

CLASSROOM DESIGN IN THE IMPLEMENTATION OF DEEP LEARNING AT SD NEGERI 16 BANDA ACEH

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Abstract

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This study aims to analyze classroom design in supporting the implementation of deep learning in primary education, with a case study conducted at SD Negeri 16 Banda Aceh, Indonesia. The research is grounded in the implementation of the Merdeka Curriculum, which emphasizes meaningful, student-centered, and in-depth learning, where the physical learning environment functions as a silent curriculum shaping student interaction and engagement. A qualitative descriptive approach was employed, with data collected through classroom observations, in-depth interviews with teachers and the school principal, and document analysis. The findings indicate that classroom design in the school is flexible and adaptive, utilizing various seating arrangements such as traditional, U-shaped, cluster-based, and modified V-shaped formations aligned with instructional objectives. These spatial arrangements were found to enhance active participation, collaboration, and students' deep conceptual understanding. However, challenges remain, including heterogeneous student abilities, limited instructional time, and constraints in the availability of technological resources. The study concludes that responsive and flexible classroom design is a critical factor in facilitating deep learning in primary schools and recommends strengthening teachers' capacity to design adaptive, student-centered learning environments.

Keywords: Classroom Design; Deep Learning; Primary Education

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INTRODUCTION

Entering the 21st century, the rapid global development of technology, information, and communication has brought significant changes to various aspects of human life, including the field of education. These changes require the education sector to continuously adapt to the dynamics of the times in order to prepare learners who are adaptive and competitive. Twenty-first century skills have therefore become increasingly important, as they emphasize not only the mastery of knowledge but also critical thinking, creativity, communication, and collaboration skills as essential provisions for active participation in the global society (Redhana, 2019; Astutik & Hariyati, 2021).

In line with the demands of 21st-century skills, the Merdeka Curriculum has been introduced as a national education policy that emphasizes learning autonomy, differentiated instruction, and the development of students' character. The essence of this policy aligns with the deep learning approach, which focuses on learning processes that are in-depth, meaningful, and relevant to students' everyday lives (Sari & Arta, 2025). Wathon (2024) argues that the implementation of deep learning within the Merdeka Curriculum is able to strengthen students' critical and creative thinking skills, while simultaneously enhancing their engagement in the learning process. Although conceptually deep learning is highly

relevant to the direction of national education policy, its implementation at the elementary school level still faces various challenges. One factor that has often received limited attention is the physical condition of the learning environment, particularly classroom design.

The implementation of deep learning in elementary schools does not only depend on pedagogical strategies and curriculum policies, but is also significantly influenced by classroom design as a physical learning environment. The physical environment of the classroom functions as a silent curriculum that shapes patterns of interaction, levels of engagement, and depth of understanding among students, thus playing an important role in supporting meaningful learning. Specifically, a physical environment that supports deep learning requires design principles such as a flexible layout that facilitates collaboration and project work, presentation areas to hone communication skills, and the arrangement of learning resources and displays of student work that trigger inquiry and critical reflection (Maulana et al., 2025; Fauziah et al., 2025).

Barrett et al. (2015) emphasize that the physical characteristics of classrooms can have a measurable impact on students' learning progress, including engagement, behavior, and academic achievement, indicating that the classroom environment functions as an active factor in the learning process. These findings are consistent with studies conducted in Indonesian elementary schools, which indicate that lighting, ventilation, and classroom layout influence students' learning comfort and participation during the learning process. Consequently, a well-designed physical classroom environment is able to promote more meaningful student engagement in learning (Noviana et al., 2025). Furthermore, Manik et al. (2025) explain that flexible classroom layouts encourage collaboration, interaction, and student-centered learning, which are key characteristics of deep learning. In contrast, rigid and one-directional classroom layouts tend to limit interaction and hinder the realization of deep learning (OECD, 2019).

