International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Students' Mathematical Connection Ability through the Problem Posing Approach Based on Learning Styles

Meutia[a*], M. Ikhsan[b], Bahrun[c]

[a,b,c]*Deparment of Mathematics Education, Syiah Kuala University, Banda Aceh*

[a]*Email: Meutia12081993@gmail.com*

Abstract

Mathematical connection ability is the ability to associate mathematical concepts both between topics in mathematics itself and to associate mathematical concepts with concepts in other fields. Without a mathematical connection, students must learn and remember too many separate mathematical concepts and procedures. Therefore, teachers in the learning process need to develop students' mathematical connection ability, for example through the application of a problem posing approach. This study aims to determine students' mathematical connection ability based on each student's learning style in mathematics learning. This research is a descriptive study that aims to describe the mathematical connection ability through a problem posing approach based on learning styles on quadrilateral material. The subjects in this study were students of class VII-2 of SMP 4 Banda Aceh who were selected based on fulfiling the four indicators, fulfilling some indicators and not fulfilling the indicators of mathematical connection ability. The data collection techniques used in this study were questionnaires, interviews and tests of mathematical connection skill. The data was analyzed by reducing data, presenting data and drawing conclusions. The results show that students who have a visual learning style fulfill their connection ability in mathematics, intertopic connections in mathematics, connections between mathematical material and other sciences besides mathematics, as well as connections between mathematics and everyday life. Students who have a visual learning style can write steps to solve problems systematically and can solve problems from all the test questions. Students who have an auditory learning style only master the connection indicators in mathematics and intertopic connections in mathematics. Students who have auditory learning styles can write steps to solving problems systematically but do not write complete solutions. Students who have a kinesthetic learning style fulfill connection skill in mathematics, intertopic connections in mathematics, and connections between mathematics and everyday life. Students who have kinesthetic learning styles prefer to think while doing something.

---

* Corresponding author.

Keywords: mathematical connection ability; learning style; problem posing approach.

1. Introduction

Mathematics is a very important and useful science that can be applied in various fields of life so that everyone can feel the benefits of learning mathematics, both at school, in the work environment, and in everyday life [1]. The purpose of learning mathematics itself is that students are able to use or apply mathematics which they learn in their daily lives and learn other knowledge [2]. Thus it can be concluded that mathematical connections are part of the purpose of learning mathematics in mathematics learning.

Mathematical connections are very important in mathematics learning because mathematical connections are one aspect of mathematical abilities that must be achieved through mathematics learning activities [3]. Because by knowing the relationships mathematically, students will better understand mathematics and it also gives them greater mathematical power. Mathematical connections can help and support students in the learning process of mathematics [4]. Without mathematical connections, students must learn and remember too many separate concepts and mathematical procedures [5]. If students are able to associate mathematical ideas, their mathematical understanding will be deeper and longer lasting because they are able to see the interrelationships between topics in mathematics with topics outside mathematics in everyday life [5].

The occurrence of student difficulties in mathematical connections is influenced, among others, by learning styles because a person's learning style determines how students can absorb something through their senses among their five senses, which senses are more developed when the learning process takes place [6]. Learning style is a method chosen by someone to facilitate the processing of information provided. Thus, with the existence of different learning styles, it is possible for students to ask different questions according to the method used in receiving information [7]. Therefore, student learning style is one of the important components to be known by the teacher as the uniqueness possessed by students in the teaching and learning process, because the learning styles that students have affect the learning process which takes place [8].

In fact, in their learning students still find it difficult to connect the material learned with the prerequisite material that they master [6]. The research by Ainurrzqiyah [9] found that students have difficulty in connecting the concepts previously known by students to new concepts that students will learn. The concepts that have been learned do not last long in the memories of students; consequently the students' ability to connect is not optimal [10]. The result of research by Rohendi [11] shows that mathematical connections are needed so that students can associate connections between mathematics and mathematics itself, mathematics with other subjects and mathematics with real-world problems. This is because the approach to mathematics learning that has been used so far does not provide opportunities for students to develop students' connection ability, or it can be said that they have never been trained connection ability.

