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Mathematics Representation Skill Seen from *Self-Efficacy* in AIR Learning with *Corrective Feedback*

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Abstract

This research aims to describe mathematics representation skill of students seen from self-efficacy on Auditory Intellectually Repetition (AIR) learning with corrective feedback of VIII graders. This mixed method research used sequential explanatory design. The subjects were categorized based on self-efficacy categories: high, moderate, and poor. The data was collected by mathematics representation skill test, self-efficacy questionnaire, and interview. The findings showed that students taught by AIR with corrective feedback passed the actual minimum passing grade and had various descriptions of mathematics representation skill based on self-efficacy. It was shown by 4 high level self-efficacy students. They consisted of 3 high mathematics skill students and one moderate level students. From 23 moderate self-efficacy level students, there were 3 with high mathematics representation skill, 19 moderate skill, and one with poor skil. From 3 students with poor self-efficacy, there was only 1 moderate student and 2 poor level student.

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INTRODUCTION

Mathematics is a basic science and mostly exists on other disciplines. Understanding, knowledge, and skill needed by students are covered in a standard process. They are problem solving, reasoning and proff, communication, connection, and representation (NCTM, 2000). Mathematics representation skill is an important parameter in current mathematics education in Indonesia. It is an ability supporting other competences. If a student fails in doing representation in various realizations (visual, mathematics equation, and words), then there is high possibility if the student does not have proper understanding about mathematics (Manurung, 2016). According to Dewi and Sopiany (2017), students had poor representation skill to create a situational problem based on the given data or representation. They tended to have difficulties in making questions based on data description. They focused on pictures without paying attention on the provided information. Furthermore, Suryowati (2015) revealed that students had not been able to interpret real problems into mathematics representations.

Lunenburg (2011) explained that besides representation skill, the efficacy of students about their abilities to reveal notions also contributed to an individual's success in solving a problem. To improve mathematics representation skill of students, there is a need to have high affective behavior such as self-efficacy. Self-efficacy is an attitude to judge or consider an individual own self in completing specific task (Lestari, 2015). Self-efficacy is a belief to have to make students succeed in learning process (Sariningsih, 2017). According to Bandura in Taubah (2018) and Isfayani (2018), self-efficacy covers three dimensions: (a) magnitude, (b) strength, and (c) generality.

Feedback provision is needed during learning process. According to Hudojo (1988), feedback could be given by teachers during correcting students' task, by providing answers related to the questions or showing the mistakes done by students. Feedback is needed to motivate students in improving mathematics representation skill. According to Kulha and Anderson (in Anggraini, 2015), feedback could make learning optimum. According to Lutan (in Isnandini, 2014), feedback is a knowledge gained from a task. To give feedback could be done by giving commentary, it will make students gaining understanding to revise their mistakes. It functions to motivate and reinforce (Isnandini, 2014). One of feedback types in the form of information or clear direction is corrective feedback. It could be done by directing or informing students about their mistakes. Corrective feedback is a teacher's response to mistake of students' learning (Wasiran, 2017). It is in line with Zhang et al (2010) telling that corrective feedback is a teacher's action in minimizing students' mistakes in leanring by informing the facts of the mistakes.

The learning process in a class needs a capable learning model to make students more active in the class. Such learning model is believed could improve effectiveness of learning. It is strengthened by Purnomo, Kartono, and Widowati (2015), Adiatuty, Rachmad, and Masrukan (2012), and Ulya, Masrukan, & Kartono (2012) concluding that problem solving of the students entailing learning with certain learning model was better than expository model. There are many learning models to trigger students' independencies, creativities, and activeness in learning. One of them is AIR.

AIR provides chance for students to be independent, creative, and active. Auditory means that learning should be listened, observed, spoken, presented, argued, shared, and responded. Intellectually means that leanring should use reasoning skill (mind-on), have concentration, and train to think, investigate, identify, find, create, construct, solve, and implement. Repetition means to repeat meaningful comprehension, extension, and reinforcement by training the students through quiz or task (Rahayuningsih, 2017). The strength poin of AIR is can be maximized by using reasoning ability whil learning o improve learning achievement (Megasari, 2012).

Based on the explanation, the researcher would like to investigate deeper how mathematics representation skill seen from self-efficacy on AIR learning with corrective feedback.

METHOD

This mixed method used sequential explanatory design. The population consisted of VIII graders of Junior High School Mataram Semarang in academic year 2018/2019. The sample was taken by using cluster random sampling. There were two classes selected VIII A as experimental group and VIII B as control group. The sujects of the research were VIII A students taken by purposive sampling. It was in line with the objectives of the research, the subjects were categorized on three levels of self-efficacy: high, moderate, and poor done from a modified self-efficacy questionnaire for educational field and it was validated by experts.

