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Understanding mathematical concepts of comparison materials based on webquiz

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Abstract

Background: Comparison is a complex mathematical concept that often leads to misconceptions among students. This study is focused on evaluating the understanding of comparative material among PGSD students at Sanata Dharma University, Yogyakarta.

Aim: The main objective of this study is to assess the level of understanding of comparative material concepts, including mathematical comparison, comparative mathematical understanding, the ratio of turning around, and mathematical understanding of scale, among the students.

Method: A survey method was employed for this research. The study involved 46 PGSD students at Sanata Dharma University who participated through Quizizz and Google Drive. The instrument consisted of 10 conceptual questions and 5 discussion questions, followed by reinforcement material to enhance understanding. Participants were instructed to complete questions via https://join.quizizz.com, and the completed steps were submitted through Google Drive.

Result: The analysis revealed that 1) the mathematical understanding of the concept of comparison was at 83%; 2) comparative mathematical understanding stood at 68.67%; 3) the mathematical understanding of the ratio of turning around was 73.2%; and 4) the mathematical understanding of scale was at 83%.

Conclusion: The study indicates that the understanding of mathematical concepts related to comparative material among PGSD students at Sanata Dharma University is in the high category. These findings could serve as a foundation for further instructional design aimed at bolstering comparative concept understanding.

INTRODUCTION

Understanding mathematical concepts is one of the cognitive aspects of learning mathematics that must be possessed by students. The significance of such comprehension is highlighted in several academic studies (Albert et al., 2010; Gikas, 2018; Hidayat, 2020). This aligns with insights from Yana et al. (2020), along with other scholarly works (Astiti et al., 2022; Do et al., 2021; Maslihah et al., 2021; Nguyen et al., 2020; Trung et al., 2019), underscoring that profound concept understanding streamlines the students' ability to tackle mathematical challenges in academic settings. A prevalent issue observed is the diminished concentration among students, leading to a deficiency in conceptual grasp (Sudarman & Vahlia, 2016). Hence, an analysis of concept comprehension, especially in comparative mathematics, is imperative to identify and address students' conceptual misunderstandings.

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These misconceptions, common among learners, are also explored in the research by Jankvist & Niss (2018). Smith's perspective on misconceptions describes them as robust yet incomplete notions held by students, often conflicting with established scientific views (Qian & Lehman, 2017). Feldman (2018) further elucidates that these misconceptions stem from procedural missteps during learning processes. Misconceptions, as detailed in various studies (Iryani et al., 2018; H. M. Sari & Afriansyah, 2020; Utami, 2019; Yana et al., 2020), represent deviations from accurate concepts, potentially arising during or as an aftermath of recent educational experiences. Mastery of Mathematical Concepts is paramount for students to fully engage with and understand the subject matter, including complex topics like comparative analysis.

In assessing the dimensions of various entities within a dataset, comparisons often emerge, particularly when these entities are quantified using identical numerical units. This process facilitates the juxtaposition of two or more similar quantities' values (Sari, 2020). Notably, grasping the nuances of comparison can pose a significant challenge for learners. Echoing this sentiment, Ardiansyah (2022) study highlighted the intricate nature of this concept, underscoring its complexity for students. Moreover, investigations by Lanya (2017) and Angraerni (2021) revealed similar findings, with participants expressing difficulties in comprehending comparative concepts. Such challenges in understanding comparison often lead to misconceptions among students, particularly in mathematical contexts. Misinterpretations in comparative analysis can adversely affect problem-solving accuracy. Mahtuum et al. (2020) noted that deficiencies in mathematical comprehension directly impact the correctness of responses to related questions. Addressing these misconceptions is crucial, and one effective strategy involves the implementation of engaging educational methods.

Engaging educational methods can positively impact students' enthusiasm for learning. Azzahra (2022) noted that utilizing captivating instructional media can bolster this interest. Incorporating quiz-based media is one such approach. Quizizz, as an example, has been effectively implemented in both learning processes and in resolving educational challenges. The appeal of educational experiences is closely tied to learners' interests. Angelina (2022) pointed out that Quizizz, functioning as an interactive quiz game, plays a key role in enhancing the appeal of educational activities. Additionally, Putra (2023) highlighted the remarkable efficiency of Quizizz in stimulating a greater interest in mathematics among students.

Recent studies, including one by Lea et al. (2022) in primary schools, revealed diverse student comprehension of comparative materials. Watratan et al. (2021) exploration into Islamic values-infused e-modules for comparative studies suggested their practicality and effectiveness in educational settings. Additionally, Mahtuum et al. (2020) focused on middle school students' grasp of comparative values, finding an enhanced understanding in comparative value materials compared to turning value comparisons. These investigations highlight the frequent exploration of comparative materials at primary and secondary educational stages. Observations at the student level indicate persistent challenges in grasping mathematical comparative concepts, prompting further research. Innovative teaching methods, including the incorporation of the Quizizz application, are being employed to enhance engagement and understanding. Considering these findings, my research at Sanata Dharma University, Yogyakarta, aims to delve deeper into students' comprehension of comparative concepts. Unlike previous studies which predominantly focused on younger students and the

effectiveness of specific educational tools, this study seeks to explore the conceptual understanding of university-level students, providing a new perspective in the field. This study is designed to shed light on effective processes and methodologies to bolster Sanata Dharma University students' understanding of these concepts.

METHODS

This study uses a survey research design. The research method used is descriptive quantitative, namely seeking information about existing symptoms, to obtain an overview of the subject's status under certain conditions. This research was conducted on 46 second-semester students of Elementary School Education at Sanata Dharma University, Yogyakarta.

