**Article**

## ANALYSIS OF UNDERSTANDING OF ALGEBRA CONCEPTS OF VII GRADE STUDENTS OF LEARNING STYLES

Iis Afidah[1], Maryono[2]

*Tadris Matematika, Pascasarjana UIN Sayyid Ali Rahmatullah Tulungagung*
*Jl. Mayor Sujadi No. 46, Plosokandang, Tulungagung*

*e-mail: afidahiis11@gmail.com[1], mario_stain@yahoo.com[2]*

**ABSTRACT**

There are some students who feel it difficult to understand Algebra materials which finally make their understanding in Algebra concepts weak. Moreover, Algebra is a new material for them since in Elementary School they only knew that Maths is a science which only talks about numbers, but now in this Algebra materials they will find out that Maths does not only talk about operation of numbers, but also operation of letters that can be found in Algebra. For the seventh grade students, Algebra is very important since it is basic material that they can use for the further materials which are more complicated. Thus, students should have good understanding in Algebra concepts. One way that can be use to optimize students' conceptual understanding is to know their learning styles. The aim of this research is to describe students' conceptual understanding in Algebra based on their learning styles. The approach used in this research is qualitative and it is a study case of the seventh grade. The data are collected by giving questionnaire of students' learning styles, conceptual understanding test, and interview. To analyze the data, there are some techniques used. They are data reduction, data presentation, and conclusion. The results of this research are: 1) Students who have visual learning style are able to meet the indicators of understanding multistructural concepts. They can identify elements of Algebraic forms and do operations of addition and substraction in Algebraic forms correctly. 2) Students who have auditory learning style are able to meet the indicators of understanding unistructural concepts because they are only able to identify elements of Algebraic forms correctly. Furthermore, students still do some mistakes when they operate negative numbers in Algebraic forms. 3) Students who have auditory learning style are able to meet the indicators of understanding unistructural concepts. Students are able to identify elements of Algebraic forms correctly, but they have some problems in doing operations of addition and substraction in Algebraic forms.

**Key words:** Conceptual Understanding, Algebra, Learning Style.

## INTRODUCTION

Mathematics as one of the basic sciences, both the applied aspect and the reasoning aspect, which has an important role in efforts to master science and technology (Lisna Agustina, 2016: 1). For this reason, mathematics is an important subject for students to prepare for the future. On the other hand, mathematics is an abstract subject, so in studying it it is necessary to have clear thinking logically and good mathematical language (Inna Rohmatun K. and A.A. Sujadi, 2018: 428). Because mathematics is an abstract subject, it requires a really mature

understanding of concepts to understand it. The phenomenon in the field indeed states that mathematics is one of the subjects that students tend to regard as a frightening specter. They think mathematics is a subject that is complicated and difficult to understand because there are many formulas in it. Such an assumption arises because of a lack of understanding of concepts in students.

Understanding of mathematical concepts must be mastered first, so that it can easily study the material received to be able to solve existing problems, and it will be easier to accept the next new concept. Thus, understanding the concept is an important element in learning mathematics. Mastery of understanding concepts, allows students not only to be able to count and memorize formulas, but also to have the ability to solve problems in everyday life both simple and complex. For example, a concept in Algebra. Whether we realize it or not, in fact most people have used algebraic concepts in their daily lives. An introduction to the concept of Algebra is given to students of class VII Junior High School (SMP). This is also a challenge in itself, because those who are in class VII are those who are completely unfamiliar with the concept of Algebra. Algebra material is new material for them, previously in elementary school they only knew mathematics limited to counting numbers, now in Algebra material they are starting to know mathematics which also contains letters in it to be operated as usual numbers. This cannot be underestimated because the Algebra material in class VII is the basic material that will continue to be related to the following mathematical materials. So students must have a really mature understanding of Algebraic concepts. One way to optimize students' understanding of concepts is to know their learning styles. By knowing the learning style of each student can find ways to be able to absorb understanding optimally. Therefore, the purpose of this research is to describe students' understanding of Algebra concepts in terms of visual, affective, and kinesthetic learning styles.

Concept understanding is the ability to be able to explain the interrelationships between concepts and apply these concepts in a flexible, accurate, efficient, and precise manner in solving problems (Wardhani in Yuyun Wahyuni, 2016: 6). It can be concluded that conceptual understanding is an ability to understand an idea that is actually abstract to be connected and applied to a concrete problem. In the process of learning mathematics, understanding concepts is an important thing for a student to master. The indicator of understanding the concept used is based on the SOLO Taxonomy. The SOLO (Structure of The Observed Learning Outcome) taxonomy was developed by Biggs and Collis (Anita Dwi Utami, 2020:12). The SOLO taxonomy is a way to classify student performance in understanding the concepts they have received in learning. The SOLO taxonomy has five levels as follows (Anita Dwi Utami, 2020:14). 1) Prastructural, 2) Unistructural, 3) Multistructural, 4) Relational, 5) Extended Abstract. The SOLO taxonomy can be used as an instructional as well as an evaluative tool (Gasela Marisa, 2020:79). In its use the SOLO Taxonomy is used as an available instrument for assessing quality retrospectively in a way that is easily understood by students and teachers. With this indicator, students can easily categorize students' understanding of concepts based on their answers in solving existing problems, so the researchers used the SOLO Takonomy in this study.

