Jurnal Penalaran dan Riset Matematika
Vol. 5, No. 2, 2026, pp: 53-58
p-ISSN 2961-8134, e-ISSN 2962-4150

STUDENTS' LEARNING STYLES AND THEIR IMPLICATIONS FOR MATHEMATICS LEARNING

Afika Monika Mone[1], Kamelia Boleng[2*], Karmeliana Celivia Mbu[3], Anjani Amir[4], Ludgardis Ja Djawa[5], Agustinus Gilang Surya Dala Wara[6], Yohanes Embu Sare[7], Hilaria Melania Mbagho[8]
[1-8]Universitas Flores, Ende, Indonesia
** Korespondensi Penulis. E-mail:* kameliaboleng6@gmail.com

ARTICLE HISTORY:
Received: Sept 17, 2026
Revised: Sept 25, 2026
Accepted: Oct 10, 2026
Published: Oct 15, 2026

KEYWORDS:
Learning Styles; VAK Model; Mathematics; Fractions; Differentiated Instruction.

ABSTRACT
This study aimed to describe the learning style tendencies of Grade IV students at SDK Ursula Ende and analyze their implications for mathematics learning. Each individual has unique preferences for receiving and processing information, known as learning styles. Understanding students' learning styles provides an important basis for designing effective mathematics learning strategies. This study used a qualitative descriptive approach involving direct observation, a learning-style questionnaire based on the VAK (Visual, Auditory, Kinesthetic) model, and structured interviews. The participants were 30 Grade IV students studying fractions, the least common multiple (LCM), and the greatest common divisor (GCD) in mathematics class taught by Ms. Maria Erlina. The results showed that 46.4% of students had a visual learning style, 32.1% a kinesthetic style, and 21.4% an auditory style. The observation findings revealed that some students had difficulty finding common denominators for fractions and distinguishing between the LCM and GCD, which was closely associated with the predominance of a visual learning style that had not been fully accommodated. The study indicates that teachers need to implement differentiated learning strategies by integrating visual media, concrete teaching aids, and verbal discussion. Aligning teaching methods with students' learning styles was found to increase active engagement and optimize understanding of mathematical concepts.

Introduction

Mathematics is a fundamental subject in the education system and plays an important role in developing logical, analytical, systematic, and critical thinking. However, classroom realities show that many students still struggle with mathematics and regard it as a difficult subject. This is closely associated with a mismatch between teachers' instructional approaches and students' learning styles (DePorter & Hearnacki, 2020).

Each individual has a distinctive way of receiving, organizing, and processing information from the learning environment, known as a learning style. Dunn and Dunn (2021) define learning styles as the conditions individuals select to concentrate, process, internalize, and remember academically challenging new information. A thorough understanding of students' learning styles is essential for teachers when designing meaningful and effective mathematics learning experiences.

An observation conducted on Tuesday, 26 May 2026, in the Grade IV classroom at SDK Ursula Ende during a mathematics lesson taught by Ms. Maria Erlina, S.Pd., revealed several noteworthy features. The teacher began the lesson with a prompt, which one student answered. She also invited students to solve problems on the board and acknowledged their contributions.

The teacher encouraged students not to fear making mistakes and applauded those who answered correctly. She guided students through questions they could not solve, while several

students participated actively. To support understanding, she introduced mathematical concepts and explained them using concrete examples. Rather than immediately reprimanding students, she used simple language to indicate when an answer was incorrect. Some students were less focused, so she guided them step by step with concrete examples until they began to understand the concepts. In addition to teaching mathematics, she modeled good manners and cooperation; one student was particularly prominent. Midway through the lesson, the teacher included a relaxation break intended to help students retain the material they had learned. Afterward, she asked review questions, provided explanations to make the material easier to understand, and assigned exercises to assess students' understanding and reinforce recall.

Among the 30 students present, overall engagement and participation in discussions were good. However, some students still had difficulty finding common denominators for fractions, distinguishing between the least common multiple (LCM) and greatest common divisor (GCD), and comparing fractions of different magnitudes. This gap indicates that the teaching strategies in use did not fully accommodate the diversity of students' learning styles.

