The Effect of Application of The Auditory Intellectually Repetition (AIR) Cooperative Learning Model to Improve the Understanding of Mathematics Concepts

Eli Hermawati✉[1], Indri Pebriyanti[2], and Yani Fitriyani[3]

[1,2] Pendidikan Guru Sekolah Dasar, Universitas Kuningan, Indonesia
[3] Pendidikan Dasar, Sekolah Pascasarjana Universitas Pendidikan Indonesia, Indonesia

✉ eli.hermawati@uniku.ac.id[1]; ndripebriyanti6@gmail.com[2]; yanifitriyani@upi.edu[3]

Abstract: The problem in this research is that understanding of concepts in mathematics is still low. The objectives of this study were to describe the differences in understanding of mathematical concepts in the experimental class that received the AIR learning model and the control class who did not get the AIR learning model, to describe the differences in the increase in students' conceptual understanding between the experimental class that received the AIR learning model and the class controls that do not get the AIR learning model. This method uses the Quasi-Experimental method, while the research design uses the Nonequivalent Control Group Design. The dependent variable in this study is the understanding of the concept and the independent variable is the application of the AIR learning model. The subjects of this study were 25 students of class V A and 25 students of class V B, which amounted to 25 students at SD in Ciporang. The instrument used in this study was an essay test. The results showed that there were differences in the results after students were given conceptual understanding treatment using the AIR learning model. This is indicated by $t_{value} > tt_{able}$. Besides, the difference in increasing understanding of the concept can be shown by the results of the t-gain test, the results of $t_{value} > t_{table}$. So that there are differences in the increase (gain) in understanding the concept of learning using the AIR learning model with those that do not use the AIR learning model.

Keywords: AIR Learning Model, Understanding Mathematical Concepts

How to Cite: Hermawati, E., Pebriyanti, I., & Fitriyani, Y. (2021). The Effect of Application of The Auditory Intellectually Repetition (AIR) Cooperative Learning Model to Improve the Understanding of Mathematics Concepts. *The 3rd International Conference on Elementary Education*, *3(*1), 145-152.

INTRODUCTION

Mathematics is a science that is most basic so that it is used in everyday human life. Most human activities carry out calculations, such as in buying and selling which require calculations related to mathematical concepts used in real problems. Learning mathematics is learning concepts. In mathematics learning, students are expected to be able to understand mathematical concepts, explain the relationship between concepts, and apply concepts.

Mathematics is used in various other sciences. Therefore, understanding mathematical concepts must be mastered by students from an early age so that students become more skilled in solving real problems and applying them in their daily life. The ability to understand mathematical concepts is an important goal in the mathematics learning process. Students should not only be emphasized to memorize but understand mathematical concepts. By understanding the concept, students can solve other problems related to the concept. However, many students cannot understand the concept and have difficulty in redefining the learning material delivered by the teacher, so that students' understanding of mathematical concepts is low and student learning outcomes are low, as is the problem experienced by grade V SD students Negeri I Ciporang. The data was obtained from the results of interviews with class V teachers of SD Negeri I Ciporang, where the results obtained from 50 students, 28 students were not able to restate a concept, and 31 students who were not able to apply the concept or problem-solving algorithm. This is something that must be addressed immediately because understanding the concept will affect students' abilities in the future.

Many factors cause low understanding of mathematical concepts in students, the cause of students' low understanding of concepts is caused by students themselves such as students who only memorize formulas

without understanding these formulas, students are not ready to take part in the learning process, students are not focused when the learning process takes place, the concentration of students is low. Therefore, the understanding of concepts in mathematics learning must be improved and improved. Besides, the learning process that makes students feel bored and bored requires a varied learning model so that students can follow the learning process and understand what the educators say.

One of the factors in the success of education is the implementation of learning that is carried out using good planning and the use of various learning models, strategies, methods, and so on. To produce conceptual understanding by the objectives, it requires the application of various kinds of learning models that can help students gain better knowledge. Learning models that involve students actively, and help students understand the subject matter more deeply (Fitriyani, 2018).

