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Multisensory Learning: Improving Conceptual Understanding Through an Intuitive Sensory Approach

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Abstract

Abstract

Learning in the modern era requires an adaptive approach to accommodate the diversity of students' learning styles to enhance the effectiveness of education. One innovative approach is multisensory learning, which combines visual, auditory, and kinesthetic sensory stimulation to aid students' understanding of concepts, particularly in abstract subjects such as science and mathematics. This study employs a descriptive qualitative approach with a case study method at a junior high school that has implemented this approach. The research subjects include 30 students, five teachers, and three education experts, selected purposively. Data were collected through in-depth interviews, classroom observations, and document analysis. The findings indicate that the multisensory approach effectively addresses the diversity of students' learning styles, enhances concept comprehension, and fosters an inclusive learning environment. This approach also supports students with special needs, such as dyslexia and sensory processing disorders, and improves students' long-term information retention. Teachers play a significant role in the successful implementation of this method through training and innovative strategies. Thus, the multisensory approach has a positive impact not only on material comprehension but also on students' enthusiasm for learning and positive peer communication. This study recommends the importance of support in teacher training and the provision of resources to optimize the application of multisensory learning.

Keywords: *Conceptual Understanding; Innovative Sensory Approach; Multisensory Learning*

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Introduction

Learning in the modern era demands approaches capable of accommodating the diverse learning styles of students to enhance the effectiveness of education. Each student has a unique learning style, such as visual, auditory, or kinesthetic, which influences how they understand and internalize information. Unfortunately, many traditional teaching methods still rely on one-directional approaches that often fail to accommodate this diversity. As a result, many students struggle to grasp abstract concepts, particularly in subjects such as science and mathematics. This poses a significant challenge for educators to develop adaptive and inclusive teaching methods. In this context, multisensory learning emerges as a promising solution. This approach not only offers diverse learning experiences but also enhances concept comprehension through the stimulation of multiple senses (Wijayanti & Laili, 2024). Therefore, further exploration of multisensory learning is relevant to improving the quality of education.

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The effectiveness of multisensory learning has been widely demonstrated in various studies. This approach involves stimulating different senses, such as vision, hearing, and movement, thereby strengthening comprehension and information retention. In learning abstract concepts, this method helps students visualize complex ideas. For instance, using teaching aids to explain geometry or virtual simulations to understand chemical reactions can provide more tangible learning experiences. Multisensory learning enables students to learn in ways that suit their individual styles, thereby increasing active participation and motivation to learn (Nurhasanah et al., 2024). These positive impacts extend beyond academics, supporting students' social and emotional skills development. Thus, multisensory learning is not only an innovative approach but also a holistic one.

In the context of inclusive education, the multisensory approach offers tremendous benefits. Many students with special needs, such as dyslexia or sensory processing disorders, face challenges in understanding information through conventional methods. Multisensory learning can bridge these gaps by providing profound and meaningful learning experiences. For example, dyslexic students can better comprehend texts through a combination of images, sounds, and movement (Primasari & Supena, 2021). This approach also strengthens students' interaction with their learning environment, creating a more inclusive learning experience. Multisensory learning allows educators to design methods that are more adaptive and responsive to individual student needs, aligning with the principles of inclusive education that emphasize equal access to learning for all students. Therefore, the application of multisensory learning is a strategic step toward achieving equitable education.

Advancements in educational technology also serve as a critical catalyst for implementing multisensory learning. Technologies such as virtual reality (VR), augmented reality (AR), and interactive applications have opened new opportunities for creating deeper learning experiences (Fatimah et al., 2024). Through these technologies, students can experience realistic simulations that engage multiple senses simultaneously. For instance, learning history through VR allows students to "visit" historical events virtually, providing experiences that are difficult to achieve through textbooks. Innovations like these not only capture students' interest but also significantly enhance their conceptual understanding. Furthermore, educational technology facilitates educators in designing dynamic and engaging learning materials. Thus, integrating technology into multisensory learning is a vital step in aligning education with 21st-century needs.