The data consisted mathematics representation skill test result (TKRM), self-efficacy questionnaire, and interview. Mathematics representation skill analysis refers to all mathematics representation skill indicators (IKRM) in this research. According to Lestari & Yudhanegara (2015), the skill covers: (1) drawing geometrical pictures to clarify problems and facilitate solution (IKRM 1) the visual representation aspect; (2) creating equation or mathematics model based on given problem or information (IKRM 2) mathematics expression representation aspect; (3) creating interpretation from a representation (IKRM 3) and (4) writing solution (IKRM 4) written text representation aspect.

The data was analyzed quantiatively by normality, homogeneity, and completeness test. In another hand, the qualitative data analysis was done by data validation, reduction, presentation, and conclusion. The validity test dealt with data credibility. It was done by technique triangulation in which the data was tested by checking the data on the same data source but with different techniques test and interview.

RESULT AND DISCUSSION

Based on the quantitative analysis with requirement test, it showed that mathematics representation skills of the students for both groups were normally distributed. It could be seen from significant level on experimental group's mathematics representation skill score $0.058 > 0.05$ while the control group was $0.200 > 0.05$. Based on the result, in level $\alpha = 5\%$, it could be concluded that the mathematics representation skills for both groups were normally distributed. The homogeneity test showed that Fcount =1.27316 < Ftable =1.860811. It meant the mathematics representation skills of both groups were homogeneous. The average score of completeness test of the students' mathematics representation skill taught by AIR with corrective feedback gained$t_{count} = 4.502 > t_{table} = 1.699$. It could be concluded that the average score of mathematics representation skills had reached actual passing grade (BTA).

The passing grade result of the students was not separated from learning model implemented in the class. It is in line to Bruner, Gagne, Ausubel, and Piaget that AIR learning, on the students' cognitive level, could solve complex problems into simpler problems when the strategy and utilization of mathematics representation were correct with the problems. Thus, the learning would be meaningful since there would be active learning, social interaction, and personal experience. According to Wijaya (2018), with AIR learning model, the learning process would be more interesting so the students would be motivated in leanring and more active.

Corrective feedback in AIR learning could better facilitate students to achieve the passing grade than expository model. According to Bandura (in Isnadini & Rasmawan, 2014), feedback provision to an individual's capability will improve his self-efficacy. It facilitates him to be aware of his mistake so that he could remember the alrady learnt concept. Furthermore, students would be more confident in working their task. It could motivate them to do the given task by teachers.

Corrective feedback provision in AIR learning also provided information for students dealing with facts of their mistakes. They could be used as revision to work on the next questions. It is in line with corrective feedback theory by Zhang et al. They argue that corrective feedback is a treatment of teacher to minimize students' mistakes in learning by informing the facts of the mistakes (Wolagole, 2018). Furthermore, Wasiran (2017) stated that test provision and regular corrective feedback could positively improve mathematics learning achievements of students. Isnadini (2014) stated that corrective feedback provision entailed by reward could improve learning achievement and students' efficacy.

It is in line with learning theory by Ausubel, quoted in Rifa'I and C.T. Anni (2012). It is a process to share and implement his own ideas, to develop correlation between new information and already existing understanding of the student, and to find new concepts or knowledge. By AIR learning, students are asked to be more active in discussing to solve problem. It helps them to enrich their experience in learning. It is in line with Piaget's learning theory as quoted by Rifa'i and C.T. Anni (2012). It is an active learning through students' own abilities to figure out, to interact socially through group discussion, and to learn with their own experiences. Those would create meaningful learning.

The qualitative analysis was done by questionnaire. It was intended to find out whether self-efficacy owned by the students were high, moderate, or poor. To determine the categories, the questionnaire was given at the first meeting. According to Siffudin (in Kurnia, Royani, Hendriana, & Nurfauzah, 2018), this categorization is used to find out the lowest and highest scores of the questionnaire. After gaining the scores, the ideal mean and standard deviation were calculated by following formulas.

$$mean\ ideal\ (M) = \frac{1}{2} \times (nilai\ tertinggi + nilai\ terendah)$$

$$standar\ deviasi\ (SD) = \frac{1}{6}(nilai\ tertinggi - nilai\ terendah)$$

Categorization of self-efficacy questionnaire could be seen on Table 1.

Table 1. Self-Efficacy Category

Interval	category
$X < 56$	poor
$56 \leq X < 88$	moderate
$X > 88$	high

Based on the findings, the percentage of the students' self-efficacy for each category could be seen on Table 2.

Table 2. Grouping Experimental Group's Self-Efficacy

Self-efficacy	Number of subject	Precentage (%)
High	4	13,33
Moderate	23	76,67
Poor	3	10,00
Total	30	100

Table 2 shows only 13.33% high category students or 4 out of 30 students with high self-efficacy. The moderate category consisted of 76.67% students or 23 out of 30 students with moderate self-efficacy. Only 10% of the students were categorized poor self-efficacy. It showed that the category was dominated by moderate level students.