The selection of a good learning model can be used as an alternative to help students acquire knowledge well and help teachers achieve their supposed learning goals (Hermawati et al., 2020). One learning model that can help students understand mathematical concepts is the AIR (Auditory, Intellectually, Repetition), learning model. The AIR learning model (Auditory, Intellectually, Repetition) can help students solve problems given by the teacher, because this model pays attention to three aspects, namely auditory, which means that during the learning process students use the sense of hearing to listen, besides helping in speaking, presentations, arguments, express opinions, and respond to the lessons given. Intellectually means students need to practice their thinking skills through training to reason, create, solve problems, construct, and apply to learn. Next, namely, repetition, which means that learning requires repetition so that problem solving can be understood in depth and broadly (Fitriyani & Supriatna, 2019).

The importance of the AIR learning model (auditory, intellectually, repetition) is reinforced by previous research conducted by Agustiana et al., (2018) entitled The Influence of Auditory, Intellectually, Repetition (AIR) Learning Models on Improved Student Mathematical Problem Solving, where the results of the study are shown. that the improvement of students 'mathematical problem-solving abilities using the Auditory, Intellectually, Repetition (AIR) learning model is better than the improvement of students' mathematical problem-solving abilities using ordinary learning. Then the results of the attitude scale questionnaire given to students showed that in general students had a positive attitude towards the Auditory, Intellectually, Repetition (AIR) learning model.

LITERATURE REVIEW

According to Dorothy J. Skeel (Nurulaen, 2011) states that a concept is something that is reflected in thought, idea, or understanding. Based on the quote above, the concept is inherent in humans which is reflected in thought, idea, or understanding. Mathematical concepts are organized systematically, logically from the simple to the complex.

Indicators are characteristics that can indicate changes that have occurred. Indicators in understanding the concept according to Mukrimatin et al., (2018) are: (1) restating a concept. (2) classify objects according to certain properties (according to the concept). (3) provide examples and non-examples of concepts. (4) presents the concept in various forms of mathematical representation. (5) developing the necessary or sufficient conditions of a concept. (6) use, utilize and select certain procedures or operations. (7) applying the concept or problem-solving algorithm. This study uses two indicators, namely (1) restating a concept, and (2) applying a problem-solving concept or algorithm.

Mathematics Learning

Mathematics is a subject that uses definite formulas and results. Mathematics is the science of logic, the arrangement of quantities, and the concept of a multitude of

relationships. According to Fitriana & Ismah, (2016), if there is a definition of mathematics then it is tentative, depending on the person who defines it. If someone is interested in numbers, he will define mathematics as a collection of numbers that can be used to solve calculation problems in trading. The objectives of learning mathematics must be divided into 2 according to Zulaicha (Restiani, 2019), namely: (1) students are clever in solving problems. This can be achieved when applying two-way mathematics learning principles. Children will be able to master math concepts very well. (2) students are good at counting. Students can do calculations properly and precisely (fast is not the main goal). Both of these objectives are achieved when students understand the basic concepts of mathematics.

Multiplication of Fractions

Some of the materials in mathematics learning in grade V elementary schools, one of which is about the multiplication of fractions which is a part of fraction material, the multiplication of fractions according to (Kurniawati & Khasanah, 2017) namely:

"Fractions are one of the materials in mathematics which is widely applied in everyday life. On the subject of fractions, there are topics on the operation of calculating multiplication and division of fractions. Therefore, it is very important for students to master and understand the concepts of fractions well, including multiplication and division of fractions, so that there are no difficulties in applying fractions in mathematics and everyday life".

The multiplication of fractions is part of fraction material in mathematics learning in class V. The basic concept of counting that students need to master is multiplication so that in the operation of the multiplication of fractions material can be a bridge so that students' understanding of indicators can be easily implemented.