The development of multisensory-based learning media also provides opportunities for educators to innovate. Teachers now have the chance to create teaching aids that are more creative and relevant to students' needs. Examples include using textured materials to explain geometric concepts or interactive devices to study scientific phenomena (Suryani, 2024). Such media not only help students grasp the material but also increase their engagement in the learning process. Additionally, collaboration among educators, media designers, and technology experts creates greater opportunities for developing innovative learning solutions. Innovations like these can catalyze the transformation of education toward more relevant and effective approaches. Therefore, investing in the development of multisensory media is a strategic step in improving educational quality.

However, the implementation of multisensory learning does not come without challenges. One major obstacle is the need for adequate resources, both in terms of technology and teacher training. Not all schools have access to advanced technology that supports multisensory learning, especially in remote areas. Furthermore, educators often require specialized training to use this method effectively. Another challenge is the limited time available to design complex multisensory learning materials (Uddin et al., 2024). Nevertheless, the long-term benefits of this approach far outweigh its challenges. Collaboration among governments, the private sector, and educational communities is therefore essential to support the widespread implementation of multisensory learning.

The multisensory approach offers a comprehensive solution to enhance conceptual understanding in education (Setiawan & Muttaqin, 2023). By engaging multiple senses, this method provides richer and deeper learning experiences for students. In today's digital era, the integration of technology further amplifies the potential of multisensory learning to deliver more relevant and engaging education. This approach also has a significant impact on fostering inclusive education, particularly for students with special needs. Thus, multisensory learning not only addresses the challenges of traditional teaching but also paves the way for transformative improvements in education.

In conclusion, multisensory learning is an innovation that is both relevant and essential for implementation in the educational sphere. This approach bridges the gap between students' learning styles and traditional teaching methods. Additionally, it supports the principles of inclusive education

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and the relevance of learning in the digital era. With appropriate support, this approach can become a cornerstone of educational transformation in the future. Therefore, it is important to continue studying and developing multisensory learning to achieve broader positive impacts.

Method

This research uses a descriptive qualitative approach based on case study to explore the application of multisensory learning in improving students' concept understanding in a junior high school. The research subjects consisted of 30 students with diverse learning styles (visual, auditory, kinesthetic), five teachers, and three education experts who were purposively selected. Data were collected through in-depth interviews, classroom observations, and document analysis such as lesson plans and teaching materials. Data were analyzed using thematic methods, focusing on the diversity of learning styles, the effectiveness of multisensory methods, and learning media innovations. To increase credibility, the research applied source triangulation, member checking, and audit trail. The research lasted for three months and is expected to contribute to the development of innovative and effective learning strategies.

Result and Discussion

1. Diversity of Student Learning Styles

The results of the study show that the diversity of students' learning styles has a significant influence on effectiveness in the learning process. Based on observations, of the 30 students studied, about 40% have a visual learning style, 30% have an auditory style, and 30% have a kinesthetic style. This data indicates the importance of applying flexible methods so that all students can understand the material well. Visual learning styles tend to be related to the ability to process information through visual media such as pictures or diagrams, while auditory styles rely more on verbal communication. Meanwhile, students with a kinesthetic style use physical movements and activities as a means of understanding information. Teachers are required to understand these differences and choose the right strategies to accommodate these variations. This research is in line with the VARK (Visual, Auditory, Reading, Kinesthetic) theory which states that every individual has a preference in processing information, which needs to be captured through diverse and flexible methods (Utami, 2016). Multisensory learning methods have emerged as one of the effective solutions to address this diversity.

In practice, students with visual learning styles benefit from materials that are based on images, diagrams, and visual presentations. Visualization helps them associate information with visual representations to facilitate understanding (Meilina et.al., 2024). Meanwhile, auditory students benefit from verbal explanations, group discussions, and audio media because the information they absorb through voice is easier to understand. Kinesthetics rely on hands-on activities such as practice, experimentation, or manipulation of props to understand concepts in a more active and applicable way. This shows that the application of multisensory methods can strengthen understanding by meeting various individual needs in learning. This study proves that choosing the right method based on learning style can affect students' understanding and their engagement in the classroom. For example, auditory students often help their peers with visual styles to understand the material through verbal explanations, demonstrating the importance of cooperation and mutual support in an inclusive learning process.