Although numerous studies have highlighted the importance of classroom design in supporting meaningful learning, the implementation of classroom environments aligned with deep learning principles in public elementary schools continues to face various challenges. Limitations in facilities and infrastructure, inflexible learning spaces, and the suboptimal utilization of classrooms as active learning environments are common issues encountered in practice (Ika Merdeka Wati Siregar, 2025; Azra Fahira Lubis, 2025). On the other hand, elementary schools also have the opportunity to develop more adaptive classroom designs through spatial arrangements, utilization of available facilities, and increased awareness among educators of the importance of the physical environment in supporting the learning process (Suruambo, 2025). In this context, SD Negeri 16 Banda Aceh is worthy of study because of its position as a public elementary school in an urban area that represents the intersection between the demands of implementing an independent curriculum that emphasizes deep learning and the real conditions, both challenges and opportunities, in developing the physical learning environment experienced by many elementary schools in Indonesia.

Based on the above description, this study aims to describe the classroom design at SD Negeri 16 Banda Aceh and analyze the challenges and opportunities faced by the school in preparing classrooms that are in line with the principles of deep learning. This study is expected to provide an empirical description of the actual conditions of classrooms in elementary schools and serve as a recommendation for the development of a learning environment that supports the implementation of an independent curriculum and 21st-century learning.

RESEACH METHOD

This study employs a descriptive qualitative approach aimed at analyzing classroom design in supporting the implementation of deep learning at SD Negeri 16 Banda Aceh. A qualitative approach is used to gain an in-depth, holistic, and contextual understanding of the phenomenon based on the perspectives of the research subjects and the actual conditions of the learning environment (Albi Anggito, 2018). Through this approach, the researcher explores the meanings of practices as well as the dynamics of classroom utilization as a learning environment within the teaching and learning process in a natural and factual manner.

Data were collected through observation, in-depth interviews, and document analysis. Primary data were obtained from interviews with homeroom teachers, the school principal, and the vice principal for curriculum affairs who were directly involved in the implementation and management of the learning process. Secondary data were derived from school documents, books, and scholarly journals relevant to classroom design and deep learning. Data analysis was conducted through the stages of data reduction, data display, and conclusion drawing, following the model proposed by Miles and Huberman (Samiaji Sarosa, 2021). The trustworthiness of the data in this study was ensured through credibility, transferability, dependability, and confirmability (Hartono, 2018).

RESULTS AND DISCUSSION

Classroom Design at Banda Aceh Public Elementary School 16

The results of the study indicate that the classroom design for the implementation of deep learning at SD Negeri 16 Banda Aceh is flexible and responsive. The classroom layout is not fixed and does not follow a single format, but is adapted to the teaching objectives, student characteristics, and types of learning activities carried out. These results are based on interviews with lower grade teachers, upper grade teachers, the principal, and the vice principal.

The existing classroom layout models consist of a classical (row) formation, a U-shape, clusters, and modified models arranged independently by teachers, such as those resembling the letter V. The classical layout is used in certain situations, such as during evaluations or activities that require individual focus. Furthermore, the U-shape and group formats are used more often because they can increase student interaction, communication, and participation in the learning process.

In lower grades, classroom arrangements tend to be changed more often to prevent students from getting bored and to maintain their concentration in learning. Teachers create open spaces in the middle or front of the classroom to facilitate interactive activities. In higher grades, classroom arrangements are designed to support discussion, experimentation, and collaborative learning, especially with the application of the U-shape model and grouping. The results of this study indicate that classroom arrangements play an important role as dynamic learning spaces and enhance the characteristics of deep learning.

Challenges and Opportunities in Preparing Deep Learning-Based Classroom Designs

The results of the study show that the implementation of deep learning-based classroom design at SD Negeri 16 Banda Aceh faces several challenges and opportunities. The main challenges stem from differences in students' learning abilities within a single class, limited learning time, and technical constraints such as device readiness and electricity conditions. Differences in student abilities require teachers to adjust their learning strategies and classroom layout so that all students remain optimally engaged.