AIR Learning Model (Auditory, Intellectually, Repetition)

According to (Shoimin, 2016) that the AIR learning model stands for Auditory, Intellectual, and Repetition. (1) Auditory learning, which is learning to prioritize speaking and listening. Learning Auditory is taught especially by the ancient Greeks because their philosophy is if you want to learn more about anything, talk about it non-stop. (2) Intellectually learning, which shows what learning is doing in the thinking of an experience and creates a relationship of meaning, plan, and value from the experience. Repetitions can be given regularly, at certain times or after each given unit, or when it is deemed necessary to repeat. (3) Repetition learning is repetition, to deepen and broaden the understanding of students who need to be trained through solving questions, giving assignments, and quizzes. Repetition in learning activities is intended for a deeper understanding of students, accompanied by giving questions in the form of assignments and quizzes.

One of the learning theories that support the AIR learning model is Thorndike's theory, one of which reveals the law of exercise (the law of exercise) which states that stimulus and response will have a strong relationship with each other if the repetition process occurs frequently. The more repetition activities are carried out, the more automatic the relationship will occur (Kök et al., 2017).

The steps of the AIR learning model According to Shoimin (2016) the steps in the AIR learning model are: (a) students are divided into several groups, each group of 4-5 members. (B) students listen and pay attention to explanations from the teacher. (c) each group discusses the material they learned and writes the results of the discussion and then presents it to the class (auditory). (d) during the presentation, students get questions or problems related to the material. (e) each group thinks of ways to apply the results of the discussion and can improve their ability to solve problems (intellectually). (f) after completing the presentation, students receive a repetition of the material by getting assignments or quizzes for each individual (repetition).

The advantages of this AIR learning model are that each student has the courage and willingness to participate in the learning process so that the stimulus-response occurs, and each student has more opportunities to utilize their knowledge and skills and can respond to a problem posed in their way alone (Qi et al., 2018). With a problem, they will be motivated to provide evidence of a problem. Besides, students can have more experience in solving a problem.

The weakness of this AIR learning model is that it is in the process of preparing problems to be solved by students that require careful preparation to make it easier for students to understand and find solutions to these problems. Besides, students who have high abilities will feel doubt about the answers they have, and raising problems directly is still difficult because many students have difficulty responding.

METHOD

This research is quantitative. Quantitative research using a quasi-experimental approach (quasi-experimental). The research design used by researchers was the Nonequivalent Control Group Design (Sugiyono, 2018). This design has two class groups which are divided into an experimental class and a control class. The experimental class is the class that gets treatment using the AIR learning model, while the control class is the class that gets treatment using the lecture method.

The tests given in this study were two times, namely pretest and posttest. The pretest was given to the experimental class and the control class to find out the understanding or initial abilities possessed by students. While the posttest was given after the experimental class and control class were given different treatments. The results of this posttest can help researchers to find out whether the application of the AIR learning model is better than the lecture method in understanding students' mathematical concepts.

Place and Research Subject. This research was conducted at SD Negeri 1 Ciporang, Kuningan District, Kuningan Regency. The subjects to be researched were class V SD Negeri 1 Ciporang with 2 classes taken, namely class V A as the control class as many as 25 people and class V B as the experimental class as many as 25 people.

Data collection technique. The data collection technique used in this study was the test method. According to (Arikunto, 2015) a test is a tool or procedure that is used to find out or measure something in an atmosphere, with predetermined methods and rules. The test used in this study was an essay test with 6 pretest questions and 6 posttest questions.

RESULTS AND DISCUSSION

Based on the results of the pre-test analysis in the experimental class, it was obtained an average value of 54.8 and the control class obtained an average value of 58.44. These results indicate the initial state of students in the two classes before giving treatment has relatively the same ability, meaning that there is no significant difference between the experimental class and the control class.