In mathematics learning, students needs to be given the opportunity to develop mathematical connection skills [12]. In classroom learning, there are many learning approaches used in the learning process; one of the learning approaches that can help the teacher connect the material taught with students' real-world situations and

encourage students to make connections between their knowledge and application in daily life and develop students' confidence is the problem posing learning approach. Problem posing is formulating or submitting mathematical questions from a given situation, both submitted before, during or after problem solving [13]. Learning using the problem posing approach is one of the learning approaches where the teacher explains the lesson, gives practice exercises and groups students in heterogeneous learning groups and then students are asked to ask questions and explain the problem in front of the class, so that students mutually interact and mutually help [14]. In the learning process, the success of learning in solving a problem that can be achieved by students depends not only on the learning process but also on the factors of the students themselves that hinder and support the success of students, including student learning styles. DePorter [15] categorizes a person's learning style seen from the tendency of his behavior into three categories, namely visual, auditory, and kinesthetic.

Based on the research by [1], it is explained that the application of the problem posing approach is effective in terms of learning achievement and mathematical connection ability. Based on [16] research, it was concluded that the students' high-level thinking skills in terms of visual, auditory and kinesthetic learning styles belong to the less/low category. However, previous studies have not discussed in depth about students' mathematical connection ability through a problem posing approach based on learning styles. So the researcher is interested to discuss further about the mathematical connection ability with the problem posing approach which in this research is a post solution posing which asks students to submit or make a new problem (problem) after completing the initial problem given according to the information available. And reviewed based on visual learning style, auditory learning style and kinesthetic learning style. Based on the description that has been stated, then the formulation of the problem in this paper is as follows: How is the mathematical connection ability of students based on each student's learning style in mathematics learning with the problem posing approach?

2. Methods

This research is a type of descriptive research that uses descriptive research methodology. The research was conducted at SMP 4 Banda Aceh. The subject in this study was carried out based on the results of the learning style questionnaire shared by students. This study selected 3 students of class VII-2 based on the equality of questionnaire scores for other learning style indicators. The topic of discussion described in this study is the mathematical connection ability of students through the problem posing approach based on student learning styles. Data collection methods used in this study were questionnaires, interviews, and tests of mathematical connection ability. Questionnaires are used to collect data on each student's learning style. The questionnaire method is equipped with alternative answers, so students choose one of the answers provided. Instrument scoring was made using a Likert scale with four alternative answers. The answer to each question is with a gradation of values ranging from positive to negative in the form of words. Interviews conducted in this study are unstructured interviews, namely free interviews where researchers do not use interview guidelines that have been arranged systematically and completely. This interview serves as a follow-up to the provision of test experienced during the process of solving mathematical problems, so that it can be adjusted to the results of the questionnaire. The test consists of four essay questions that meet the four indicators of mathematical connection

ability. Data analysis techniques include data reduction, data presentation and conclusion drawing.

3. Result and discussions

The following are the results of the students' mathematical connection ability test after the application of the problem posing approach based on student learning styles.

Table 1: The results of the students' mathematical connection ability test after the application of the problem posing approach based on student learning styles

Subject	Final Test Total Score	Student's Final Test Score	Learning Style
AA	44	92	Visual
NE	25	52	Auditory
IH	34	71	Kinesthetic

Table 2: The Results of each indicator of mathematical connection ability

Indicator	Learning Style		
	Visual (AA)	Auditory (NE)	Kinesthetic (IH)
Connection in mathematics	√	√	√
Connection between topics in mathematics	√	√	√
Connection between mathematical material and other sciences	√	-	-
Connection between mathematics and everyday life	√	-	√

The following are the descriptions of each indicator of students' mathematical connection abilities in terms of learning styles:

3.1. Mathematical connection ability in terms of visual learning style

Based on table 1, it can be seen that the total value of mathematical connection ability in visual learning style student is 92. The value is in the very good category. This shows that the student with visual learning styles has a very good level of connection ability in mathematics. As shown in table 2, for the questions of mathematical

connections on indicator 1, the students is very able to connect concepts into mathematics, understand and provide information in mathematics. This is based on the student's connection ability to use images in his brain and learn faster using visuals, such as images, diagrams, tables and more. He takes very detailed notes to get all the information, needs comprehensive views and goals and is alert before mentally feeling confident about a problem. For the problem on indicator 2, student AA with visual learning styles can answer the questions well so that he gets the maximum score. This shows that the student with visual learning styles has good intertopic connection skill in mathematics. The students is able to judge, deny, or support an idea and provide reasons that can strengthen the answers obtained well. Regarding the problem on indicator 3, student AA with visual learning styles can work on the questions well so that he gets the maximum score. This is because the student understands sciences other than mathematics such as physics, so that in connecting mathematical concepts with other sciences the student is able to apply the problem solving procedure properly and correctly. Regarding indicator 4, student AA with visual learning styles can solve the problem well so that he gets the maximum score. This shows that the student with visual learning styles has a good level of connection between mathematics and daily life. The students is able to connect problems in everyday life by using quadrilateral material concepts and procedures. The students who has a visual learning style can write steps to solve the problem systematically and clearly. The research subject with visual learning styles prefers to think using illustrations and is neat, so that when making a solution to a problem he is accustomed to making illustrations first. This is in line with De Porter [17] regarding the characteristics of a visual learner, that is, regular, paying attention to everything, maintaining appearance. remembering with pictures, preferring to read rather than to be read, requires an overall picture and purpose and capturess details, remembering what is seen. It can be concluded that student's mathematical connection ability with visual learning styles including indicators is fulfilled because the student with visual learning styles can solve problems from all test questions. Another characteristic possessed by the student with visual learning styles is that he or she can systematically write steps to solve problems.

3.2. Mathematical connection ability of students in terms of auditory learning styles

Based on table 1, it can be seen that the total value of mathematical connection ability in the auditory learning style student is 52. This value is in the average category. This shows that the student with auditory learning styles has an average level of connection ability in mathematics. As shown in table 2, for the questions of mathematical connections on indicator 1, the student is very able to connect concepts to mathematics, understand and provide information in mathematics. This is based on the student's ability to memorize faster by reading texts or listening to sounds. The students can dig up information by saying it repeatedly, so that he feels he can understand the information he reads faster. Regarding indicator 2, student NE with auditory learning styles can answer the questions well. This shows that the student with auditory learning styles has a lack of inter-academic connection skill in mathematics. Student NE is able to judge, deny, or support an idea and provide reasons that can strengthen the answers obtained. The ability of interopic connections in mathematics can be done if the student is able to connect the quadrilateral concept to the previous material concepts, understand the material being taught by linking the previous material and providing strong evidence/evidence. But because of the weakness of auditory-style students, which is weak in visual activity, it is certain that student NE is able to connect between students in mathematics. Concerning the problem on indicator 3, student NE with

auditory learning styles cannot answer the questions well. This is certainly due to the student's low understanding of the mathematical concept with other sciences. Concerning indicator 4, student NE with auditory learning styles cannot solve the questions well so he gets a score that is not optimal. This shows that the student with auditory learning styles has a lack of connection ability between mathematics and everyday life. The student is less able to connect problems in daily life using quadrilateral concepts and procedures. The ability of mathematical connections in terms of auditory learning styles has characteristics that are almost the same as students with visual learning styles when making a problem solving. The students with auditory learning styles can systematically write down the problem solving steps but does not write a complete solution. The research subject with auditory learning styles prefers to think quickly, when understanding the problem in the question. The students with auditory learning styles likes to move his lips/voices. This is in line with the statement of De Porter [17] regarding one of the characteristics of an auditory learning, that is, gathering information that is read aloud and may not comprehensively understand written information. Based on the results of the above analysis, it can be concluded that the student's'mathematical connection ability with audiori learning styles is still under that with visual and kinesthetic learning styles. In solving test questions, the auditory learning style student is not careful, because he prefers to think quickly. Another characteristic possessed by the student with auditory learning styles is that he or she can write steps to solve problems systematically but does not write complete solutions.