On the other hand, there are opportunities that support the application of deep learning. The principal gives teachers the freedom to arrange the learning space according to learning needs without a standard model or fixed student seating. In addition, the availability of learning facilities such as projectors, interactive flat panels (IFP/PID), and

computer labs supports the creation of a more interactive and meaningful learning experience, even though their use is shared.

Support from school education policies, continuous academic supervision, and innovation from teachers in changing classroom layouts are key elements that support the implementation of deep learning despite several limitations. Therefore, the challenges and opportunities in preparing classrooms are interrelated and create flexible learning methods at SD Negeri 16 Banda Aceh.

DISCUSSION

Classroom Design in Learning

A classroom is essentially a place where the teaching and learning process takes place, bringing teachers and students together at the same time. Esti ismawati (2016) states that a classroom is a space within an educational institution that is specifically used for the learning process. Hadari Nawawi in Djamarah divides the definition of a classroom into two categories: first, a classroom in the narrow sense, which is a room enclosed by four walls where students gather to participate in the teaching and learning process. Second, a classroom in a broad sense, which is a small community within a school that is dynamically organized to carry out the teaching and learning process creatively and achieve educational goals (Djamarah, Syaiful Bahri, 2013). This shows that a classroom is not only viewed as a physical space but also as a social environment that shapes the interaction between teachers and students. Therefore, a classroom design that can integrate these physical and social dimensions is needed to create an optimal learning atmosphere.

Classroom design is understood as the process of arranging learning space elements, ranging from the placement of tables and chairs, lighting, ventilation, colors, to decorations, with the aim of creating a conducive, interactive learning environment that supports the achievement of educational goals. According to Hasibuan, classroom design is a process of arranging the layout of a building from various interior elements to create a sturdy physical structure that makes students comfortable in learning (Hasibuan et al., 2023). Suyanto (2016) emphasizes that classroom arrangement is a very important classroom management strategy to create positive interactions between teachers and students and support learning effectiveness. With good space arrangement, student concentration and motivation can increase significantly. This is in line with Slameto's view that the physical condition of the classroom greatly affects student motivation and learning ability (Slameto, 2010).

Thus, classroom design needs to be based on certain layout principles so that the learning environment created is truly conducive, interactive, and supports learning effectiveness. The principles of an effective classroom environment aim to create a safe, comfortable, and conducive learning atmosphere so that students can learn optimally (faidzal djabidi, 2016). To achieve these conditions, there are several classroom layout principles that need to be considered, including the following.

1. Visibility, meaning that the placement and arrangement of items in the classroom does not obstruct students' view, so that they can freely see the teacher, objects, or activities taking place.
2. Accessibility, meaning that the layout of the room must make it easy for students to reach or take the items they need during the learning process.
3. Flexibility, meaning that items in the classroom should be easy to arrange and move around to suit learning activities.
4. Comfortable, comfort here relates to room temperature, lighting, sound, and class density.
5. Beauty, this principle relates to the teacher's efforts to arrange the classroom in a way that is pleasant and conducive to learning activities.

These principles of classroom arrangement are then manifested in various classroom layout models that are tailored to the learning objectives and characteristics of the students.

Classroom Layout Model

The layout of the classroom and its environment plays an important role in supporting the achievement of learning objectives. A good layout can facilitate effective learning activities, while an inappropriate layout can actually be an obstacle (Heni Listiana, 2025). Therefore, teachers need to arrange the classroom according to the learning objectives, the number of students, and the available facilities and infrastructure. This arrangement is dynamic because it can be adjusted to the needs, methods, and learning activities that are taking place (Hasanah & Zainuri, 2021). Widiasworo (2018) states that seating arrangements can be varied into a number of formations, such as traditional, circle, cluster, conference, and U-shape. Thus, classroom seating arrangements can be arranged in various formations, and each formation has different characteristics, advantages, and disadvantages.

