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MATHEMATICAL REPRESENTATION ABILITY OF HIGH SCHOOL STUDENTS IN SOLVING PROBABILITY MATERIAL PROBLEMS BASED ON HONEY MUMFORD LEARNING STYLE

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Abstract

This study aims to describe the mathematical representation ability of grade XII high school students in solving probability material problems on the subject of permutations based on Honey Mumford's learning style. This type of research is qualitative research with a descriptive method. The data collection techniques used were Honey Mumford's learning style questionnaire, mathematical representation ability test, and interview. The source of data in this research is grade XII students of science 5 MAN 2 Pamekasan for the 2023/2024 school year. The subjects selected were 2 students who each had a theorist learning style and an activist learning style based on questionnaires and considerations by mathematics teachers. The data analysis techniques used are data reduction, data presentation, and conclusion drawn. The results of the study show that students with a theorist learning style can meet all indicators in the aspect of representation, both visual, symbolic, and verbal representation. Meanwhile, students with activist learning styles have not been able to meet the indicators in the aspect of visual representation, but can meet all indicators in the aspect of symbolic representation and verbal representation.

Keywords: Mathematical Representation Abilities, Honey Mumford's Learning Style

1. Introduction

One of the subjects that plays a very important role in the world of education is mathematics because learning mathematics can hone students' abilities, including thinking in a patterned, meticulous and logical manner to express thoughts or solutions in solving various kinds of problems (Aisyah & Rahmat, 2023). Each individual certainly has various ways of solving a problem. Therefore, it is very important for students to know and have the ability to solve various problems systematically. A student must have the ability to convey their ideas in a specific way.

Among the abilities that students must have in learning mathematics is the ability to represent mathematics (Muhammad, 2016). In line with this, NCTM (*National Council of Teacher of Mathematics*) explained the abilities that will be achieved in mathematics learning, including

the ability to solve problems (*problem solving*), the ability to create connections (*connections*), the ability to communicate (*communication*), the ability to reason (*reasoning*), and the ability to represent (representation) (National Council of Teachers of Mathematics, 2000). Therefore, the ability to represent is a very useful ability for students, especially in learning mathematics.
In addition, students need to hone their representation skills to determine how to think in communicating mathematical ideas from abstract to concrete, determine solutions to mathematical problems, and present mathematical ideas or ideas in the form of symbols, pictures, and writing (Putri, 2017). Representation is the basis that allows students to understand and apply mathematical concepts (Fauzan & Yerizon, 2013). The level of understanding and how students solve mathematical problems can be seen from their mathematical representation skills. If the representation used matches the problem at hand, the difficult problem will be easy to overcome. The use of representations with the right mathematical models is very helpful for students in expressing their mathematical concepts.
Among the mathematical materials that can give rise to the idea of students' mathematical representation abilities is probability material. In solving problems on probability material, each student has their own diverse ways. Problem solving in probability material can be interpreted in the form of drawings in the form of tree diagrams or branched trees, tables, numbers, and other mathematical symbols that are forms of mathematical representation. The indicator of mathematical representation ability is very related to how to solve problems in the probability material. Symbolic representation indicators allow mathematical expression models, visual representation indicators allow problems to be represented in the form of pictures, graphs, and tables while verbal representation indicators allow problems to be represented in writing or words.
Related to the ability of students' mathematical representation on probability material, the problem-solving ability of grade XI students of Putra Juang High School on probability material is still relatively low. These factors include student errors in the process of understanding the problem; students' inability to understand how to interpret information in problems in mathematical operational form; the inability of students to plan their completion strategies correctly; and lack of data availability (Akbar et al., 2017). Based on this, students still have low mathematical representation abilities.
Furthermore, as many as 284 high school students in Indragiri Hilir Regency showed some difficulties experienced by students in solving mathematical problems about probability materials, namely 64.1% difficulty in understanding problems, 71.1% difficulty in making transformations, 89.4% difficulties in process skills, and 94% difficulty in making conclusions. This data shows that the percentage of difficulties experienced by students in solving problems on probability materials is very high (Fitri & Abadi, 2021). This reveals that students' skills in solving mathematical problems are still very low and need to be honed. From some of the research data that has been presented, it shows that there are still many students who have relatively low mathematical representation skills, especially in probability materials.
It is undeniable that every student has a variety of learning styles. This needs to be realized and understood by teachers as educators. The learning style in question is a step taken by a person in accepting an explanation easily (Amelia, 2018). Students' ability to represent can be influenced by their learning style which affects the way they express their mathematical ideas. Therefore, each student's learning style can affect their ability to represent in solving problems. The differences in learning styles that each individual has show their best way of absorbing information from the outside (Nur & Risnawita, 2013). In order to gain a better understanding

