

Implementing Differentiated Learning through Nusantara Cultural Coloring Activities in Grade IV Integrated Natural and Social Sciences

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ABSTRACT

This study aims to describe the implementation of differentiated learning through Nusantara cultural coloring activities in science learning (IPAS) in grade IV of elementary school, and to explore teachers' perceptions of how these activities relate to students' engagement, motivation, conceptual understanding, creativity, concentration, and participation. This study used a qualitative, single-case design, conducted at SD Negeri 01 Gumawang, involving one fourth-grade class of [X] students and one classroom teacher as the primary informant and facilitator of the learning activities. Data were collected over [X weeks/sessions] through [X] non-participatory classroom observations, one in-depth interview with the teacher, and documentation of student coloring work. Data were analyzed using thematic analysis, involving data reduction, categorization, and interpretation of interview and observation findings. The findings indicate that differentiation was applied primarily at the process and product levels, as students were given flexibility to choose colors, coloring techniques, and the level of detail in completing their assignments. At the same time, content and learning objectives remained the same for all students. The teacher reported adjusting support based on observed differences in student readiness, providing additional guidance and color examples for students who needed more assistance, and encouraging more advanced students to add cultural details or ornaments. Based on the teacher's observations and interview accounts, the coloring activities were perceived to contribute to a more enjoyable, concrete, and contextual learning environment, and were associated with increased student engagement, motivation, and interest in the cultural material. The teacher also reported observing improvements in students' attentiveness, participation, and confidence during the activity, along with signs of stronger recall of cultural symbols and concepts; however, these outcomes were not measured through tests, rubrics, or standardized observation instruments, and should be interpreted as the teacher's professional perception rather than objectively verified learning outcomes. As a single-classroom case study, these findings offer contextual insight into one teacher's practice and should not be generalized beyond this setting without further research involving multiple classrooms and more systematic measurement tools.

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1. INTRODUCTION

Education in Indonesia currently faces challenges that extend beyond the transfer of academic knowledge to include the formation of students' character and the strengthening of the nation's cultural identity [1]. Indonesia, as an archipelagic nation, boasts a rich and diverse culture, encompassing hundreds of ethnicities, regional languages, traditional arts, and customs spread from Sabang to Merauke. This diversity constitutes a national identity that is crucial to introduce and preserve from an early age, particularly in elementary school. However, the rapid spread of globalization and the development of digital technology have led to a decline in younger generations' interest in local culture, as they are more readily exposed to global popular culture [2], [3].

In implementing the Independent Curriculum, one approach is differentiated instruction. This model emphasizes student-centered learning and is designed to adapt to individual needs, including readiness, interests, and learning profiles. Tomlinson (2001) emphasized that differentiated learning is a strategy for systematically responding to student diversity by adjusting learning content, processes, and products. Therefore, teachers are required to design learning that is responsive and adaptive to student needs [4], [5].

The diversity of students' social, cultural, and economic backgrounds also shapes their learning styles, motivation, and readiness to learn. In this context, teachers need to develop learning strategies that can effectively accommodate these differences. Suprijono (2016) emphasized that meaningful learning must provide space for active interaction between students and their learning environment. Therefore, differentiated learning is an important approach that includes effective classroom management, clear learning objectives, a conducive learning environment, and ongoing assessment that is responsive to student needs [6], [7].

Art plays an important role in human development, especially in fostering creativity, sensitivity, and self-expression [8], [9]. Arts education aims to develop students' aesthetic experiences, enabling them to appreciate the beauty of their surroundings. Dewey (1938) emphasized that meaningful learning experiences occur when students engage directly with contextual, relevant activities. Furthermore, education is also directed at strengthening the Pancasila Student Profile, particularly in the global diversity dimension, which emphasizes understanding and appreciation of local culture before exploring other cultures.

The Natural and Social Sciences (IPAS) subject in the Independent Curriculum integrates natural and social sciences and is designed for elementary school students. Local wisdom-based learning is an important approach to building students' cultural awareness [10]. Natural Sciences (IPAS) provides ample space to introduce Indonesian cultural diversity in a contextualized way, enabling students to understand not only scientific concepts but also social and cultural values as part of the nation's identity.

Elementary school-age children (7–12 years) are at the concrete operational stage according to Piaget [11], [12]. Vygotsky (1978) also emphasized that social interactions and meaningful activities within the learning environment greatly influence children's cognitive development. Therefore, abstract learning is less effective without concrete experiences. Teachers need to present activities that involve direct, visual, and kinesthetic experiences so that students can build understanding more optimally.