1. Row Formation

Traditional formation places students in straight rows facing forward, usually toward the teacher and the blackboard. The main characteristics of this formation are individual orientation and minimal visual contact between students. Its main advantage is that it is very effective for increasing focus on independent tasks, exams, or when the teacher is presenting new material, because it reduces distracting social interaction and makes it easier for the teacher to supervise the class and prevent cheating. However, its disadvantages are significant for interactive learning: this formation severely limits communication and cooperation between students, creates a rigid, teacher-oriented atmosphere, and can make students in the back rows feel isolated and less involved in class discussions (Pédro Marius Egounléti, Ulrich O. Sèna Hindémè, 2018).

2. Cluster Formation

Cluster formation arranges students into small units, generally consisting of 3-4 people sitting facing each other. The main feature of this formation is the formation of small social groups within the classroom. Its advantages are particularly evident in learning activities that require cooperation, such as discussions, group projects, and peer learning, as it significantly increases interaction and support among students. In addition, this formation helps students who tend to be shy to become more confident in participating in a limited setting before appearing in a larger class forum. However, its weakness lies in the potential for behavioral disturbances because students may be less monitored in groups, and it is not optimal for activities that require individual concentration and independent thinking (Pédro Marius Egounléti, Ulrich O. Sèna Hindémè, 2018).

3. U-Shape Formation

The U-shape formation places student desks in a U shape, with the teacher occupying a position in an open area or the center of the room. Its main feature is the creation of a focused and open space, allowing for optimal visual contact between all members of the class. The advantage of this formation lies in its ability to create equal interaction between the teacher and students, as well as among students, making it ideal for class discussions, debates, and teacher-guided learning games. In addition, student accountability increases because each individual is under the visual supervision of the teacher and classmates. However, the disadvantage is the need for a large space, making it less effective in classes with large numbers of students or limited space. Furthermore, this formation is not ideal

for early childhood students because it requires a relatively higher level of maturity and social awareness (Pédro Marius Egounléti, Ulrich O. Sèna Hindémè, 2018).

4. Circle Formation

Circle formation is generally implemented without tables and chairs, with participants sitting on the floor, thus providing comfort, freedom of movement, and enhancing interaction and discussion among students. This formation also makes it easier for educators to control classroom dynamics and effectively supports collaborative problem solving, especially in large groups. However, sitting facing each other has the potential to cause noise, a less conducive classroom atmosphere, and fatigue due to the absence of tables and chairs. In addition, the effectiveness of assigning tasks tends to decrease because students are more easily distracted and less focused on learning activities (Yusuf & Rahman, 2025).

Thus, the variations in classroom layout proposed by Widiaworo reflect the need to adjust seating arrangements to suit different learning objectives. On the other hand, the traditional model is more suitable for individual teaching or lectures, while circular, cluster, and U-shaped arrangements are more conducive to collaborative and interactive learning methods, which are characteristic of 21st-century education.

Deep Learning in Primary Education

Deep learning in the context of education refers to a learning approach that emphasizes deep understanding, interconnections between concepts, and the application of knowledge to real-life situations. Unlike surface learning approaches, which emphasize memorization and repetition of information, deep learning focuses on mastering meaningful concepts and developing critical, analytical, and reflective thinking skills (Biggs & Tang, 2011).

According to Hattie and Donoghue in Hadikusuma, deep learning involves higher-order cognitive activities, such as analyzing, evaluating, and creating. This process emphasizes not only what students learn, but also how they learn, including understanding, reflection, and transforming knowledge into relevant and applicable insights (Zaka Hadikusuma Ramadan, Miranti Eka Putri, 2025). This concept is in line with the view of Abdul Mu'ti Mu'ti in Suwandi, who states that deep learning is a learning model that emphasizes deep understanding, where students not only memorize but also internalize knowledge in a meaningful way (Suwandi et al., 2024).

Based on this description, deep learning is understood as a learning approach that emphasizes deep understanding, interconnections between concepts, and the application of knowledge in real life, actively involving students' cognitive, affective, and reflective aspects.

The deep learning approach consists of three main components: meaningful learning, mindful learning, and joyful learning. These three components work together to create a deep, relevant, and motivating learning experience. This approach also combines contextual understanding, focused attention, and an exciting learning environment to help students achieve their goals (Mohammad et al., 2025).