of students' learning styles, a number of theorists have created theories that divide students into groups based on their own learning styles. Peter Honey and Alan Mumford created one of the learning styles. This learning style is divided into four categories, namely activists, reflectors, theorists, and pragmatists, which is later known as the Honey Mumford learning style (Zakirman, 2017). Those who learn in an activist style prefer to actively participate in activities to gain experience. Theorist is a learning style that tends to be very critical in thinking, a reflective learning style tends to be very careful in doing something, while pragmatic is a learning style that tends to attach importance to practical actions.

Students' mathematical representation abilities vary depending on their learning style. Each of the theorist, activist, reflector, and pragmatic learning styles possessed by students has a different influence on mathematical representation abilities. Students with theorist learning styles have good visual representation skills, while activist, reflector, and pragmatic learning styles are still sufficient. In terms of symbolic representation ability, the four learning styles are considered good. Students with theorist and reflective learning styles have good verbal representation skills, while activist and pragmatic learning styles are still sufficient (Sanjaya et al., 2018).

In this study, researchers only used two Honey Mumford learning styles, namely activist and theorist learning styles. This is because there are significant differences between the two learning styles (Sanjaya et al., 2018). In the study, it was shown that compared to reflector and pragmatic learning styles, activist learning styles tend to be less in terms of mathematical representation, while theorist learning styles can represent all aspects of visual, symbolic, and verbal representation.

From this presentation, to find out the mathematical representation ability possessed by students, it is necessary to analyze it by considering different learning styles so that researchers are interested in conducting research on students' representation ability in solving probability material problems on the subject of permutations reviewed from Honey Mumford's learning style, especially the theorist learning style and activist learning style. The researcher chose high school students as the subject of study because the thinking level of high school students was more abstract than students with an age level below them. In addition, high school students are more courageous in taking risks and accounting for decisions.

2. Methods

This research is a descriptive research with a qualitative approach. This research was carried out from January 26, 2024 to March 16, 2024 at MAN 2 Pamekasan. The target in this study is grade XII Science 5 MAN 2 Pamekasan students in the even semester of the 2023/2024 school year who are selected based on discussions with mathematics teachers. The subjects in this study came from 2 selected students who each had a theorist learning style and an activist learning style with consideration between the researcher and by mathematics teacher. Filling out the Honey Mumford's learning style questionnaire which is then grouped according to the category of each student's learning style is the process of selecting the subject in this research. The instrument used in this research is the Honey Mumford learning style questionnaire which contains 40 statement items, a mathematical representation ability test, and interview guidelines. The data collection technique in this study is by distributing questionnaires to grade XII students of Science 5 MAN 2 Pamekasan totaling 34 students, giving mathematical

representation ability test questions to 2 selected subjects, and interviewing subjects. Data reduction, data presentation, and conclusion drawing are the process of analysis carried out on the data that has been obtained. To determine the type of learning style owned by each student, the results of filling out the questionnaire from the data that have been obtained are scored. The subjects for the study were chosen from among the students with the highest scores who exhibited both theorist and activist learning styles, after careful consideration by the researcher and the mathematics teacher. The mathematical representation ability test scores of each subject were then corrected according to the steps in the alternative solution to determine their level of mathematical representation ability. Reduction, presentation, interpretation, and conclusion drawing is the process of analyzing the results of interview transcripts from the data that has been obtained.

3. Result and Discussion

The following are the results of the work on the mathematical representation ability test of students with a theorist learning style in the first and second tests.

