



# A qualitative study on the impact of local wisdom-based discovery learning in teaching concept geometry

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## Article Information

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Discovery learning; Geometry concept; Local wisdom; Qualitative analysis.

## Abstract

**Background:** Teaching geometric concepts in elementary schools often faces challenges because traditional methods do not actively engage students and fail to utilize local wisdom.

**Aim:** This study aims to assess the impact of applying a local wisdom-based discovery learning model on the understanding of geometric shapes among fifth-grade students.

**Method:** This research employs a descriptive analysis method with a qualitative approach. Data collection was conducted through various means, including observation, interviews, and document analysis. The informants consisted of the school principal, vice principal, teachers, parents, and retired school principals. Data analysis was carried out in a cyclical and interactive manner, involving data collection, data presentation, data reduction, and drawing verification conclusions.

**Results:** The findings indicate that the Discovery Learning model, using local media, successfully stimulates student engagement and creativity, particularly in geometry learning.

**Conclusion:** The use of an appropriate learning model accompanied by local media can be an effective choice in enhancing student involvement and active participation in the learning process. Integrating local wisdom into learning models can be an effective strategy for enhancing the quality of mathematics education in elementary schools. For future research, it is recommended that this study be expanded to include other schools with diverse demographic variations and to compare the impact of this model with other teaching methods.

## INTRODUCTION

Mathematics has become an indispensable field of knowledge in the 21st century. One of the critical areas in mathematics that students need to master is the concept of geometry. Geometry helps students develop essential spatial and visualization skills needed to understand the physical world (Helsa, 2024; Ismail & Sulfiyah, 2020). It also trains students in critical thinking and problem-solving (Hidayat & Rosnawati, 2020; Syafari, 2020; Syam et al., 2020; Türkoğlu & Yalçınalp, 2024; Wicaksono et al., 2022). Through geometry, students learn to analyze shapes, make conjectures, and find solutions. Additionally, geometry can stimulate student creativity through activities such as drawing shapes, manipulating objects, and imagining spatial transformations (Nurudin et al., 2019; Schoevers et al., 2022; Waluya et al., 2019). By reinforcing fundamental mathematical skills like measurement, calculation, and the use of formulas, geometry provides a solid foundation for a comprehensive understanding of mathematics. However, students often face difficulties in grasping geometric concepts.

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Geometric concepts are often abstract and require strong visualization skills (Liu et al., 2022; Nadzeri et al., 2023; Pujiastuti et al., 2024). Traditional teaching methods frequently do not actively engage students, resulting in insufficient involvement in the learning process necessary for a deeper understanding of these concepts (Yulianti et al., 2024). Additionally, the use of teaching aids or visual media that could help students visualize geometric concepts is often suboptimal (Sumarwati et al., 2020). Another challenge is that students may not see the relevance of geometry to their daily lives, making the subject feel less interesting or important. Furthermore, geometry lessons are often not connected to local contexts or local wisdom, despite the fact that such approaches can make learning more meaningful and engaging for students.

In the context of geometry learning in Riung Barat District, Ngada Regency, it was factually found that teachers are still implementing a teacher-centered learning model. Educators have not yet utilized current learning strategies. They are also not proficient in using and applying various teaching media appropriately. In other words, teachers continue to explain learning material using conventional approaches (Sinta et al., 2022).

Given these issues, innovation in classroom learning is essential. Utilizing appropriate learning models and media can be an effective solution. Several learning models are commonly used, especially in teaching geometry, such as the Van Hiele model (Naufal et al., 2021), the technology acceptance model (Pittalis, 2021), project-based learning (Kholid et al., 2022), and the discovery learning model (Putri et al., 2020). The discovery learning model is particularly suitable. This model has proven to be highly successful in enhancing students' understanding by providing deep learning experiences that enable them to retain information effectively. discovery learning encourages students to independently discover concepts and principles through their own thought processes. It creates an active learning environment where the teacher does not directly present material at the beginning of the lesson. During the learning process, students are guided to find their own ways to solve problems and gain conceptual understanding (Akihary et al., 2023; Hariyanto et al., 2023; Tampubolon, 2017).

