Eduvest – Journal of Universal Studies
Volume 5 Number 8, August, 2025
p- ISSN 2775-3735- e-ISSN 2775-3727

Analysis of the Ability of Number Sense of Elementary School Grade V Students In Understanding The Concept of Fractional Numbers

I Gusti Agung Shomia Anjali, Subanji, Intan Sari Rufiana
Universitas Negeri Malang, Indonesia
*Corresponding Author: i.gusti.2321038@students.um.ac.id, subanji.fmipa@um.ac.id, intan.sari.pasca@um.ac.id

DATE
Accepted:
Revised:
Published:

ABSTRACT
The importance of number sense in helping students learn mathematics is reflected in the achievement of elementary school mathematics learning outcomes within the number element at each phase. Individual number sense abilities vary, influenced by factors such as their level of education, learning experience, and mathematical ability, whether high, medium, or low. The purpose of this study is to analyze and describe the number sense ability of grade V students at SDK Marsudisiwi, taking into account their mathematical ability. The research method used is descriptive qualitative research. Three students were selected as research subjects, each representing a different category of mathematical ability: high, medium, and low. Data collection techniques included written tests, interviews, and documentation methods. Data analysis involved reduction, presentation, and drawing conclusions. The results of the analysis showed that students across various levels of mathematical ability were capable of evaluating the fairness of calculation results. Although students with high and moderate mathematical ability could identify the characteristics of number operation results, they—and students with low ability—were not able to produce the closest approximate estimates for the results of number operations or present them adequately. Furthermore, they were unable to determine the sequential nature of number results and their regularity within the number system.

KEYWORDS *Number Sense; Concept; Number of Fractions*

INTRODUCTION

The curriculum that applies in elementary schools today, namely the Independent Curriculum, emphasizes Learning Outcomes on the number element; specifically, by the end of phase A, students are expected to show understanding and possess number sense. This indicates that within this Independent Curriculum, number sense skills are a primary focus in mathematics education. The number sense ability in question refers to students' capacity to have a solid understanding of number operations (Azzahro & Siswono, 2018). The importance of students having an understanding and intuition of numbers—that is, number sense—demonstrates the need in education to foster and train these abilities, especially by teachers as educators (Rufiana et al., 2022).

In addition, the ability of number sense is also identified with the term good number interpretation, which enables one to produce a systematic assessment (Fatimah & Wahyudin, 2020). This means that having this ability allows individuals to easily understand and manipulate numbers in various contexts, whether in everyday life or in more complex situations such as data analysis. Therefore, number sense becomes an important foundational skill in developing mathematical literacy, enabling individuals to make more informed and effective decisions based on a deep quantitative understanding.

The usefulness of the ability to understand number sense lies in students' capacity to comprehend mathematical problems easily because of high-level thinking skills (Kardiadinata & Duryati, 2019). This means students can identify relationships between mathematical concepts, predict results accurately, and find efficient solutions to different types of problems. This shows that number sense ability not only improves students' overall mathematical skills but also aids them in applying mathematical knowledge in daily life, thereby facilitating more meaningful and applicable learning.

Various studies related to number sense have been conducted by many researchers. First, research by Nugraha & Mulhamah (2017) emphasizes that many students still experience difficulties in operations where numerous errors occur. Second, research by Hidayah & Sholihah (2023) highlights that simple calculations using fingers remain difficult for elementary students. Third, research by Simorangkir & Sembiring (2018) explains that students face great difficulty when confronted with mathematical problems because they tend to memorize rather than understand.

The various studies above serve as the researcher's foundation in identifying problems and academic gaps in this study, where the focus is on the ability of number sense in elementary school students learning fractional mathematics.

This study seeks to address this gap by analyzing the number sense abilities of Grade V students at SDK Marsudisiwi, with a focus on fractional numbers. The novelty of this research lies in its qualitative exploration of how varying levels of mathematical ability (high, medium, and low) influence students' number sense, particularly in understanding and applying fractional concepts—a domain often overlooked in prior studies. By employing a case study approach, the research provides an in-depth examination of individual student performance, offering nuanced insights into the specific strengths and weaknesses within each ability group.

