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Mathematical Literacy Seen from Cognitive Style in Learning of Auditory Intellectually Repetition Model with Constructivism Approach Assisted by Google Classroom

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Abstrack

This study aims to describe mathematical literacy seen from cognitive style in learning of Auditory Intellectually Repetition model with constructivism approach assisted by google classroom. This research is a type of qualitative research. The approach used in this study is a descriptive approach. The subjects in this study were class VIII G of SMP Negeri 1 Welahan. Subjects were chosen by each of the 5 students based on the type of cognitive style Field Independent (FI) and type cognitive style Field Dependent (FD). Data collection is done by Group Embedded Figure Test (GEFT), interview guide, and observation. The results of this study indicate that students with a cognitive style Field Independent (FI) capable of the mathematical literacy component communication, mathematizing, representation, and using symbolic, formal, and technical language and operation. Less capable on components devising strategies for solving problems. sufficient on components using mathematics tools. Then students with type cognitive style Field Dependent (FD) is sufficient of the mathematical literacy component communication, devising strategies for solving problems, using symbolic, formal, and technical language and operation. Then less able on components mathematizing, representation, reasoning and argument, using mathematics tools

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INTRODUCTION

According to the OECD (2013) in PISA mathematical literacy is defined as an individual's capacity to formulate, use, and interpret mathematics in various contexts. As explained by Rosa & Orey (2015) implies that mathematical literacy is not only in mastering the material but also in the use of reasoning, concepts, facts, and mathematical tools in solving everyday problems. Mathematical literacy is defined as the ability to formulate, apply, and interpret mathematics in various contexts.

According to Syawahid & Putrawangsa (2017) which states that mathematical literacy is the ability of students to interpret mathematics which includes mathematical reasoning and using mathematical concepts, procedures, facts, and tools to describe and predict a phenomenon. These abilities include mathematical reasoning and using concepts. There are seven components in mathematical literacy. The seven components are (1) communication, (2) mathematizing, (3) representation, (4) reasoning and argument, (5) devising strategies for solving problems, (6) using symbols, formal and technical language, and operation, (7) using mathematics tools (Nolaputra, et al., 2018). Thus, mathematical literacy is defined as the understanding and application of mathematical concepts in everyday life

As for the implementation, several things cause low mathematical literacy in students. This is supported by research results from Rusmining, et.al (2014) which showed that the mathematical literacy abilities of the students studied were low, namely at levels below 3. Diyarko & Waluya, S.B (2016) stated that many factors caused students' low difficulty in solving mathematical literacy questions, apart from the lack of habituation from the teacher with math literacy questions, the method and media factors used do not support learning. In addition to these results, based on previous research according to Wardono (Putri, et al. 2017) the ability of Indonesian students to solve problems that require the ability to analyze, give reasons, communicate effectively, and solve and interpret problems in various situations is still very low. Then Harahap & Surya (2017) stated that students were still not familiar with problem solving questions and generally they were less able to write down the solutions.

Based on the results of observations, then followed by interviews with mathematics teachers at SMPN 1 Welahan stated that most students experienced difficulties in solving math problems, especially in the form of word problems on geometry material. Students find it difficult to interpret questions, model in a mathematical context, and relate mathematical problems related to everyday life. As a result, the perception that appears in solving the problem is not as expected. this has a huge impact on developing mathematical literacy.

According to Sari (2015), mathematical literacy can be defined as the ability of students to formulate, use, and interpret mathematics in various problem solving contexts of everyday life effectively. In line with the opinion of Budiono & Wardono (2014) who state that applying problem based learning and relating it to everyday life can improve mathematical literacy skills.

Based on the description above, one of the efforts to increase student's mathematical literacy is through innovation in learning mathematics. (Shoimin, 2014) stated 68 innovative learning models in the 2013 curriculum, including the learning model Auditory, Intellectually, Repetition (AIR). (Irmayanti, 2019) The learning model that can be used to solve problems with problem solving skills is learning Auditory Intellectually Repetition (AIR). According to Ananditaet al (2016) assume that the learning model Auditory, Intellectually, Repetition (AIR) is an effective model that can influence student learning outcomes in class. In line with Lestari & Yudhanegara (2017) states that one of the learning models that can optimize student learning processes and outcomes is the Auditory Intellectually Repetition (AIR).