The instrument in this study was a worksheet of 5 questions as material for student discussion and 10 conceptual questions focused on understanding concepts related to the concept of comparison, comparison of values, comparison of reverse values, and scale. The grid questions are as follows.

Table 1. Materials of Comparison

No.	Material	Question Number
1	Definition of Comparison	6
2	Comparison Worth	5,7, and 8
3	Reverse Value Comparison	1,2,3,9, and 10
4	Scale	4

The level of understanding of the concepts presented is the percentage of understanding of mathematical concepts based on categories (Sari et al., 2017) as follows.

Table 2. Levels of Understanding of Mathematical Concepts

No	Uraian	Kategori
1	$0 \leq \times \leq 30\%$	Rendah
2	$30 < \times \leq 60\ \%$	Sedang
3	$60 < \times \leq 100\ \%$	Tinggi

The instrument was assessed and *validated two mathematics Lectures PGSD Sanata Darma* lecturer in mathematics before being tested limited to 10 students and data collection was carried out in. Assesed and valitaed instruments in April, 10-20 2022. Data collection is done through the platform *Quizizz* and google *drive*. Research subjects work on questions through the page https://join.quizizz.com and the completion steps are sent via google *drive* as in the following chart.

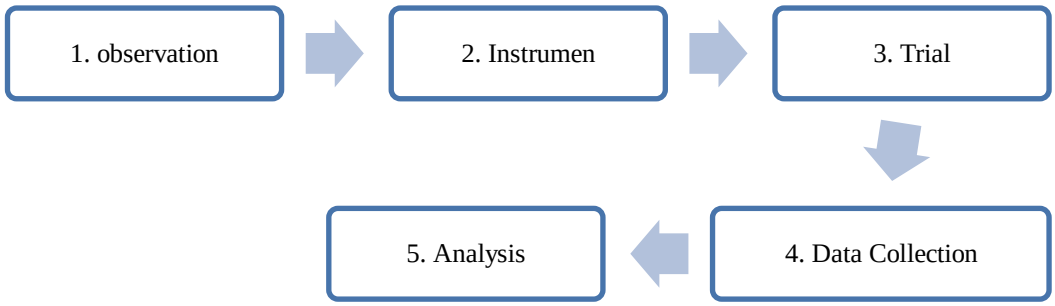


Figure 1. Reserach Steps

Data collection is done from *Quizizz*. *Quizizz* is used by students working on questions and answering questions by writing answers. Furthermore, *Google Drive* is used to collect ways of

solving problems so that they can be analyzed in depth. After the student has worked on the questions through *Quizizz*, the results of the student's work are immediately presented and can be downloaded in the format spreadsheet *Excel* and solution at Google *Drive* in the shape of PDF. Then the results obtained were analyzed descriptive.

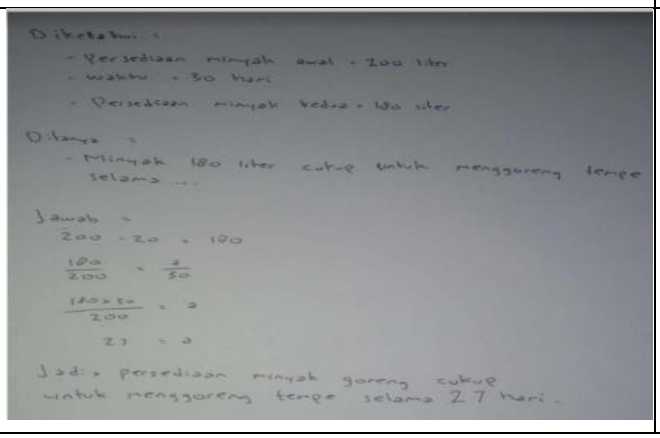
RESULTS AND DISCUSSION

Results

The results of the research conducted on the results of the discussion of 46 PGSD students at Sanata Dharma University Yogyakarta stated that there were still misconceptions in the comparison material related to distinguishing between worth comparisons and reversed values as follows.

Tabel 3. Discussion Results

Translate: Cooking oil provided by the Tempe Chips entrepreneur for frying 200 Kg and used for 30 days. If today's tempeh will be reduced by 20 kg from usual, then stock of cooking oil enough to fry Tempe for . . .

Code	Learning Outcomes	Information
Student 1	C. Penyelesaian diketahui : 200 Kg minyak goreng yang digunakan selama 30 hari tempe yang akan dikurangi 20 Kg dari biasanya ditanya : persediaan minyak goreng cukup untuk menggoreng tempe selama jawab : rumus perbandingan senilai : keterangan : a1 = 200 kg a2 = 30 hari b1 = 20 kg a1 / a2 = b1 / b2 200/30 = 20/b2 200 x b2 = 20 x 30 b2 = 20/200 x 30 = 3 kesimpulan : jadi persediaan minyak goreng cukup untuk menggoreng tempe selama 3 hari	On the results of student 1 work, they have not been able to write down the information that is known about the problem completely. Furthermore, the use of solutions using equivalent comparison solutions with inaccurate data. The value of b1 should be 200-20 = 180 (in Kg units). This causes the completion of the next stage is not right.
Student 2		In student 2's work, students already know the right information. Furthermore, at the completion stage students have not been able to use a settlement using a reverse value comparison correctly, students use a method of solving equivalent comparisons. This causes students to get inaccurate final results.