The primary objective of this study is to identify and describe the number sense capabilities of students across different mathematical proficiency levels, using descriptive qualitative methods. Additionally, it aims to uncover the underlying factors contributing to disparities in number sense development, such as instructional methods or cognitive barriers. The findings are expected to yield significant practical benefits, including informing targeted pedagogical strategies to enhance number sense instruction, particularly in fractional operations. For educators, this research offers actionable recommendations to tailor teaching approaches to diverse learner needs, ultimately fostering more effective and inclusive mathematics education. For policymakers, it underscores the need for curriculum adjustments to strengthen foundational numeracy skills, aligning with the goals of the Independent Curriculum.

METHOD

This research employed a qualitative approach with a case study design to gain an in-depth and comprehensive understanding of the phenomenon, in line with the study's objectives. A case study was chosen because the research focused on the number sense skills of Grade V students at SDK Marsudisiwi.

Data were collected through three methods: tests, interviews, and documentation. The data were then analyzed through three stages: reduction, presentation, and conclusion drawing. Data validity was ensured using triangulation by comparing data from multiple sources and collection techniques.

The research consisted of three main stages. The first stage involved preparation, including a location survey, obtaining a research permit, and preparing and validating research instruments. The second stage was data collection through tests, interviews, and documentation. The final stage included data analysis, drawing conclusions, and preparing the research report.

The test instrument comprised four questions based on number sense ability indicators adapted from Hidayah & Sholihah (2023): evaluating the fairness of calculation results; identifying characteristics of number operation results and their effects on various number types; determining and presenting the closest estimates for number operation results; and assessing the sequential nature and regularity of the number results within the number system.

1. Perhatikan operasi penjumlahan pecahan berikut.
   $\frac{2}{4}+\frac{1}{2}=1$
   Apakah hasil dari penjumlahan di atas sudah tepat? Jelaskan pendapatmu!

2. Perhatikan operasi pengurangan pecahan berikut.
   a. $\frac{1}{2}-\frac{1}{8}$ b. $\frac{7}{8}-\frac{3}{4}$
   Dari kedua operasi penjumlahan pecahan di atas, manakah hasil yang nilainya lebih besar? Jelaskan!

3. Perhatikan operasi penjumlahan pecahan berikut.
   a. $\frac{1}{4}+\frac{4}{8}$ b. $\frac{6}{8}+\frac{1}{2}$ c. $\frac{1}{2}+\frac{2}{4}$
   Urutkan hasil dari operasi penjumlahan pecahan di atas dari yang terkecil ke yang terbesar tanpa melakukan perhitungan hasil masing-masing soal di kertas. Jelaskan caramu!

4. Menurutmu apakah terdapat bilangan pecahan di antara $\frac{2}{4}$ dan $\frac{3}{4}$? Jika ada, tuliskan bilangan pecahan tersebut dan jelaskan!

Figure 1. Number Sense Ability Test Instrument

Source: Adapted from Hidayah & Sholihah (2023), modified by the researcher for this study

The test instrument was developed based on the established indicators. The questions were arranged according to the number sense ability indicators; for example, question 1 represented the first indicator—evaluating the fairness of calculation results—question 2 represented the second indicator, and so forth.

RESULTS AND DISCUSSION

The selection of subjects was carried out based on the results of daily math repetitions with high, medium, and low categories.

Table 1. Criteria for the Limit of the Research Subject Group.

Group	Border
Tall	$X \geq \bar{X} + SD$
Keep	$\bar{X} - SD < \bar{X} + SD$
Low	$X \leq \bar{X} - SD$

Source: Developed by the researcher based on the analysis of student test scores (2025)

Table 2 is a calculation obtained based on the criteria for the limit of the research subject group.

