

STAR Quartet Card Learning Media Improves Social Science Learning Outcomes Human Motion Joint Material Class VI

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ABSTRACT

This study aims to develop, determine, and test the level of effectiveness of the Joint & Motion Quartet Card (STAR) Learning media on student learning outcomes in human motion joint material in science subjects. This study applies a Research and Development (R&D) approach using the ADDIE development model. The participants in this research include material experts and media experts, while the trial was conducted with 26 sixth-grade students at SD N Mangkangwetan 03, Semarang City. This media contains visualizations of human motion joints which are visual stimuli for students to create movements creatively, so that students can find the characteristics of human motion joints. The results indicated that the material feasibility achieved a score of 68 with a percentage of 86%, categorized as very feasible. Meanwhile, the media feasibility reached a score of 76 with a percentage of 95%, also classified as highly appropriate for implementation in the learning process. Furthermore, the analysis revealed an improvement in student learning outcomes, as the posttest scores exceeded the pretest scores. The effectiveness test results demonstrated a significant difference between pre-test and post-test scores (Sig. 0.002 < 0.05), with an N-Gain value of 0.5870, which falls into the moderate category. Thus, the Joint & Dance Quartet Card (STAR) media can be used as an innovative learning medium to improve students' learning outcomes on human motion joint materials in elementary school.

Keywords: *Generation Z, Hoaxes, Digital Literacy, Media Education, Digital Natives*

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PENDAHULUAN

Education is an important role for a country. Education Providers require careful planning and implementation of educational processes to make sure that the results achieved are in line with the expected objectives. This is in line with the National Education System Law No. 20 of 2003 (Habe & Ahiruddin, 2017) which states that education is learning so that students can effectively develop their potential such as religious spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves, society, nation and

state. This states that education is a conscious and planned effort to create an atmosphere and learning process.

Natural and Social Sciences (IPAS) learning in elementary school is ideally able to encourage active involvement of students in understanding scientific concepts through a contextual and fun approach. One of the important topics in IPAS is joint movement material in humans which is closely related to physical activity and daily life. Ideally, the learning process of the material is carried out through an interactive approach based on concrete media that is able to bridge abstract understanding into concrete. Research from (Sari, 2020) It shows that the use of interesting and game-based learning media can increase interest in learning and strengthen students' understanding of concepts in elementary school. In addition, the combination of IPAS thematic learning with art elements, such as dance, can enrich students' learning experiences and improve information retention. According to (Zaeni & Na'ima, 2025), learning media that combines visual and motion elements such as card games or art activities can strengthen cognitive and affective aspects of learning. This ideal condition shows that the use of educational card-based media that includes elements of dance movement has great potential in supporting the achievement of IPAS learning objectives. In other words, Learning that utilizes innovative media such as quartet cards that are designed thematically and creatively according to the characteristics of elementary school students has a great opportunity to improve learning outcomes optimally.

However, the ideal conditions in social studies learning have not been fully achieved in various basic education units. Based on research by (Jannah et al., 2025) Most students have difficulty understanding the material of the movement system because the learning method is still conventional and lacks visual media. Other research by (Wulandari & Kurniawati, 2026) revealed that the use of concrete media such as educational cards has been proven to improve student learning outcomes, but its use is still limited to certain subjects. Similar findings were also seen in previous studies by other researchers who showed that quartet card media effectively improved learning outcomes in PPKn content, but it has not been widely developed for IPAS materials, especially human joint movement materials. Based on observations made at SDN Mangkangwetan 03 Semarang City, it was found that IPAS learning, especially joint materials, is still carried out conventionally without interesting and contextual media support. Students look less enthusiastic during the learning process and have difficulty in connecting the concept of joint movement with real activities. In addition, based on interviews with grade VI teachers, it is known that students tend to be passive because the material is delivered only through oral explanations and package books, without involving visual media or fun movement activities such as games or dance. The teacher also stated that there is no learning media that can integrate aspects of movement, art, and conceptual understanding at the same time. This fact shows the need for the development of innovative learning media that is able to stimulate active student involvement while facilitating the understanding of human motion joint material as a whole.

