Differences in Mathematical Communication Skills and Study Habits between Students Who Were Given RME and Students Who Were Given Guided Discovery at SMP-IT Jabal Noor.

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Abstract. This study intends to examine the variations in students' study habits and mathematical communication skills between those who received guided discovery learning and RME learning, as well as the impact of learning models and early mathematics skills on students' study habits and mathematical communication skills. 132 students from four classrooms in class VIII at SMP-IT Jabal Noor participated in the study during the odd semester of the 2023–2024 academic year. The class VIII-C and VIII-D made up the research sample, which was selected at random. A guided discovery learning model is used with the second experimental class, while a realistic mathematical education model is used with the first experimental class. The tool comprises of a questionnaire on students' study habits and an assessment of mathematics communication abilities. Two-way ANOVA was used with other methods of data analysis. The findings demonstrated variations in the improvement in mathematical communication abilities, with the average before treatment being 62,13 (RME) and 61,8 (PT), and after treatment being 81,53 (RME) and 77,2 (PT), with the computed fvalue being 13,822 larger than 3,16 in the ftable. Additionally, there are variations in the way that mathematics is learned. Before receiving therapy, the average was 68,27 (RME) and 69,47 (PT); after receiving treatment, it was 80,7 (RME) and 78,67 (PT), with a computed fvalue of 6,484 higher than 3,16 in the ftable. However, as shown by the significant values of students' mathematical study habits (0,352) and mathematical communication (0,182) more than 0,05, there was no interaction between the learning model and early mathematical competence on communication skills and students' study habits.

Keywords: Communication, Study Habits, Realistic, Discovery.

ICoSTA 2023, November 02, Medan, Indonesia

DOI 10.4108/eai.2-11-2023.2343258

1 Introduction

Education is an intentional, methodical, and focused endeavor that aims to enable learners to fully realize their potential. Many stakeholders in the field of education wish to see changes in students' attitudes, talents, and thinking skills. The capacity of every student to think mathematically is one of the goals of teaching mathematics in the classroom. The definition of mathematical thinking is a manner of thinking about the properties of mathematics, hence a discussion of mathematical thinking is directly tied to a discussion of the nature of mathematics [15]. Mathematical aptitude in learning encompasses more than simply comprehension of mathematical concepts. Mathematical communication is one of the key mathematical competencies. The fact that mathematical communication is a fundamental mathematical skill that is necessary for both mathematics and mathematics education itself is further supported by the National Council of Teachers of Mathematics [12].

Learning to communicate is a critical component of studying mathematics. Mathematical communication plays a crucial part in the learning of mathematics since it can be seen from several angles, (1) which helps students develop their critical thinking skills while approaching different types of mathematical problems. (2) Students' mathematical comprehension may be reflected in and measured via communication. (3) Students may structure and solidify their mathematical ideas via communication. (4) Building mathematical knowledge, refining thinking and problem-solving techniques, boosting self-esteem, and enhancing social skills all depend heavily on student communication while studying mathematics. (5) "Writing and discussing" is a highly useful strategy for creating a community of inclusive mathematicians [2].

Learning is a process, an activity and not a result or goal. Thus, learning is not just remembering or memorizing, but is broader than experiencing it. Learning is a mental process in understanding human behavior, involving several factors, namely association, motivation, variability, habits, sensitivity, imprinting and obstacles [11]. The meaning of the expert opinion above is the interaction between an individual with attitudes, values and habits, knowledge and skills and their relationship with the world so that the individual changes, in a good sense. Study habits can be measured through aspects, namely: making a schedule and implementing it, reading and taking notes, repeating study material, preparing equipment before learning, concentrating and doing assignments [17]. Describes good study habits as covering several aspects, namely: (1) writing down each assignment, (2) communicating with the teacher, (3) having time to study at home, (4) knowing learning styles, and (5) have a good summary/notes [9].

The government supports the implementation of learning-oriented curricula at the primary and secondary education levels, which are intended to foster children's creativity in a way that is both enjoyable and successful. This approach is in keeping with the new educational paradigm in Indonesia, which places a greater emphasis on students as human beings with the capacity to learn and develop. Realistic mathematics education, or RME, is a method of teaching that focuses on real-world situations for students, highlighting the mathematical skills necessary for problem-solving, discussing, and working together with peers. and finally, both individually and collectively, use mathematics to solve an issue [8].

