UJMER 11 (2) (2022) :114 - 120

Unnes Journal of Mathematics Education Research

http://journal.unnes.ac.id/sju/index.php/ujmer

Students' Mathematical Connection Ability on the Material of Volume of Cubes and Blocks in View of Keirsey's Personality Type

Theresia Avila Pontus ✉, Iwan Junaedi, Putut Marwoto

Universitas Negeri Semarang, Indonesia

Article Info

Article History:
Received :
10 August 2022
Accepted:
9 September 2022
Published:
30 December 2022

Keywords:
Mathematical Connection Ability, Keirsey's Personality Type.

Abstract

The purpose of this study was to describe students' mathematical connection abilities in terms of Keirsey's personality type. This type of research is descriptive qualitative. The research subjects consisted of 36 fifth grade students at SDN Petompon 02 Semarang. Data collection techniques in this study were tests, observations, and interviews. The test results were analyzed, namely the indicator of mathematical connection ability refers to the NCTM indicator (2000). Data analysis was carried out with the following steps: reduction stage, presentation stage, and conclusion stage. The results of the study found that: (1) out of 36 students there were 11 artisan, 10 guardian, 7 idealist, 7 rational, and 1 artisan-guardian; (2) each personality type has various mathematical connection abilities, as well as the ability of mathematical connections within a personality also varies. For example, students with the idealist are generally able to master the three indicators of connecting between topics in mathematics, connecting mathematical concepts with other disciplines, but there are also some who fail to relate mathematics to everyday life.

✉Correspondence:
Jl. Kelud Timur II No.15, Gajah Mungkur, Kota Semarang.Indonesia
E-mail: theresiaavilapontus@students.unnes.ac.id

p-ISSN 2252-6455
e-ISSN 2502-4507

INTRODUCTION

Humans in everyday life are inseparable from problems. Problems can be solved through various scientific fields, including Mathematics. Mathematics plays an important role in building human scientific mindsets and attitudes (Diana et al., 2020). In the world of mathematics education consists of concepts that are interrelated so that learning them must be sequential and sustainable (Fahrudin et al., 2018; Hasbi et al., 2019). Mathematics in addition to solving problems in society is also good for the benefit of mathematics itself, therefore mathematics is very important in the world of education.

Mathematical connections help shape students' perceptions by seeing mathematics as an integral part of their lives, so that they can use and apply mathematics in problem solving (D. A. Putri et al., 2020). Students' mathematical connection ability is one of the standards set by NCTM (2002). Mathematical connections are students' abilities to find relationships between representations of concepts and procedures, understanding between mathematical topics, and students' abilities to apply mathematical connections in other fields or in everyday life (Febriyanti et al., 2019; Jawad, 2022).

Mathematical connections help students to achieve deep conceptual understanding. On an international scale, mathematical connections have been shown to have a direct, positive influence on problem-solving abilities. The ability of students to connect ideas will determine the success of students in solving mathematical problems. when students solve problems, information on the problem must be connected to the knowledge that has been mastered, then students recall knowledge related to the questions from the problem (Quilang & Lazaro, 2022; Arjudin et al., 2020).

Mathematical connection is one of the higher order thinking skills, therefore it is

important to be trained and developed in learning mathematics (Bernard & Senjayawati, 2019). Connections consist of intra-mathematical connections and extra-mathematical connections. Intra-mathematical connections include conceptual relationships in learning mathematics while extra-mathematical connections are connected with other disciplines or real life (Zubillaga-Guerrero et al., 2021; García-García & Dolores-Flores, 2018).

Mathematical connections as skills and processes. The process in question is a cognitive process in which a person connects two or more ideas, concepts, definitions, theorems, procedures, representations and meanings with each other with other scientific disciplines or with real life (Rodríguez-Nieto et al., 2022; Dolores-Flores et al., 2018). Mathematical connections help students generate connections of ideas that can help solve problems (Hardi et al., 2020). Connection as a link that allows students to learn more young and meaningful (Zenging, 2019). A good mathematical connection shows that students have high learning independence (Putri et al., 2020).

The process of mathematical connections needs to be built and improved (Islami et al., 2018). One aspect of important mathematical connection skills that needs to be considered in the learning process includes positive attitudes or students' views of mathematics (Kartika et al., 2019). In solving mathematical connection ability questions, problem solving skills are needed, which include the very familiar stages of problem solving, namely understanding the problem, making plans, carrying out plans, and checking again (Baiduri et al., 2020).