Table 2. Calculation of Average Value

N	Min	Max	Mean	Hours of deviation
26	42	90	64,77	16,56

Source: Primary data analysis conducted by the researcher (2025)

Table 2 presents the results of the calculation of the average score of 26 respondents. The minimum score obtained is 42, while the maximum score reaches 90. The mean of all respondents was 64.77 with a standard deviation of 16.56. This standard deviation shows the degree of variation or spread of values from the mean, giving an idea of how much those values vary among respondents.

Based on the criteria for the limit of the research subject group in Table 1, students who are included in the group of students with high mathematical ability are 4 people with scores of more than the same as 81.33. Students who are included in the group of moderately capable students are 8 with scores between 48.21 and 81.33. Finally, students who are included in the group of low-ability students, namely with a score of less than 48.21 as many as 4 people. Each group of students was randomly selected to be the subject of the research.

Table 3. Grouping of Research Subjects based on Mathematical Ability

Test Result Category	Sum	Student Code
Tall	1	KT
Keep	1	KS
Low	1	KR

Source: Primary data collected and categorized by the researcher (2025)

The following are answer sheets from KT subjects that fall under the category of students with high math ability.

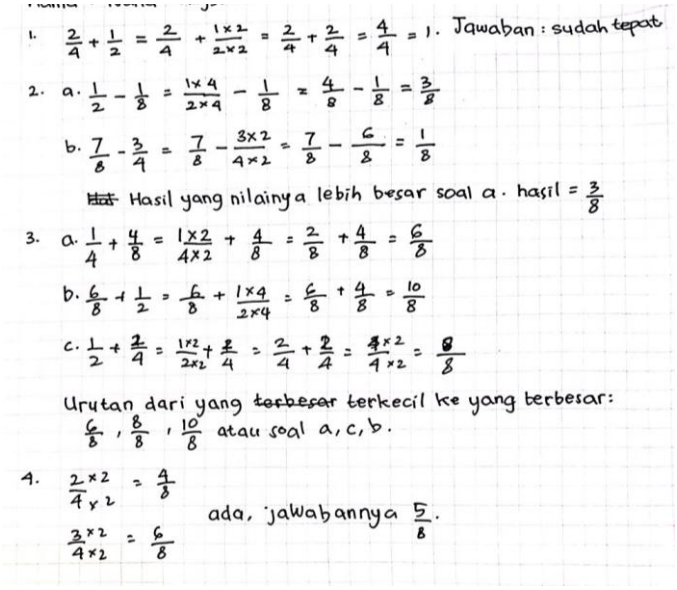

Figure 2. KT Test Answer Results

Source: Primary data collected by the researcher during the study (2025)

In Figure 2, it can be seen that KT is able to meet 3 indicators of number sense ability with correct answers. However, one question answered by KT can be said to have not met the standard of number sense ability. The description of each of these indicators is as follows.

a. KT answered the summation results on the correct question, namely 1 by showing the correct calculation operation process, showing the right understanding in evaluating the fairness of the calculation results.
b. KT completed both subtraction operations correctly and stated that the larger result was the fraction reduction operation in question number 2a. It shows a good ability in identifying the characteristics of the results of number operations.
c. KT sorted the results of the sum of fractions from smallest to largest correctly, but did not heed the instructions in the problem, namely without doing calculations on paper, showing poor estimation ability.
d. KT managed to find the answer by using equal fractions, showing a good understanding of the order of numbers in the fractional system.

The following are the answer sheets of the KS subject that are included in the category of students with moderate math ability.

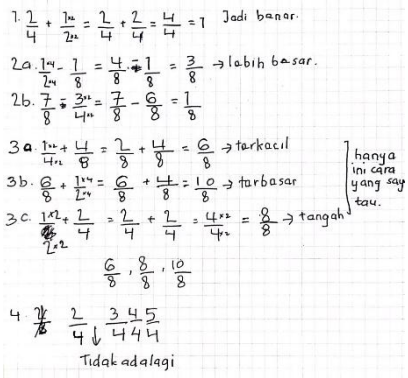

Figure 3. KS Test Answer Results

Source: Primary data collected by the researcher during the study (2025)