In the meanwhile, "teachers have the most essential effect on student advancement in the learning process," In guided discovery, the instructor facilitates learning by leading students through questions that ask them to make connections between what they already know and what they are learning now. In order for them to identify ideas, principles, or methods based on the instructional materials that the instructor has supplied, students are encouraged to think independently and examine themselves [5]. This is consistent with [18] assertion that children would benefit much from guided discovery learning, namely in the areas of problem-solving, creativity development, direct experience, rational thinking skills development, and learning innovation. Additionally, children who learn via guided discovery learning have superior improvements in their mathematics communication abilities than students who study through traditional learning, according to research [13]

2 Riview Of Literature

2.1 Mathematical Communication Skills

Ability is the capacity or aptitude a person has to acquire a skill that is either inherent from birth or the outcome of training to be applied to a desired outcome. A conversation event or reciprocal connection that takes place in a classroom setting and involves the transmission of messages containing the mathematical content that students are learning is often understood as mathematical communication. For instance, as a notion, equation, or approach to problem-solving. Teachers and students are the people engaged in communication events in the classroom. The message might be communicated orally or in writing. According to Greenes and Schulman, students can develop their mathematical communication skills by: (1) expressing mathematical ideas orally, in writing, through demonstration, and in various visual formats; (2) understanding, interpreting, and evaluating ideas presented orally, in writing, or visually; and (3) creating, interpreting, and connecting various representations of ideas and their relationships [1].

2.2 Mathematics Study Habits

Study habits according to [4], are routines or approaches that students stick to while taking classes, reading books, doing homework, and scheduling their time. Learning habits are a person's learning behavior that has been imprinted over a reasonably long period such that it characterizes the learning activities they carry out, this is in keeping with his or her definition [3]. Study habits can be measured through aspects, namely: making a schedule and implementing it, reading and taking notes, repeating study material, preparing equipment before learning, concentrating and doing assignments [17]. Describes good study habits as covering several aspects, namely: (1) writing down each assignment, (2) communicating with the teacher, (3) having time to study at home, (4) knowing learning styles, and (5) have a good summary/notes. However, the most important thing in students' study habits according to is having notes. Students who have a record in learning can maintain knowledge in the long term [9].

2.3 Realistic Mathematic Education (RME)

The Freudenthal Institute in the Netherlands created Realistic Mathematic Education (RME) initially, drawing inspiration from Freudenthal's ideas. The fundamental tenet of the realistic mathematics method is that pupils should be given the chance, under the supervision of an adult, to reimagine mathematical ideas and concepts by investigating a variety of real-world scenarios and issues [14].

Three RME principles, might be consulted while creating educational materials. The following is an explanation of these three concepts: (1) Progressive mathematization and guided innovation. Students should be provided the chance to encounter mathematical ideas and concepts via various contextual problem kinds and situational encouragement in order to help them develop and rediscover them. (2) Phenomenology of didactics. In this instance, the learning phenomena highlights how crucial contextual issues are when introducing pupils to mathematical concepts. (3) A model that was created by oneself. This idea serves to close the knowledge gap that exists between students' formal and informal mathematics understanding. In order to arrive at a solution in the form of formal mathematical knowledge, students should first solve contextual problems based on real-world scenarios that they are already familiar with. Next, they should identify an informal "model of" the situation and then identify a formal mathematical "model for" it [7]. Learning using realistic mathematics learning involves the following steps: (1) Comprehend contextual difficulties; (2) elucidate contextual problems; (3) address contextual problems; (4) contrast and deliberate on solutions; and (5) draw conclusions [6].

2.4 Guided Discovery Learning

In order to learn anything new via teaching and learning activities, guided discovery learning is a method, If teachers plan the different materials that will be provided beforehand, the learning process may uncover something. Teachers can then carry out the process to uncover many significant items linked to learning challenges on their own [18]. The discovery approach can be implemented if the following conditions are met (1) the teacher must be skilled at selecting relevant problems to pose to the class (problems sourced from learning materials that challenge students/are problematic) and in accordance with students' reasoning abilities. (2) teachers must be skilled at fostering students' learning motivation and creating enjoyable learning situations, (3) there are sufficient learning facilities and resources, (4) there is freedom for students to express opinions, work, discuss, (5) the participation of every student in every activity learning, and (6) teachers do not interfere and intervene much in student activities [14]. In order for the implementation of this guided discovery model to run effectively. Several steps that need to be taken by mathematics teachers are as follows : (1) Provide stimulus, (2) Identification of problems, (3) Compiling the information. (4) Data analysis, (5) Proof, and (6) Conclusion. [10]

3. Method

3.1 Normality Test

The purpose of the test was to determine if the distribution of data on study habits and mathematical communication abilities was typical among the students receiving guided discovery learning and RME learning. With the aid of SPSS 26, the Kolmogorov Smirnov normality test was performed to evaluate the pretest and posttest results in each group.