Previous studies have shown that alignment between teaching approaches and learning styles is positively associated with students' mathematics achievement, motivation, and self-confidence (Pashler et al., 2021; Widoddo et al., 2022). Therefore, examining students' learning styles and their implications for mathematics instruction in elementary schools is highly relevant.

Based on the background described above, this study addressed the following research questions: (1) What learning styles were most prevalent among Grade IV students at SDK Ursula Ende in mathematics learning? (2) How does the diversity of students' learning styles affect mathematics teaching strategies? (3) Which teaching strategies are most effective for accommodating diverse learning styles in mathematics instruction?

The objectives of this study were to (1) describe the learning style tendencies of Grade IV students at SDK Ursula Ende in mathematics learning, (2) analyze the implications of diverse learning styles for mathematics teaching strategy design, and (3) formulate recommendations for effective mathematics teaching strategies based on students' learning profiles.

Concept and Classification of Learning Styles

Learning style is generally defined as an individual's consistent way of perceiving stimuli or information, remembering, thinking, and solving problems (Nasution, 2020). Fleming and Mills (1992) developed the VARK model (Visual, Aural, Read/Write, Kinesthetic), one of the most widely used frameworks for classifying learning styles in education. By contrast, DePorter and Hearnacki (2020), in the Quantum Learning approach, popularized the VAK model, which classifies learning styles into three primary modalities: visual, auditory, and kinesthetic.

Students with a visual learning style tend to learn most effectively through sight. They understand information more easily when it is presented through learning materials, concept maps, color, and images. Students with an auditory learning style learn best through listening, such as in lectures, discussions, and oral explanations. Students with a kinesthetic learning style, meanwhile, learn most effectively through direct experience, touch, and physical movement (DePorter & Hearnacki, 2020).

Learning Styles in Mathematics Education. Learning styles are particularly relevant to mathematics education. Alkhasawneh et al. (2022) found that students with a visual learning style performed better when mathematics content was presented through graphic representations, whereas students with a kinesthetic learning style performed better in hands-on activities using concrete manipulatives. Rahmawati (2023) specifically studied elementary school students and found that difficulty understanding LCM and GCD concepts is often associated with a mismatch between the mode of instruction and students' learning styles.

Mayer's (2021) Cognitive Theory of Multimedia Learning holds that learning is more effective when information is presented simultaneously through verbal and visual channels. This finding supports the importance of multimodal instruction in mathematics to accommodate students' varied learning preferences.

Relevant Psychological Theories. Several foundational psychological theories inform the study of learning styles in mathematics education. First, Atkinson and Shiffrin's Information Processing Theory explains that information enters through sensory systems (visual, auditory, and kinesthetic), is processed in working memory, and is ultimately stored in long-term memory. Learning styles influence which sensory channels are used most prominently; therefore, instructional strategies should be designed to optimize those channels (Santrock, 2021). Second, Howard Gardner's theory of multiple intelligences (Gardner, 2021) proposes that each individual has a unique intelligence profile encompassing linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic intelligences. These profiles are closely associated with learning modality preferences, suggesting that no single teaching method is suitable for every student.

Third, Vygotsky's constructivist theory emphasizes that individuals actively construct knowledge through interaction with their social environment within the Zone of Proximal Development. In the context of learning styles, this theory implies that teachers should provide scaffolding suited to each student's learning modality so that mathematical knowledge can be constructed effectively (Santrock, 2021).

Fourth, differentiated instruction theory (Tomlinson, 2022) integrates learning styles into pedagogical practice. Tomlinson argues that teachers who respond to student diversity should differentiate learning content, processes, and products according to students' readiness, interests, and learning profiles, including their learning styles.

Method

Research Design

This study used a qualitative descriptive approach, a research method that aims to describe phenomena systematically, factually, and accurately on the basis of field data without manipulating variables (Creswell & Creswell, 2022). This approach was selected to develop an in-depth understanding of students' learning styles in the natural context of classroom mathematics learning and to analyze their implications holistically.