Based on the results of an interview with one of the homeroom teachers at SDN Petompon 02 Semarang, it was found that the students' mathematical connection abilities were not maximized. This can be seen in the test scores of students who have not reached the KKM of 65%. Materials that are considered difficult are cubic and block building materials. Many students have not been able to relate questions related to everyday life. The questions given are in an unusual form, students find it difficult to convey the formula in solving problems. There are even students who only write the formula and don't continue their work. The results of the researcher's observations were that students did not dare to ask for difficulties in solving problems, students lacked initiative, this was evident when the teacher gave them the opportunity to ask questions or argue.

Students have good mathematical connection skills if they meet the indicators of mathematical connection ability which refer to NCTM (2000), namely (1) Connecting between mathematical topics; (2) Linking the concepts of mathematics and other disciplines; (3) Connecting mathematics with everyday life.

Consciously or unconsciously, everyone behaves, acts, speaks, and thinks differently by psychologists called personality. Personality differences can contribute to how students learn in class (Murphy et al., 2020). Individual differences in personality can have an influence on cognitive abilities in general through differences in motivational orientation, learning approaches, levels of self-confidence, achievement goals, and self-regulation tendencies resulting in different academic achievements (Agler et al., 2019). Personality type is a psychological classification of various individuals (Anggraini et al., 2022). Personality type is considered an important factor in determining student behavior that influences the learning process (Winarti et al., 2021). Personality is defined as a description of how a person takes information and how a person makes decisions (Maya, 2018).

Keirsey in 1998 grouped personality into four types of namely Artisan, Idealist, Guardian, Rational. This grouping is based on how individuals obtain energy (extroverted or introverted), how individuals take in information (sensing or intuitive), how individuals make decisions (thinking or feeling), and how their basic lifestyle is (jugjing or perceiving). Type artisan is characterized by a class form that has lots of discussions and presentations because this type tends to want to show its abilities and likes change and dislikes stability. Type guardian is characterized by following routine procedures with detailed instructions, or in other words, this type prefers classes with traditional models with regular procedures. Type idealist is characterized by liking to complete tasks in group discussions, likes reading and writing so that it is more suitable if given a test in the form of a description or story questions. Type rational is characterized by liking learning methods by solving complex problems, preferring to learn independently, and being able to grasp abstractions and material that requires high intellect.

Based on the description above, the researcher is interested in conducting research on students' mathematical connection abilities in the material volume of cubes and blocks in terms of personality type Keirsey.

METHOD

This type of research is descriptive qualitative. The research was carried out at SDN Petompon 02 Semarang on March 15 – 15 April 2022. The research subjects were 36 students in class V at SDN Petompon 02 Semarang. The choice of subject is based on the classification of student personality types according to Keirsey, namely artisan, guardian, idealist, and rational.

The determination of the subject of this study was based on the classification of students' personality types and the results of the Mathematical Connection Ability Test (TKKM). Obtained 11 subjects of artisan type, 10 subjects of guardian type 7 type, idealist 7 subjects of rational, and artisan-guardian 1 subject.

Data collection techniques in this study were tests, observations, and interviews. The test results were analyzed referring to the indicators of mathematical connection, namely: (1) indicators of connecting between topics in mathematics (I1); (2) indicators connecting mathematical concepts with other scientific disciplines (I2); (3) indicators connecting mathematics with everyday life (I3). Data analysis was carried out through the reduction stage, the data presentation stage, and the conclusion making stage.

RESULTS AND DISCUSSIONS

Filling out the Keirsey personality type questionnaire in the experimental class was given on Thursday 22 March 2022. The purpose of giving the questionnaire is as a basis for grouping students based on Keirsey's personality type.

The grouping of experimental class students based on Keirsey's personality type can be seen in the following table.

.

Table 1.1 Grouping of Experimental Class Students Based on Keirsey's Personality Types

Personality Type	Number of Student	Percentage(%)
Artisan	11	31%
Guardian	10	28%
Idealist	7	19%
Rasional	7	19%
Artisan-Guardian	1	3%
Total	36	100%

Based on the results of filling out the Keirsey personality type questionnaire which was filled out by 36 students in the experimental class, 2 student

representatives were taken for each category for in-depth analysis of their mathematical connection abilities. Of the 6 valid category questions, the researcher used 2 items from each indicator to analyze mathematical connection abilities. The following will review the pattern of mathematical connection ability in terms of Keirsey's personality type.

Type artisan masters almost all indicators of mathematical connection ability. In the first indicator, the artisan able to relate beam volume material and comparative material. The artisan type solves the problem according to the completion steps, namely finding the length value by connecting the ratio of length and width and then looking for the height value. Subject artisan calculates the volume of the lamp using the volume of the beam formula, but for question number 2 the artisan still has difficulty finding the cube root value

In the indicators connecting mathematical concepts with other disciplines, the artisan completes according to the completion steps, namely calculating the volume of figure 2 using the beam volume formula, the next step is the subject calculates the volume of the cube using the lever balancing conditions even though on the answer sheet the subject does not write the lever balance requirements, but steps completion and final results are correct.

