results that were not optimal (**Figure 1**). In the fluency indicator, a score of 29.41 was obtained which can be interpreted as still limited students providing ideas or solutions. The flexibility indicator shows a score of 45.59 which is still a lack of students providing alternative solutions or ideas from different perspectives. The original indicator was worth 33.33 which students were not able to give original ideas or rarely others gave them. Finally, the elaboration indicator with a value of 32.35 indicates that the student's explanation has not touched on small details that clarify an idea or alternative solution. it can be concluded that students' creative thinking skills are still in the low category.

The results of the initial analysis were used by the researcher to design an interactive multimedia based on CRT by creating flowchart and storyboard designs. flowchart is a flowchart of connectivity between content or interactive multimedia operations that is created as a basic guide for creating a comprehensive multimedia flow. As shown in the following **Figure 2**, after creating a flowchart, the researcher then creates a Storyboard which is a template design to describe each scene of an interactive multimedia from the opening page, main page, information page, pop up menu page, learning video page, learning material page, quiz page and game page. The results of the design were then translated by the researcher to create multimedia content using several applications such as Canva, Corel Draw X7, Audacity, and Elevenlabs. Furthermore, the content is integrated in the Articulate Storyline 3 application and converted into a mobile application in the Web 2 APK Builder. The results of the development of interactive multimedia were then validated by three experts in their fields, namely media experts, material experts and linguists. The expert validation results indicate that the developed interactive multimedia meets a very high level of feasibility. The media expert provided an expert value of 97.27, demonstrating excellent functionality, interface design, and technical performance. The material expert assigned a score of 94.28, confirming the accuracy, relevance, and pedagogical appropriateness of the content. Meanwhile, the linguist rated the product at 91.67, indicating strong clarity, linguistic accuracy, and alignment with the target learners' language level. Overall, the average expert score reached 94.47, which categorizes the multimedia as highly valid and suitable for implementation.

The CRT-based interactive multimedia practicality test was carried out on five teachers by conducting an assessment through an online questionnaire which contained four aspects of assessment, namely language practicality, product use practicality, learning content practicality, and media component practicality. The questionnaire is rated on a scale of one to five representing "very poor" to "very good".

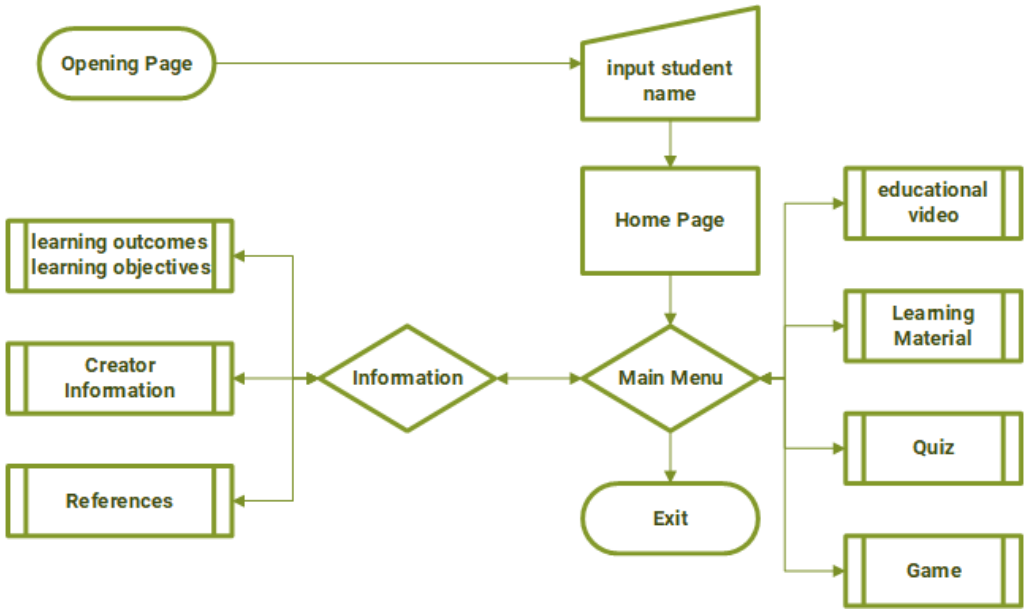

Figure 2. CRT-based interactive multimedia flowchart design results

Table 1. Results of Teacher's Practical Assessment

Aspects	Grain	Average Score
Product Practicality	1-13	4,74
Practicality of using the product	14-17	4,65
Practicality of learning content	18-20	4,80
Practicality of media components	21-23	4,60
A Teacher's Practical Approach		4,70