Research Participants

The participants were all 30 Grade IV students at SDK Ursula Ende during the second semester of the 2026/2027 academic year. Grade IV was selected based on the theoretical consideration that students at this level are transitioning from concrete to abstract thought (Piaget), making the identification of learning styles at this stage particularly relevant. The classroom teacher, Ms. Maria Erlina, S.Pd., was also included as a key informant to provide richer pedagogical context.

Data Collection Techniques

Data were collected using three complementary techniques. First, structured participant observation was conducted on Tuesday, 26 May 2026, during one mathematics lesson covering fractions, multiples, common multiples, LCM, GCD, and word problems. The observer recorded students' learning behaviors, participation patterns, and responses to the various approaches used by the teacher, following a prepared observation guide. Second, a learning-style questionnaire adapted from the VARK Questionnaire (Fleming, 2020) was used. The instrument had been modified and validated for elementary school students. It consisted of 30 statements designed to identify the dominant visual, auditory, or kinesthetic learning style. Third, semi-structured interviews were conducted with the teacher and six selected students (two from each learning-style category) to gather in-depth information about their learning experiences and preferences.

Data Analysis

Data were analyzed using the interactive model (Miles et al., 2021), which comprises four stages: data collection, data condensation, data display, and conclusion drawing/verification. Data validity was ensured through source triangulation (students, teacher, and documents) and method triangulation (observation, questionnaire, and interviews).

Results and Discussion

Students' Learning Style Profiles

Analysis of the learning-style questionnaire completed by 30 Grade IV students at SDK Ursula Ende yielded the distribution presented in Table 1.

Table 1. Distribution of Learning Styles among Grade IV Students

Learning Style	Number of Students	Percentage	Category
Visual	15 students	46.4%	Predominant
Kinesthetic	9 students	32.1%	Moderate
Auditory	6 students	21.4%	Minority
Total	30 students	100%	

As shown in Table 1, the visual learning style was the most prevalent, accounting for 46.4% (15 students), followed by the kinesthetic style at 32.1% (9 students) and the auditory style at 21.4% (6 students). This finding is consistent with Utami and Surya (2023), who reported a predominance of visual learning styles among elementary school students. They explained that, at the concrete operational stage of cognitive development (Piaget), students still rely heavily on visual representations to develop an understanding of abstract concepts.

Classroom Observation Findings. The classroom observation conducted on 26 May 2026 yielded the data presented in Table 2.

Table 2. Observation of Grade IV Mathematics Learning

Observation Aspect	Result	Description
Student engagement	Good	Students were enthusiastic in participating in the lesson
Discussion participation	Good	Actively participated in group and individual discussions
Understanding of fraction concepts	Good	Most students understood the material
Ability to solve LCM and GCD problems	Fairly good	Still confused about the difference between the LCM and GCD
Word-problem solving	Good	Able to apply the concepts

The data in Table 2 indicate that the lesson generally proceeded well. Student engagement and discussion participation were rated as good, suggesting a conducive learning environment. Understanding of fraction concepts and the ability to solve word problems were also rated as good. However, students' ability to determine the LCM and GCD was rated only as fairly good. This finding warrants further analysis in relation to students' learning styles.

Relationship Between Learning Styles and Learning Outcomes

The difficulty students experienced in distinguishing between the LCM and GCD, as identified during the observation, can be interpreted from the perspective of learning styles. Given the predominance of the visual style (46.4%), students require clear visual representations that distinguish between the two concepts. When the LCM and GCD are explained only through verbal procedures, without adequate conceptual visualization (such as factor diagrams, color-coded factor trees, or comparison tables), students with a visual learning style may experience conceptual confusion.

This interpretation is supported by Rahmawati (2023), who found that appropriate visual representations, such as animated factor trees illustrating the difference between the LCM and GCD, significantly improved elementary students' conceptual understanding. Meanwhile,

some kinesthetic learners' difficulty finding common denominators for fractions may be addressed through concrete manipulatives, such as fraction puzzles or fraction strips.
Conversely, students' good performance on general fraction content and word problems suggests that more varied and contextual approaches can better address diverse learning styles. This is consistent with Tomlinson's (2022) view that differentiating the learning process is key to success in heterogeneous classrooms.