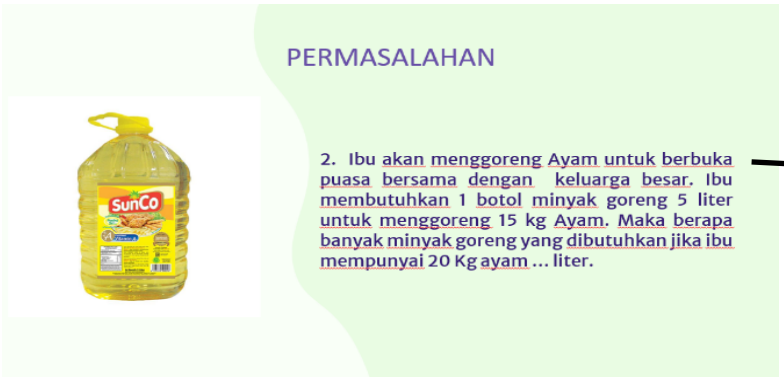
Student 3	**Diketahui** : Minyak goreng yang digunakan untuk menggoreng keripik pisang 200 Kg dan digunakan selama 30 hari **Ditanya** : maka persediaan minyak goreng cukup untuk menggoreng tempe selama . . . . **Jawab** : $\frac{a1}{a2} = \frac{b2}{b1}$ $\frac{200}{180} = \frac{30}{y}$ $\frac{5}{2} \times 30 = 12$ hari Jadi, persediaan minyak goreng cukup untuk menggoreng tempe selama 12 hari	On the results of student 3's work, students have not presented complete information. Furthermore, in solving the students have been able to conclude which concept is used but students have not been able to group it correctly according to the symbol, b1 should be filled with a value of 30 and b2 is the thing being asked.

Tabel 3. We can analyze that there are differences in the errors made by students. Student 1, shows an error in determining the value and determining the formula used. Student 2, indicates an error in determining the formula used. Furthermore, student 3, shows that the error made is not focusing on putting the value into a predetermined formula, namely putting the number 30 on the value and the calculations performed.

Based on the picture, in general, the error that occurs is a lack of understanding of the concept of *translation (translation)* which is changing words into symbols that are shown in determining the value, namely errors that occur in numbers 1a and 1c. Furthermore, the lack of understanding of concepts related to Interpretation *is* an understanding of using suitable concepts in solving problems which are shown in determining the appropriate formula for the problem. In addition, errors that arise related to the understanding of Extrapolation *(Extrapolation)* is an understanding of calculations in mathematical problems shown in the calculations on the problem. This is in Russefendi's opinion which states that understanding mathematical concepts consists of 3 things, namely, interpretation, and extrapolation *translation* (Nugraha et al., 2014). Problems that occur can be overcome by providing reinforcement related to comparative material.

The provision of reinforcement aims to make students better understand the concept of comparison. Strengthening is done by explaining the comparison material and linking it to the problems that are around. After the explanation was given, questions related to comparative material were given to determine the level of understanding of students' concepts. Furthermore, reinforcement is given regarding problem-based materials related to student life as follows.

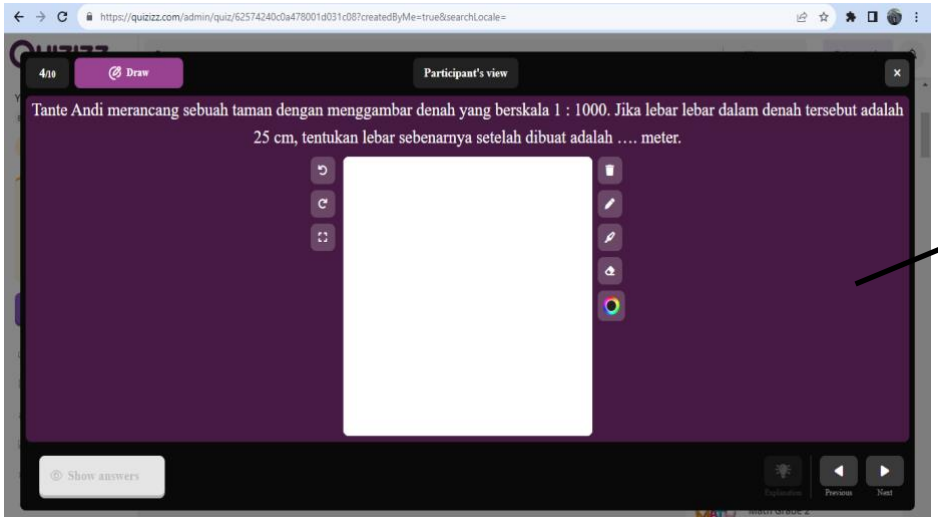
Translate:
Dad will buy Pertamax and Pertalite at POM. If the comparison between the prices of Pertamax and Pertalite is 3:4 and the money you have is Rp. 150.000, then how much pertamax and pertalite you get?



Translate:
Mother will fry the chicken to break the fast with the big family. You need 5 liter of cooking oil to fry 15 kg of chicken. So how much cooking oil is needed if the mother has 20 kg of chicken... liters.

Figure 2. Problem Based Reinforcement

Furthermore, students are given questions with the Quizizz media which aims for students can solve problems in different and interesting ways. Questions related to comparative material are as follows.



Translate:
Aunt Andi designed a garden by drawing a floor plan with a scale of 1: 1000. If the width in the plan is 25 cm, determine the actual width after it ade is .... Meters.

Translate:
A project is planned to be completed in 8 months by 120 employees. If the project is accelerated, then it can be completed within 5 months many employees to be added as much as....

Figure 3. Problem-Based

After being given reinforcement in the form of material understanding of students' concepts as a whole, the class average value is 73%. This shows that the understanding of the concept of PGSD students at Sanata Dharma University Yogyakarta is in the high category.

Furthermore, the results of the assessment of understanding the concept of comparative material are as follows.