In Figure 3, it can be seen that KS is able to meet 2 indicators of number sense ability with the correct answer. However, the two questions answered by KS can be said to have not met the standard of number sense ability. The description of each of these indicators is as follows

a. KS also answered the summation results on the correct question, namely 1 by showing the correct calculation operation process, showing the right understanding in evaluating the fairness of the calculation results.
b. KS completed the fraction reduction operation and concluded that the larger one was the fraction reduction operation in problem number 2a. KS also showed good ability in identifying the characteristics of the results of number operations.
c. Just like KT, KS also sorts the results of adding fractions from smallest to largest correctly, but does not heed the instructions on the problem, namely without doing calculations on paper, showing poor estimation ability.
d. KS answered this part inappropriately. By answering "no more", KS shows a lack of understanding of the sequential nature of the results of numbers in a fractional system.

The following is an answer sheet from the KR subject which falls under the category of students with low math ability.

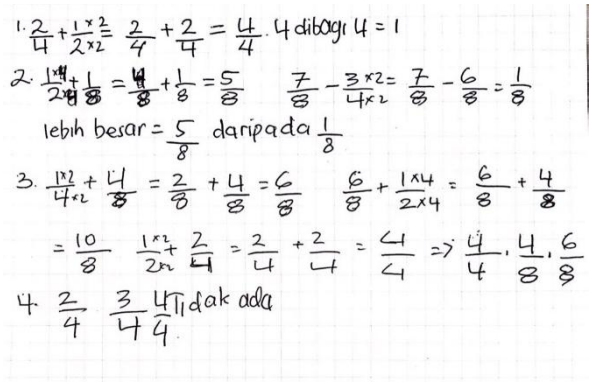

Figure 4. KR Answer Results

Source: Primary data collected by the researcher during the study (2025)

In Figure 4, it can be seen that KR is able to meet 1 indicator of number sense ability with the correct answer. However, the three questions answered by KR can be said to have not met the standard of number sense ability. The description of each of these indicators is as follows

a. KR also answered that the summation results on the question were correct, namely 1 by showing the correct calculation operation process, showing the right understanding in evaluating the fairness of the calculation results.
b. KR is not thorough in writing questions before doing them, so the results obtained are not in accordance with the answer key. This shows that KR lacks in identifying the characteristics of the results of number operations and their impact on different types of numbers.
c. KR does the same thing as KT and KS, sorting the results of adding fractions from smallest to largest correctly, but does not heed the instructions on the problem, which is without doing calculations on paper, showing poor estimation ability.

d. Just like KS, KR answered this part inappropriately. By answering "none", KR shows a lack of understanding of the sequential nature of the results of numbers in a fractional system.

Students with high math skills have good number sense skills. This is because students have the ability to evaluate the fairness of calculation results, identify the characteristics of the results of number operations, and have a good understanding of the sequence of numbers in the fractional system. Previous research has consistently shown that high mathematical ability is directly proportional to high number sense ability. Studies conducted by Nugraha & Mulhamah (2017) and Setyaningsih & Ekayanti (2019) confirmed that students with high mathematical skills tend to have better number sense skills. This ability allows them to assess the fairness of the calculation results, understand the characteristics of the numbers, and identify more efficient settlement alternatives.

These findings are also in line with research by Kondapaneni & Perona (2024) which shows that students with strong number sense skills are more successful in understanding complex mathematical concepts and solving mathematical problems more precisely. This shows that number sense skills play an important role in students' success in mathematics, and students with high math skills have generally developed this ability significantly.

Students with moderate math ability can meet 2 indicators of number sense ability with the right answers. However, the two questions answered by students with moderate math ability did not fully meet the number sense ability standard.

First, students with moderate mathematical ability are able to answer the summing results of the problem correctly, showing the right understanding in evaluating the fairness of the calculation results. This is in line with previous findings that show that students are able to demonstrate understanding and use of number sense in making good mathematical decisions (Mucti et al., 2020).