3.3. Mathematical connection ability of students in terms of kinesthetic learning styles

Based on table 1, it can be seen that the total value of mathematical connection ability in the student with kinesthetic learning style is 71. This value is in the good category. This shows that the student with kinesthetic learning styles has a good level of connection ability in mathematics. As shown in table 2, for the questions of mathematical connections on indicator 1, the student is very able to connect concepts into mathematics, understand and provide information in mathematics. This is based on the students' ability to learn through manipulating and practice, using fingers or underlining as a pointer when reading. The student digs information by highlighting the points he reads, so the student feels he can analyze the information he reads faster. For the problem on indicator 2, student IH with kinesthetic learning styles can answer the questions well. This shows that student IH with kinesthetic learning styles have good intertopic connection skill in mathematics. This is because student IH is able to assess, deny, or support an idea and provide reasons that can strengthen the answers obtained. The ability of intertopic connections in mathematics can be done if the student is able to connect the quadrilateral concept to the previous material concepts, understand the material being taught by linking the previous material and providing strong reasons/evidence. Regarding indicator 3, student IH with kinesthetic learning styles cannot work on the problem well. This is certainly due to the students' low understanding of mathematical concepts with other sciences because of the weaknesses of kinesthetic-style students, namely learning with physical activity, so it can be ascertained that the student with kinetic learning styles will be less able to evaluate information without meaningful physical activity. Regarding indicator 4, student IH with kinesthetic learning styles can solve the questions well so that he gets the maximum score. This shows that student IH with kinesthetic learning styles has less ability to connect mathematics to everyday life. Student IH cannot connect problems in daily life using quadrilateral concepts and procedures. The student with kinesthetic learning style prefers to think while doing something, when understanding the problem in the

question the student with kinesthetic learning styles likes to refer to the writing he reads. This is in line with the explanation of De Porter [17] regarding one of the characteristics of a kinetic learner, namely collecting information that is read while doing something, pointing to writing while reading, responding physically. Based on the result of the above analysis, it can be concluded that students' mathematical connection ability with kinesthetic learning styles is still lower than that with visual learning styles and higher than that with auditory. In solving test questions, the student with kinesthetic learning styles is not careful, because he or she prefers to think rather than do things. Another characteristic that the student with kinesthetic learning styles has is that he or she prefers to think while doing something.

4. Conclusion and recommendation

Based on the result of the research it can be concluded that the student with visual learning styles fulfills connection ability in mathematics, intertopic connections in mathematics, connections between mathematical material and other sciences other han mathematics, and connections between mathematics and everyday life. The student who has visual learning styles can write steps to solve problems systematically and can solve problems from all test questions. The student who has auditory learning styles only masters the connection indicators in mathematics and intertopic connections in mathematics. The student who has auditory learning styles can write steps to solve problems systematically but does not write complete solutions. The student who has a kinesthetic learning style fulfills connection skills in mathematics, intertopic connections in mathematics, and connections between mathematics and everyday life. The student who has kinesthetic learning styles prefers to think while doing something. Thus, efforts should be made to foster students' mathematical connection ability through the problem posing approach based on learning styles carried out continuously and consistently so that students' mathematical connection ability can develop well.

Based on the conclusions described, some suggestions can be given as follows:

(1) In the teaching and learning process teachers should use a fun learning approach.

(2) This research is only limited to quadrilateral material, expected by other researchers to develop learning with a problem posing approach to mathematical abilities and other appropriate material.

(3) Further research is expected not only to test the questions, the RPP and LKPD should also be tested.