The discovery learning model can be integrated with local wisdom-based education. Understanding the various potentials within the surrounding environment is considered highly significant, as it can identify various aspects that develop in the region. This potential can later become an integral part of the teaching material. Local wisdom can be viewed from various aspects, including natural resources, traditional beliefs, cultural heritage, and historical context (Parmadi et al., 2022). Integrating local wisdom into the curriculum makes learning more relevant and meaningful for students (Handayani et al., 2018; Sari et al., 2023).

Previous research on effective teaching methods for geometry has been extensive. Studies include ethnomathematics of Borobudur Temple to understand students' geometry literacy (Muhammad & Marsigit, 2019), the cooperative learning technique Team-Assisted Individualization for geometry (Erkoç & Dinç Artut, 2016), problem-based learning (Zusti Jamaan et al., 2019), the Two Stay Two Stray (TSTS) learning model (Respati & Qohar, 2021), and the STAD cooperative model assisted by GeoGebra (Rahmat et al., 2019). These studies predominantly focus on the implementation of various models in geometry teaching. However, there is a gap in research analyzing the effectiveness of the discovery learning model integrated with local wisdom. Therefore, the aim of this study is to analyze the effectiveness of the local wisdom-based discovery learning model in teaching geometric concepts.

## METHODS

### *Design*

This study employs a qualitative approach using descriptive analysis methods (Creswell, 2014). A qualitative approach was chosen to understand the processes and uncover the meanings behind the effectiveness of the discovery learning model and the application of learning by doing, related to local wisdom for fifth-grade students in understanding geometric concepts in mathematics learning.

### *Participants*

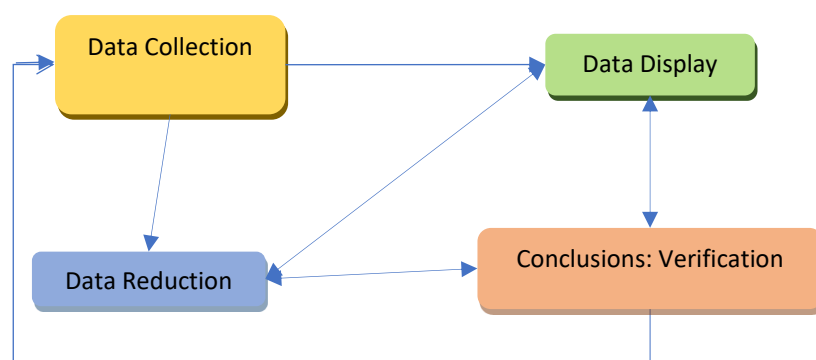
The focus of data collection is on fifth-grade students. The research subjects consist of fifth-grade students and informants drawn from the school community, students' parents, and a retired principal. The total number of informants is seven, including the Principal (P1), Curriculum Coordinator (P2), First Grade Homeroom Teacher (P3), Second Grade Homeroom Teacher (P4), two Parents (K1 and K2), and one Retired Teacher (S1).

### *Instruments*

Data collection was conducted by the researcher using various techniques, including observation, interviews, and document analysis. Each informant was given a code to maintain research ethics.

### *Data Analysis*

Data analysis was conducted simultaneously with the data collection process, following a cyclical and interactive approach. The analysis process encompasses three main stages: data reduction, data display, and conclusion drawing/verification. The data reduction stage involves selecting important data through triangulation for further analysis, concluding with drawing conclusions as the crystallization and verification of the research data. The data processing is cyclical and interactive rather than linear. Miles and Huberman (1992) describe the qualitative research data analysis process as presented in Figure 1.



**Figure 1.** Qualitative Data Analysis Process

The issues concerning the abilities of early grade students and the efforts to address them were comprehensively presented during the data collection process. In the next stage, data reduction was performed, which involved selecting important data through data triangulation for further analysis. Following this, final conclusions were drawn as the crystallization and verification of the research findings.

## RESULTS AND DISCUSSION

In-depth interviews and observations revealed that, in addition to the low abilities of the students, other issues included the inadequate readiness of educators, and the improper application of teaching models, methods, and media. The implementation of the Discovery Learning model using local media represents an innovation in teaching that can be developed by teachers to facilitate learning, capture students' attention, and expedite the understanding of mathematical concepts for fifth-grade students.

Below are detailed findings from the interviews and field observations that uncover the fundamental issues related to the students' inability to improve early grade literacy skills.