Second, students with moderate mathematical ability are able to identify the characteristics of number operations results well, but there are still errors in answering questions related to the sequential nature of number results in fractional systems. This shows that even if students are able to complete mathematical operations correctly, their understanding of sequential properties in number systems still needs to be improved.

In the context of previous research, these findings are consistent with the research of Kusnadi & Sari (2023) which states that students with moderate mathematical abilities do not fully understand the basic concepts of number sense, such as estimating the results of number operations and sequential properties in number systems. Therefore, special practice and a deeper understanding of these concepts are needed so that number sense skills can be applied properly by students.

Students with low math ability were able to answer one indicator of number sense ability correctly, but there were still three other questions that did not meet the number sense ability standard. Although students are able to answer the summing results correctly, this does not fully reflect the complete number sense ability. Previous research findings by Mucti et al. (2020) show that students' ability to assess the fairness of a calculation result using mathematical logic still needs to be strengthened, especially in the context of comparing the results of number operations.

Furthermore, students' attention in compiling questions before working on them affects the accuracy of the results obtained. Previous findings by Hidayah & Sholihah (2023) indicate that students need to understand the characteristics of the results of number operations and their implications in order to be able to formulate questions appropriately.

Although students are able to sequence the results of the sum of fractions correctly, the lack of estimation ability can be seen from the inconsistency in following the instructions of the questions. This is in line with the findings of Kusnadi & Sari (2023), which highlight that students' ability to use "sense" in solving problems still needs to be improved through proper practice.

In addition, the students' "none" answer to this section shows their lack of understanding of the sequential nature of number outcomes in a fractional system. Previous findings by Nugraha & Mulhamah, 2017 emphasize that students need to understand the basic properties of numbers to be able to answer correctly.

Therefore, in the context of learning, it is important for educators to provide opportunities for each student to develop their number sense skills through exercises that are in line with the findings of previous research.

CONCLUSION

The study concluded that students across high, medium, and low mathematical abilities can evaluate the reasonableness of calculation results, with those of high and medium ability also able to identify characteristics of number operation results and their effects on different types of numbers. However, students at all ability levels struggled to approximate calculation results accurately, and those with medium and low abilities were unable to recognize the sequential nature and regularity of numbers within the number system. These findings highlight the need for practical improvements in mathematics education, such as emphasizing estimation strategies and number pattern recognition through concrete examples and visual fraction models, providing teacher training in differentiated instruction, and restructuring fraction curricula to develop number sense progressively. Future research is recommended to investigate the impact of these instructional approaches on students' long-term number sense development, ideally through classroom-based action research that examines their effectiveness in diverse learning settings.

RAEFERENCES

Azzahro, E. F., & Siswono, T. Y. E. (2018). Number Sense Siswa SMP dalam Menyelesaikan Soal Matematika. MATHEdunesa:Jurnal Ilmiah Pendidikan Matematika, 7(2).

Dyson, N. I., Jordan, N. C., Rodriguez, J., Barbieri, C., & Rinne, L. (2024). Exploring the impact of a fraction sense intervention in authentic school environments: An initial investigation. Contemporary Educational Psychology, 77, 102248. https://doi.org/10.1016/j.cedpsych.2024.102248

Fatimah, A. T., & Wahyudin, W. (2020). Number Sense Siswa Smk Pada Tugas Matematis Berbasis Pertanian. Teorema: Teori Dan Riset Matematika, 5(2). https://doi.org/10.25157/teorema.v5i2.3322

Gabriel, F., Coché, F., Szucs, D., Carette, V., Rey, B., & Content, A. (2013). A componential view of children's difficulties in learning fractions. Frontiers in Psychology, 4, 715. https://doi.org/10.3389/fpsyg.2013.00715

Gözüm, A. İ. C., Özberk, E. H., Kaya, Ü. Ü., & Özdemir, E. (2024). Number sense across the transition from preschool to elementary school: A latent profile analysis. Early Childhood Education Journal, 52(5), 1221–1243. https://doi.org/10.1007/s10643-023-01511-w