References

[1] Setyaningsih, E. & Djamilah, B. W. (2015). Kefektifan pendekatan problem posing ditinjau dari prestasi belajar, kemampuan koneksi matematis, dan disposisi matematis. Jurnal Pendidikan Matematika. 10(1), hal. 28-37.

[2] Rismawati, M., Irawan, E.B., & Susanto, H. (2016). Analisis Kesalahan Koneksi Matematis Siswa pada Materi Sistem Persamaan Linier Dua Variabel. Jurnal, hal. 126-134. ISSN 2502-6526.

[3] Romli, M. (2016). Profil Koneksi Matematis Siswa Perempuan SMA dengan Kemampuan Matematika Tinggi dalam Menyelesaikan Masalah Matematika. Journal of Mathematics Education, Sciense and

Technology. 2(1), hal. 144-163.

[4] Wilburne, J.M. and Napoli, M. 2008. Connecting mathematics and literature: an analysis of pre-servise elementary school teacher's changing beliefs and knowledge. Journal issues in the undergraduate mathematics preparation of school teachers, 2, hal. 1-10.

[5] National Council of Teacher of Mathematics. 2000. Principles and Standards for School Mathematics. Reston, VA: Author.

[6] Apipah, S., & Kartono. (2017). Analisis kemampuan koneksi matematis berdasarkan gaya belajar siswa pada model pembelajaran vak dengan self assessment. Unnes Journal of Mathematics Education Research. 6(2), hal. 148-156.

[7] Saraswati, N.E. & Faridatul, M. (2014). Proses Berpikir Mahasiswa dengan Gaya Belajar Visual dalam Mengajukan Soal Matematika Tipe Post Solution Posing. Al-Khwarizmi. 2(2), hal. 29-46.

[8] Patmawati, Abdul,R. & Asdar. (2015). Efektivitas Penerapan Strategi TTW dalam Pembelajaran Matematika ditinjau dari Gaya Belajar Siswa. Journal of EST, 1(2), hal. 73-85.

[9] Ainurrizqiyah, Z., Mulyono., & Sutarto, H. 2015. Keefektifan Model PJBL dengan CREATIVE MIND-MAP Untuk Meningkatkan Koneksi Matematika Siswa. Unnes Journal of Mathematics Education, 4(2), hal. 172-179.

[10] Linto, R.L., Elniati, S., & Rizal, Y. 2012. Kemampuan koneksi matematis dan metode pembelajaran quantum teaching dengan peta pikiran. Junral pendidikan Matematika, 1(1), hal. 83-87.

[11] Rohendi, D,. & Dulpaja, J. (2013). Connected Mathematics Project (CMP) Model Based on Presentation Media to the Mathematical connection Ability of Junior School Student. Journal of Education and Practice, 4(4), hal. 17-22.

[12] Meika, I. & Asep, S. (2017). Kemampuan berpikir kreatif dan pemecahan masalah matematis siswa SMA. Jurnal Penelitian dan Pembelajaran Matematika (JPPM). 10(2), hal. 8-13.

[13] Suryanto. (1998). Problem Posing dalam Pembelajaran Matematika. Makalah disajikan pada Seminar Nasional: Upaya-upaya Meningkatkan Peran Pendidikan dalam Menghadapi Era Globalisasi. Program Pascasarjana IKIP: Malang.

[14] Thobroni, M. (2015). Belajar & Pembelajaran:Teori dan Praktik. Yogyakarta: Ar-Ruzz Media.

[15] DePorter, Bobbi & Hernacki,M. (2002). Quantum Teaching. Bandung: Kaifa.

[16] Purbaningrum, K., A. (2017). Kemampuan Berpikir Tingkat Tinggi Siswa SMP dalam Pemecahan Masalah Matematika ditinjau dari Gaya Belajar. JPPM. 10(2), hal. 40-49.

[17] DePorter, Bobbi & Hernacki,M. (2013). Quantum Learning: Membiasakan Belajar Nyaman dan Menyenangkan. Translated by Alwiyah.Bandung: Kaifa.