The results of the practicality test by the teacher showed that the practicality of the product had an average score of 4.74 which means that the CRT-based interactive multimedia product is good in terms of the correctness of the language used, the simplicity of sentences and easy to understand, the size and type of font are well readable, the image and position of the image are clear and easy to understand, the video and audio are clear and easy to understand and the instructions and buttons are easy to understand (**Table 1**). Finally, the systematics of the presentation of the material are very clear.

In terms of product use, CRT-based interactive multimedia received a practicality value of 4.65 which shows that CRT-based interactive multimedia is good in the overall ease of use of media, interactive multimedia can be used on various devices, facilitates the learning process and is flexible because it can be used on various devices. The practicality of CRT-based interactive multimedia learning content received a score of 4.80 which means that interactive multimedia can help teachers to increase their mastery of students' sound concepts and the available videos and materials can make it easier for students to master sound concepts. The practicality of the media component received a score of 4.60 which shows that teachers have no difficulty in operating CRT-based interactive multimedia because the function of the buttons is easy to remember and runs well, the navigation buttons can work according to their functions and the instructions on the multimedia facilitate the operation of learning media.

The five teachers have provided comments and suggestions which are summarized as follows: *"This application is very helpful for students in understanding the material because this media is easy to use, interesting, and in accordance with the level of competence of 5th grade elementary school students and the learning media has a very good impact, and the results of experiments in my classroom show that students are more motivated to learn the material. However, as much as possible, use large, high-contrast fonts (e.g. black on white), as well as child-friendly fonts such as Comic Sans or Nunito Sans. Avoid using decorative fonts that are difficult for early age students to read"*.

From the comments and suggestions that have been given by the five teachers, it shows that this multimedia can be practically used and has a good impact on helping students to be motivated to learn so that students' understanding of the material of sound wave phenomena increases. But it is also necessary to pay attention to the use of fonts so that it is easier for students to understand.

The practicality test for students was carried out by 14 randomly selected elementary school fifth grade students. The practicality test was carried out by filling out a questionnaire with seven statements representing assessment indicators including presentation design, content/material quality, accessibility, learning

objectives, feedback and adaptation, and motivation. The questionnaire is rated on a scale of one to five which represents statements of "very lacking" to "very good". From the comments and suggestions that have been given by the five teachers, it shows that this multimedia can be practically used and has a good impact on helping students to be motivated to learn so that students' understanding of the material of sound wave phenomena increases. But it is also necessary to pay attention to the use of fonts so that it is easier for students to understand. The practicality test for students was carried out by 14 randomly selected elementary school fifth grade students. The practicality test was carried out by filling out a questionnaire with seven statements representing assessment indicators including presentation design, content/material quality, accessibility, learning objectives, feedback and adaptation, and motivation. The questionnaire is rated on a scale of one to five which represents statements of "very lacking" to "very good".

Table 2. Results of Practicality Assessment by Students

Aspects	Grain	Average Score
Presentation Design	1	4,00
Quality of Content/ Material	2 & 5	4,00
Accessibility	3	4,21
Learning Objectives	4	4,21
Feedback and Adaptation	6	3,93
Motivation	7	3,71
Practical Score by Students		4,01

From the Table 2, it is known that the value of the presentation design aspect gets an average score of 4.00 which means that students have a good interest in CRT-based interactive multimedia displays so that students are interested in using the learning media. In the quality aspect of the content/multimedia material, it gets a score of 4.00 which shows that students find it easy to understand and concentrate well so that the sound wave phenomenon material can understand the sound wave phenomenon material well. In terms of accessibility of CRT-based interactive multimedia, it received a score of 4.21 which means that students can play the learning media anywhere and anytime without the need for an internet connection. In the aspect of CRT-based interactive multimedia learning objectives, it received a score of 4.21 which means that students can well understand the learning objectives of the media. Then in the feedback and adaptation aspects, the average score is 3.93, which means that students understand the instructions in the CRT-based interactive multimedia quite well. Finally, in the aspect of motivation, an average score of 3.71 is obtained, which means that students are quite motivated to learn the material on sound wave phenomena after using this learning medium.