Hidayah, R. W., & Sholihah, U. (2023). Analisis Kemampuan Number Sense Siswa Berdasarkan Kemampuan Matematika pada Materi Bilangan. JNPM (Jurnal Nasional Pendidikan Matematika), 7(1). https://doi.org/10.33603/jnpm.v7i1.7417

Liu, X., Zhang, Y., & Chen, H. (2024). Gender differences in elementary school students' fraction learning: Roles of spatial ability and mathematical anxiety. Frontiers in Psychology, 15, 1464501. https://doi.org/10.3389/fpsyg.2024.1464501

Jordan, N. C., Glutting, J., & Ramineni, C. (2010). The importance of number sense to mathematics achievement in first and third grades. Learning and Individual Differences, 20(2), 82–88. https://doi.org/10.1016/j.lindif.2009.07.004

Kardiadinata, S. S. T., & Duryati, D. (2019). Pengaruh Number Sense Terhadap Prestasi Belajar Matematika Siswa SD di Kota Bukittinggi. Jurnal Riset Psikologi, 2019(3).

Kondapaneni, N., & Perona, P. (2024). A Number Sense as an Emergent Property of the Manipulating Brain. Scientific Reports, 14. https://doi.org/10.1038/s41598-024-56828-2

Kusnadi, D., & Sari, R. (2023). Dampak Learning Loss: Kemampuan Number Sense pada Mahasiswa Pendidikan Guru Sekolah Dasar. JIIP - Jurnal Ilmiah Ilmu Pendidikan, 6(4). https://doi.org/10.54371/jiip.v6i4.1787

Mucti, A., Astuti, D., & Susanti, D. (2020). Profil Kemampuan Number Sense Siswa Kelas VIII SMPN 8 Tarakan. Edukasi, 7(37).

Nugraha, Y., & Mulhamah, M. (2017). Analisis Kemampuan Number Sense Dalam Pemecahan Masalah Matematika. JTAM | Jurnal Teori Dan Aplikasi Matematika, 1(1). https://doi.org/10.31764/jtam.v1i1.315

Rufiana, I. S., Ekayanti, A., Munawaroh, I. T., Putri, F. I. P., Yuwiarti, I., & Wulantar, V. (2022). Pembelajaran Bilangan Bulat dengan Menggunakan Cuisenaire Rods. JURNAL SILOGISME : Kajian Ilmu Matematika Dan Pembelajarannya, 7(2). https://doi.org/10.24269/silogisme.v7i2.6457

Saksvik-Raanes, M. (2024). Patterning strategies in grade 1 students with low and high number sense proficiency. Educational Studies in Mathematics, 106(3), 421–445. https://doi.org/10.1007/s10649-024-10341-5

Schoen, H. L., Bray, A., Wolfe, C., Tran, D., & Huang, M. (2023). Impact of lesson study and fractions resources on instruction and student learning. The Journal of Experimental Education, 91(2), 234–258. https://doi.org/10.1080/00220973.2023.2183374

Setyaningsih, L., & Ekayanti, A. (2019). Keterampilan Berfikir Siswa SMP dalam Menyelesaikan Soal Matematika Ditinjau dari Kemampuan Number Sense. Jurnal Didaktik Matematika, 6(1). https://doi.org/10.24815/jdm.v6i1.11699

Simorangkir, F. M. A., & Sembiring, R. K. B. (2018). Peningkatan Kemampuan Number Sense Siswa Melalui Media Pembelajaran Matematika Berbantuan Software Lectora Inspire. MES: Journal of Mathematics Education and Science, 4(1). https://doi.org/10.30743/mes.v4i1.866

Tsao, Y. L., & Lin, Y. C. (2014). The study of number sense and teaching practice. Journal of Case Studies in Education, 6(2), 1–14.

Whitacre, I., Henning, B., & Atabas, S. (2024). An empirically validated rational number sense framework. Mathematics Education Research Journal, 36(2), 341–368. https://doi.org/10.1007/s13394-024-00484-2