**Table 2.1 Indicators of the SOLO Taxonomy Level in Algebra Material**

| No. | SOLO Taxonomy Level | Indicators |
|-----|---------------------|------------|
| 1. | Prestructural Level | Do not understand Algebraic forms, addition, subtraction, multiplication, and division of Algebraic forms. |
| 2. | Unistructural Level | Understanding Algebraic forms, but do not understand addition, subtraction, multiplication, and division of algebraic forms. |
| 3. | Multistructural Level | Understanding Algebraic forms and addition |

| | | operations, subtraction of Algebraic forms, but do not understand the operations of multiplication and division of algebraic forms. |
|---|---|---|
| 4. | Relational Level | Understanding Algebraic forms and addition, subtraction, and multiplication of Algebraic forms, but do not understand the operation of division of Algebraic forms. |
| 5. | Abstract Extended Level | Understand Algebraic forms, addition, subtraction, multiplication, and division of Algebraic forms. |

Algebra is a form of mathematics that was created to make it easier to present problems by using letters as unknown variables in a calculation (Meliana Safitri, 2021:77). Studying Algebra in class VII is indeed a new thing, but more attention should be paid because this material is the basic provision for understanding further mathematical concepts. One way to optimize students' understanding of concepts is to know their learning styles. Learning style is a combination of a person's way of absorbing information, then organizing information, and processing this information to become meaningful (DePorter and Hernacki), which groups it into three learning styles, namely visual, auditory, and kinesthetic.

**METHOD**

Research methods The approach to this study is a qualitative approach, namely an approach based on postpositivism philosophy used to examine the condition of natural objects, with the researcher as the key instrument for purposive and snowball sampling of data sources, triangulation of inductive/qualitative data analysis which emphasizes more on the meaning of generalization (Sugiyono, 2016:15). The purpose of qualitative research is to describe, explore and explain phenomena during the study. Judging from the problems discussed in this study, namely "Analysis of Understanding of Algebraic Concepts of Class VII Students in View of Learning Styles", the researcher used a case study type of research. Researchers are key instruments (key-instruments) in research (Muri Yusuf, 2014: 332). In qualitative research, the presence of the researcher is very important, because it is the researcher who will make the observations, make notes, use the supporting tools in the research. Researchers act as instruments as well as data collectors and observers of the processes that occur. To get the most complete data, the researcher interacts in the field to see, observe, and identify the object of his research directly. Collaborate with teachers and students involved in research. In the data collection process, researchers used observations, tests, and interviews with students who were the object of research. Starting from the observation process to find out student learning styles, the process of students completing tests in the form of math questions on Algebra material, then collecting data in the form of analysis from the results of interviews with students about how to solve the questions used, and also interviews with related teachers. Therefore, success in research is largely determined by the ability of researchers. The data analysis technique in this study refers to the data analysis technique of the Milles and Huberman models (Sugiyono, 2016: 337), which consists of data reduction, data presentation, and drawing conclusions. Qualitative research is research that does not yet have a clear problem or desire, but can directly enter the field or object of research. After entering the research object in the early stages, the researcher still sees everything that exists in general, only in the second stage begins to focus on something that is considered important, useful and new. The stages of this qualitative research procedure research which refers to the stages of John Creswell's research are as follows. The chosen topic needs to be investigated or it can be changed, the topic appears during the research involved in the research and setting. From books or journals research results, personal experiences and wishes relevant to this research, or replications of existing research.

**RESULTS AND DISCUSSION**

The research was carried out from Monday, 4-10 April 2022 which was attended by 15 students of class VII. From the results of completing the learning style questionnaire, students were grouped according to their respective learning styles, namely visual, auditorial, and kinesthetic. There are 6 students with an auditory learning style, 5 students with a visual learning style, and 4 students with a kinesthetic learning style as presented in table 4.1 as follows.