The AIR learning model can also be an option for constructivist learning methods in implementing the 2013 curriculum. This is in line with (Purnamasari, 2013) which states that AIR is a learning model based on constructivist learning. The constructivist approach emphasizes that when learning mathematics, the most important thing is the student learning process, the teacher is only a facilitator who directs, guides, straightens, and complements so that the construction of knowledge possessed by students becomes correct. This is in line with (Sahrudin, 2014) which states that the constructivism approach is an approach whose implementation positions students as individuals who actively construct their knowledge derived from their experiences.

Each learning activity, of course has a style that students have according to their respective characters to understand the material being studied. One of them is the cognitive style of students.

According to Messick (Amirulmukminin, 2017) cognitive style is a stable or consistent characteristic in remembering, thinking, and solving problems. Witkin et al (1977) added that the cognitive style in learning mathematics is a cognitive style field independent and field dependent. Field independents are individuals who are free and can separate a part of a whole. Field dependents are individuals who cannot separate apart from a whole. Individual field dependents tend to accept the dominant part or context and tend to group. While Individual field independent tend to be individual.

Online learning is learning that can facilitate a broader, more numerous and varied learning process. Through the facilities provided by the system, students can study anytime and anywhere without being limited by distance, space and time (Munir, 2012). One way that can be used to carry out the learning process online is to useGoogle Classroom. According to Herman (Hammi, 2017) Google Classroom is an application that allows the creation of classrooms in cyberspace. Besides that, google classroom can be a means of distributing assignments, submitting assignments, and even assessing the assignments collected. Therefore, using Google Classroom makes it easier for teachers to manage learning and convey information precisely and accurately to students (Hakim, 2016).

Based on the background above, the formulation of the problem in this study is (1) How is the learning quality of the AIR model assisted constructivism approach Google Classroom on students' mathematical literacy? (2) How is the description of mathematical literacy in learning the AIR model in terms of the cognitive style of the assisted constructivism approach Google Classroom?. While the aims of this study were (1) to analyze the learning quality of the AIR model with the assisted constructivism approach Google Classroom on students' mathematical literacy; (2) To describe the mathematical literacy in learning the AIR model in terms of the cognitive style of the assisted constructivism approach Google Classroom.

METHOD

This research uses a descriptive qualitative research type. The subjects used in this study were class VIII A students of SMP Negeri 1 Welahan, a total of 30 even semester students for the 2020/2021 academic year, where the process of taking them used the purposive sampling. Then ten students were taken, namely 5 students with type Field Dependent (FD) and 5 students with type Field Independent (FI) to be analyzed and interviewed. The data sources for this qualitative research were observation sheets on the implementation of learning, results of analysis of mathematical literacy tests, results of GEFT analysis, and interviews with students. Researchers use triangulation to account for this study, namely triangulation of sources and techniques. The validity of the data in this study used a trust test, transferability test, dependency test, and certainty test (Moleong, 2013). Meanwhile, qualitative data analysis follows the concept of Miles & Huberman with stages namely data reduction, data presentation, and drawing conclusions (Sugiyono, 2017).

RESULT AND DISCUSSION

The cognitive style test in this study used the GEFT instrument (Group Embedded Figure Test). The filling of the GEFT instrument was carried out in class VIII G as an experimental class at SMPN 1 Welahan with a total of 30 students. Following are the results of filling in the GEFT instrument which are presented in Table 1

Table 1. GEFT Class Experiment Results

Cognitive style	Lots of students	Percentage (%)
Field Independent	19	63,33%
Field Dependent	11	36,66%

Of the 30 students in class VIII G, type students obtained Field Independent (FI) as many as 19 students and type students Field Dependent (FD) as many as 11 students. Based on the results of the GEFT cognitive style as shown in table 1, five students were selected for each cognitive style as research subjects. Then each of these categories will be interviewed to analyze mathematical literacy in depth.