Data from interviews with students show consistent findings regarding this diversity of learning styles. Students with visual style report easier to understand concepts through diagrams and images displayed by the teacher. As the AR student said,

> *"I understand the material faster when the teacher explains with pictures and diagrams on the board."*

Students with an auditory style also revealed that the verbal method helps them understand the material through direct communication and active discussion. RZ student stated

> *"I prefer to listen to the teacher's explanations and discuss with friends because it helps me understand the concepts better."*

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The students with the kinesthetic style admitted that practice-based activities helped their understanding of the material. IJ students said,

> *"I feel like I understand the material better when I can practice directly or model what the teacher is teaching."*

This research supports the perspective that multisensory methods help create a different learning experience for each student, strengthen their understanding, and reduce barriers to understanding complex concepts. The selection of this method is in line with a constructivist approach that emphasizes the importance of hands-on experience in building students' understanding.

Through the analysis of documents such as lesson plans and teaching materials, it can be seen that teachers are trying to integrate multisensory methods in each learning session. For example, when discussing mathematics material, teachers use diagrams (visual), oral explanations (auditory), and hands-on practical activities with models (kinesthetic). This approach aims to ensure that all student learning styles get attention and access to understand the material optimally. Teachers who combine these methods create learning experiences that are varied, active, and relevant to the needs of each student. According to education experts, the application of this method not only helps students' understanding but also builds an inclusive learning environment. Based on an interview with one of the education experts, they stated,

> *"A multisensory approach is not only relevant to improve students' understanding, but it also helps foster interest in learning and create a positive learning environment."*

With the right approach, students' interest in learning will also increase. This multisensory strategy can be used as a foundation in learning that focuses on meeting various student needs. This also emphasizes Howard Gardner's theory of multiple intelligences, which emphasizes the importance of understanding the uniqueness of each student in the learning approach (Hasanah, 2018).

Based on the results of this study, it can be concluded that the multisensory strategy is an effective solution to overcome the diversity of students' learning styles. By combining visual, auditory, and kinesthetic approaches, teachers can create an environment that supports student understanding and engagement. The implication of this study is the importance of training for teachers to understand the application of multisensory methods and adaptive learning strategies. Furthermore, this approach focuses not only on understanding concepts but also on improving students' cooperation, communication, and enthusiasm for learning. This approach can be a bridge to build a learning atmosphere that is active, inclusive, and in accordance with the needs of students in a variety of different learning styles.

2. Effectiveness in Improving Concept Understanding

The results of the study revealed that the multisensory approach has a significant influence on improving students' understanding of abstract concepts that are often difficult to understand with conventional methods. Based on the observation results, students who previously had difficulty understanding abstract materials such as geometric concepts and the solar system showed increased understanding when multisensory methods were applied in learning. For example, students with visual learning styles are helped by the use of three-dimensional (3D) diagrams, auditory students feel clearer through verbal explanations combined with sound or illustrations, while kinesthetic students show better understanding through the manipulation of props such as physical models of planets and geometric shapes (Sirait et.al., 2022). This approach utilizes a combination of sensory channels to help students understand the material more comprehensively and more easily through the various sensory experiences provided.

Interviews with students supported the results of such observations, in which students stated that the multisensory approach helped them relate abstract concepts to their real experiences. A student, Fatima (15 years old), revealed that the experience of understanding the concept of building volume of space using physical models makes the abstract concept easier to understand than just through numbers and formulas in books.

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"By playing directly with the model, I can see and feel the shape, not just imagining the numbers in the book," said Fatima.

The interviewed teachers also emphasized that this method creates a more concrete learning experience, making it easier for students to understand material that was previously abstract and complex. The teacher, Mr. Aryanto, stated,

"The combination of different modalities such as images, sounds, and physical activity gives students a hands-on experience and makes it easier for them to understand complex concepts."

Data from the analysis of the document also showed that teaching materials designed with multisensory methods were proven to be effective in improving student understanding. The guidebook is equipped with visual elements such as colorful diagrams, audio guides, as well as practical experimental steps helping students to understand the material in a diverse and flexible way. Teachers report that with this approach, students tend to be more focused and active during learning sessions compared to traditional learning methods. The results of the evaluation showed that the students' comprehension scores increased by up to 25% compared to methods that did not use a multisensory approach. As explained by one of the JH teachers,

"We incorporated these various elements in learning, and I saw students start to actively ask questions and try to participate. It really helps them understand the material more deeply."