### *Why hasn't the learning process in elementary schools utilized contextual models, methods, strategies, and media for elementary students?*

The application of learning models, teaching strategies, and the use of media and technology in elementary schools, especially for lower grade students, is crucial. Proper implementation can stimulate students' interest and curiosity, making the learning process engaging and easier to understand. Below is an interview excerpt with one of the informants.

*“Ideally, the application of learning strategies, models, and the appropriate selection of learning media for lower grade students will make learning enjoyable. Students will be impressed and interested in learning to read, for instance” (P1).*

However, in the context of applying learning models, methods, strategies, and media in the learning process for fifth-grade students at Riung Barat, the implementation has not been fully effective. One significant issue is the lack of human resources. The educators at Riung Barat, are predominantly inexperienced and many are still on temporary contracts. It was reported that:

*“Educators in schools are very young. Most of them are temporary staff with limited experience in the education field. They lack experience in implementing various learning models and using contextual learning media for lower grade students.” (P2)*

To address the fundamental issues related to the availability of competent human resources, it is essential to improve both the quality and quantity of human resources. Based on this understanding, the term "human resources" refers to individuals who possess potential and energy, and who constitute a significant strength. This perspective is relevant in the context of the notion that to become a significant force, the quality and competence of human resources must be enhanced. Currently, schools require professional, skilled educators who can understand students' needs in line with the evolving context of science and technology. This necessity underscores the importance of continuous professional development for educators to ensure they are well-equipped to meet the demands of modern education and can effectively utilize contemporary teaching strategies and media.

*“One of the key aspects that need attention to ensure the quality of educators is the ability to develop teaching skills. This makes the learning process engaging and can foster children's interest in understanding lessons in early grades. Activities such as training, utilizing infrastructure, and motivating educators to continuously create, innovate, and seek*

*breakthroughs are crucial. This encourages educators' curiosity to discover relevant teaching models and modify contextual teaching media for classroom use.” (P3)*

From interviews with key informants and observations, it was found that fifth-grade students have not been able to improve their numeracy literacy skills due to the educators' inability to effectively apply innovative teaching models. Teachers also struggle to use teaching media appropriately to create student interest. The teaching strategy often places the teacher as the dominant figure in the learning process. In the context of learning geometric concepts for fifth-grade students, the curriculum coordinator stated:

*“The essence of the learning by doing method is that students learn directly and experience hands-on practice in the classroom. Students learn numbers through direct practice. They do not just recite numbers; they write and say the numbers along with their peers under the teacher's guidance. Therefore, students learn concretely until they can write, recognize, and pronounce numbers directly.” (P4)*

The learning by doing method emphasizes the active role of students, allowing them to directly experience and practice numeracy during the learning process. For example, when students learn about numbers, the teacher shows number shapes through picture cards. Students then practice writing and saying the numbers, experiencing the learning process directly in class. The importance of the learning by doing method is also highlighted by a former teacher and principal.

*“Through the learning by doing model, students learn from the realities of their environment and surrounding natural resources. Students bring the real world into the classroom. For instance, when learning geometry, teachers and students can use familiar objects. Students might be asked to bring leaves and create triangles or squares as part of their learning. The real world becomes a model for learning. This is why the learning by doing method is essential for students.” (S1)*

This aligns with the concept of "learning by doing" as defined by Bruce & Bloch (2012): "Learning by doing is the process whereby people make sense of their experiences, especially those experiences in which they actively engage in making things and exploring the world." According to this definition, learning by doing refers to the process where individuals gain understanding through experiences that actively involve them in making things and exploring the world. Active student involvement in learning activities provides significant and profound experiences. In the learning by doing approach, mistakes made by students are considered part of the learning process, aligning with the trial-and-error principle, which involves cycles of trying, making mistakes, reflecting, and improving.