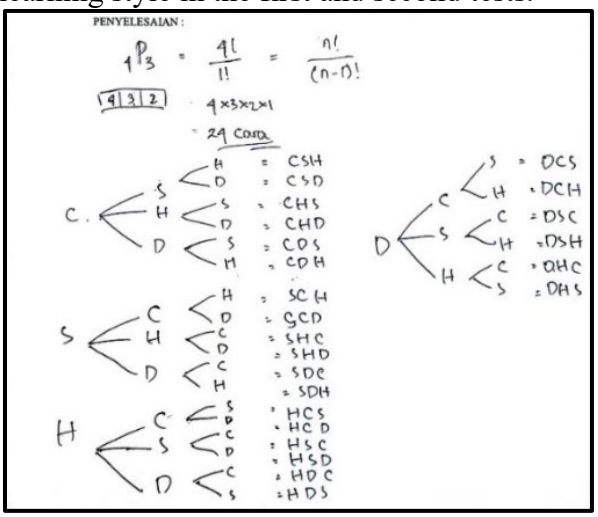

Figure 1. Subject Answers with Theorist Learning Style on Test 1

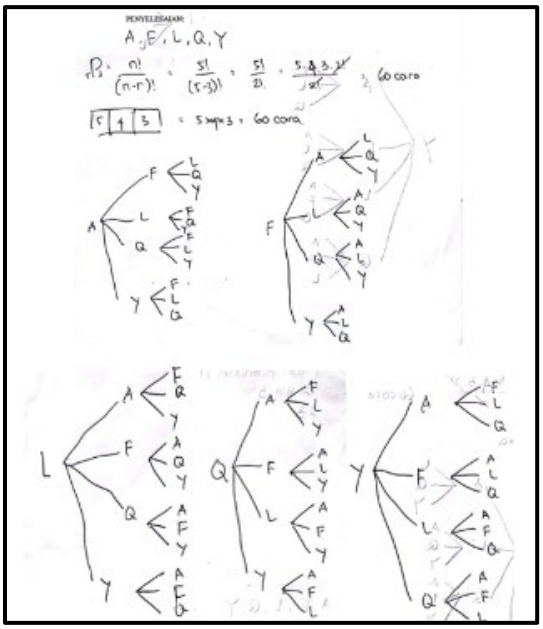

Figure 2. Subject Answers with Theorist Learning Style on Test 2

Subjects with a theorist learning style can solve problems with some of the methods that have been learned before correctly. The subject with a theorist learning style can also create and explain the branched tree method used and label the letters correctly and make the arrangement of cards in order and correctly, he can also create the feeling slot table correctly. This meets the indicators in the aspect of visual representation. Thus, it can be concluded that the mathematical representation ability of students with a theorist learning style in solving probability material problems on the subject of permutations in the aspect of visual representation is included in the good category.

Furthermore, subjects with a theorist learning style can create mathematical models or equations that involve permutation formulas to determine many ways to construct multiple cards out of the overall number of available cards. Subjects with a theorist learning style can also use mathematical expressions in solving problems and can answer problems through correct calculations. This meets the indicators in the aspect of symbolic representation. Thus, it can be concluded that the mathematical representation ability of students with a theorist learning style in solving the probability material problems on the subject of permutations in the aspect of symbolic representation is included in the good category.

Meanwhile, the mathematical representation ability of students with a theorist learning style in solving probability material problems on the subject of permutations in the aspect of verbal representation is also included in the good category. This can be proven by the subject who can understand and explain the information contained in the question and can explain what is asked in the question. In addition, subjects with a theorist learning style can also explain each step in accordance with the representation presented and can make conclusions or solutions to solve problems appropriately so that this meets the indicators in the aspect of verbal representation.

Because subjects with a theorist learning style can meet all indicators in aspects of visual, symbolic, and verbal representation, it can be concluded that the mathematical representation ability of students with a theorist learning style in solving probability material problems on the subject of permutations is included in the good category.

Meanwhile, the results of the students' mathematical representation ability test with activist learning styles in the first and second tests are presented in the following figure.