As an effort to overcome students' low understanding of human motion joint materials in learning IPAS, learning media innovations that are not only visually appealing, but also able to actively engage students through physical activities and art (Hana Andriana & Ary, 2023). One potential alternative solution is the development of a quartet card-based learning media in collaboration with elements of dance movement (Agustina et al., 2022). This medium integrates students' cognitive, affective, and psychomotor domains through educational card games and engaging movement activities. Dance as a form of expression of human movements can be used as a concrete representation of joint function, making it easier for students to understand abstract concepts contextually. According to (Maretyaningrum, 2019), the integration of art in science learning is proven to increase students' motivation and understanding of scientific material because it touches on the aesthetic and emotional side of students (Rahmatullah, 2023). Media that involves physical activities such as dancing also encourages active student participation and improves information retention in the long run (Sofila et al., 2025). Thus, the combination of educational card media and dance movements is an innovative approach that is in line with the characteristics of elementary school students who tend to be active, imaginative,

and like play while learning. This innovation is expected to be able to answer challenges in social studies learning and become an alternative learning model that is applicable in various elementary school contexts

According to Puspitasari & Kurniawan (2017) in (Ismail et al., 2020), the quartet card game is one of the many fun activities that some people do in their free time. The quartet card learning media that is collaborated with dance elements is not only a visual aid, but also an active learning strategy that integrates elements of play and art. The quartet card media is in the form of thick paper like a group of four tickets, consisting of several numbers of picture cards and there is a caption in the form of writing explaining the picture (Ismail et al., 2020). According to (Samsiyah et al., 2021), Quartet Card Media is an educational game media in the form of picture cards designed to strengthen concept understanding through fun collaborative activities and trigger students' thinking. Meanwhile, the dance movements according to (Syaidah & Kurniawan, 2021) is a structured body expression and has aesthetic value that can be used in learning to develop students' cognitive and motor aspects at the same time. The combination of these two elements can create a learning atmosphere that is interactive, contextual, and appropriate to the learning style of elementary school-age children. The involvement of movement in learning is believed to be able to help students remember concepts better because the brain works more optimally when the body is actively moving. In addition, the presence of dance elements in the media also fosters students' confidence and creativity. This media also provides a space for students to learn in groups, discuss, and learn to appreciate differences through games. Therefore, the development of the STAR (Joint & Dance) quartet card media is an innovative step that is very relevant to answer the needs of IPAS learning that is fun, active, and meaningful.

To overcome the low learning outcomes of students in the joint movement material of IPAS students, one of the solution steps taken is to develop innovative learning media that is in accordance with the characteristics of elementary school students (Puspitasari & Da Ary, 2024). The medium used is the STAR (Joint & Dance) quartet card that combines visual, game, and dance elements. The development of this media applies the ADDIE model, a systematic process that includes the stages of analysis, design, development, implementation, and evaluation. This model is commonly utilized in developing learning media due to its flexibility and its emphasis on meeting students' needs. According to (Tegeh, 2020), the ADDIE model is effective in helping teachers produce interactive media and are able to increase student learning participation. Through this medium, social studies learning becomes more interesting and easy to understand, because students not only read and hear, but also see and move. With this approach, it is hoped that the understanding of the concept of joints and their motion functions will be stronger and longer-lasting.

Based on the relevant previous problems and research above, the researcher intends to conduct research and development solutions in the form of the Development of Joint & Dance Quartet Card (Star) Learning Media for the Learning Outcomes of Social Science Learning Materials for Grade VI students of SDN Mangkangwetan 03 Semarang City

METHODS

Development Approaches and Models

This study utilizes the Research and Development method. According to (Scott, 2013) in (Pramono, 2022) The Research and Development method is an approach designed to create a product and evaluate the effectiveness of the product that has been developed. The development model applied in this study is the ADDIE model introduced by (Branch & Varank, 2009), which includes five main stages of Analysis, Design, Development, Implementation, and Evaluation:

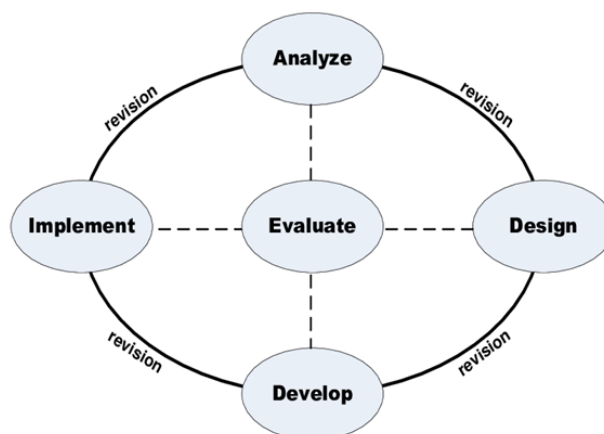


Figure 1. ADDIE Development Model

Research Subject and Location

The study was carried out at grade VI students of SD Negeri Mangkangwetan 03, Semarang City. The study subjects consisted of validators (material experts and media experts) and 26 sixth-grade students. The class was selected using purposive sampling, a sampling technique based on special considerations because the class studies the material of human motion joints. The subject of the students is divided into two stages of the trial: Small-scale trial: Consists of 4 students selected based on the low and high ability categories; Large-scale trial: Consists of 26 students.

Data Collection Techniques

Data collection methods consist of test and non-test techniques. Test Technique: in the form of pre-test and posttest containing multiple-choice questions to measure student learning outcomes. Non-Test Techniques: includes interviews with teachers, documentation, questionnaires on teachers and students needs, as well as expert validation (media and materials), and teacher and student response questionnaires.

Data Analysis

Data analysis is conducted in several stages to ensure the validity of the research findings:

Instrument Validity and Reliability Test

The test instruments are analyzed to obtain accurate data. The validity test used the correlation of the product moment with a Sig. value of <0.05 , while the reliability test used Alpha Cronbach with a criterion of $\alpha > 0.70$.

Media Feasibility Analysis

Purwanto, 2017:102 in (Meilani & Erita, 2023) The level of media feasibility is measured based on the percentage of validator scores achieved with the following criteria:

Yes	Assessment presentation	Categories
1.	81% - 100%	Highly feasible
2.	61% - 80%	Worthy
3.	41% - 60%	Quite feasible
4.	21% - 40%	Less worthy
5.	0% - 20%	Not eligible

Table 1 Eligibility Criteria

Effectiveness Analysis (Learning Outcomes)

Normality Test: uses the Shapiro-Wilk test (due to the sample size <50) to determine the distribution of data. The data is considered normal if the significance value is >0.05 ; Paired Sample t-test: Performed if data are distributed normally to determine differences in learning outcomes before and after treatment (significance tail 2 <0.05); N-Gain Test: Used to measure improved learning outcomes with the following categories:

Table 2 N-Gain Criteria

Interval Gain	Criteria
$g > 0.7$	Low
$0.3 < g < 0.7$	Medium
$g > 0.3$	Height

RESULTS AND DISCUSSION

The Joint & Dance Quartet Card (STAR) learning media was developed following the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation.

The following will be presented the findings of the research on the development of STAR Quartet Card media products (joints & dance) to enhance the learning outcomes of IPAS class VI with Human Motion Joint material including: (1) the process of developing STAR Quartet Card learning media, (2) the feasibility of STAR Quartet Card learning media, (3) the efficacy of STAR Quartet Card media on human motion joint material for grade VI elementary school students. Media development is conducted using the ADDIE model, which consists of the analysis, design, development, implementation, and evaluation stages.

The development of the STAR Quartet Card media began In the analysis stage, needs analysis was carried out through observations, interviews, and questionnaires given to teachers and grade VI students at SDN Mangkangwetan 03. Observations were carried out to find out the conditions of learning science in the classroom, the use of learning media, and the difficulties experienced by students in understanding the material of human motion joints. Interviews were conducted with grade VI teachers to identify problems that arise in the IPAS learning process. In addition, a needs questionnaire is given to teachers and students to find out the need for learning media that can support the learning process. The results of the analysis show that student learning outcomes in human motion joint material are still low. This is due to the limited use of learning media that can attract attention and increase student activity. Therefore, more interesting and interactive learning media is needed to support student understanding.