Table 4. Descriptive Statistic of Student Concept Understanding

NO	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
1	46	10	0	10	290	6.30	.720	4.880	23.816
2	46	10	0	10	350	7.61	.636	4.313	18.599
3	46	10	0	10	360	7.83	.615	4.170	17.391
4	46	10	0	10	320	6.96	.686	4.652	21.643
5	46	10	0	10	310	6.74	.699	4.740	22.464
6	46	10	0	10	380	8.26	.565	3.832	14.686
7	46	10	0	10	370	8.04	.591	4.011	16.087
8	46	10	0	10	270	5.87	.734	4.978	24.783
9	46	10	0	10	370	8.04	.591	4.011	16.087
10	46	10	0	10	310	6.74	.699	4.740	22.464
Valid N (listwise)	46								

Based on the table 4, the average value is 7.239 with a total value of 3.330. The results of the study also show that the understanding of the mathematical concept of comparative material in detail is 1) understanding of the mathematical concept of comparison is 83%; 2) Comparative mathematical understanding of 68,67%; 3) The mathematical understanding of the ratio of turning around is 73, 2%; and 4) 83% mathematical understanding of the scale. And totally the false is 29,6 % or 136 numbers and true is 70,4 % or 324 number. This shows that PGSD students at Sanata Dharma University have a level of understanding of the mathematical concept of comparison material sequentially, namely the concept of comparison is categorized as high, comparisons of values are categorized as high, comparisons of reverse values are categorized as high, and scales are categorized as high. The percentage of understanding of students' mathematical concepts based on the picture is as follows.

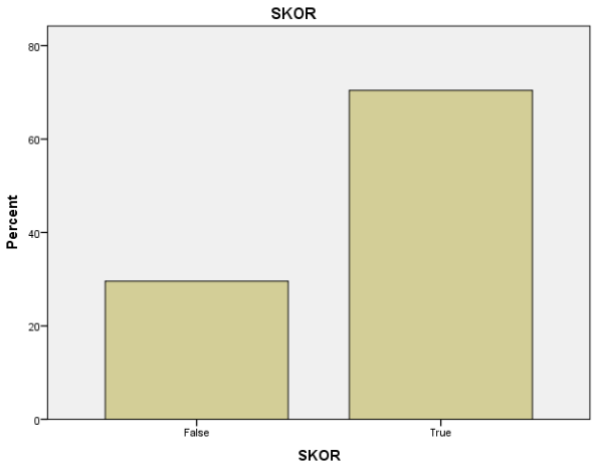


Figure 5. Percentage False and True of Understanding Mathematical Concepts Based

Figure 5. This shows that each material provided has a high level of understanding of mathematical concepts. This is because every material that is spread out in the problem has a percentage of 60 < × 100% (more than 60%).

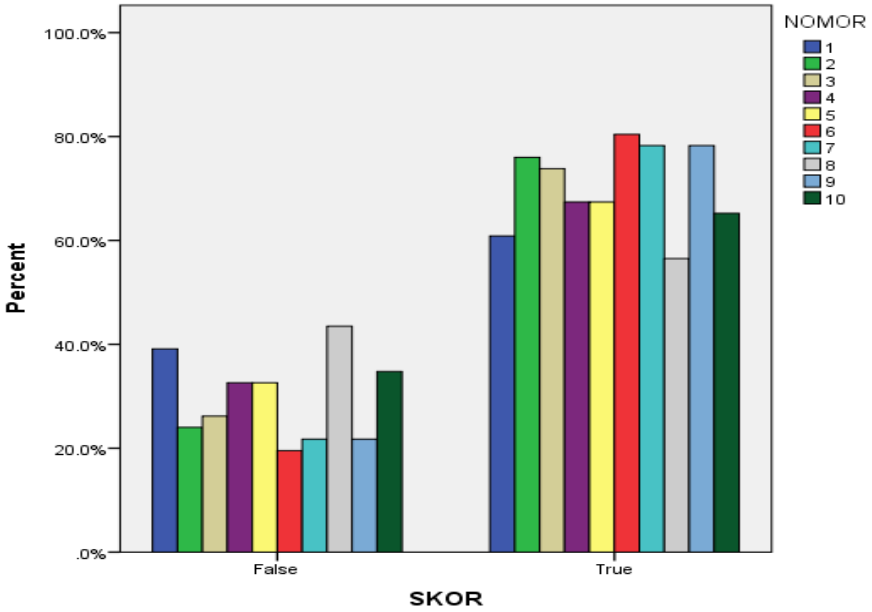


Figure 6. Distribution of student answers

Based on the instruments made, the material for understanding comparison lies at number 6, comparison worth at numbers 5, 7, and 8, inverse comparison values 1,2,3,9, and 10, and scale at number 4. Figure 6. Shows that the order of the most correct number is 6 by 83% with a high category of understanding of the concept of comparison. Question numbers 7 and 9 with a value of 80% show an understanding of the concept of comparison of worth and comparison of turning values categorized as high. Furthermore, question number 3 shows that students' understanding of the concept of inverse comparison is categorized as high with a value of 78%. Question number 2 shows a high understanding of the concept of reverse comparison with a value of 76%. Question number 4 shows the understanding of the concept of the scale is categorized as high with a value of 70%.

Furthermore, the understanding of concepts related to the comparison of reversed values shows a high value with a value of 67% in question number 10. Number 5 also shows an understanding of concepts that are categorized as high related to comparisons worth 67%. Question number 1 also shows a high understanding of the concept of reverse comparison with a score of 65%. Furthermore, the understanding of the comparison value in question number 8 is categorized as moderate with a value of 59%. This states that out of 10 questions, there are 9 questions in which the understanding of concepts is in the high category and 1 question is in the medium category.

Discussion

Based on the results of the study, students understanding of comparative material concepts at Sanata Dharma University, Yogyakarta, is categorized as high. A high understanding of mathematical concepts is caused by several things, namely lecturers and students trying to fulfill all indicators of understanding mathematical concepts, using media in learning, being active and critical, discussing, and being independent.