Description of mathematical literacy in terms of cognitive style

The students' mathematical literacy in terms of cognitive style was analyzed based on the steps written by the students on the TLM answer sheet on the flat sided geometric material and the results of the interviews. The mathematical literacy referred to in this study includes seven process components in PISA, namely (1) communication (2) mathematizing, (3) representation, (4) reasoning and argument, (5) devising strategies for solving problems, (6) using

symbolic, formal, and technical language and operation, (7) using mathematics tools.

The following is an analysis that has been carried out about the type of cognitive style Field Independent (FI) and Field Dependent (FD), there are differences in mathematical literacy presented in Table 2.

Table 2. Differences in cognitive style students' mathematical literacy Field Independent (FI) and Field Dependent (FD).

Mathematical literacy component	Type	
	FI	FD
Communication	Capable	Sufficient
Mathematising	Capable	Less Capable
Representation	Capable	Less Capable
Reasoning and Argument	Less Capable	Less Capable
Devising Strategies for Solving Problem	Less Capable	Sufficient
Using Symbolic, Formal and Technical Language and Operation	Capable	Sufficient
Using Mathematics Tools	Sufficient	Less Capable

Based on Table 2, students with cognitive styles Field Independent (FI) are capable of the mathematical literacy component Communication, Mathematising, Representation, and Using Symbolic, Formal and Technical Language and Operation. Less capable on components Devising Strategies for Solving Problems sufficient on components Using Mathematics Tools. Then students with type cognitive style Field Dependent (FD) is sufficient of the mathematical literacy component Communication, Devising Strategies for Solving Problems, Using Symbolic, Formal and Technical Language and Operation. Then less able to components Mathematising, Representation, Reasoning and Argument, and Using Mathematics Tools.

Subject with cognitive style Field Independent (FI) on the component communication able to present important information contained in the problem and understand the questions referred to in the problem. This is in line with the results of previous research that FI subjects relate the information received and the knowledge they possess, and process the information (Ngilawajan, 2013). Then according to Qoriawati, et. al (2021) students can identify information and able to write down things that are known and asked from the problem. On components of mathematizing the subject can change a problem in a real context into a mathematical context and solve it well. This is in line with the results of previous research that field independent students understand information directly and convert information from images into written form (Ningsih, 2017). On components representation, FI cognitive style subjects are also able to interpret problems and use mathematical formulas correctly to solve problems. This is in line with the results of previous research, namely FI students write formulas and work according to these formulas (Ningsih, 2017). On components of reasoning and argument, the subject can provide logical reasoning, provide clear arguments so that conclusions are obtained with clear reasons. This is in line with Qoriawati, et. al ((2021) that students can write the conclusions obtained from the questions on the answer sheets. On components devising strategies for solving problems, FI cognitive style subjects in this study were less able to determine the right strategy for solving problems. On components using symbolic, formal, and technical language and operation the subject can use mathematical symbols and mathematical operations correctly so that the correct completion results are obtained. As for the components using mathematics tools the subjects in this study were sufficient of using mathematical aids in the form of calculators and rulers to help solve the given problems.

Based on the description above, identify that the subject with the type of cognitive style Field Independent (FI) was able to achieve the seven components of mathematical literacy even though it was not optimal in determining the right strategy and using tools in solving mathematical problems.