Based on the results of the analysis, the next stage is design. At this stage, the STAR Quartet Card media concept is designed which integrates visual illustrations, commands as lighters, musical accompaniment barcodes, and joint names. The media is designed in the form of picture cards that display various joints, namely rotary joints, hinge joints, saddle joints, bullet joints, sliding joints, and roll joints arranged in cards with simple commands that help students understand the movements that can be caused by these motion joints. In addition, the media is developed by applying a motor movement approach through the use of creative illustrations, attractive colors, music as an accompaniment to movements, and commands that can stimulate the imagination and increase students' emotional involvement in the learning process.

After the design stage is completed, the researcher continues to the development stage. At this stage, the media that has been designed is then developed and validated by media experts and material experts to assess the feasibility of the product. The results of media development are presented in Figures 1 and 2

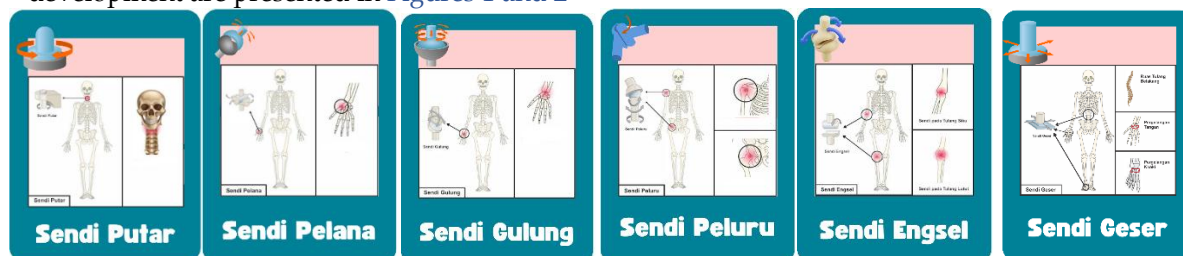


Figure 2. Front view of the STAR Quartet Card Human Motion Joint



Figure 3. Back view of the STAR Quartet Card Human Motion Joint

After being developed, the STAR Quartet Card media is validated by expert experts. Validation by experts in the field of related studies, Dr. Deasylina da Ary, S.Pd., M.Sn. and Dewi Nilam Tyas, S.Pd., M.Pd. The average obtained from two expert experts is 86. Meanwhile, the feasibility assessment by media expert Abtadi Tris Hamdani, S.Pd., M.Pd. obtained a score of 95.

No.	Validation	Score	Presses	Categories
1	Media Member	76	95%	Highly Worth It
2	Subject Matter 1	69	88,57%	Highly Valid
3	Subject Matter 2	67	83,75%	Highly Valid

Table 3 Results of Expert Assessment

These results show that the developed media has met the feasibility aspects of content, display, and suitability with learning objectives. After the media is declared feasible by expert experts, the research continues at the implementation stage. This stage was carried out through a limited trial involving 26 grade VI students of SD Negeri 03 Mangkangwetan. Before learning begins, the researcher prepares supporting facilities and conditions the classroom so that the learning process can take place properly. Learning activities began with the provision of a pre-test to find out students' initial understanding of human motion joint material. Furthermore, the STAR Quartet Card media is used as the main media in learning. Students are divided into groups to encourage interaction and discussion in understanding the various joints of motion in humans, their direction of motion, and understanding the commands listed. After the learning activities are completed, students are given a post-test to measure their improvement in comprehension. The results of the trial showed that the use of the STAR Quartet Card was able to increase student involvement in learning, which can be seen from the students' activeness in observing pictures, following the lighter's commands, and discussing the movements that can be caused by the joint.

The last stage is evaluation. At this stage, an evaluation is carried out to assess the effectiveness of the STAR Quartet Card media after the implementation process. The evaluation was carried out by analyzing the results of the students' pre-test and post-test as well as the response questionnaire given to teachers and students. The results of the evaluation were used to determine the improvement of students' understanding of food chain materials and assess the practicality of using media in the learning process

No.	Respondents	Score	Presses	Categories
1.	Teacher's Response	93	88.57%	Very valid
2.	Student Response	88	83.81%	Very valid