1. Meaningful learning

Meaningful learning is a learning approach that involves critical thinking and development through interactive activities, aiming to build meaning through the introduction of patterns and concepts. This process includes critical thinking, creativity, problem solving, and memory skills. Meaningful learning focuses on understanding and connecting new knowledge with existing

knowledge, so that students gain a deep understanding and can relate their learning to the context of their lives (Diputera et al., 2024).

2. Mindful learning

Mindful learning is a learning model rooted in mindfulness theory, with the main characteristics of full presence, reflection, and flexibility of thinking. This is in line with the characteristics of mindfulness, which emphasizes the continuous creation of new categories, openness to new information, and awareness of various perspectives (Ramadhan, 2025).

3. Joyful Learning

Joyful learning is an approach that utilizes students' excitement and interest to create a more meaningful and memorable learning experience. This approach engages students emotionally and intellectually so that they feel inspired and enjoy the learning process. Its characteristics include an exciting learning atmosphere, interesting materials and methods that suit students' interests, and interactive activities such as games and collaborative group work. A positive, inclusive classroom environment that values diversity in learning styles also makes students feel comfortable, accepted, and more motivated to learn (Diputera et al., 2024).

The deep learning approach consists of three main components: meaningful learning, mindful learning, and joyful learning. These three elements support each other in building a comprehensive, efficient, needs-based, and motivating learning experience.

The Relationship Between Classroom Design and Deep Learning Implementation

The educational environment is an important factor that influences students' learning experiences and outcomes. According to Bronfenbrenner's ecological theory of education in Adi Dharma, the learning environment is multidimensional, encompassing physical, psychological, socio-cultural, and technological aspects that interact with each other (Ady Dharma, 2023). The physical environment, such as classroom design, lighting, ventilation, and sound, plays a role in increasing student engagement and concentration. Good room layout can reduce distractions and encourage an active learning atmosphere (Singgih Aji Purnomo, 2024).

Meanwhile, a supportive psychological environment can foster a sense of security, motivation, and emotional well-being. On the other hand, an inclusive socio-cultural environment encourages positive interaction and collaboration, while the use of technology enriches the learning experience and supports flexible and meaningful learning. Therefore, an integrated learning environment plays an important role in supporting the implementation of deep learning (Ady Dharma, 2023).

Effective classroom design plays a crucial role in enhancing student interaction and engagement. Varied seating arrangements, such as U-shape, group, or circle models, can reduce boredom, maintain focus on learning, and facilitate communication and collaboration among students. Good classroom management is not only about aesthetics, but also part of a learner-centered learning strategy, where teachers act as classroom managers who design a conducive and participatory learning environment (Sudjana, 2019).

In the context of deep learning, classroom design serves as a pedagogical strategy that supports meaningful, reflective, and collaborative learning. Flexible, ergonomic classrooms equipped with learning tools and technology enable students to actively engage, collaborate, and develop a deep understanding. Thus, classroom design that is responsive to the needs of students is an important foundation for realizing the principles of deep learning in elementary schools.

CONCLUSION

Based on the results of the research and discussions that have been conducted, it can be concluded that the classroom design at SD Negeri 16 Banda Aceh is flexible and dynamic, covering various layout models such as traditional, U-shape, cluster, and modified V-shape, which are tailored to learning objectives and student characteristics. This classroom design greatly supports the implementation of deep learning by facilitating interaction, collaboration, and active student participation in a meaningful learning process. However, its implementation faces real challenges such as differences in student abilities, learning limitations, and technical problems in the use of educational technology. On the other hand, this study also found strategic opportunities such as support from school leadership that provides opportunities for teachers to innovate and be creative, positive student responses to collaborative learning methods, and the ability of teachers to adapt in modifying the learning environment even with limited resources. The findings of this study provide opportunities for further development, including experimental research on the specific effects of classroom layout on deep learning indicators.

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