The student's understanding of the concepts of PGSD Sanata Dharma Yogyakarta is classified as high. Lecturers design learning according to indicators and then apply it to students. This causes students to get used to the learning. This is also shown by Sujadi and

Kholidah (2018), Kartika (2018), Merangin (2018), Fajar (2019), Unaenah and Sumantri (2019), Septiani & Pujiastuti (2020), and Alzanatul (2022) who use indicators of understanding mathematical concepts in determining to understand of mathematical concepts. The indicators of understanding the concept are as follows.

a. able to restate the concept of comparison in solving problems
b. able to determine the concept of each comparison material on each question
c. able to distinguish the concept in each question
d. able to write down the concept of each question
e. able to develop the concept of the problem
f. being able to use the concept of comparison is shown by working on questions, and
g. able to solve the problems given in the questions.

A high understanding of mathematical concepts can be obtained from student focus through learning media. This is in line with the research conducted by Hamidah (2018) which states that students' understanding of the concept of comparison increases with learning media. The learning media used in giving questions to students is *Quizizz*. The research results stated *Quizizz* can increase understanding of concepts because it is creative, innovative, and fun (Ardiansyah et al., 2022), (Al Mawaddah et al., 2021). In addition, *Quizizz* can increase concentration to be able to understand the concept of comparison (Fitriani & Kusumadewi, 2022; Putra & Saputra, 2018). Based on this, the media has a good impact on the focus of students so that they can solve problems properly.

The understanding of the mathematical concepts of PGSD Sanata Dharma Yogyakarta students was relatively high, which was also shown by the effort made by asking questions to the lecturer during the lesson. This causes the understanding of concepts to be improved by the activeness of students in learning, for example when there is something that is confusing, students immediately ask and confirm it to the teacher. This is also explained in research Annisa (2023) dan Belanisa (2019) which states that active and students' critical thinking skills lead to a higher understanding of students' concepts.

The high understanding of the mathematical concepts of PGSD Sanata Dharma Yogyakarta students is also due to the discussion activities used by the lecturer so that students can confirm each other with their group mates. This can increase students' understanding of mathematical concepts as also conveyed Yuningsi et al. (2021); Rohmah (2019); Yanti (2019) that discussion activities with colleagues in discussing the material in the learning process can provide increased understanding of concepts students.

The understanding of the mathematical concepts of PGSD Sanata Dharma Yogyakarta high students is also greatly assisted by the independent attitude of students in seeking information so that they can improve and add to their knowledge from external references. The references used in this case are usually books, articles, proceedings, news, and the surrounding environment. This is also done by lecturers by providing website addresses that can assist students in finding these references. This activity is well carried out by students in increasing their independence and understanding of students' mathematical concepts in learning. This is in line with research results (Amalia et al., 2021; Asfar et al., 2019; Atikah and Isran, 2022; Hilliyani, 2018; Huda et al., 2019; Kowiyah et al., 2019; Marlena & Nugrheni, 2019; Rahmi, 2021; Amalia, 2020; Supriadi et al., 2020; Widodo, 2021) that independence can increase

understanding of concepts and independence can be done by finding knowledge independently on various available platforms as a result technological development.

The high understanding of the mathematical concepts of PGSD Sanata Dharma Yogyakarta students in this study aims to help and facilitate students and lecturers in evaluating learning in everyday life and as a reference for application to other students. In addition, this research also has the advantage of being able to examine problems in higher education. This is a great hope that in the future it will be able to provide good benefits for students, researchers, and the general public. Furthermore, it is hoped that this research will be able to provide lessons and experiences for writers and students, and Sanata Dharma lecturers in conducting learning evaluations.

The limitations carried out in this study were that researchers were not able to see the whole due to the Covid-19 Pandemic transition. In addition, activities that can increase conceptual understanding have many variants so that they can be developed from various sides. Based on this, it is hoped that suggestions and input from readers will be able to redevelop this research and serve as evaluation material for future writers and researchers.

CONCLUSIONS

Based on the analysis of the results of the study, it can be concluded that the understanding of mathematical concepts in comparative material based webquiz students is categorized as high. Student understanding of mathematical concepts in comparison material is is 70,4 % with the following details. 1) The mathematical understanding of the concept of comparison is 83%; 2) Comparative mathematical understanding of 68, 67%; 3) The mathematical understanding of the ratio of turning around is 73,2%; and 4) 83% mathematical understanding of the scale. Understanding of mathematical concepts of comparative material based in Webquiz is categorized as high because they try to fulfill all indicators of understanding mathematical concepts, Use of Media in learning, Active and Critical, Discussion, and Independent is 60% < 70,4 %.

AUTHOR CONTRIBUTIONS STATEMENT

YF generates research ideas, data acquisition, data analysis, computational statistics, interpretation of results, manuscript drafting, statistical analysis, admin, and technical support. BSA data acquisition, data analysis, statistical computation, interpretation of results, drafting, statistical analysis, admin, and funding support technical. MAA data acquisition, data analysis, statistical computation, interpretation of results, drafting, statistical analysis, admin, and technical support. SA revised the manuscript and finalized the manuscript. JS makes interpret the results, revises the script, and finalizes the script.