Apart from the seven statements, the researcher also asked for input and suggestions from students so that several inputs and suggestions were collected which were summarized as follows: *"Overall it might be good enough, but it seems like there are too few modes in the app and games, and also maybe in the learning videos you can set the seconds or minutes you want to play the video."* From these inputs and suggestions, it was obtained that CRT-based interactive multimedia is quite good in being a learning medium, but in learning videos students want to have navigation such as video navigation in general, such as when students see videos on youtube that can be played back and accelerated and can even be directly at the desired minute. Then students were very interested in educational games in interactive multimedia so students asked to add game levels to CRT-based interactive multimedia. However, for this reason, the researcher did not increase the level because it can increase the size of interactive multimedia files and can distract students to prefer games over opening other menus.

This test was conducted to see the effectiveness of CRT-based interactive multimedia in improving the creative thinking skills of elementary school fifth grade students. This test analyzes the pre-test and post-test data that have been obtained by students who have been tested for normality. Based on **Table 3** in the N-Gain column, the score can be seen an increase in creative thinking skills from 27 students with a range of 0.52 (minimum score) to 0.74 (maximum score) with an average of 0.6251 and a standard deviation of 0.06107. These results reflect that in general, the level of improvement in creative thinking skills is in the "Medium to High" category. Meanwhile, based on the N-Gain percent column that describes the percentage data, it shows that the N-Gain value is in the range of 52.00% to 74.08% with an average of 62.51% and a standard deviation of 6.11%. The data puts the effectiveness of using CRT-based interactive multimedia to improve creative thinking skills in the "moderately effective" category. The percentage also explained that some students experienced an increase in creative thinking skills of more than 60%. The standard deviation value also shows a relatively even distribution or variation in the increase in creative thinking skills. The results of the N-Gain test above can be concluded that the data strengthens that CRT-based interactive multimedia is quite effective in improving creative thinking skills significantly and evenly.

Table 3. N-Gain Test Results

	N	Minimum	Maximum	Mean	Std.Deviation
N-Gain Skor	27	0,52	0,74	0,6251	0,06107
N-Gain Percent	27	52,00	74,08	62,5127	6,10677
Valid N (listwise)	27				

The Paired Sample t-Test is used to see if there is a significant difference between the pre-test score and the post-test score of the student's creative thinking ability. This test is also suitable for use in this study because the pre-test and post-test data come from the same object. Based on **Table 4**, the average score difference data was -39,198 which reflects that on average the post-test score is higher than the pre-test score, this also reflects an increase in creative thinking skills and education after receiving treatment. Then the standard deviation score of 6.886 also shows a small variation in the difference in students' grades with the average increase in creative thinking skills, which means that the change in grades is relatively consistent. The low standard error of mean (SEM) value of 1.325 reflects the average estimate (-39.198) has a high level of data confidence, this shows that the results of the improvement in creative thinking skills are quite consistent and not affected by data fluctuations in the sample.

Table 4. Paired Sample T-Test Test Results

		Mean	Hours of deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest - Posttets	-39,198	6,886	1,325	-41,922	-36,474	-29,577	26	0,000

The t-value of the calculation is -29.577 with a significance value of 0.000. Because the significance value is less than 0.05, the hypothesis results received are that there is a significant difference between the pre-test and post-test values. This reflects a significant improvement in students' creative thinking skills after using CRT-based interactive multimedia in learning sound wave phenomena. The above results are also strengthened by the value of the Confidence Interval of the Difference which is at -41.922 to -36.474 which is reluctant to include a zero value. These results reinforce the conclusion that the increase in creative thinking skills does not occur by chance, but rather as a real result of the use of CRT-based interactive multimedia in the learning of sound wave phenomena. Overall, the data on the results of the Paired Sample t-Test test reflect the success of the use of CRT-based interactive multimedia in learning sound wave phenomena in improving students' creative thinking skills in a real, even, and significant manner.