**Table 4.1 List of Students Learning Styles Questionnaire Results**

| No. | Students Code | Learning Style |
|-----|---------------|----------------|
| 1.  | AAS | Visual |
| 2.  | MMF | Visual |
| 3.  | MHN | Visual |
| 4.  | YAA | Visual |
| 5.  | RHY | Visual |
| 6.  | NSH | Auditory |
| 7.  | JKN | Auditory |
| 8.  | ASP | Auditory |
| 9.  | ODR | Auditory |
| 10. | RDR | Auditory |
| 11. | SFA | Auditory |
| 12. | MAH | Kinesthetic |
| 13. | IAR | Kinesthetic |
| 14. | BPA | Kinesthetic |
| 15. | RDW | Kinesthetic |

The next stage of research, namely testing students' understanding of Algebraic concepts. Tuesday, April 5, 2022 a test for understanding the concept of Algebra for class VII students. The test was given to research subjects which consisted of questions on understanding Algebraic concepts which were in accordance with indicators of understanding concepts based on the SOLO Taxonomy (Structure of The Observed Learning Outcome). In the SOLO Taxonomy students' understanding of concepts is grouped into five levels, namely prestructural, unistructural, multistructural, rational, and extended abstract.

**Table 4.2 List of Participants Codes and Test Result for Understanding Algebraic Concepts**

| No. | Participants Code | Score | | | | Categori |
|-----|-------------------|-------|-------|-------|-------|----------|
|     |                   | Q1 (Maks. 20) | Q2 (Maks. 20) | Q3 (Maks. 30) | Q4 (Maks. 30) | |
| 1.  | AAS | 16 | 7  | 5  | 3 | *Unistructural* |
| 2.  | MMF | 20 | 15 | 15 | 0 | *Multistructural* |
| 3.  | MHN | 20 | 20 | 15 | 3 | *Multistructural* |
| 4.  | YAA | 20 | 20 | 17 | 0 | *Multistructural* |
| 5.  | RHY | 16 | 10 | 5  | 3 | *Unistructural* |
| 6.  | NSH | 0  | 0  | 5  | 0 | *Prastructural* |
| 7.  | JKN | 16 | 10 | 15 | 3 | *Unistructural* |
| 8.  | ASP | 16 | 15 | 10 | 0 | *Unistructural* |
| 9.  | ODR | 20 | 20 | 20 | 3 | *Multistructural* |
| 10. | RDR | 20 | 10 | 10 | 0 | *Unistructural* |
| 11. | SFA | 20 | 7  | 5  | 0 | *Unistructural* |
| 12. | MAH | 16 | 10 | 15 | 0 | *Unistructural* |
| 13. | IAR | 20 | 20 | 10 | 0 | *Multistructural* |
| 14. | BPA | 16 | 15 | 10 | 3 | *Unistructural* |

| 15. | RDW | 20 | 10 | 5 | 0 | *Unistructural* |

The results of the implementation of the concept understanding test obtained data, 1 student at the prestructural level, 9 unistructural students, and 5 multistructural students out of a total of 15 students who took the test. Based on the data that has been collected from tests of understanding the concepts and learning styles of each student, the researcher determines the research subject. Researchers took research subjects from each learning style and took 2 students as research subjects, so that the total number of research subjects was 6 students. The six subjects will continue with the next research stage, namely an interview on Wednesday, April 6, 2022. The following is the student code that will be the research subject.

**Table 4.3 List of Participant Codes of Subjects Research**

| No. | Code | Subject | Learning Style | Categori | |
|---|---|---|---|---|---|
| | | | | **Tes 1** | **Tes 2** |
| 1. | MHN | SV1 | Visual | *Multistructural* | *Multistructural* |
| 2. | YAA | SV2 | Visual | *Multistructural* | *Multistructural* |
| 3. | JKN | SA1 | Auditory | *Unistructural* | *Unistructural* |
| 4. | RDR | SA2 | Auditory | *Unistructural* | *Unistructural* |
| 5. | RDW | SK1 | Kinesthetic | *Unistructural* | *Unistructural* |
| 6. | MAH | SK2 | Kinesthetic | *Unistructural* | *Unistructural* |

Based on the results of the conceptual understanding tests and interviews, it can be concluded that students with visual, auditory, and kinesthetic learning styles in understanding the concept of Algebraic forms are still low, it is found that students with a visual learning style are one level superior to students with auditory and kinesthetic learning styles. Students who have a visual learning style in this study have achieved a multistructural level conceptual understanding, students who have an auditory learning style in this study have achieved a unistructural level conceptual understanding, and students who have a kinesthetic learning style have an understanding of the concept at the unistructural level. Students with a visual learning style in the process of working on problems are more structured and systematic than students with other learning styles, they have a high interest in reading and good memory skills. Students with a visual learning style are able to remember visual associations well, both through writing on the blackboard and they also like to read (Erlando Doni S., 2017: 208). Students with an auditory learning style are still confused in operating the reduction of algebraic forms, because in the learning process there are some students who create a noisy atmosphere in the class so that auditory students are disturbed. Meanwhile, students with a kinesthetic learning style have a lack of conceptual understanding because they cannot fully understand the operation of negative numbers in algebraic form. Students with a kinesthetic learning style learn by increasing practice questions, but these kinesthetic students rarely work on practice questions given by the teacher so that their understanding of the concept is low.