Subject with cognitive style Field Dependent (FD) On components communication, the subject is sufficient of presenting the information contained in the problem and can write down what is asked in the given problem. This is to the results of previous research that students field dependent solve problems according to plan and process the information shown (Ngilawajan, 2013). Qoriawati, et.al (2021) students can identify information and able to write down things that are known and asked from the problem. Then for components mathematizing, the subject is

less able to change a real problem into a mathematical form. On components representation, the FD cognitive style subjects in this study were less able to use mathematical formulas to help simplify problem solving. On components reasoning and argument, the subject is also less able to describe logical reasoning and appropriate arguments, so results obtained are still not quite right. This is in line with Aisha, et.al (2021) that students are field dependent and less able to provide reasons or evidence for several solutions, draw conclusions, and check the validity of arguments because students lack mastery of material concepts and are not precise in calculations resulting in inaccurate conclusions. Then the results of other studies state that the category of cognitive style field dependent has problems not being able to determine the pattern or nature of mathematical symptoms and cannot make general conclusions from the answers given (Utami, 2020). As for the components devising strategies for solving problems, the subject is sufficient for determining the appropriate steps to solve the given problem. These results are to the findings of Utomo, et. al (2020) that students carry out procedures clearly, solve problems and apply simple strategies well. On components using symbolic, formal, and technical language and operation, the subject is not yet sufficiently capable of using symbols and mathematical operations correctly. This is in line with Utomo, et. al (2020) Students can get the right answers, then all subjects can also use knowledge, assignments, use of symbols and mathematical operations, develop solving strategies quite well. These findings are in line with the results of previous studies namely students' field dependent sufficient of deciphering mathematical ideas and interpreting them (Putriana, 2017). As for the components using mathematics tools subjects are also less able to operate mathematical aids in the form of calculators and rulers to help solve problems.

Based on the description above, identify that the subject with the type of cognitive style Field Dependent (FD) is quite capable of achieving the mathematical literacy component communication and component devising strategies for solving problems. although less than the maximum in the components mathematizing, representation, reasoning and argument using symbolic, formal, and technical language, and using mathematic tools.

This is reinforced by the results of previous research from Rosyada & Wardono (2021) stating that students with a cognitive style field independent have excellent mathematical literacy in components of communication, mathematizing, representation, reasoning, and argument, using symbolic formal and technical language and operation, capable for components using mathematics tool, and less able for components devising strategies for solving problems. Then students with cognitive style Field Dependent (FD) have good mathematical literacy in components communication and devising strategies for solving problems. As for components mathematizing, representation, reasoning and argument using symbolic, formal, and technical language, and using mathematic tools still not good. So, it can be said students with type cognitive style field independent have a higher ability than the type of field dependent. In line with research from Mailili (2018), namely cognitive style Field Independent higher than the cognitive style Field Dependent on solving problems and cognitive style contributes to students' mathematics learning outcomes. Another statement was also found in research from 'Aisyah, et.al (2021) shows that students who are cognitively style field independent have all six indicators while students who are cognitive style field dependent only able to master two indicators of mathematical literacy. students who have mathematics learning outcomes in the category field independent most of them have been able to solve the questions given and students in the category field dependent some students have not been able to complete the questions given (Sulistiyono, et. al, 2021).

Then research from Anandita et al (2016) assumes that the learning model Auditory, Intellectually, Repetition (AIR) is effective so that it can influence student learning outcomes in class. (Sahrudin, 2014) states that a constructivist approach is an approach whose implementation positions students as individuals who actively construct their knowledge that comes from their experiences. (Salamah. 2020) shows that the application of google classroom is a learning medium that is very flexible in place and time. Application usage google classroom was also effective in delivering material and collecting assignments because they don't use stationery.

CONCLUSION

Based on the results of research data analysis and discussion then referring to the formulation of the problem that has been described previously, it can be concluded that students with a cognitive style type

Field Independent (FI) capable of the mathematical literacy component communication, mathematizing, representation, and using symbolic, formal, and technical language and operation. Less capable on components devising strategies for solving problems and devising strategies for solving problems. Sufficient on components using mathematics tools. Then students with type cognitive style Field Dependent (FD) sufficient on component literacy mathematics communication, devising strategies for solving problems, using symbolic, formal, and technical language and operation. Then less able to components mathematizing, representation, reasoning, and argument, using mathematics tools.