After different treatments were carried out in the two classes, the final test (posttest) was then given to determine students' understanding of mathematical concepts. Based on the results of the final test (posttest), it is known that both classes have an increased understanding of mathematical concepts. However, the increase that occurred in the experimental class was greater than the control class. This can be seen from the posttest mean score in the experimental class of 88.42, while the control class got an average score of 83.38. This shows that the use of the AIR learning model in the experimental class can improve students' understanding of mathematical concepts, in contrast to the control class which uses the lecture method.

Then, to determine hypothesis testing, the two test results are tested for normality and homogeneity test. The results of the pretest normality test in the experimental class obtained x^2 value (6.68) < x^2 table (7.81). While the results of the normality test in the control class obtained x^2 value (2.35) < x^2 table (7.81). The data of the two classes are

said to be normally distributed because of the calculated x^2 value < x^2 table. Then the results of the posttest normality test in the experimental class obtained x^2 value (3.39) < x^2 table (7.81). While the normality test results in the control class obtained x^2 value (5.76) < x^2 table (7.81). The data of the two classes are said to be normally distributed because of x^2 value < x^2 table.

The results of the pretest homogeneity test in the experimental class and control class obtained F_{value} (1.14) < F_{table} (1.98) meaning that the pretest data for both classes were declared homogeneous because the value of F_{value} < F_{table}. Meanwhile, the posttest homogeneity test in the experimental class and control class F_{value} (1.21) < F_{table} (1.98) means that the posttest data for both classes are declared homogeneous because the value of F_{value} < F_{table}. It can be concluded that the data is normally distributed and has a homogeneous variance, so to test the hypothesis using the t-test.

Based on the results of hypothesis testing using the t-test from the posttest results obtained t_{value} (2.27) > t_{table} (2.01), meaning that there are differences in understanding of mathematical concepts in the experimental class whose learning uses the AIR learning model with the control class using the lecture method.

Based on the results of the t-gain test, it was obtained t_{value} (3.97) > t_{table} (2.01), meaning that there was a difference in the increase in understanding of the concept between the experimental class using the AIR learning model and the control class using the lecture method. These data indicate that the AIR learning model is more effectively used to improve understanding of mathematical concepts and is different from the lecture method, and it can be said that the use of the AIR learning model in class V affects the understanding of mathematical concepts.

This AIR learning model is a learning model which is a type of cooperative learning model, the use of the AIR learning model in the multiplication of fractions material encourages students to be more active in the learning process to understand understanding mathematical concepts. So that students' understanding of fraction material is helped by the existence of a learning model such as the AIR learning model.

The difference in increasing understanding of mathematical concepts in the experimental class and the control class can be proven by the results of hypothesis testing. The data obtained from the research will be used as a source to answer the hypothesis that the researcher has proposed. There are two hypotheses submitted by the researcher.

According to (Arikunto, 2017) that a hypothesis is a temporary answer to a research problem until it is proven through the collected data. The resulting data shows whether the hypothesis used can be accepted or rejected. The first hypothesis proposed by the researcher is to answer the hypothesis that there are differences in understanding of mathematical concepts in the experimental class using the AIR learning model with the control class using the lecture method. The submission of the hypothesis resulted in the calculation of the t-test post-test obtained tcount (2.2731)> t table (2.0106). This shows that there are differences in learning outcomes after getting post-test treatment of understanding the concept of the learning process using the AIR learning model and using the lecture method. By Arikunto's statement (2015: 164) that the criteria for acceptance of the hypothesis, namely if tcount> ttable then Ho is rejected and Ha is accepted and if tcount <ttable then Ho is accepted and Ha is rejected.

The second hypothesis proposed by the researcher is to answer the hypothesis that there is a difference in the increase (Gain) between the experimental class using the AIR learning model and the control class using the lecture method, which aims to determine the difference in improvement between the experimental class and the control class. The submission of the hypothesis resulted in the calculation of the t-gain test obtained by tcount (3.9703)> ttable (2.0106). It can be said that there are differences in the increase (gain)

understanding of the concept of students using the AIR learning model with students using the lecture method. So that using the AIR learning model can improve students' understanding of concepts.