Table 4 Results of Teacher and Student Response Questionnaire

To find out the responses of the developed learning media, data collection was carried out through a questionnaire of teacher and student responses. The results of the analysis of these responses are presented in Table 3. Based on the results of the analysis of user responses to the developed media, data was obtained that the teacher's response showed a score of 93 with a percentage of 88.57% which was included in the very valid category. Meanwhile, the students' response obtained a score of 88 with a percentage of 83.81% which is also in the very

valid category. These results show that the learning media developed received excellent responses from teachers and students and is considered suitable for use in the learning process. Table 5. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Pretest	Posttest
N		26	26
Normal Parameters, b	Red	45.0385	59.8077
	Std. Deviation	21.20468	17.74716
Most Extreme Differences	Absolute	.146	.144
	Positive	.146	.144
	Negative	-.111	-.142
Test Statistic		.146	.144
Asymp. Sig. (2-tailed)		.165c	.175c

- a. Test distribution is Normal.
- b. Calculated from data.
- c. Lilliefors Significance Correction.

Table 5 Normality Test Results

Based on the results of the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk tests, the significance value of the pretest and posttest data was greater than 0.05. The results of the analysis showed that the significance value of the pretest was 0.4543 or 45%, while the significance value of the posttest was 0.598 or 59.8% which was in the medium category. Since the total significance value is greater than 0.05, it can be concluded that the pretest and posttest data are normally distributed. Thus. Further analysis can be continued using a parametric test, namely the t-test.

Table 6. T-test results

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Red	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test Post Test	- 14,76923	12,82905	2,51598	-19,95100	-9,58746	-5,870	25	0,000

Table 6 T-test Results

The t-test was carried out to find out if there was a significant difference between student learning outcomes before and after using the developed learning media. Based on the results of the paired sample t-test, a significance value (Sig. 2-tailed) of 0.000 (Sig. <0.05) was obtained with a calculated t-value of 5.870 and a degree of freedom (df) of 25. When the significance value was less than 0.05, H₀ was rejected and H₁ was accepted. This shows that there is a significant difference between students' pretest and posttest scores after using the developed learning media.

Table 7. N-Gain Results

Average Pretest	Posttest Average	Max score	N-Gain	Criteria
45,04	59,80	80	0,30276	moderate

Table 7 N-Gain Results

The N-Gain test was conducted to determine the level of improvement in student learning outcomes after using learning media (Lestari, Yudhanegara, 2018) in (Munirah & Mulyani, 2024). The results of the analysis showed an average value of 0.3027 or 30.27% which was in the medium category. In addition, H_0 was rejected and H_1 accepted, which means that there is an improvement in student learning outcomes after using the media that has been developed.

DISCUSSION

This study developed and validated the STAR Quartet Card as an innovative learning medium for sixth-grade science instruction on human motion joints. The findings demonstrate that the integration of visual elements, movement-based activities, and musical accompaniment significantly enhances students' concentration, engagement, and motivation during the learning process. Unlike conventional instructional media, which tend to emphasize passive knowledge transfer, the STAR Quartet Card promotes active learning by involving students cognitively, physically, and emotionally. This aligns with the *Education Through Art* framework, which posits that artistic experiences contribute not only to aesthetic appreciation but also to the development of higher-order thinking and intellectual capacity (Read, 1974). Moreover, UNESCO's perspective reinforces that arts integration fosters deeper conceptual understanding through experiential and creative learning processes (Blanco-García et al., 2025). Therefore, the novelty of this study lies not merely in the development of a new medium, but in the deliberate pedagogical integration of science content, kinesthetic learning, and artistic expression into a cohesive instructional design.

Empirically, the feasibility and effectiveness of the developed media are strongly supported by validation and response data. The high validation scores from media experts (91%) and material experts (95%) indicate that the product meets both technical and pedagogical standards. In addition, positive responses from teachers (93%) and students (88%) suggest high acceptability and usability in real classroom contexts. These findings are further reinforced by improved student learning outcomes, supporting the argument that well-designed instructional media can significantly enhance learning effectiveness (Sari, 2020). From a critical standpoint, these results highlight that the success of learning media is not solely determined by its visual appeal, but also by its alignment with pedagogical principles and learner characteristics.

The results of this study are consistent with prior research emphasizing the effectiveness of game-based and interactive learning media. Scott (2021) on (Rahmatullah, 2023) demonstrated that quartet card media contribute to improvements in learning activities, motivation, reading ability, and academic achievement. Similarly, (Walidiati et al., 2023) found that such media increase student motivation and enjoyment, while (Samsiyah et al., 2021) and (Walidiati et al., 2023) confirmed their role in fostering learning interest and engagement. However, while these studies primarily position quartet cards as cognitive reinforcement tools, the present study extends their function into a more holistic learning medium that integrates cognitive, affective, and psychomotor domains. This indicates a conceptual advancement beyond previous implementations of similar media.