In addition to improving understanding, this approach also has a positive influence on information retention in the long term. Based on the results of the retest conducted one month after the learning session, students who experienced a multisensory approach were able to remember and apply the material better than students with traditional methods. Students reported that they were able to relate the material to visual visualizations, sounds associated with the material, and hands-on experience with the props they used during the learning process. A student, Dimas (16 years old), revealed,

"I can still remember the explanations with the diagrams and voices that the teacher used even though a month has passed."

In line with (Kadi, 2023) mentioning that this high ethane is related to the involvement of multisensory that stimulates various memory pathways in the brain simultaneously, which makes information more integrated and durable. In other words, a multisensory approach helps build active learning habits and encourages students to understand and remember concepts in a deeper context.

Additional observations show that this approach also has a positive impact on students' motivation and builds their confidence in dealing with material that is considered difficult. Students who were previously passive and tend to avoid difficult material begin to show courage to ask questions and have active discussions during learning sessions. Teachers reported that the classroom atmosphere became more dynamic and students were more actively involved in the teaching and learning process, which proved that the multisensory approach increased student motivation and engagement in the learning process. As one of the teachers expressed,

"With this method, students are more enthusiastic and actively ask questions. The classroom atmosphere is also more lively, and they show courage to try to understand difficult material without fear."

These findings show that this approach not only aids in concept understanding but also builds a positive, inclusive learning environment and encourages students to interact actively. Overall, the multisensory approach has proven to be effective in overcoming the challenges of learning abstract concepts, increasing long-term retention, and building higher student learning motivation.

3. Inclusive Learning

The results of the study show that the application of a multisensory approach has an important role in helping students with special needs, such as dyslexia and sensory processing disorders, in

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understanding learning materials. Based on interviews with teachers and the results of direct observations in the field, students with sensory processing disorders and dyslexia showed ease in understanding material through this method compared to conventional methods that only rely on one sensory channel. For example, one of the teachers interviewed revealed that

> *"The multisensory method provides flexibility in learning. By combining a variety of media such as visual, audio, and kinesthetic, students with special needs can understand concepts in a way that is most effective for them."*

The multisensory method provides a variety of flexible communication channels, allowing students to access information according to the needs and uniqueness of each individual (Abusaada, 2020). By combining various sensory modalities, such as audio, visual, and kinesthetic, these methods make it easier for them to understand concepts that were previously difficult or confusing.

Direct observation showed that students with dyslexia responded positively to the application of multisensory methods involving various media such as images, sounds, and manipulative activities. For example, when teachers combine verbal explanations with the support of pictures and illustrations, students with dyslexia can understand material that was previously confusing if only presented in text. One student with dyslexia revealed that listening to explanations while looking at pictures helps them understand information more easily. In the interview, the student stated,

> *"Images and voice explanations help me understand things that are often confusing when just reading text. It feels easier when I can see and hear at the same time."*

This shows that multisensory experiences create a learning environment that is more flexible and adaptable to individual needs. With this approach, students feel more helped and have the opportunity to understand the material in the most effective way for them.

Students with sensory processing disorders also show significant progress in engagement and understanding through the application of multisensory methods designed with their individual needs intact. Activities such as prop manipulation and kinesthetic activities have been proven to help them understand concepts without experiencing excess sensory stimulation that can confuse them (Ma'usarah, 2020). The teacher reported in the interview that

> *"Kinesthetic activities such as the manipulation of props help students with sensory impairments to understand the material without feeling confused due to overstimulation. It helps them to focus and stay active."*

With this approach, teachers have succeeded in building a safer, more comfortable, and supportive learning environment for students with this disorder. Teachers also reported that the classroom atmosphere became more positive and inclusive, as all students were given the opportunity to learn through a variety of methods that supported them.

In addition to helping understanding, the application of multisensory methods also plays a role in building a more positive and inclusive learning environment (Fitriana et.al., 2024). The interviewed teachers stated that the classroom atmosphere becomes more harmonious when all students are given the opportunity to learn through a variety of flexible sensory methods. In the interview, the NH teacher said,

> *"We see a more positive classroom atmosphere because all students can interact and understand each other without differentiating their needs. Students with sensory processing disorders feel more welcome and their enthusiasm for learning increases."*

This inclusive learning environment not only impacts students with special needs but also creates positive communication between other students (Budianto, 2023). This helps build mutual understanding and empathy between them. Based on the results of the students' evaluation, they showed an increase in comprehension and skill scores after participating in multisensory activities. In other words, this approach has proven to be effective in supporting students with dyslexia and sensory processing disorders to overcome their barriers to understanding learning material.