**CONCLUSION**

Students with a visual learning style are able to fulfill indicators of understanding Algebraic concepts at the multistructural level. Students with an auditory learning style are able to meet indicators of understanding Algebraic concepts at the unistructural level. Students with a kinesthetic learning style are able to fulfill indicators of understanding Algebraic concepts at the unistructural level. As for some suggestions that will be given by researchers to several parties as follows. For Students For students, they should pay close attention to the teacher's explanation during learning and also do the assignments that have been given by the teacher as well as possible and better understand the characteristics of their respective learning styles so that they can carry out learning activities properly and obtain optimal understanding of concepts. 2. For Subject Teachers The current learning system the role of the teacher is still very dominant and

pays little attention to the different learning styles of students. Teachers should know and understand the characteristics of the learning styles of their students so that they can be adapted to the methods and media that will be used in learning, so that optimal learning is achieved. 3. For Further Researchers For future researchers to pay more attention to students' learning styles that affect their understanding of algebraic concepts, both visual, auditory, and kinesthetic learning styles.

## REFERENCES

Agustina, Lisna. 2016. "Upaya Peningkatan Kemampuan Pemahaman Konsep dan Pemecahan Masalah Matematika Siswa SMP Negeri 4 Sipirok Kelas VII Melalui Pendekatan Matematika Realistik" dalam *Jurnal Eksakta*, Vol. 1:1.

Anggito, Albi dan Setiawan, Johan. 2018. *Metodologi Penelitian Kualitatif*. Jawa Barat: CV. Jejak.

Apipah, Salisatul. 2021. *Analisis Kemampuan Koneksi Matematis Berdasarkan Gaya Belajar Siswa Model Pembelajaran Visual Auditori Kinestetik Dengan Self Assesment*. Jawa Tengah: CV. Tahta Media Group.

Baety, Dwinda Nur dan Munandar, Dadang Rahman. 2021. "Analisis Efektifitas Pembelajaran Daring Dalam Menghadapi Wabah Pandemi Covid-19" dalam *Edukatif: Jurnal Pendidikan*. Vol. 3. No. 3:881.

Sirait, Erlando Doni. 2017. "Pengaruh Gaya dan Kesiapan Belajar terhadap Pemahaman Konsep Matematika Siswa". *Jurnal Formatif*. Vol.07. No. 3:208.

Fajar, Ayu Putri, dkk. 2018 "Analisis Kemampuan Pemahaman Konsep Matematis Siswa Kelas VIII SMP Negeri 17 Kendari" dalam *Jurnal Pendidikan Matematika*. Vol.9 No. 2: 229.

Fathoni, Abdul Halim. 2012. *Matematika Hakikat dam Logika*. Jogjakarta: Ar-Ruzz Media.

Ilela, Nathalia, dkk. 2021. "*Model pembelajaran Core, Scramble, Hasil belajar, dan Operasi Hitung Bentuk Aljabar*" dalam *Journal of Honai Math*. Vol. 4, No. 1:84.

Marisa, Gesela, dkk. 2020. " Analisis Kesalahan Siswa dalam Menyelesaikan Soal Operasi Aljabar Berdasarkan Taksonomi SOLO" dalam *Jurnal Pendidikan Matematika*. Vol.11, No.1:79.

Rohmatun K., Inna. dan Sujadi, A.A. 2018. "Analisis Pemahaman Konsep MatematikaSiswa Kelas V Dalam menyelesaikan Soal Di SD Negeri Gunturan Pndak Bantul Tahun Ajaran 2016/2017" dalam *Trihayu: Jurnal Pendidikan Ke-SD-an*, Vol. 4, No. 3:428.

Safitri, Meliana, dkk. 2021. " Analisis Kesulitan Siswa SMP Kelas 7 dalam Menyelesaikan Soal Cerita Operasi Aljabar Ditinjau dari Gender"dalam *Jurnal Pendidikan dan Konseling*. Vol.3, No.2:77.

Sugiyono. 2016. *Metode Penelitian Pendidikan*. Bandung: CV. Alfabeta.

Sirait, Erlando Doni. 2017. "Pengaruh Gaya dan Kesiapan Belajar terhadap Pemahaman Konsep Matematika Siswa". *Jurnal Formatif*. Vol.07. No. 3:208.

Wahyuni, Yuyun. 2016. "Analisis Pemecahan Kemampuan Pemahaman Konsep Matematis Siswa pada Materi Sintem Persamaan Linear Dua Variabel Kelas VIII SMP Negeri 2 Padamara". FKIP UMP.