3.2 Homogeneity Test

The goal of the homogeneity of variance test is to ascertain if the variances of the two groups those receiving guided discovery learning and those receiving RME are the same or different. A variance test between two independent variables is used in this homogeneity test.

3.3 Inferential Statistical Analysis

This research uses two-way inferential statistical analysis of variance (ANOVA) or what is called more than one-way Anava (Two Ways Analysis of Variance). This inferential statistical analysis is used to test comparisons as well as regression by fulfilling 2 conditions, the research sample is normally distributed and the research sample is homogeneous. The linear model for this experiment is as follows :

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk} \, ; i = 1,2,3 \, ; \, j = 1,2 \, ; k = 1,2,3 \ldots, n \qquad (1)$$

4. Result

4.1 Initial Mathematics Ability Results (IMAR)

Table 1. Distribution Of Research Samples

IMAR Category	Statistic	Class	
		RME	**PT**
High	N	6	6
	Mean	84,16	82,66
	Standard Deviation	1,16	2,25
Currently	N	19	16
	Mean	77,05	75,87
	Standard Deviation	1,43	1,14
Low	N	5	8
	Mean	70,80	72,00
	Standard Deviation	0,45	1,85

Table 1 above indicates that the number of students in the high category (6 students), medium category (19 students), and low category (5 students) in the RME learning model class. The students' skills fall into three categories: high (6 students), medium (16 students), and low (8 students), even though the class employs the PT learning style.

4.2 Description Results Of Students' Mathematical Communication Ability

Table 2. Mathematical Communication Ability

IMAR Category	Statistic	Learning Model			
		RME		**Guided Discovery**	
		Pretest	**Postest**	**Pretest**	**Postest**

High	N	3	13	4	19
	Mean	81,33	84,31	81,00	86,32
Currently	N	5	9	5	5
	Mean	77,2	76,89	76,4	77,2
Low	N	22	8	21	6
	Mean	57,18	66,00	57,05	69,33

It is evident from Table 2 above that students who get guided exploration and RME learning have much higher average mathematical communication abilities. Furthermore, for every pair of IMAR categories, students who received RME learning increased their mathematical communication abilities on average more than students who received guided exploration.

4.3 Description Results Of Students' Mathematical Study Habits

Table 3. Mathematical Study Habits

IMAR Category	**Statistic**	**Learning Model**			
		RME		**Guided Discovery**	
		Pretest	**Postest**	**Pretest**	**Postest**
High	N	3	3	3	3
	Mean	71,00	89,33	72,00	84,67
Currently	N	23	23	23	23
	Mean	63,78	82,43	65,43	77,57
Low	N	4	4	4	4
	Mean	61,25	73,00	56,25	72,00

Table 3 shows that students receiving guided exploration and RME learning had more average study habits than those receiving other learning methods. For RME and guided discovery learning, students with high IMAR achieved a greater average increase in study habits than students with medium IMAR and low IMAR for each lesson. In addition, students who received RME learning obtained an average increase in student learning habits that was greater than students who received guided discovery for each pair of IMAR categories.

5. Discussion

5.1 Initial Mathematics Ability Results (IMAR).

Six students in experimental class I fell into the high category of IMAR, 19 students were in the medium group, and five students were in the low category, according to the researcher's analytical findings. Six kids were in the high IMAR group, sixteen children were in the middle category, and eight students were in the low category in experimental class II. Researchers discovered that, based on the data they had collected, the average level of students' initial mathematical abilities was still in the medium category because there were more students in the medium category than there were in the high or low categories.

5.2 Students' Mathematical Communication Ability

The two-way ANOVA test results using SPSS 26 provide the statistical test results for the hypothesis. An F_{count} value of 13,822 > 3.16 (F_{table}) indicates that the learning model significance value of 0.000 is less than 0.05. Thus, it can be said that students taught utilizing RME learning in this research increased their mathematical communication abilities more than students taught using guided discovery.

5.3 Mathematical Study Habits.

The two-way ANOVA test results using SPSS 26 provide the statistical test results for the hypothesis, showing that the learning model significance value is 0.014, which is less than 0.05, and the F_{count} value is 6.484 > 3.16 (F_{table}). Thus, it can be said that in this research, students who were taught using RME learning had a greater rise in learning habits than students who were taught using guided exploration.