REFERENCES

Al Mawaddah, A. W., Hidayat, M. T., Amin, S., & Hartatik, S. (2021). Pengaruh Penggunaan Media Pembelajaran Quizizz terhadap Hasil Belajar Siswa pada Mata Pelajaran Matematika melalui Daring di Sekolah Dasar. *Jurnal Basicedu*, *5*(5), 3109–3116. https://doi.org/10.31004/basicedu.v5i5.1288

Albert B. Bennett, Jr., Laurie J. Burton, L. T. N. (2010). Mathematics for elementary teachers : a conceptual approach. In *วารสารวิชาการมหาวิทยาลัยอีสเทิร์นเอเชีย* (9th ed., Vol. 4, Issue

1). McGraw-Hill, Inc.
Alzanatul Umam, M., & Zulkarnaen, R. (2022). Analisis Kemampuan Pemahaman Konsep Matematis Siswa Dalam Materi Sistem Persamaan Linear Dua Variabel. *Jurnal Educatio FKIP UNMA*, *8*(1), 303–312. https://doi.org/10.31949/educatio.v8i1.1993
Amalia, S. R. (2020). Pengaruh pembelajaran e- learning tipe web course berbantuan Google classroom dan whatsapp group diharapkan membangun self regulated learning mahasiswa dan mengembangkan kemampuan pemahaman konsep mahasiswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(4), 917-925. https://doi.org/10.24127/ajpm.v9i4.3009
Amalia, S. R., Puwaningsih, D., & Utami, W. B. (2021). Problem Based Learning Berbantu Google Calssroom Terhadap Kemampuan Pemahaman Konsep Matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(2), 1110-1117. https://doi.org/10.24127/ajpm.v10i2.3649
Angelina, F., Purwati, T., Kariadi, M. T., & Riyadi, S. (2022). Students' Perception on Quizizz As Digital Game-Based Learning Tool For Formative Assessments. *JELLE: Journal Of English Literature, Linguistic, and Education*, *3*(2), 13–20. https://doi.org/10.31941/jele.v3i2.2297
Angraerni, D. (2021). Analisis Kesalahan Dalam Membuat Konsep Nilai Perbandingan dan Perubahan Nilai untuk Kelas VII Siswa SMAN 2 Palopo. *DEIKTIS: Jurnal Pendidikan Bahasa dan Sastra*, *1*(2), 159-166. https://doi.org/10.53769/deiktis.v1i2.144
Annisa, W. N., Nurfitriyanti, M., & Masruroh, A. (2023). *Pengaruh kecerdasan intrapersonal terhadap pemahaman konsep matematika*. *6*(1), 1–10. https://doi.org/10.22460/jpmi.v6i1.12659
Ardiansyah, M. (2022). Efektivitas Penggunaan Platform Quizizz dalam Meningkatkan Minat dan Pemahaman Konsep Matematika. *SAP (Susunan Artikel Pendidikan)*, *6*(3), Article 3. https://doi.org/10.30998/sap.v6i3.9892
Asfar, A. M. I. T., Asmawaty, A., & Nursyam, A. (2019). Mathematical Concept Understanding: the Impact of Integrated Learning Model. *Al-Jabar : Jurnal Pendidikan Matematika*, *10*(2), 211–222. https://doi.org/10.24042/ajpm.v10i2.3880
Astiti, D. O., Pratiwi, D. D., Matematika, P., Raden, U. I. N., & Lampung, I. (2022). Peningkatan kemampuan berpikir matematis dan pemahaman konsep dengan menerapkan model pembelajaran CMI berbantuan RME. *Delta: Jurnal Ilmiah Pendidikan Matematika*, *10*(1), 35–44.
Atikah, N., & Isran, D. (2022). Pengaruh Metode Pembelajaran Flipped Classroom Terhadap Pemahaman Konsep Matematika Mahasiswa. *Jurnal Pendidikan Islam Al-Affan*, *3*(1), 12-18.
Azzahra, M. D., & Pramudiani, P. (2022). Pengaruh Quizizz sebagai Media Interaktif terhadap Minat Belajar Siswa pada Pelajaran Matematika Kelas V di Sekolah Dasar. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *6*(3), 3203-3213. https://doi.org/10.31004/cendekia.v6i3.1604
Belanisa, S. (2019). Pengaruh Kemandirian Belajar dan Berfikir Kritis terhadap Pemahaman Konsep Matematika (Survei Pada Mts Swasta di Kota Tangerang Selatan). *Alfarisi: Jurnal Pendidikan MIPA*, *2*(1), 73–79.
Do, T. T., Hoang, K. C., Do, T., Trinh, T. P. T., Nguyen, D. N., Tran, T., Le, T. T. B. T., Nguyen, T. C., & Nguyen, T. T. (2021). Factors influencing teachers' intentions to use realistic mathematics education in Vietnam: An extension of the theory of planned behavior. *Journal on Mathematics Education*, *12*(2), 331–348. https://doi.org/10.22342/JME.12.2.14094.331-348
Fajar, A. P., Kodirun, K., Suhar, S., & Arapu, L. (2019). Analisis Kemampuan Pemahaman Konsep Matematis Siswa Kelas VIII SMP Negeri 17 Kendari. *Jurnal Pendidikan*