The auditory, intellectually, repetition (AIR) learning model used in the experimental class mathematics subject in class V SD Negeri 1 Ciporang can improve understanding of different concepts from the control class. This can be seen from the higher N-gain value of the experimental class (0.74) than the control class (0.60). When viewed from the results of the calculation of the higher N-gain value of the experimental class using the AIR learning model. Judging from the N-gain criteria, the two classes belong to the high and medium criteria.

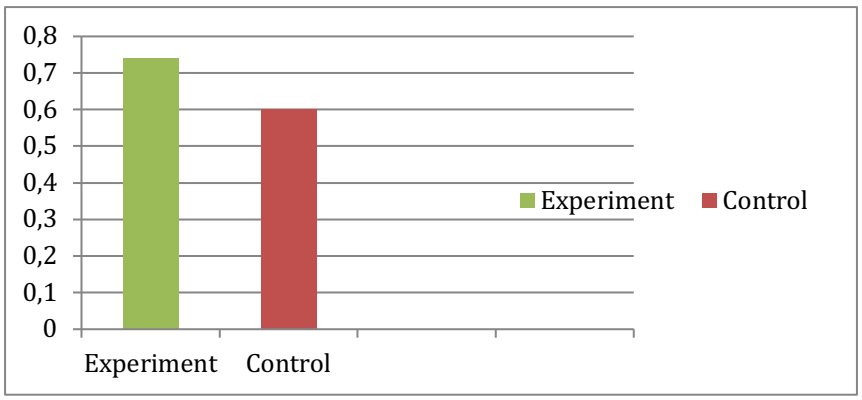

Figure 1. The difference in control class N-Gain and Experiment Class

The use of the AIR learning model has a positive impact on understanding concepts. There are differences in understanding the concepts of students who use the AIR learning model in the learning process and those who do not use the AIR learning model. This is in line with the results of research conducted by Wijaya, Destiniar, and Mulbasari with the title "The Ability of Students' Understanding of Mathematical Concepts Using Auditory Intellectually Repetition (AIR) Learning Models". The result of the research is a learning model that is considered appropriate to solve the problem, namely the Auditory Intellectually Repetition (AIR) learning model, which is a learning model that emphasizes student learning activities in which students actively build their knowledge individually or in groups by integrating three aspects (1) Auditory (2) Intellectually (3) Repetition. Therefore, the Auditory Intellectually Repetition (AIR) learning model can improve students' ability to understand mathematical concepts. Understanding the concept which means being able to express a material presented in a form that is easier to understand, able to provide interpretation, and be able to classify it (Lestari, 2015).

The use of the AIR learning model in the learning process can improve conceptual understanding. With a good understanding of the concept, the learning outcomes of students will increase. In addition to increased learning outcomes, the activities of students in the learning process have increased because the use of the AIR learning model can help students work together and participate actively in the learning process to make it easier for students to understand the concepts given.

CONCLUSIONS

Students 'understanding of mathematical concepts and students' mastery of low mathematical concepts. To be able to improve the ability to understand mathematical concepts requires the use of a variety of learning models that are suitable for students' understanding of concepts so that students can more actively participate in the learning process and understand the material presented by the teacher. One learning model that can actively involve

students is the Auditory Intelligent Repetition (AIR) learning model. With the AIR learning model, the learning process can be more interesting so that students can be more enthusiastic and motivated in participating in learning activities, besides being able to improve their ability to understand mathematical concepts.

The use of the AIR learning model in the mathematics learning process significantly influences students' understanding of mathematical concepts, in contrast to the class not using the AIR learning model.

REFERENCES

Agustiana, E., Putra, F. G., & Farida, F. (2018). Penerapan Model Pembelajaran Auditory, Intellectually, Repetition (AIR) dengan Pendekatan Lesson Study terhadap Kemampuan Pemecahan Masalah Matematis Peserta Didik. *Desimal: Jurnal Matematika*, *1*(1), 1. https://doi.org/10.24042/djm.v1i1.1905

Arikunto, S. (2015). *Dasar-dasar Evaluasi Pendidikan*. Jakarta : PT Rineka Cipta.