REFERENCES

'Aisyah, M. N., Sutrisno, & Pramasdyahsari, A. S. 2021. "Kemampuan Penalaran Matematis dalam Menyelesaikan Soal Literasi Matematika Ditinjau dari Gaya Kognitif". *(JKPM) Jurnal Kajian Pendidikan Matematika*, 7 (1): 143-158.

Amirulmukminin. 2017. "Analisis Kemampuan Calon Guru Matematika dalam Pengajuan Masalah Ditinjau dari Gaya Kognitif Field Independent dan Field Dependent". *Jurnal Matematika Kreatif Inovatif*, 8(1): 69-75.

Anandita, D., Sukasno, & Mulyono, D. 2016. "Efektivitas Model Auditory Intellectually Repetition Pada Pembelajaran Matematika Siswa Kelas VIII SMP Negeri 8 Lubuklinggau Tahun Pelajaran 2016/2017". *Jurnal Pendidikan*, 2 (2): 20-35.

Budiono, C. S., & Wardono. 2014. " PBM Berorientasi Pisa Berpendekatan PMRI Bermedia LKPD Meningkatkan Literasi Matematika Siswa SMP". *Unnes Journal of Mathematics Education*, 3 (3): 210-219.

Burhan, A. V, Mirna & Suherman. 2014. "Penerapan Model Pembelajaran AIR Pada Pembelajaran Matemtika Siswa Kelas VIII SMPN 18 Padang". *Jurnal Pendidikan Matemtika.* 3(1): 6-11.

Diyarko & Waluya, S, B. 2016. "Analisis Kemampuan Literasi Matematika Ditinjau dari Metakognisi dalam Pembelajaran Inkuiri Berbantuan Lembar Kerja Mandiri Mailing Merge". *Unnes Journal of Mathematics Education Research*, 5 (1): 70-80.

Hakim, A. B. 2016. "Efektifitas Penggunaan E-Learning Moodle, Google Classroom Dan Edmodo". *Journal of Information System and Technology Management,* 2(1): 2-6.

Hammi, Zedha. 2017. "Implementasi Google Classroom Pada Kelas XI IPA MAN 2 Kudus". *Unnes Journal Of Mathematics Education Research*, 5(1). 54-61.

Harahap, R.E., & Surya, E. 2017. "Kemampuan Pemecahan Masalah Matematis Kelas VII dalam Menyelesaikan Persamaan Linier Satu Variabel". *Jurnal Education Mathematic*, 7(1): 44-54.

Lestari, K.E & Yudhanegara, M.R. 2015. *Penelitian Pendidikan Matemtika*. Bandung: PT Refika Aditama.

Moleong, L. J. 2013. *Metodologi Penelitian Kualitatif.* Bandung: Remaja Rosdakarya.

Munir. 2012. *Pembelajaran Jarak Jauh (2nd ed.)*. Bandung: Alfabeta.

Ngilawajan, D. A. (2013). "Proses Berpikir Siswa SMA dalam Memecahkan Masalah Matematika MaTeri Turunan Ditinjau dari Gaya Kognitif Field Independent dan Field Dependent". *PEDAGOGIA*, 2(1), 71–83.

Ningsih, P. S. (2017). "Analisis Hasil Belajar Matematika Ditinjau Dari Gaya Kognitif Berdasarkan Revisi Taksonomi Bloom Pada Peserta Didik Kelas VIII Mts Al-Hikmah Bandar Lampung". *Disertasi*. Lampung: UIN Raden Intan Lampung.

Nolaputra, A.P., Wardono & Supriyono. 2018. Analisis Kemampuan Literasi Matematika pada Pembelajaran PBL Pendekatan RME Berbantuan Schoology Siswa SMP. PRISMA 1. *Prosiding Seminar Nasional Matematika*, 15: 18-32.

OECD. 2013. *PISA 2012 Assesment and Analytical Framework: Mathematics, Raeding, Science, Problem Solving and Financial Literacy*. OECD Publisher.

Purnamasari, D. 2013. "Faktor-Faktor yang Mempengaruhi Kecurangan Akademik Pada Mahasiswa". *Educational Psychology Journal*, 2 (1): 13-21.