Matematika, *9*(2), 229-239. https://doi.org/10.36709/jpm.v9i2.5872
Feldman, M. Q., Cho, J. Y., Ong, M., Gulwani, S., Popovic, Z., & Andersen, E. (2018). Automatic diagnosis of students' misconceptions in K-8 mathematics. *Conference on Human Factors in Computing Systems - Proceedings*, *2018-April*, 1–12. https://doi.org/10.1145/3173574.3173838
Fitriani, S. A., & Kusumadewi, R. F. (2022). *Efektivitas penggunaan aplikasi quizizz dalam pembelajaran matematika terhadap pemahaman konsep siswa kelas V di SDN Karangtowo* (Doctoral dissertation, Universitas Islam Sultan Agung).
Gikas, J., & Grant, M. M. (2018). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*(1), 18–26. https://doi.org/10.1016/j.iheduc.2013.06.002
Hamidah, D., Putri, R. I. I., & Somakim, S. (2018). Eksplorasi Pemahaman Siswa pada Materi Perbandingan Senilai Menggunakan Konteks Cerita di SMP. *Jurnal Riset Pendidikan Dan Inovasi Pembelajaran Matematika (JRPIPM)*, *1*(1), 1-10. https://doi.org/10.26740/jrpipm.v1n1.p1-10
Hidayat, E. I. F., Vivi Yandhari, I. A., & Alamsyah, T. P. (2020). Efektivitas Pendekatan Realistic Mathematics Education (RME) Untuk Meningkatkan Kemampuan Pemahaman Konsep Matematika Siswa Kelas V. *Jurnal Ilmiah Sekolah Dasar*, *4*(1), 106-113. https://doi.org/10.23887/jisd.v4i1.21103
Hilliyani. (2018). *Pengaruh Media Timbangan Yang Berorientasi Model Polya dan Kemandirian Belajar Terhadap Pemahaman Konsep Matematis Mahasiswa Tadris Matematika STAIN GPA*. *2*(1), 45–56. https://doi.org/10.22373/jppm.v2i1.4498
Huda, S., Firmansyah, M., Rinaldi, A., Suherman, S., Sugiharta, I., Astuti, D. W., Fatimah, O., & Prasetiyo, A. E. (2019). Understanding of Mathematical Concepts in the Linear Equation with Two Variables: Impact of E-Learning and Blended Learning Using Google Classroom. *Al-Jabar : Jurnal Pendidikan Matematika*, *10*(2), 261–270. https://doi.org/10.24042/ajpm.v10i2.5303
Iryani, I., Tandililing, E., & Hamdani, H. (2018). Remediasi Miskonsepsi Siswa dengan Model Pembelajaran Children Learning in Science (CLiS) Berbantuan Simulasi PhET. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa (JPPK)*, *7*(4), 1 -14.
Jankvist, U. T., & Niss, M. (2018). Counteracting destructive student misconceptions of mathematics. *Education Sciences*, *8*(2). https://doi.org/10.3390/educsci8020053
Kartika, Y. (2018). Analisis kemampuan pemahaman konsep matematis peserta didik kelas vii SMP pada materi bentuk aljabar. *Jurnal Pendidikan Tambusai*, *2*(2), 777–785.
Kowiyah, K., Mulyawati, I., & Umam, K. (2019). Conceptual Understanding and Mathematical Representation Analysis of Realistic Mathematics Education Based on Personality Types. *Al-Jabar : Jurnal Pendidikan Matematika*, *10*(2), 201–210. https://doi.org/10.24042/ajpm.v10i2.4605
Lanya, H. (2017). Retracted: Pemahaman Konsep Perbandingan Siswa Smp Berkemampuan Matematika Rendah. *APOTEMA : Jurnal Program Studi Pendidikan Matematika*, *3*(2), 53–57. https://doi.org/10.31597/ja.v3i2.142
Lea, L., Mantili, T. S., & Christin, E. (2022). Analisis Kemampuan Pemahaman Matematis Siswa pada Materi Turunan Fungsi Kelas XI SMA. *Juwara Jurnal Wawasan Dan Aksara*, *2*(1), 15–24. https://doi.org/10.58740/juwara.v2i1.35
Mahtuum, Z. A., Nurhayati, A., Hidayat, W., & Rohaeti, E. E. (2020). Analisis kemampuan pemahaman matematis siswa kelas vii smp budi luhur pada materi perbandingan. *Jurnal Pembelajaran Matematika Inovatif*, *3*(2), 137–144. https://doi.org/10.22460/jpmi.v3i1.p137-144
Marlena, L., & Nugrheni, E. A. (2019). Probit Regression Analysis in Estimating the Effect of Learning Assisted by Cabri 3D on Students' Mathematical Understanding Ability. *Al-*

Jabar : Jurnal Pendidikan Matematika, *10*(2), 319–326. https://doi.org/10.24042/ajpm.v10i2.4729

Maslihah, S., Waluya, S. B., Rochmad, Kartono, Karomah, N., & Iqbal, K. (2021). Increasing mathematical literacy ability and learning independence through problem-based learning model with realistic mathematic education approach. *Journal of Physics: Conference Series*, *1918*(4). https://doi.org/10.1088/1742-6596/1918/4/042123

Merangin, R. (2018). Analisis Kemampuan Pemahaman Konsep Matematika Mahasiswa PGSD STKIP Persada Khatulistiwa Sintang. *Jurnal Pendidikan Dasar Perkhasa: Jurnal Penelitian Pendidikan Dasar*, *4*(1), 91-105.

Nguyen, T. T., Trinh, T. P. T., Ngo, H. T. V., Hoang, N. A., Tran, T., Pham, H. H., & Bui, V. N. (2020). Realistic mathematics education in Vietnam: Recent policies and practices. *International Journal of Education and Practice*, *8*(1), 57–71. https://doi.org/10.18488/journal.61.2020.81.57.71

Nugraha, M. I., Handayani, S., & Sumarno. (2014). Implementasi Nilai Karakter Tokoh Werkudara Dalam Pembelajaran Sejarah. https://repository.unej.ac.id/xmlui/handle/123456789/6345

Putra, Y. Y., & Saputra, A. (2018). The applying of hypothetical learning trajectory (HLT) on comparison material using nisab Zakat theory toward the student's learning outcomes. *Al-Jabar : Jurnal Pendidikan Matematika*, *9*(2), 135–146. https://doi.org/10.24042/ajpm.v9i2.2950