Coloring is a very popular activity among children because it provides a fun space for creative expression [13]. Besides being a recreational activity, coloring also has educational value, improving students' concentration, fine motor coordination, and visual-spatial skills. When combined with cultural elements such as batik motifs, traditional houses, or traditional clothing, this activity can be an effective learning tool for introducing local culture in context.

The implementation of Indonesian culture-based coloring activities in science lessons aligns with the art-based learning approach. This approach views art as a strategic medium for conveying values, knowledge, and cultural identity. Through visual activities such as coloring, students can develop a more concrete understanding of Indonesia's cultural diversity while fostering curiosity and an appreciation for differences.

However, in elementary school science instruction, material on cultural diversity is often delivered through conventional, text-based methods that lack interactivity. This leads to low student emotional engagement with the material, with culture largely memorized. emphasizes that learning must stem from real-life experiences to be more meaningful. The lack of visual and interactive learning media is one cause of the mismatch between the material and students' cognitive developmental stages.

In this context, coloring activities can be an effective pedagogical bridge to transform passive into active, exploratory learning. Through visualization of cultural objects such as traditional houses, clothing, and regional ornaments, students learn not only cognitively but also emotionally and motorically. Kirom (2017) states that contextual learning, which links material to students' cultural realities, can enhance understanding and meaningful learning.

The implementation of differentiated learning through activities that highlight Indonesian culture in science lessons is not merely an artistic activity but an integrated cultural literacy strategy. With teacher guidance through narrative and discussion, students can build a stronger conceptual understanding of Indonesia's diversity. This active and meaningful learning environment aligns with the principles of constructivism, which emphasize students' active role in constructing knowledge.

Therefore, this study aims to describe and analyze the effectiveness of implementing coloring activities as a creative learning medium to introduce Indonesian cultural diversity in fourth-grade elementary school science. By integrating visual and motor skills, this activity is expected to improve students' cognitive understanding while fostering a deeper, more meaningful appreciation of the nation's cultural identity [14], [15].

2. METHOD

This research uses a qualitative case study design to achieve an in-depth understanding. This approach was chosen because it allows for contextual and naturalistic exploration of phenomena, consistent with real-world conditions [16]. This research was conducted at SD Negeri 01 Gumawang, a school that uses coloring activities to introduce elementary school students to the rich culture of the Indonesian archipelago. Subjects included students participating in the learning process and educators facilitating the learning activities.

The data collection technique in this study used documentation, primarily in the form of images. In addition to documentation, data can also be supported by non-participatory observation, where researchers directly observe the activity process without being involved in the learning activity. This was done to capture authentic student behavior during the activity. With this method, the study aims to provide a comprehensive picture of the Coloring Activity to introduce the Richness of Indonesian Culture in Science Learning.

3. RESULTS AND DISCUSSION

3.1 Results

This study aims to describe the implementation of differentiated learning through Nusantara cultural coloring activities in science instruction in fourth-grade elementary schools and to analyze their role in learning outcomes, conceptual understanding, learning motivation, creativity, concentration, and student participation. Research data were collected through interviews with fourth-grade teachers who implemented Nusantara cultural coloring activities in science instruction.

Based on interviews with KRM informants, findings indicated that differentiated learning was implemented through coloring activities tailored to students' needs, interests, and characteristics. Teachers gave students the freedom to choose colors, coloring techniques, and methods for completing assignments so that they could learn according to their individual learning styles and abilities. Coloring activities on Nusantara culture were implemented using images of traditional houses, traditional clothing, regional cultural symbols, and local cultural activities as an engaging, contextually relevant visual learning medium.

1. Implementation of Differentiated Learning Based on Activities to Color the Indonesian Culture

KRM's interview results indicated that differentiated learning was implemented by inserting illustrated worksheets into the science and science materials on the diversity of Indonesian culture. The teacher first explained the material, then asked students to color images of regional cultures using their own creativity. During implementation, the teacher gave students the freedom to determine color combinations, coloring techniques, and the level of detail of the images based on their abilities.

Differentiated learning through coloring activities is also implemented with consideration of students' learning readiness. Students with higher abilities are challenged to add ornaments or cultural information to their coloring, while students who still need guidance are given color examples and more intensive guidance. Thus, coloring activities are not only artistic activities but also learning strategies that can accommodate students' diverse learning needs.

The findings of this study align with the concept of differentiated learning, which emphasizes tailoring the learning process, content, and products to students' needs to make learning more meaningful [17]. In addition, the use of local cultural media in science learning can help students better understand the nation's cultural identity more contextually and authentically [18].