Implications for Mathematics Teaching Strategies

The learning-style profiles and observation findings have several implications for Grade IV mathematics instruction.
First, to accommodate the largest group of students, those with a visual learning style, teachers should consistently integrate visual materials in multiple representations, including instructional media, color coding, concept maps, and multimedia presentations in each lesson. For the LCM and GCD, visual tables and factor-tree animations would be particularly helpful.
Second, to accommodate the 32.1% of students with a kinesthetic learning style, instruction should include hands-on activities using concrete teaching aids. When learning about fractions, these students may benefit from fraction strips, fraction puzzles, and number-card games that allow them to interact physically with mathematical concepts. Mayer (2021) emphasizes that concrete experiences provide a firm foundation for developing abstract understanding.
Third, to support the 21.4% of students with an auditory learning style, teachers should plan structured group discussions, interactive question-and-answer sessions, and opportunities for students to verbalize problem-solving procedures. Asking students to explain their solutions to peers (peer teaching) may also be effective for this group. Fourth, cooperative learning models such as Student Teams-Achievement Divisions (STAD) or Jigsaw allow students with different modalities to interact and complement one another's learning (Slavin, 2021).

Conclusion

Three main conclusions can be drawn from the findings and discussion. First, the learning styles of Grade IV students at SDK Ursula Ende were predominantly visual (46.4%), followed by kinesthetic (32.1%) and auditory (21.4%) styles. This distribution indicates diverse learning profiles that require pedagogical attention. Second, the diversity of students' learning styles has direct implications for the effectiveness of mathematics instruction. Some students' difficulties in distinguishing between the LCM and GCD and finding common denominators for fractions are closely associated with the predominance of the visual learning style, which the teaching strategies used did not fully accommodate. Third, differentiated instruction that integrates visual media, concrete manipulatives, and verbal discussion is the most comprehensive approach to optimizing mathematics learning outcomes in classrooms with diverse learning styles.

References

Alkhasawneh, R,;Mrayyan,M.; Docherty,C,;Alashram,S.;Youshef, H. (2022). The effect visual learning modalities on mathematics achievement:Evidence from elementary schools. *Journal Educational Research*, *115*(3), 210–224.

Creswell, j. w;Creswell, J. d. (2022). *Research design:Qualitative,quantitative,andmixed methods approachers*.

DePorter,B.;Hearnacki, M. (2020). *Quantum learning:Membiasakan belajar nyaman dan menyenangkan*.

Dunn,R.;Dunn, K. (2021). *Teaching students through their individual learning styles:A practical apporoach for grades*.

Fleming, N. D. (2020). *Teaching and learning atyles: VARK strategies*.

Gardner, H. (2021). *Frames of mind: The theory of multiple intelligences*.

Mayer, R. E. (2021). *Multimedia learning*.

Miles, M. B.; Huberman,A. M.;Saldana, J. (2021). *Qualitative data analysis:A menthods sourcebook*.

Nasution, S. (2020). *Bagaimana pendekatan dalam proses belajar dan mengajar*.

Pashler, H.; McDaniel, M.;Bjork, R. (2021). Learning styles: concepts and evidence. *Psychological Science in the Public Interest*, *9*(3), 105–119.

Rahmawati, D. ;Purnawanto;Sudirma. (2023). Analisis Kesulitan Belajar Siswa SD dalam memahami konsep KPK dan FPB ditinjau dari gaya belajar. *Jurnal Pendididkan Matematika Indonesia*, *8*(1), 45–58.

Santrock, J. W. (2021). *Educational psychology*.

Slavin, R. E. (2021). *Cooperative learning: Theory,research,andpractive*.

Tomlinson, C. A. (2022). *The differentiated clasrom: Responding to the needs of alllearners*.

Utami, R. D.; Surya, E. (2023). Identifikasi gaya belajar siswa sekolah dasar dan hubungannya dengan presentasi belajar matematika. *Jurnal Ilmiah Penddidikan Dasar*, *10*(2), 112–128.

Widoddo, S. A.;Darhim;Ikhwanudin, T. (2022). Exploring mathematics problems-solving proces on student learning styles. *Journal on Mathematics Education*, *13*(1), 103–118.