Local culture of West Java such as traditional musical instruments including *lute*, *calung*, *angklung*, *karinding*, *rebab*, and *seruling bambu* must be introduced to students from an early age. The development of culture-based interactive media (CRT) is an effective way to introduce culture. This method not only helps bridge learning with local culture, but it also helps students develop creative thinking skills. CRT-based interactive multimedia combines science material, especially sound theory, with local elements, such as traditional musical instruments. CRT-based learning prioritizes language, social, and cultural interactions in building students' knowledge, in accordance with the theory of social constructivism proposed by Bruner (1996). Students are taught to understand sound as a scientific phenomenon and as part of everyday life, through the traditional musical instruments they own and play. Not only that, this multimedia allows students to compile their own knowledge through an animated display (Sari & Susanti, 2016). According to constructivism, science teaching aims to provide students with science knowledge so that they not only understand the concepts and principles of science but also understand the importance of learning science. An emphasis on constructivism and direct inquiry-oriented learning has been used to enhance children's conceptual knowledge through prior understanding, active social science in the material, and its application to real-world situations. a constructivist view that emphasizes open problems, inventions, and experiments (Sugrah, 2019). The CRT approach supports also student-centered learning that is in line with constructivist theory (Fathurrahman & Puspita, 2025).

In the learning linkup, students are encouraged to actively explore the topic of sound through multimedia interactions that display traditional musical instruments with the original shapes and sounds of the musical instrument as well as the narrative of the historical origins of the musical instrument. It is also in line with Piaget and Bruner's opinion that student cognition is built through direct interaction between students and their environment, as well as experiences involving the affective and cognitive aspects of the student (Mandar & Sihono, 2025). Interactive multimedia makes students learn contextually and personally, so that students in learning new knowledge always relate to the knowledge they already have (Arini & Umami, 2019). The CRT approach also makes learning more inclusive of the culture that students have. This is reflected in sound learning by the students' enthusiasm when playing multimedia interactions featuring traditional musical

instruments. Students can get to know the shape, sound and play of the traditional musical instrument. What's more, the CRT approach has advantages in learning including motivation to learn, contextual relevance, life skills strengthening, social science community support, and multicultural development. (Laksana et al., 2023; Laksana et al., 2022).

Interactive multimedia is also directed to improve students' creative thinking skills. In the use of CRT-based interactive multimedia, students are not only seen and listened, but also given the freedom to be creative such as doing simulations, playing traditional musical instruments, providing ideas about proving the properties of sound, providing unique ideas from different perspectives on the use of sound with high intensity, explaining the idea of making concerts in space in detail, providing original ideas to overcome hearing loss, Play Educative games and answer quizzes that are based on creative thinking skills. The activity is directed to hone the indicators of creative thinking skills, including fluency refers to the ability to produce many ideas or solutions. Flexibility is the capacity to generate diverse ideas or approaches, which is crucial in adapting to scenarios. Originality involves generating unique or new ideas, a critical component of creativity that distinguishes creative thinkers from others. Elaboration, the ability to expand ideas by adding details, is another important indicator, especially in tasks that require depth and complexity. (Fatmawati et al., 2022; López Martínez et al., 2024; Nurhanifah, 2022; Ramal et al., 2023).

In the learning process using interactive multimedia, group learning and discussions are also carried out to observe, analyze and make products in solving problems about sound. These activities also strengthen the social aspect in building their knowledge. The process of social activities carried out by the students above strengthens the construction of students' knowledge in understanding sound materials with a constructivist learning approach (Kusmawati & Ginanjar, 2016). In addition, this interactive multimedia strengthens teachers as facilitators who are responsive to student culture. Teachers are no longer just delivering material; They are now building a learning experience rich with local values and cultural significance. In addition to improving students' cognitive abilities, the use of CRT in interactive media instills a sense of nationalism and love for the nation's culture. Overall, the development of interactive multimedia based on culturally responsive learning on sound materials is an innovative step in answering the challenges of 21st-century learning that require the integration of technology, culture, and extraordinary thinking skills. This method provides students with not only scientific knowledge but also the ability to think critically, act reflectively, and appreciate their cultural identity as part of meaningful learning.