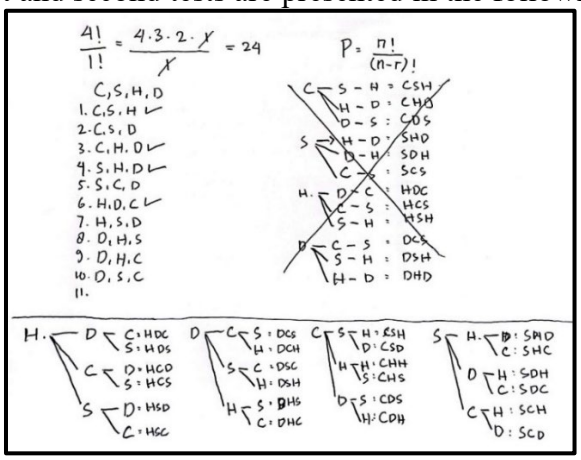

Figure 3. Subject Answers with Activist Learning Style on Test 1

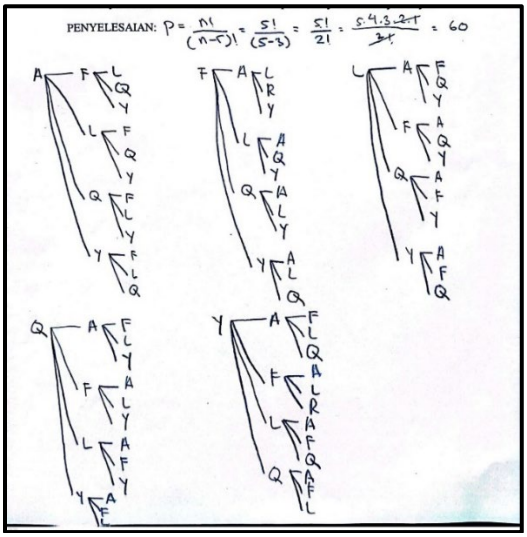

Figure 4. Subject Answers with Activist Learning Style on Test 2

Subjects with activist learning styles can solve problems using the branched tree method. Subjects with a theorist learning style can also create and explain the branched tree method used that has not been able to label the letters on the arrangement of the cards correctly. Subjects with activist learning styles have not been able to meet the indicators in the aspect of visual representation as evidenced by the results of tests and interviews with subjects. Thus, it can be concluded that the mathematical representation ability of students with activist learning styles in solving probability material problems on the subject of permutations in the aspect of visual representation is included in the category of sufficient.

Furthermore, subjects with activist learning styles can create mathematical models or equations that involve permutation formulas to determine many ways to construct multiple cards out of the overall number of available cards. Subjects with activist learning styles can also use mathematical expressions in solving problems and can answer problems through correct calculations. This meets the indicators in the aspect of symbolic representation. Thus, it can be concluded that the mathematical representation ability of students with activist learning styles

in solving probability material problems on the subject of permutations in the symbolic representation aspect is included in the good category.
Meanwhile, the mathematical representation ability of students with an activist learning style in solving probability material problems on the subject of permutations in the aspect of verbal representation is also included in the good category. This can be proven by the subject who can understand and explain the information contained in the question and can explain what is asked in the question. In addition, subjects with activist learning styles can also explain each step in accordance with the representation presented and can make conclusions or solutions to solve problems appropriately so that this meets the indicators in the aspect of verbal representation.
Thus, it can be concluded that the mathematical representation ability of students with activist learning styles in solving probability material problems on the subject of permutations in the visual representation aspect is included in the sufficient category while the symbolic and verbal representation aspects are included in the good category.

The representation skills possessed by students with theorist learning styles are classified as good. Students with a theorist learning style can meet all indicators in terms of mathematical representation ability, both visual, symbolic, and verbal representations. This is in line with previous research conducted by Sanjaya et al., (2018) which states that students with a theorist learning style have good visual, symbolic, and verbal representation skills.
In the aspect of visual representation, students with this theorist learning style can present well and use the concept of tree diagrams or branched trees and feeling slot tables in answering questions. In addition, the labeling of letters carried out by the subject with this theorist learning style is answered completely and correctly in determining many ways to arrange several cards in accordance with the permutation theory that has been studied previously. This is because students with a theorist learning style tend to be firm and meticulous in expressing their opinions. This is in line with previous research that reveals that when learning, students with this theorist learning style have a lot of considerations and tend to rely on theory (Kuncoro & Ruli, 2022).
In symbolic representation, students with an overall theorist learning style can find the correct answer to the problem and use mathematical concepts correctly, students can use the permutation formula correctly and can involve mathematical symbols in its completion. Students with a theoretical learning style tend to solve problems correctly because they are meticulous, unhurried, and careful in their calculations. This is in line with the research of Hendriana et al. (2019) which shows that students with a theoretical learning style have a tendency to stick to theories, concepts, and applicable laws. In addition, a person with a theorist learning style in deciding or doing something, is full of careful consideration and planning.
Furthermore, in the ability of verbal representation, students with a theorist learning style can state the information requested in the question, and can state the steps in solving the problem in a concise and complete manner from beginning to end. This is also in accordance with the research conducted by Sanjaya et al., (2018) which states that students' verbal representation skills with theorist learning styles are included in the good category. In addition, students can expressly convey their ideas, and can express the conclusions of the results they have found. This is in accordance with the characteristics of a person with a theorist learning style, namely not liking opinions or judgments that are subjective and speculative in nature that are quite risky and able to observe things logically without being easily influenced by other people's opinions, so that they are firm and have a strong stance in expressing their opinions (Masuda et al., 2021).