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Overall, the results of this study confirm that a multisensory approach has a crucial role in supporting students with special needs and creating an inclusive learning environment. With this method, students with dyslexic disorders and sensory processing disorders get equal access to effective and meaningful learning materials. Therefore, the application of a flexible and inclusive multisensory approach needs to be encouraged in the education system to support the diverse needs and learning experiences of all students. Teachers and students interviewed also agreed that this method has the potential to build a supportive and non-discriminatory learning environment.

4. Innovation in Teaching

The results of the study show that the development of multisensory-based learning media has an important role in increasing teaching effectiveness and student engagement. Based on the results of observations and interviews with teachers, they are actively developing various types of multisensory media that combine physical teaching aids and innovative educational technologies such as Virtual Reality (VR) and Augmented Reality (AR). This media is designed to meet the needs of different learning styles of students, create an engaging learning experience, and help students understand the material in a more active and interactive way. One of the teachers from SMP Negeri 2 Jakarta explained that

> "We use a variety of tools such as physical models and technologies such as VR to create a more immersive learning experience for students."

These innovations aim to increase student engagement in the learning process and help them understand difficult material in a more practical and fun way.

In practice, teachers utilize different types of physical props to support multisensory methods, such as 3D space building models, magnetic boards, and other practical manipulation tools. These props allow students to interact directly with the material and visualize abstract concepts through hands-on experience. For example, by utilizing 3D space building models, students can understand the concept of geometry more easily. One of the teachers with the initials KL revealed in an interview that

> *"Teaching aids such as space building models and manipulation of these tools are very helpful for students to understand material that was previously difficult to understand with conventional methods."*

This activity has proven to be effective in helping students who have difficulty understanding the material through a traditional approach that only relies on verbal or textual explanations.

In addition to physical teaching aids, modern technologies such as VR and AR also play a significant role in supporting innovation in multisensory learning (Siregar et.al., 2024). The results of interviews with teachers show that this technology provides an immersive and interactive learning experience for students. With VR technology, students can explore simulated environments such as ecosystems, cell structures, and journeys in the solar system in real life. One of the teachers from the Integrated Islamic Junior High School revealed that

> *"With VR, students can explore simulated environments without having to leave the classroom. It helps them understand concepts more deeply and contextually."*

Meanwhile, AR allows students to see abstract objects in an easy-to-understand visual form through their digital devices. Teachers also report that

> *"With this technology, students are more active and excited because they can see and feel hands-on experiences related to the subject matter."*

The evaluation of learning outcomes showed the positive impact of the application of multisensory media based on technological innovations such as VR and AR on student understanding. Students who learn through this method have a deeper understanding compared to traditional teaching methods. Their involvement in these activities also showed that they were able to remember information

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better and were able to relate concepts to their first-hand experiences. One of the teachers with the initials FA said that

> *"Students who use these technology-based media show a deeper understanding and more actively participate in the classroom compared to conventional teaching methods."*

This positive impact confirms that innovation through multisensory media can improve the quality of students' learning experience and help them develop critical thinking and exploration skills through engaging and interactive simulation activities (Ali et.al., 2024). This encourages teachers to continue to innovate in developing creative and inclusive teaching methods

Conclusion

The multisensory approach has proven to be effective in addressing the diversity of students' learning styles, improving understanding of concepts, and building an inclusive learning environment. This strategy combines visual, auditory, and kinesthetic methods, which help students understand the material through hands-on experience and flexible methods. In addition to improving understanding of abstract concepts such as geometry and the solar system, the multisensory approach also improves students' information retention in the long run. This method has also been shown to support students with special needs, such as dyslexia and sensory processing disorders, in comprehending material more easily and effectively. This approach creates a positive, inclusive, and harmonious learning environment, as well as builds an active student learning spirit. Teachers play an important role in implementing this method through the integration of multisensory strategies in daily activities in the classroom. In other words, the application of this approach not only helps understanding but also builds positive communication between students. This success demonstrates the importance of teacher training to implement this flexible and innovative method.

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