2. The Role of Coloring Activities on Learning Outcomes and Concept Understanding

Based on interviews with KRM informants, the Nusantara cultural coloring activity had a positive impact on student learning outcomes. The informants stated that students understood and remembered learning materials more easily when presented through visual activities and hands-on practice. The coloring activity helped strengthen students' visual memory, making memorization and understanding of cultural concepts more effective.

The teacher explained that students recognized the shapes of traditional houses, traditional clothing, and regional cultural symbols more quickly after coloring. Furthermore, students found it easier to understand regional cultural characteristics because they observed the details of the images during the coloring process. Thus, previously abstract concepts were transformed into concrete and easily understood learning experiences.

This finding is supported by research indicating that visual learning media can improve learning outcomes and conceptual understanding among elementary school students, as they align with the concrete operational stage of children [19]. Other research also shows that the use of culture-based visual media can increase the effectiveness of science learning in elementary schools [20].

Furthermore, implementing differentiated learning in coloring activities helps students learn at their own pace. Students with strong visual abilities can explore their creativity more broadly, while slower learners can still understand the material through visual aids and teacher guidance. This demonstrates that arts-based differentiated learning can create an inclusive and adaptive learning environment.

3. The Role of Coloring Activities on Learning Motivation and Interest

Interviews with KRM class teachers revealed that coloring activities positively impacted students' motivation and interest in learning. The interviewees stated that coloring activities created a fun and less monotonous learning environment, making students feel more comfortable participating in the lesson.

The teacher explained that students appear more enthusiastic when science lessons are combined with arts activities, such as coloring Indonesian culture. Students feel like they are learning while playing, which reduces the stress of studying. This fosters student engagement and encourages them to participate more actively in learning activities.

Besides boosting learning motivation, coloring activities also help maintain student interest throughout the learning process. The use of engaging images of Indonesian culture can foster students' curiosity about regional cultures in Indonesia. Learning becomes more lively because students not only receive information verbally but also interact directly with the learning media.

This finding aligns with Wafiqni et al. (2023), who found that the use of creative learning media can increase elementary school students' learning motivation. Furthermore, enjoyable learning can support students' emotional engagement, making the learning process more effective [21].

4. The Role of Coloring Activities in Creativity and Artistic Expression

Based on interviews, coloring activities can develop elementary school students' creativity. Informants explained that students learn to explore color combinations, gradients, and decorative techniques during the coloring process. The freedom students have to choose colors and coloring techniques is an important part of implementing differentiated learning.

The teacher revealed that each student produced a different piece of work, even though they used the same image. This demonstrates the creativity, imagination, and unique character of each student. Differentiated learning provides students with the space to express their ideas and learning styles through the visual work they produce.

In addition to fostering creativity, coloring activities also contribute to students' artistic expression skills. Informants explained that coloring provides a medium for students to express their emotions and visual perceptions. Through these activities, students learn to develop self-confidence and courage in presenting their work to their classmates.

This finding is supported by research by Oktasabella et al. (2024), which states that drawing and coloring activities can encourage creativity and creative thinking skills in elementary school students. Other research also shows that arts-based learning can help students develop self-expression and emotional intelligence more optimally [22].

5. The Role of Coloring Activities on Student Concentration, Activeness, and Participation

The research results showed that coloring activities had a positive impact on students' concentration. Informants explained that students must pay attention to image details and color accuracy to ensure neat coloring. This activity trains students to focus, be meticulous, and maintain attention throughout the learning process.

Teachers also revealed that coloring activities encourage student engagement in class. Students are more likely to ask their teacher and peers about appropriate colors and the cultural information they are learning. This interaction creates a more communicative and interactive learning environment.

Furthermore, coloring activities can foster student participation in learning. Resource persons stated that students' success in completing coloring assignments provides a sense of accomplishment, boosting their self-confidence. By fostering self-confidence, students become more active participants in discussions and other learning activities.

The findings of this study indicate that arts-based differentiated learning not only develops students' academic aspects but also supports their social and emotional development during the learning process.

6. Challenges and Solutions in Implementing Differentiated Learning Based on Coloring Activities

Despite its numerous benefits, implementing differentiated learning based on Nusantara cultural coloring activities still faces several challenges. Resource persons

stated that limited learning time is a major obstacle, as students often become too focused on coloring, making it difficult to stop the activity on time.

Furthermore, differences in student work speed also pose a challenge in implementing differentiated learning. Faster-paced students tend to complete assignments earlier, while others require additional time and teacher support. Another obstacle identified is the limited availability of coloring tools.

To overcome these obstacles, teachers implemented several solutions, such as setting clear time limits, having students help each other provide coloring materials, and integrating coloring activities into project assignments. These strategies ensured effective learning and allowed all students to participate at their own pace.