Conclusion

This study shows that the development of interactive multimedia based on Culturally Responsive Teaching (CRT) has a significant impact on improving students' creative thinking skills on sound materials. This multimedia is able to produce interesting, contextual, and meaningful learning by combining elements of local culture, especially traditional West Java musical instruments. Indicators of creative thinking such as elaboration, flexibility, fluency, and originality can be developed by methods through interactive and exploratory learning activities. By incorporating elements of local culture, especially traditional West Javanese musical instruments, this media can produce interesting, contextual, and meaningful learning. This multimedia can be used to improve the quality of creative thinking such as elaboration, flexibility, fluency, and originality. This is achieved through interactive and exploratory learning. This study recommends strengthening policies to support the implementation of the CRT approach into the primary school curriculum and ongoing teacher training to ensure consistent and targeted implementation. Further research is needed to refine these multimedia models, evaluate the application of these methods in other learning contexts, and study their long-term impact on students' affective and cognitive development.

References

Ahmad, F., Nurdiawan, O., & Setiawan, A. (2021). Pengembangan media pembelajaran multimedia interaktif alat masak tradisional berbasis etnomatematika. *Mosharafa: Jurnal Pendidikan Matematika, 10*(2), 301–310.

Anila, N., & Adri, M. (2022). Pengenalan kesenian alat musik tradisional Sumatera Barat dengan augmented reality berbasis mobile device. *Algoritma: Jurnal Ilmu Komputer dan Informatika, 6*(1), 35–47.

Arini, A., & Umami, H. (2019). Pengembangan pembelajaran pendidikan agama Islam melalui pembelajaran konstruktivistik dan sosiokultural. *Indonesian Journal of Islamic Education Studies, 2*(2), 104–114.

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.

Bruner, J. S. (1996). *The culture of education*. Harvard University Press.

Dani, K. G., Saputro, E. F. H., & Lestari, N. (2022). Penerapan media pembelajaran interaktif untuk meningkatkan keterampilan berpikir kreatif siswa. *Quantum: Jurnal Pembelajaran IPA dan Aplikasinya, 2*(2), 37–41.

Fadilah, D., Rohini, R., & Sumiati, S. (2020). Pengembangan bahan ajar tematik sekolah dasar berbasis kearifan lokal Samawa berbentuk multimedia interaktif. *Jurnal Elementary: Kajian Teori dan Hasil Penelitian Pendidikan Sekolah Dasar, 3*(2), 97–101.

Fathurrahman, F., & Puspita, R. D. (2025). Application of constructivism theory in Pancasila education learning in class IV SDN 18 Dodu. Scientific Journal of the Education Profession, 10(1), 124–129. https://doi.org/10.29303/jipp.v10i1.2883

Fatmawati, B., Jannah, B. M., & Sasmita, M. (2022). Students' creative thinking ability through creative problem-solving-based learning. *Jurnal Penelitian Pendidikan IPA, 8*(4), 2090–2094.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education*. McGraw-Hill Higher Education.

Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational research: An introduction* (7th ed.). Allyn and Bacon.

Ginting, F. W., Widya, W., Sakdiah, H., Novita, N., Sulastri, S., & Damanik, A. K. (2024). Interactive audio-visual learning media through Articulate Storylines containing problem-based contextual learning to improve students' HOTS and scientific attitudes. *International Journal of Religion, 5*(12), 1031–1044.

Hafis, C., Ashari, A., & Ngazizah, N. (2022). Multimedia interaktif berbasis literasi sains dan karakter bagi siswa sekolah dasar. *Edukasiana: Jurnal Inovasi Pendidikan, 1*(4), 246–252.

Hamdani, S. A., Prima, E. C., Agustin, R. R., Feranie, S., & Sugiana, A. (2022). Development of Android-Based Interactive Multimedia to Enhance Critical Thinking Skills in Learning Matters. *Journal of Science Learning*, *5*(1), 103-114.

Juliani, A., Permanasari, A., & Patras, Y. E. (2024). Enhancing creative thinking and global diversity through culturally responsive teaching in primary schools. *Al-Ishlah: Jurnal Pendidikan, 16*(3), 3248–3262.

Justi, E., Hala, Y., & Herwati, H. (2023). Implementasi model PjBL (project-based learning) dengan pendekatan CRT (culturally responsive teaching) terhadap hasil belajar biologi di kelas X2 UPT SMA Negeri 10 Makassar. *Jurnal Pemikiran dan Pengembangan Pembelajaran, 5*(3), 596–603.