### ***The Use of Discovery Learning Models in Mathematics Education with a Focus on Local Wisdom***

To broaden students' abilities, teachers need high levels of skill and creativity in organizing lessons using innovative and diverse methods. This is crucial because there often exists a gap between desired outcomes and the reality of classroom learning, or there are challenges in implementing the learning process. For instance, to explain the concept of geometric shapes, a teacher cannot solely rely on direct instruction. Teachers must be creative in applying

appropriate learning models. One such model is discovery learning. The Vice Principal for Curriculum highlighted its relevance:

*“Discovery Learning is among the recommended models in the 2013 Curriculum, as per Permendikbud No. 103 of 2014. This recommendation is based on the method's ability to support teaching and learning activities where students can develop superior knowledge, curiosity, social behavior, and independence. In the context of geometric shapes, students will explore and discover concepts independently. This is especially effective when using local media or resources derived from local wisdom, such as using sticks or seeds to construct shapes.” (P2)*

The discovery learning model can encourage elementary students to develop their academic potential across various subjects. Previous research supports that discovery learning enhances students' conceptual understanding in mathematics (Ana, 2018; Humairah et al., 2019). Moreover, students exhibit higher curiosity during the learning process when using the discovery learning model (Zahara et al., 2020). Thus, in mathematics education, the teacher's role shifts from being dominant to acting as a facilitator. As one teacher expressed:

*“It is crucial for teachers to understand that when using the discovery learning model, they act as guides, providing opportunities for students to learn actively and directing their learning activities towards the goal of understanding geometric concepts. Students will be able to design and create geometric models using local materials from their environment”. (P1)*

In line with previous studies, the discovery learning model positions the teacher as a facilitator, where students discover knowledge they do not yet know, guided by the teacher's questions, worksheets, or student activity sheets (Nur Sya'adah & Samsudin, 2022). The most important aspect of mathematics learning is for students to understand geometric concepts through self-discovery processes and stages within the discovery learning model. A classroom teacher elaborated.

*“This learning model helps students understand the concepts, meanings, and structures of geometric shapes to ultimately reach a conclusion. Discovery occurs when students are actively involved in the process, finding geometric concepts and principles independently through activities like observation, classification, measurement, prediction, determination, and constructing geometric shapes.” (K1)*

Discovery learning encourages students to be active in the learning process by discovering and investigating concepts themselves, leading to longer retention of the learned material. This finding aligns with Trianingsih et al. (2019), who found that the discovery learning model significantly improves students' mathematical abilities by encouraging them to find and explore knowledge independently.

Thus, research and data analysis indicate that the use of the discovery learning model enables fifth-grade students to develop active learning habits by discovering and investigating on their own. Consequently, the knowledge gained is retained longer, especially regarding geometric concepts in mathematics. The positive impact of the discovery learning model not only helps students independently understand geometric concepts but also fosters creativity and innovation in creating geometric shapes using materials sourced from their environment, reflecting local wisdom.



The importance of utilizing media based on local wisdom aligns with Faela's (2018) study, which states that local wisdom can enhance students' knowledge of local culture through interactive learning media. This approach is more enjoyable compared to traditional manual learning (Shufa, 2018). The crucial aspect of incorporating local wisdom into the learning process lies in creating learning experiences that enrich students' knowledge while fostering awareness and appreciation of the cultural diversity around them. Implementing learning rooted in local wisdom significantly impacts by not only enriching the learning experience but also strengthening students' connections to their environment and culture.

### ***Context of Geometry Concept Learning Based on Local Wisdom***

Education at the elementary level is expected to adopt local wisdom as the foundation for learning. In elementary education, a thematic approach is used to integrate various subjects, enhancing students' attitudes, skills, and knowledge while enriching their understanding of local cultural diversity (Shufa, 2018). One recommended strategy is to incorporate aspects of local wisdom into the learning process, aiming to enrich students' experiences with local values and to help preserve local wisdom in an era of rapid globalization.