3.2 Discussion

The study's results indicate that implementing differentiated learning through Nusantara cultural coloring activities in fourth-grade elementary school science lessons has a positive impact on student learning processes and outcomes. Differentiated learning allows teachers to adapt learning strategies to students' needs, interests, and characteristics, making learning more inclusive and meaningful. The concept of differentiated learning emphasizes that each student has different learning readiness, interests, and learning profiles, so teachers need to provide flexible and adaptive learning experiences.

The Nusantara cultural coloring activity has been proven to support students' learning outcomes and conceptual understanding by using a visual approach and hands-on experience, which are appropriate for elementary school children at the concrete operational stage. Through this activity, students more easily grasp cultural concepts because they are actively involved in the learning process. This aligns with research showing that the use of visual media in science learning can support elementary school students' conceptual understanding and learning outcomes by helping them visualize abstract material more concretely [23]. In addition, according to Piaget's theory of cognitive development, elementary school students find it easier to understand material through direct experience and concrete media compared to abstract learning [19].

The implementation of differentiated learning also provides students with the space to learn according to their individual learning styles and abilities. Freedom in choosing colors, coloring techniques, and forms of assignment completion helps students develop creativity, artistic expression, and self-confidence. Learning becomes more humanistic because teachers focus not only on the final result but also value each student's learning process. This finding is supported by research showing that arts-based learning can develop creativity, creative thinking skills, and self-expression in elementary school students [21]. Other research also shows that art activities such as drawing and coloring can make students more confident by fostering freedom of expression in producing visual works.

From the perspective of motivation and learning interest, coloring activities can create a pleasant learning atmosphere, making students more enthusiastic about participating in learning. Arts and culture-based learning provides a learning experience that is not monotonous and closer to students' lives. This condition supports meaningful learning in accordance with the principles of the Independent Curriculum, which place students at the

center of learning. The results of this study align with Wafiqni et al. (2023), who found that the use of creative learning media can encourage student motivation and engagement in learning. Furthermore, Magdalena et al. (2023) explain that interesting and enjoyable learning can significantly increase elementary school students' enthusiasm for learning [24].

In terms of concentration, engagement, and student participation, coloring activities help students focus and actively engage during learning. Visual activities involving hand-eye coordination train accuracy, focus, and attention to detail. Furthermore, coloring activities encourage social interaction among students through discussions about colors, cultural forms, and their creations. These findings indicate that arts-based learning not only impacts cognitive aspects but also supports the social and emotional development of elementary school students.

However, implementing differentiated learning through coloring activities still faces several obstacles, including limited learning time, varying student abilities, and limited learning media. Therefore, teachers need to be creative in managing time, providing adequate learning media, and implementing flexible learning strategies so that all students can be optimally involved in the learning process. Teachers also need to develop project-based and collaborative learning models so that coloring activities are not only individual activities but also a means of building cooperation and communication between students [25].

4. CONCLUSION

This qualitative case study suggests that Nusantara cultural coloring activities can provide a contextual and enjoyable medium for implementing limited forms of differentiation in a Grade IV IPAS classroom. In this case, differentiation occurred mainly through task choice (color, technique, and level of detail), variation in teacher support (additional guidance for students needing help versus extension challenges for more advanced students), and flexibility in student pace during task completion.

Based on the teacher's observations and interview accounts, the coloring activities were associated with increased student engagement, motivation, and enthusiasm, as well as signs of stronger attentiveness and recall of cultural symbols. However, these findings reflect the teacher's professional perception and classroom observation rather than objective measures such as tests, rubrics, or validated assessment instruments; claims regarding academic achievement or measured conceptual gains should therefore be avoided. Similarly, the activity's contribution to the appreciation of Indonesian cultural diversity and to the Pancasila Student Profile should be understood as a potential contribution suggested by this case, rather than a demonstrated outcome. The implementation also faced practical challenges, including limited instructional time, differences in student work pace, and constraints in coloring materials, which the teacher addressed through time management, peer support, and integrating coloring into broader project tasks.

This study is limited by its single-classroom, single-teacher design and its reliance on teacher-reported perceptions and researcher observation, without student perspectives, validated instruments, or pre-post measures. Future research should involve multiple schools and teachers, incorporate student perspectives, use validated observation and

assessment tools, compare coloring with alternative learning activities, measure conceptual understanding before and after the intervention, and examine culturally responsive differentiation over a longer period. Building on these findings, further work might also explore related art-based activities—such as simple batik or regional craft-making—as a natural extension of this approach, provided such activities are studied with similarly rigorous methods.

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