Khoirunisa, I., Purwoko, R. Y., & Anjarini, T. (2023). Multimedia interaktif berbasis contextual teaching and learning pada materi pecahan sederhana di sekolah dasar. *Edukasiana: Jurnal Inovasi Pendidikan, 2*(3), 186–196.

Kurniasari, I., Choyrunisa, R. V., & Sanjaya, I. G. M. (2024). Pengaruh model pembelajaran problem-based learning berbasis culturally responsive teaching untuk meningkatkan kemampuan berpikir reflektif peserta didik. *Jurnal Tadris IPA Indonesia, 4*(2), 259–271.

Kusmawati, L., & Ginanjar, G. S. (2016). Peningkatan kemampuan pemahaman konsep perkalian melalui pendekatan pembelajaran konstruktivisme pembelajaran matematika di kelas 3 SDN Cibaduyut 4. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang, 1*(2), 262–271.

Laksana, D. N. L., Kaka, P. W., & Bunga, K. W. (2022). Analisis kebutuhan sumber belajar berbasis budaya lokal bagi guru sekolah dasar. *Jurnal Pendidikan Dasar Flobamorata, 3*(1), 248–255.

Laksana, D. N. L., Lawe, Y. U., Ngura, E. T., & Kata, F. (2023). Analisis kebutuhan bahan ajar untuk pembelajaran baca tulis kelas rendah berbasis bahasa ibu dengan muatan budaya lokal Nagekeo. *Jurnal Ilmiah Pendidikan Citra Bakti, 10*(1), 45–56.

López Martínez, O., Lorca Garrido, A. J., & de Vicente-Yagüe Jara, M. I. (2024). Indicators of verbal creative thinking: Results of a Delphi panel. *Frontiers in Psychology, 15*, 1–8.

Mandar, Y., & Sihono, S. (2025). Implementasi teori konstruktivisme dalam PAI: Kajian teori Jean Piaget dan Jerome Bruner. *Raudhah Proud to Be Professionals: Jurnal Tarbiyah Islamiyah, 10*(1), 223–237.

Manurung, P. (2021). Multimedia interaktif sebagai media pembelajaran pada masa pandemi COVID-19. *Al-Fikru: Jurnal Ilmiah, 14*(1), 1–12.

Monica, T., & Pramudiani, P. (2022). Pengembangan multimedia interaktif berbasis Google Slide dalam meningkatkan kemampuan berpikir kritis siswa materi luas bangun datar kelas IV sekolah dasar. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 6*(2), 2228–2239.

Mukti, R. W. T., & Fathurrahman, M. F. (2023). Development of Artsteps learning media to improve music arts learning outcomes: Materi alat musik tradisional siswa kelas IV SD. *Jurnal Pendidikan Teknologi Informasi (JUKANTI), 6*(2), 329–341.

Nabila, P., Rahim, F. R., & Sari, S. Y. (2023). Development of interactive learning media using Lectora Inspire oriented towards critical and creative thinking skills on simple harmonic motion. *Jurnal Ilmiah Pendidikan Fisika, 7*(3), 377–390.

Nuraini, S., & Rezaki, I. (2023). Games-based interactive multimedia to increase student creativity in physical education. Global Journal of Information Technology: Emerging Technologies, 13(2), 144–155.

Nurhanifah, N. (2022). Kemampuan berpikir kreatif matematis siswa kelas VIII SMP pada materi geometri. *Jurnal Inovasi Pembelajaran Matematika PowerMathEdu, 1*(2), 161–172.

Patras, Y. E., Juliani, A., Nurhasanah, N., Maksum, A., & Hidayat, R. (2023). A review of culture-based learning at primary level in Indonesia. *Al-Ishlah: Jurnal Pendidikan, 15*(3), 3923–3936.

Qulboyeva, D. (2023). The essence of developing creative abilities in primary school pupils. *Current Research Journal of Pedagogics, 4*(6), 95–100.

Rachmawati, D. N., Kurnia, I., & Laila, A. (2023). Multimedia interaktif berbasis Articulate Storyline 3 sebagai alternatif media pembelajaran materi karakteristik geografis Indonesia di sekolah dasar. *Jurnal Pemikiran dan Pengembangan Sekolah Dasar (JP2SD), 11*(1), 106–121.