Putri, E. L., Dwijanto, D., & Sugiman, S. 2017. "Analysis of Mathematical Communication Skills and Confidence of 10th Grader of SMK in Geometry Material Viewed from Cognitive Style". *Unnes Journal of Mathematics Education*, 6(1): 97-107.

Putriana, Y. (2017). "Analisis Kemampuan Komunikasi Matematis Berdasarkan Gaya Kognitif Siswa SMA". Disertasi. Semarang: Pendidikan Matematika FKIP.

Qoriawati, R., Sulistyawati, I., & Yustitia V. 2021. "Literasi Matematika Siswa Sekolah Dasar Ditinjau dari Gaya Kognitif Field Independent". *UNION: Jurnal Pendidikan Matematika*, 9 (2): 215-225.

Rahayuningsih, Sri. 2017. "Penerapan Model Pembelajaran Matematika Model Auditory Intellectually Repetition (AIR)". *Erudio (Journal Of Educational Innovation),* (3)2: 67-83.

Rosyada, S. M. A., & Wardono, 2021. "Analisis Kualitatif Kemampuan Literasi Matematika Ditinjau dari Gaya Kognitif pada Pembelajaran Daring Model MURDER dengan Pendekatan Humanistik Berbantuan Schoology". *(PRISMA) Prosiding Seminar Nasional Matematika,* 4: 397-405.

Rr. Kuntie Sulistyowaty & Firdaus. 2020. "Penggunaan Google Classroom dalam Pembelajaran Matematika Jarak Jauh untuk Meningkatkan Keaktifan Belajar Siswa". *Lentera Sriwijaya: Jurnal Ilmiah Pendidikan Matematika*, 2 (2): 14-24.

Rusmining, Waluya, S.B, & Sugianto. 2014. "Analysis Of Mathematics Literacy, Learning Constructivism and Character Education (Case Studiesmon XI Class Of SMK Rodlotus Saidiyyah Semarang, Indonesia)". *International Journal Of Education And Research*, 2: 331-340.

Sahrudin, A. 2014. "Implementasi Strategi Pembelajaran Discovery untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis dan Motivasi Belajar Siswa SMA". *Jurnal Pendidikan Unsika*, 2(1): 1–12.

Salamah, W. 2020. "Deskripsi Penggunaan Aplikasi Google Classroom dalam Proses Pembelajaran". *Jurnal Penelitian dan Pengembangan Pendidikan*, 4 (3): 533-538.

Sari, R. H. N. 2015. "Literasi Matematika: Apa, Mengapa, dan Bagaimana?". *Seminar Nasional Matematika dan Pendidikan Matematika* UNY. 713-720.

Shoimin, A. 2014. *68 Model Pembelajaran Inovatif dalam Kurikulum 2013*. Yogyakarta: Ar Ruzz Media.

Sugiyono. 2017. *Metode Penelitian Kombinasi (Mix Methods)*. Bandung: Alfabeta.

Syawahid, M., & Putrawangsa, S. 2017. "Kemampuan literasi matematika SMP Ditinjau dari Gaya Belajar". *Beta, Jurnal Tadris Matematika*, 10 (2): 222-240.

Utami, T. R. (2020). :Analisis Kemampuan Penalaran Matematis Ditinjau dari Gaya Kognitif". *Skripsi*. Bandung: UIN Sunan Gunung Djati.

Utomo, M. F. W., Pujiastuti, H., & Mutaqin, A. 2020. "Analisis Kemampuan Literasi Matematika Ditinjau Dari Gaya Kognitif Siswa". *(Kreano) Jurnal Matematika Kreatif – Inovatif*, 11(2): 185-193.

Witkin, H. A., Moore, C.A., Goodenough, D.R & Cox. PW Winter. (1977). "Field-Dependent And Field-Independent Cognitive Styles And Their Educational Implications". *Review Of Educational Research*, 47 (1): 1-64.