In the aspect of visual representation, the mathematical representation ability of students with activist learning styles is included in the sufficient category while in the aspect of symbolic and verbal representation is included in the good category. Students with activist learning styles can only meet a few indicators in terms of visual representation ability, while in the aspect of symbolic and verbal representation, they can already meet the representation indicators.

In visual representation, students with an activist learning style can already answer the probability material problems on the subject of permutations into a representation of a tree diagram or branched tree. It can create a tree diagram or branched tree but can't label the letters correctly. In the interview activity, subjects with a theorist learning style also did not realize that some of the card arrangements were not arranged correctly. One of the factors that makes students mistaken in using their visual representations is that the students look rushed and tend to be less thorough in doing the questions. In line with research conducted by Alwandita (2024) which states that the factors that cause students to make mistakes in doing the questions are carelessness, inaccuracy, and haste. This is also in line with previous research that states that students with activist learning styles do not like activities that take a long time which leads to errors when writing labeling in tree diagrams or branched trees (Kuncoro & Ruli, 2022). This is also strengthened by the opinion that students with an activist style have visual representation skills that are still in the sufficient category (Sanjaya et al., 2018).

In the aspect of symbolic representation, students with activist learning styles can already find and answer problems with the concept of permutation formulas. The student has answered correctly. He can make equations or mathematical models from the information contained in the problem. It can also involve a permutation formula in solving problems. In addition, subjects with activist learning styles can use mathematical symbols or expressions in solving problems and can determine the answer to the question through correct calculations by involving mathematical expressions. But in the first test, he immediately calculated by writing without substituting into the formula first. This is in line with previous research which revealed that students with activist learning styles tend to do calculations using short steps and tend to be weak in planning (Masuda et al., 2021).

Furthermore, in the ability of verbal representation, students with an activist learning style can understand and explain the information contained in the questions and know what is asked in the questions. He can also explain the steps that are in accordance with the representation presented and write the conclusion or solution to the question answer appropriately. This is also in accordance with the characteristics of activist learning styles, namely people with activist learning types are easy to talk to so that they can communicate well (Masuda et al., 2021). Students who have an activist learning style try to arrange cards at random and write down the results directly which proves that the student dares to try something new. However, in this case, the subject is not finished in finding a solution to the given problem and feels confused so he immediately uses another way, this is strengthened by the characteristics of the activist learning style, namely a person with an activist learning style tends to like new discoveries or ideas and is brave enough to take risks, but a person with this learning style tends to be weak in planning and lacks mature consideration in implementing something (Masuda et al., 2021).

4. Conclusion

The mathematical representation ability of students with a theorist learning style in solving probability material problems on the subject of permutations is included in the good category. Students with the theorist learning style can meet all aspects of mathematical representation indicators in solving probability material problems on the subject of permutations, including using visual representations to solve problems; create drawings, tables, or diagrams to clarify the problem and facilitate the answer; making equations or mathematical models from other given representations; solve problems by involving mathematical expressions; create problem situations based on the data or representations provided; and answer questions using words or written text. Meanwhile, the mathematical representation ability of students with an activist learning style in solving probability material problems on the subject of permutations is included in the sufficient category. Students with activist learning styles only meet a few aspects of mathematical representation indicators. In the aspect of visual representation, he can only fulfill indicators using visual representation in solving problems, while in indicators of making pictures, tables, or diagrams to clarify problems and facilitate answers, students with activist learning styles have not been able to meet these indicators. In the aspect of symbolic and verbal representation, students with activist learning styles have been able to meet the indicators. Among these indicators are making equations or mathematical models from other representations given; solve problems by involving mathematical expressions; create problem situations based on the data or representations provided; and answer questions using words or written text.