5.4 Interaction Between Learning and IMAR on Increasing Students' Mathematical Communication Abilities.

A value of sig.0.182 (sig > 0.05) was found based on the outcomes of inferential statistical analysis using the two-way ANOVA test on the Learning Model*IMAR line. H_o is acceptable, or 95%, since the significant value is bigger than the significant value of 0.05. Regarding students' mathematical communication skills, there is no relationship between the learning models Realistic Mathematics Education and Guided Discovery with IMAR.

5.5 Interaction Between Learning and IMAR on Increasing Mathematical Study Habits.

Table 4.15 displays the results of the two-way ANOVA test calculated using SPPS 26. It is evident that the F_{count} produced for the learning model and IMAR is smaller than F_{table} (1.066 < 3.160) and has a probability value (sig) of 0.352. The probability value (sig) is higher than 0.05, which means that the hypothesis H_0 is admissible. In this instance, it can be said that there is no relationship between the learning model and IMAR in terms of how pupils approach learning mathematics.

6. Conclusion

A number of conclusions were drawn from the study, including the accomplishment of the researcher's goals, which were established after the research results were analyzed and discussed. The variations in study habits and mathematical communication abilities between students who received guided discovery and those who received RME are the subject of this study.

References

[1] Ansari, B. I. 2009. Komunikasi Matematik dan Politik, Suatu Perbandingan: Konsep dan Aplikasi. Banda Aceh: Penerbit PENA.

[2] Asikin, M &Junaedi, I. 2018. Kemampuan Komunikasi Matematika Siswa SMP dalam Setting Pembelajaran RME (RealisticMathematisc Education). UJMER. Vol. 2.No. 1.

[3] Aunurrahman. 2016. Belajar dan Pembelajaran. Bandung: Alfabeta.

[4] Djali. 2017. Psikologi Pendidikan. Jakarta: Bumi Aksara.

[5] Effendi, L. 2017. Pembelajaran Matematika dengan Metode Pembelajaran Penemuan Terbimbing untuk Meningkatkan Kemampuan Representasi dan Pemecahan Masalah Matematis Siswa SMP. Bandung: Pascasarjana UPI.
[6] Fauzi, M.A. 2002. Pembelajaran Matematika Realistik Pada Poko Bahasan Pembagian di SD. Tesis tidak diterbitkan. Surabaya:Program Pascasarjana Universitas Negeri Surabaya
[7] Hasratuddin. 2002. Pembelajaran Matematika Unit Geometri Dengan Penekatann Realistik di SLTP 6 Medan. Tesis tidak diterbitkan. Surabaya : Program Pascasarjana Universitas Negeri Surabaya.
[8] Istarani. 2017. 58 Model Pembelajaran Inovatif. Medan: Media Persada.
[9] Jato, M, Ogunniyi, S &Olubiyo, O. 2014. Study habits, use of school libraries and students' academic performance in selected secondary schools in Ondo West Local Government Area of Ondo State. Adeyemi College o Education, Bab Fafunwa Library, P.M.B 520, Ondo, Ondo State, Nigeria. Vol.6 No.4
[10] Markaban. 2017. Model Penemuan Terbimbing pada Pembelajaran Matematika SMK. Yogyakarta: PPPPTK,.
[11] Mulyati, 2018. PsikologiBelajar. Yogyakarta: CV ANDI OFFSET
[12] NCTM. 2000. Principles and Standards for School Mathematics. Reston: NCTM
[13] Riska Novia Sari, 2014. Peningkatan kemampuan penalaran, komunikasi matematis dan keyakinan kemandirian belajar siswa SMP melalui pembelajaran penemuan terbimbing. Tesis. Bandung: UPI.
[14] Sagala, S. 2016. Konsepdan Makna Pembelajaran. Bandung: Alfabeta.
[15] Sanjaya. W. 2017. Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta : Prenada Media Grup
[16] Saragih, S. 2017. Mengembangkan Kemampuan Berpikir Logis dan Komunikasi Matematik Siswa Sekolah Menengah Pertama Melalui Pendekatan Matematika Realistik. Disertasi tidak diterbitkan. Bandung: Sekolah Pasca Sarjana UPI Bandung.
[17] Slameto. 2017. Belajardan Faktor-Faktor yang Mempengaruhinya. Jakarta: PT.RinekaCipta.
[18] TakdirIllahi, M. 2016. Pembelajaran Discovery Strategy & Mental Vocational Skill Yogyakarta: Diva Press.