The similarities between this study and previous research can be attributed to the shared use of interactive and student-centered learning approaches, which are widely recognized for their effectiveness in enhancing engagement and motivation. Nevertheless, the present study introduces a significant pedagogical distinction. The STAR Quartet Card incorporates structured movement instructions and musical elements, requiring students not only to understand but also to physically enact scientific concepts. This multimodal learning approach is particularly relevant for elementary students, who tend to benefit from kinesthetic and experiential learning environments. The incorporation of movement-based activities is supported by findings from (Dyah et al., 2025), which indicate improvements in motor skills, while the use of interactive media has been shown to enhance engagement and instructional effectiveness (Kristiyawati & da Ary, 2024). These differences suggest that the effectiveness of the developed media is influenced by its ability to address diverse learning modalities.

From a theoretical and practical perspective, the primary contribution of this study lies in advancing the application of the *Education Through Art* approach within science education. Unlike conventional media that often focus on memorization, the STAR Quartet Card facilitates contextual and meaningful learning by integrating visual representation, bodily movement, and creative expression. This approach not only supports conceptual understanding but also encourages creativity and active participation. The findings are consistent with (Carolin & Da Ary, 2025), who emphasize that art- and creativity-based learning media can significantly enhance student engagement and expressive abilities. Thus, this study contributes to the growing body of literature advocating for interdisciplinary and arts-integrated approaches in elementary education.

The implications of this study are multifaceted. Practically, the STAR Quartet Card offers an effective alternative for teachers seeking to implement more engaging and interactive instructional strategies. Academically, this study enriches existing literature by providing empirical evidence on the effectiveness of integrating art-based approaches into science learning. However, it is important to critically acknowledge that this study is limited to a specific context, subject matter, and grade level. Therefore, future research should explore the scalability of this media across different subjects, educational levels, and technological formats, including digital adaptations. Additionally, further studies are needed to examine the long-term impact of such media on students' cognitive, affective, and psychomotor development. Overall, this study confirms that the integration of *Education Through Art* within game-based learning media has the potential to transform traditional classroom practices into more dynamic, meaningful, and student-centered learning experiences.

CONCLUSION

Based on the results of the research and development that has been carried out, it can be concluded that the STAR Quartet Card media based on the Education Through Art approach has been successfully developed as an IPAS learning media on human motion joint material for grade VI students of SDN Mangkangwetan 03 Semarang City through Research and Development (R&D) research design with the ADDIE model. The media developed has characteristics in the form of the integration of visual illustrations, lighter commands, musical accompaniment, and artistic elements that help students understand various kinds of motion joints in a card with movement technology in a more contextual and interesting way. The results showed that the media had a very good feasibility level with a validation score of 86% of material experts and 95% of media expert validation, as well as teacher responses of 91% and student responses of 88% with the category of excellent. The paired sample t-test showed a significance value of 0.002 ($p < 0.05$) which indicates a significant difference between student learning outcomes before and after the use of media. In addition, the N-gain value of 0.3027 (30.27%) is in the medium category, which shows that the media is able to improve student learning outcomes in human motion joint material in science learning. Thus, Education Through Art-based STAR Quartet Card media can be used as an alternative innovative learning media that is effective to improve student learning outcomes and create more interesting and meaningful IPAS learning in elementary schools.

CONFESSION

I would like to convey my deepest thanks and appreciation to Allah SWT for His abundant blessings and grace, which have enabled this research to be completed successfully. This study would not have been accomplished without the support, guidance, and contributions of various parties. I would like to express my gratitude to my parents for their constant support and assistance until its completion. I am also grateful to my Supervisor for his dedication in offering guidance, direction, and valuable knowledge throughout this research process. His guidance has been the main foundation in the completion of this research. I would also like to thank the Principals, Teachers, and Students of SD N Mangkangwetan 03 Semarang City and SD N Kedungcino, who have given permission and facilitated the implementation of this research in schools. The support and cooperation from all parties at the school really helped

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