In this research, mathematics representation skill was seen from self-efficacy category of the students. The analysis result showed that the skills based on their self-efficacy were varied. There were several similarities and differences among high self-efficacy, moderate self-efficacy, and poor self-efficacy students as shown in Table 3.

Table 3. Summary of KRM Analysis Seen from Self-Efficacy

Self-efficacy category	Number of subjects	KRM category
High	3	High
	1	Moderate

Moderate	3	High
	19	Moderate
	1	Poor
Poor	1	Moderate
	2	Poor

Based on the Table, it shows that the students with self-efficacy categories had various mathematics representation skills.

High self-efficacy students

The high self-efficacy students showed various mathematics representation skills. It was shown by 4 students, 3 of them having high mathematics representation skill and only 1 with moderate level. The high self-efficacy students could solve problems well.

Based on the findings, it was gained information that generally those students were able to solve problems concerning with mathematics representation skill. It was due to self-efficacy contributed to role or influence of mathematics representation skill of the students (Dewantoro, 2008). The students with high confidence would be able to share and present their mathematics ideas well (Sahara, 2018). According to Wasiran (2017), self-efficacy also caused achievement improvement during learning process optimally. It is in line with Victoriana in Yuliani (2018) telling that high self-efficacy students assumed problems as challenges instead of thread. They struggled hard to what they did and increased their effort to face failures. This finding is supported by Nadia (2017) telling that such student could utilize all mathematics representation skill indicators maximally. It was proven by their works there were 2 students could master all indicators and only 1 student with moderate mathematics representation skill had not utilized it maximally. When the students' works were triangulated by interview, in each answer of the question, it ensured that the works were written correctly and clearly.

Students with high self-efficacy could solve problems well. They tended to struggle to achieve their target. Therefore, they met all indicators of mathematics representation skills. Those students could draw geometrical figure based on the question, create equation or mathematics model from other representation, and solve problems by involving equation or mathematics model, and write steps of solving mathematis problems by words.

Moderate self-efficacy students

The moderate self-efficacy students showed their various mathematics representation skills. It was shown from 23 students, there were 3 students with high mathematics representation skill, 19 moderate level, nd only 1 with poor level. The moderate self-efficacy students could solve problems well although there were little mistakes. Based on the findings, it was noticed that this student category could solve problems dealing with mathematics representation skill because self-efficacy influenced the students' mathematics skill achievement (Dewanto, 2008). According to Wasiran (2017), self-efficacy also improved students' achievements during learning process optimally. It is in line with Sahara (2017) telling that moderate self–efficacy students could deliver and present their mathematics ideas although they were not maximum. According to Juhrani (2017), they could express their mathematics ideas in written forms. They could use terms, symbols, and mathematics structures properly although they were little bit careless in presenting them.

It was proven by the students' works. There were 2 high mathematics representation skill whom met all 4 indicators, 19 of them mastering 3 indicators – IKRM 1, 2, and 4, and only 1 student mastering 2 indicators IKRM 1 and 4. When the works were triangulated by interview, each answer on the question ensured that the students wrote the answer clearly and accurately although it was not maximum. They could draw geometrical figure as demanded by the questions, create equation or mathematics model from other representation, and write mathematics solution steps with words.

Poor self-efficacy students

The categorization result of high self-efficacy showed various mathematics representation skills. It was shown from 3 students having high self-efficacy, there was 1 student with moderate mathematics representation skill and 1 with poor skill. The poor self-efficacy students could not solve problems perfectly. Based on the findings, it was gained that generally this category had not been able to solve problems dealing with mathematics representation skill because self-efficacy influenced to mathematics skill achievement (Dewanto, 2008). It is in line with Sefiany (2016) telling that poor self-efficacy could not reach standards to interpret and evaluate mathematics ideas and to create assumption based on mathematics questions. Such individual would be easy to give up in facing problems and tended to be depressed and stressed. They also had a very narrow vision about what was the best thing to do (Himmi, 2017). According to Wasiran (2017), self- efficacy improved achievement of students during learning process.

It was proven by the students' works, there was 1 student having moderate mathematics representation skill could master 2 indicators although it was not maximum. He could master IKRM 1 and 4. The other 2 students having poor mathematics representation skill only could master 1 indicator – IKRM 1. When the works were triangulated by interview, the subjects with poor self-efficacy could not explain their works properly. They only could draw geometrical figures as demanded by the question although there was only 1 students capable of writing the solutions by words. Generally, they could not make equation or mathematics model from other representation, solve problems by involving mathematics model or equation, and write the mathematics solution by words.

CONCLUSION

Based on the findings, it could be concluded that the students taught by AIR with corrective feedback had various mathematics representation skill on each category of self-efficacy even when they were in a same category. It meant self-efficacy did not influence mathematics representation skill so that learning with AIR model and corrective feedback was needed to achieve mathematics representation skill.

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