Putra, R. W. P. (2023). Improving Students' Vocabulary Through Paper-Mode Quizizz: A Classroom Action Research in Indonesian EFL setting. *English Learning Innovation (englie)*, *4*(1), 22-31. https://doi.org/10.22219/englie.v4i1.24832

Qian, Y., & Lehman, J. (2017). Students' misconceptions and other difficulties in introductory programming: A literature review. *ACM Transactions on Computing Education*, *18*(1), 1–24. https://doi.org/10.1145/3077618

Rahmi, R. (2021). Pengaruh kemandirian belajar dan motivasi belajar melalui pembelajaran TPSq terhadap kemampuan pemahaman konsep siswa SMK. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(4), 2446–2457. https://doi.org/10.24127/ajpm.v10i4.4210

Rohmah, Z., Matematika, P., Islam, U., Sunan, N., & Yogyakarta, K. (2019). Penerapan Pembelajaran Matematika melalui Model Tutor Sebaya dengan Pendekatan Saintifik sebagai Upaya Meningkatkan Pemahaman Konsep dan Motivasi Belajar Siswa di Kelas Inklusif. *Suska Journal of Mathematics Education*, *5*(2), 149-158. https://doi.org/10.24014/sjme.v5i2.8171

Sari, H. M., & Afriansyah, E. A. (2020). Analisis Miskonsepsi Siswa SMP pada Materi Operasi Hitung Bentuk Aljabar. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(3), 439–450. https://doi.org/10.31980/mosharafa.v9i3.511

Sari, N. M. (2020). Analisis Kesulitan Siswa dalam Mengerjakan Soal Matematika Materi Perbandingan Kelas VII SMP Luhur Baladika. *Jurnal Equation: Teori Dan Penelitian Pendidikan Matematika*, *3*(1), 22–33.

Sari, W. P., Suyanto, E., & Suana, W. (2017). Analisis Pemahaman Konsep Vektor pada Siswa Sekolah Menengah Atas. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *6*(2), 159–168. https://doi.org/10.24042/jipfalbiruni.v6i2.1743

Septiani, L., & Pujiastuti, H. (2020). Analisis kemampuan pemahaman konsep matematis siswa sekolah menengah pertama berdasarkan gaya kognitif. *Media Pendidikan Matematika*, *8*(1), 28-41. https://doi.org/10.33394/mpm.v8i1.2567

Sudarman, S. W., & Vahlia, I. (2016). Efektifitas penggunaan metode pembelajaran quantum learning terhadap kemampuan pemahaman konsep matematis mahasiswa. *Al-Jabar: Jurnal Pendidikan Matematika*, *7*(2), 275-282. https://doi.org/10.24042/ajpm.v7i2.42

Sujadi, A., & Kholidah, I. R. (2018). Analisis Pemahaman Konsep Matematika Siswa Kelas V dalam Menyelesaikan Soal di SD Negeri Gunturan Pandak Bantul Tahun Ajaran 2016/2017. *Trihayu: Jurnal Pendidikan Ke-SD-An*, *4*(3), 428–431.

Supriadi, N., Ramadona, K., Pratiwi, D. D., & Widyawati, S. (2020). Concept Understanding and Mathematic Problem Solving Skills in Algebraic Materials: the Effect Of Dragonbox Game Assisted DMR Of Covid-19. *Al-Jabar : Jurnal Pendidikan Matematika*, *11*(1), 191–198. https://doi.org/10.24042/ajpm.v11i1.8332

Trung, N. T., Thao, T. P., & Trung, T. (2019). Realistic mathematics education (RME) and didactical situations in mathematics (DSM) in the context of education reform in Vietnam. *Journal of Physics: Conference Series*, *1340*(1), 1-14. https://doi.org/10.1088/1742-6596/1340/1/012032

Unaenah, E., & Sumantri, M. S. (2019). Analisis Pemahaman Konsep Matematis Siswa Kelas 5 Sekolah Dasar Pada Materi Pecahan. *Jurnal Basicedu*, *3*(1), 106–111. https://doi.org/10.31004/basicedu.v3i1.78

Utami, R. (2019). Analisis Miskonsepsi Siswa Dan Cara Mengatasinya Pada Materi Bentuk Aljabar Kelas VII-C SMP Negeri 13 Malang. *JPM : Jurnal Pendidikan Matematika*, *3*(1), 37. https://doi.org/10.33474/jpm.v3i1.2606

Watratan, Y., Ratuanik, M., & Srue, O. (2021). Leibniz: Jurnal Matematika. *Jurnal Matematika*, *1*(1), 21–35. https://doi.org/10.59632/leibniz.v1i1.50

Widodo, A. N. A. (2021). Pengaruh kemandirian dan aktivitas model PBL berbantuan google classroom terhadap kemampuan pemahaman konsep. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(4), 2757–2764. https://doi.org/10.24127/ajpm.v10i4.4279

Yana, A. U., Antasari, L., & Kurniawan, B. R. (2020). Analisis Pemahaman Konsep Gelombang Mekanik Melalui Aplikasi Online Quizizz. *Jurnal Pendidikan Sains Indonesia*, *7*(2), 143–152. https://doi.org/10.24815/jpsi.v7i2.14284

Yanti, S. (2019). Upaya meningkatkan pemahaman konsep matematika melalui diskusi kelompok berbantuan alat peraga. *Jurnal Pendidikan Matematika dan IPA*, *10*(1), 63- 73. https://doi.org/10.26418/jpmipa.v10i1.29658

Yuningsi, Y., Syamsu, S., & Darmadi, I. W. (2021). Pengaruh Metode Eksperimen Diskusi terhadap Pemahaman Konsep Fisika Siswa Kelas VII SMP Negeri 9 Palu. *Jurnal Kreatif Online*, *9*(1), 140-149.