Arikunto, S. (2017). *Prosedur Penelitian: Suatu Pendekatan Praktik*. Jakarta: PT. Rineka Cipta.

Fitriana, M., & Ismah, I. (2016). Pengaruh Model Pembelajaran Auditory Intellectually Repetition Terhadap Hasil Belajar Matematika Siswa Ditinjau Dari Kedisiplinan Siswa. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, *2*(1), 59. https://doi.org/10.24853/fbc.2.1.59-68

Fitriyani, Y. (2018). The Influence Of The Using Guide Note Taking Method To Students ' Learning Outcomes On. *International Conference on Elementary Education*, *1*(1), 594–600.

Fitriyani, Y., & Supriatna, N. (2019). Effect of Effectiveness of Application Used Cooperative Learning Model Type Numbered Head Together (NHT), Teams Games Tournament (TGT), and Course Review Horay (CRH) against Increased Critical Thinking Skill of Students. *The 2nd International Conference on Elementary Education*, *2*(1), 955–968. http://proceedings.upi.edu/index.php/icee/article/view/707/623

Hermawati, E., Sari, M. Z., & Fitriyani, Y. (2020). The effectiveness of using cooperative learning models toward pre-service elementary teacher's understanding on social science education course: a comparison for cooperative script, articulation, and guided note-taking. *Indonesian Journal of Elementary Teachers Education (IJETE)*, *1*(1), 39–48.

Kök, I., Şimşek, M. U., & Özdemir, S. (2017). A deep learning model for air quality prediction in smart cities. *Proceedings - 2017 IEEE International Conference on Big Data, Big Data 2017*, *2018-January*(December), 1983–1990. https://doi.org/10.1109/BigData.2017.8258144

Kurniawati, S., & Khasanah, U. (2017). *Effectiveness Of Cooperative Learning Model Type Of Numbered Heads Together (NHT) With Think Pair Share (TPS) Type Towards Mathematics Learning Outcomes In Students Class VII In SMP Negeri 2 Sleman*. *4*(2), 16–17.

Lestari, M. (2015). *Pengaruh Metode Diskusi Berbasis Media Tiga Dimensi untuk Meningkatkan Penguasaan Konsep siswa*. Skripsi Sarjana pada FKIP Uniku. Kuningan : tidak di terbitkan.

Mukrimatin, N. A., Murtono, M., & Wanabuliandari, S. (2018). Pemahaman Konsep Matematika Siswa Kelas V SD Negeri Rau Kedung Jepara Pada Materi Perkalian Pecahan. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *1*(1), 67–71. https://doi.org/10.24176/anargya.v1i1.2277

Nurulaen, Y. (2011). Edisi Khusus No. 2, Agustus 2011. *Jurnal Penelitian Pendidikan*, *Edisi Khusus*(2), 154–163.

Qi, Z., Wang, T., Song, G., Hu, W., Li, X., & Zhang, Z. (2018). Deep Air Learning: Interpolation, Prediction, and Feature Analysis of Fine-Grained Air Quality.

IEEE Transactions on Knowledge and Data Engineering, *30*(12), 2285–2297. https://doi.org/10.1109/TKDE.2018.2823740

Restiani, N. A. (2019). *Pengaruh Penerapan Media Pembelajaran Kantong Bilangan Terhadap Pemahaman Konsep (Studi Quasi Eksperimen pada Mata Pelajaran Matematika di Kelas II SD Negeri 2 Kasturi Kecamatan Kuningan Kabupaten Kuningan)*. Skripsi Sarjana FKIP Uniku: tidak diterbitkan.

Shoimin, A. (2016). *68 Model Pembelajaran Inovatif dalam Kurikulum 2013*. Yogyakarta : Ar-ruz Media.

Sugiyono. (2018). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.