Rahmawati, D., & Hidayati, Y. (2022). Pengaruh multimedia berbasis website pada pembelajaran matematika terhadap motivasi belajar siswa sekolah dasar. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 6*(3), 2367–2375.

Ramal, R. F., Meiliasari, M., & El Hakim, L. (2023). Systematic literature review: Kemampuan berpikir kreatif matematis. *Griya Journal of Mathematics Education and Application, 3*(1), 36–42.

Rianto, N. (2021). Pengenalan alat musik tradisional Lampung menggunakan augmented reality berbasis Android. *Jurnal Informatika dan Rekayasa Perangkat Lunak (JATIKA), 2*(1), 64–72.

Rijali, A. (2019). Analisis data kualitatif. *Alhadharah: Jurnal Ilmu Dakwah, 17*(33), 81–95.

Saputra, K. S. A., Upadani, I. G. A. W., & Krisnawan, G. N. A. (2023). Pengembangan media pembelajaran alat musik tradisional Bali berbasis Android. *JUKI: Jurnal Komputer dan Informatika, 5*(1), 52–63.

Sari, A., Sari, Y. A., & Namira, D. (2023). Penerapan model pembelajaran problem-based learning terintegrasi culturally responsive teaching (CRT) untuk meningkatkan motivasi dan hasil belajar siswa kelas X IPA 2 SMA Negeri 7 Mataram pada mata pelajaran kimia tahun ajaran 2022/2023. *Jurnal Asimilasi Pendidikan, 1*(2), 110–118.

Sari, L. Y., & Susanti, D. (2016). Uji efektivitas media pembelajaran interaktif berorientasi konstruktivisme pada materi neurulasi untuk perkuliahan perkembangan hewan. *Jurnal Bioconcetta, 2*(1), 158–164.

Siahaan, F. E., & Simamora, A. B. (2023). Development of interactive teaching media to improve the creativity of UHKBPNP physics education students. *Journal of Education and Teaching Learning (JETL), 5*(2), 194–207.

Sidabutar, Y. A. (2021). Pengaruh kemampuan berpikir kreatif terhadap kemampuan menulis karangan deskripsi siswa sekolah dasar. *Jurnal Basicedu, 5*(6), 5379–5385.

Siswoyo, A. A., Wijaya, B. R., & Nizar, R. C. (2023). Multimedia interaktif game edukasi terintegrasi kearifan lokal Madura untuk menanamkan literasi budaya siswa sekolah dasar. *Edukatif: Jurnal Ilmu Pendidikan, 5*(6), 2879–2888.

Sugrah, N. U. (2020). Implementasi teori belajar konstruktivisme dalam pembelajaran sains. *Humanika: Kajian Ilmiah Mata Kuliah Umum, 19*(2), 121–138.

Sundapa, A. P., Syamsurizal, S., Irdawati, I., & Putri, D. H. (2022). Interactive multimedia development using Adobe Flash CS6 to improve critical and creative thinking skills of class VIII junior high school students. *International Journal of Current Science Research and Review, 5*(11), 4187–4193.

Ulum, R., Nulhakim, L., & Nestiadi, A. (2023). Development of interactive learning media assisted by Padlets on the theme of environmental change to foster student creative thinking skills. *Jurnal Pijar Mipa, 18*(3), 398–403.

Utami, K., Akhyar, M., & Sudiyanto, S. (2023). Potential implementation of android-based interactive multimedia for student learning activities. *Al-Ishlah: Jurnal Pendidikan*, *15*(1), 507-518.

Wibowo, A. A. (2022). Multimedia interaktif berbasis Lectora Inspire pada subtema sumber energi siswa kelas IV sekolah dasar. *Jurnal Fundadikdas (Fundamental Pendidikan Dasar, 3*(1), 55–60.

Wulandari, R., Widodo, A., & Rochintaniawati, D. (2020). Penggunaan aplikasi augmented reality untuk memfasilitasi penguasaan konsep dan keterampilan berpikir kreatif peserta didik. *Jurnal Pendidikan Biologi, 11*(2), 59–69.