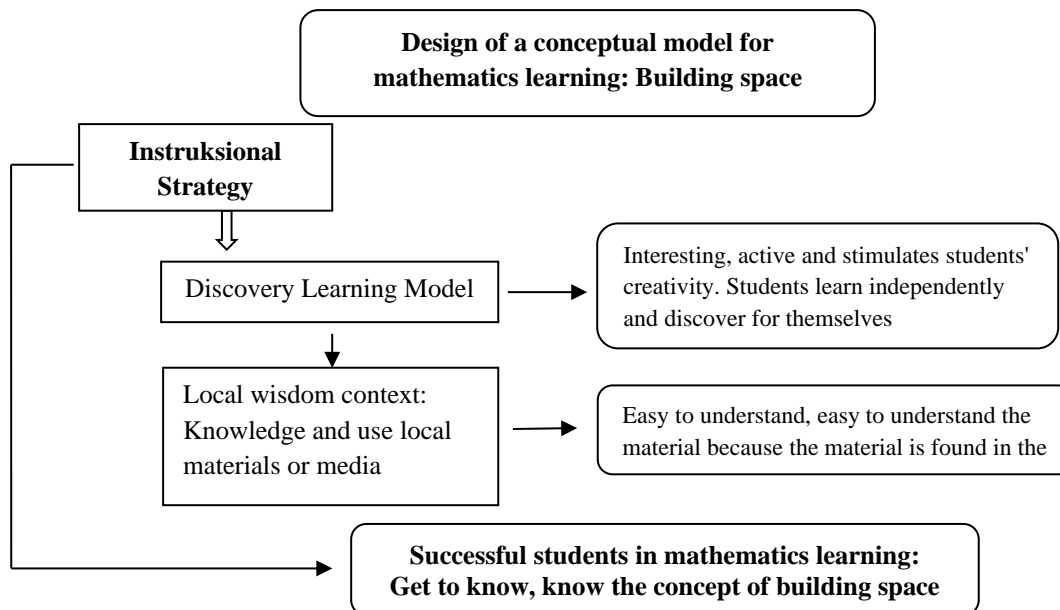
Local wisdom in practice and implementation is not limited to value elements alone. It also involves the ways and activities through which local communities utilize and manage their natural environment. The skills of local communities can become knowledge because they have been practiced over time. For example, the way houses are built or how specific building models are created. Local wisdom reflects the values and local knowledge manifested in local behavior, ingenuity, and skills.

Based on the concept of local wisdom, it can be concluded that local wisdom encompasses all the intellectual heritage and potential of humans, bearing wise, inherited values that define a region's unique identity. Integrating local wisdom into the learning process aims to foster a love for local culture and efforts to maintain its existence amidst the powerful challenges of globalization.

Previous studies have extensively explored local wisdom. For instance, research by Mulbasari et al. (2024) examined local wisdom in the geometric concepts found in traditional South Sumatra snacks. Another study by Yustinaningrum et al. (2018) focused on the local wisdom of the Gayo tribe in mathematics education, highlighting geometric concepts found in kerawang fabric motifs such as matanelo, pucuk rebung, puter tali, emun berkune, peger, emun berangkat, rante, emun beriring, and cucuk pengong. Sugianto et al. (2019) explored mathematical calculation patterns in the construction of Ponorogo community houses. These studies make mathematics learning more meaningful by incorporating local wisdom familiar to everyday life.

### *Conceptual Model Design for Mathematics Learning for Fifth-Grade Students*

The visualization of the conceptual model for geometry learning developed is presented in Figure 2.



**Figure 2.** Conceptual Model Design for Geometry Learning

The conceptual model for geometry learning employs the discovery learning model with a basis in local wisdom. The discovery learning model engages students in learning geometry by using materials or media derived from local wisdom. However, this study has several limitations that need to be addressed. First, this study was only applied to fifth-grade students in one elementary school, so the results may not be generalizable to a broader context. Second, this study has not compared the effectiveness of the local wisdom-based discovery learning model with other teaching methods, so it is unclear whether this model is more effective than others in various situations. Additionally, the evaluation tools used may not fully measure all aspects of student learning outcomes comprehensively, particularly regarding creativity and student engagement.

## **CONCLUSIONS**

The results of this study indicate that the discovery learning model can enhance students' understanding, strengthen their engagement in learning, and foster creativity using local materials. Despite challenges related to the readiness and experience of educators, the benefits of implementing this model are significant. Integrating local wisdom into the learning process makes students more connected to the material, increasing their motivation and participation. Therefore, it is crucial to improve teacher quality through continuous training and adequate institutional support to maximize the potential of this learning model.

Integrating local wisdom into learning models can be an effective strategy for improving the quality of mathematics education in elementary schools. School authorities and education policymakers need to consider the development and implementation of more intensive training for teachers to master the local wisdom-based discovery learning model. For future research, it



is recommended to extend this study to other schools with diverse demographic variations and to compare the impact of this model with other teaching methods. Further research should also explore the long-term effects of this model's implementation on students' academic achievement and critical thinking skills.

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