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6. References

Aisyah, R., & Rahmat, T. (2023). Kemampuan Pemahaman Konsep Matematika Siswa Ditinjau Berdasarkan Gaya Belajar Honey Mumford. *JP2M (Jurnal Pendidikan Dan Pembelajaran Matematika)*, *9*(1), 98–108. https://doi.org/10.29100/jp2m.v9i1.3660

Akbar, P., Hamid, A., Bernard, M., & Sugandi, A. I. (2017). Analisis Kemampuan Pemecahan Masalah dan Disposisi Matematik Siswa Kelas XI SMA Putra Juang dalam Materi Peluang. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *2*(1). https://doi.org/10.31004/cendekia.v2i1.62

Alwandita, H. (2024). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Pecahan pada Siswa Kelas VI di Sekolah Dasar Kartika XVII-1 Pontianak Kota. *Journal on Education*, *06*(03).

Amelia, S. F. (2018). Analisis Gaya Belajar dan Gaya Berpikir Siswa Kelas VIII pada Pembelajaran IPA Di SMP Negeri 5 Padang Panjang. *IAIN BATUSANGKAR*, *1*(1).

Fauzan, A., & Yerizon. (2013). Pengaruh Pendekatan RME dan Kemandirian Belajar Terhadap Kemamampuan Matematis Siswa. *Prosiding Semirata FMIPA Universitas Lampung*.

Fitri, A., & Abadi, A. M. (2021). Kesulitan Siswa SMA dalam Menyelesaikan Soal Matematika pada Materi Peluang. *Jurnal Riset Pendidikan Matematika*, *8*(1). https://doi.org/10.21831/jrpm.v8i1.17004

Hendriana, B., Waluya, B., Rochmad, & Mulyono. (2019). *Kemampuan Komunikasi Matematis Siswa Berdasarkan Gaya Belajar Honey dan Mumford*.

Kuncoro, A. R., & Ruli, R. M. (2022). Analisis Kemampuan Pemahaman Konsep Matematis Siswa SMP Pada Materi Relasi dan Fungsi Berdasarkan Teori Honey Mumford. *Jurnal Ilmiah Dikdaya*, *12*(1). https://doi.org/10.33087/dikdaya.v12i1.271

Masuda, A., Sugeng Pambudi, D., & Murtikusuma, R. P. (2021). Analisis Penalaran Matematis Siswa SMA Kelas XI dalam Menyelesaikan Soal Barisan dan Deret Aritmetika Ditinjau dari Gaya Belajar Honey-Mumford. *JRPIPM*, *5*(1), 2581–0480.

Muhammad, N. (2016). Pengaruh Metode Discovery Learning untuk Meningkatkan Representasi Matematis dan Percaya Diri Siswa. *Jurnal Pendidikan Universitas Garut*, *09*(01).

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics.

Nur, M. G., & Risnawita, R. (2013). Gaya Belajar: Kajian Teoritik. In *Pustaka Pelajar*. http://repository.iainkediri.ac.id/id/eprint/583

Putri, H. E. (2017). Pendekatan Concrete-Pictorial-Abstract (CPA), Kemampuan-Kemampuan Matematis dan Rancangan Pembelajarannya. In *UPI Sumedang Press*. https://tinyurl.com/ywo7h7dt

Sanjaya, I. I., Maharani, H. R., & Basir, M. A. (2018). Kemampuan Representasi Matematis Siswa pada Materi Lingkaran Berdasar Gaya Belajar Honey Mumfrod. *Kontinu: Jurnal Penelitian Didaktik Matematika*, *2*(1). https://doi.org/10.30659/kontinu.2.1.72-87

Zakirman. (2017). Pengelompokkan Gaya Belajar Mahasiswa Menurut Teori Honey Mumford Berdasarkan Intensitas Kunjungan Pustaka. *RISTEKDIK, Jurnal Bimbingan Dan Konseling*, *4*(1).