On the indicator of connecting mathematics with everyday life, the subject was not right in solving problem number 4. The subject had difficulty determining the steps for solving it, however, in question number 5, the subject had completed according to the steps, namely finding the volume of water using the volume of blocks, then looking for costs by diverting the volume of water and the cost per liter. This is in line with research conducted by Prasetyo et al., (2017) namely artisan tend to be active in class but always want to be noticed so they don't focus too much on learning.

Subject guardian mastered the first indicator and the second indicator, while in the third indicator the guardian subject still had difficulty solving the questions. In the indicator connecting between topics in mathematics, the subject completes the steps, namely the first step is to find the width value using the ratio of length and width, find the height value, then calculate the volume of the lamp using the volume of the beam. The subject's answer is correct.

In the second indicator, namely connecting mathematical concepts with other disciplines, the guardian type completes according to the completion steps, namely calculating the volume of Figure 2 using the beam volume formula, the next step is that the subject calculates the volume of the cube using the lever balancing conditions as well as the completion steps and the result is correct.

On the indicator of connecting mathematics with everyday life, it is known that the subject is not correct in solving questions number 5 and number 6. The subject has difficulty in determining the steps for completion and the result is still wrong. This is contrary to research conducted by Purwaningsih et al., (2017), guardians are able to restate a concept, classify objects according to certain properties according to the concept, provide examples and non-examples, present concepts in various forms of mathematical representation but are less able to develop necessary or sufficient requirements of a concept, using, utilizing and selecting certain procedures or operations, and applying concepts or algorithms to problem solving. In this study, guardians experienced difficulties in solving problems on indicators connecting mathematics with everyday life.

Type idealist can relate the material of the block volume and the comparison material type idealist solves the problem according to the completion steps, namely finding the length value by connecting the ratio of length and width and then looking for the height value. The subject calculated the volume of the lamp using the beam volume formula however, the idealist subject was mistaken in writing the answer to question number 2. After the interview was conducted, the idealist was finally able to explain properly and was able to justify the wrong calculation. This is in accordance with what was said by Dewiyani (2015) that the soft skill attributes possessed by idealists are fighting spirit and creativity. Subject idealist solves questions on indicators connecting mathematical concepts with other disciplines, the first step, the subject calculates the volume of figure 2 using the volume beam formula, the next step is the subject calculates the volume of the cube using the lever balance conditions and the result is correct.

On the indicator of connecting mathematics with everyday life, the subject completes it by writing

the steps sequentially and the answers given are correct.

Type rational able to relate beam volume material and comparison material. The rational type solves the problem according to the completion steps, namely finding the length value by connecting the ratio of length and width and then looking for the height value. The subject calculated the volume of the lamp using the volume of the beam formula, however, for question number 2 of the rational type, it was still difficult to find the cube root value.

In the indicators connecting mathematical concepts with other disciplines, the rational completes according to the completion steps, namely calculating the volume of figure 2 using the beam volume formula, the next step is the subject calculates the volume of the cube using the lever balancing conditions even though on the answer sheet the subject does not write the lever balancing conditions but steps completion and results are correct.

On the indicator connecting mathematics with everyday life, the subject was not correct in solving problem number 5. The subject had difficulty determining the steps for solving it, however, in question number 6 the subject had completed the steps according to the steps, namely finding the volume of water using the volume of the block. The result is true. This is contrary to research conducted by Yuwono (2010), that Rational type students tend to ignore material that is deemed unnecessary or a waste of time. In this study, Rational wrote detailed calculations and the results were correct.

CONCLUSION

Obtained from this study are (1) The results of distributing personality type questionnaires in class V out of 36 students there were 11 or 31% who had the artisan personality type, 10 students or 28% had the guardian, 7 students or 19 personality type idealist, 7 students or 19% had a rational personality type, and 1 student or 3% had an artisan-guardian. (2) Each personality type has various connection abilities, as well as the ability of mathematical connections within a personality also varies. For example, students with the idealist are generally able to master indicators of mathematical connection ability, namely mastering indicators of connecting between topics in mathematics, connecting mathematical concepts with other disciplines, but there are also some who fail to relate mathematics to everyday life.

REFERENCES

Agler, L. L., Noguchi, K., & Alfsen, L. K. (2019). Personality traits as predictors of reading comprehension and metacomprehension accuracy. *Current Psychology*, *40*(1), 5054–5063. https://doi.org/https://doi.org/10.1007/s12144-019-00439-y

Anggraini, M. P., Cahyono, B. Y., Anugerahwati, M., & Ivone, F. M. (2022). The interaction effects of reading proficiency and personality types on EFL university students' online reading strategy use. *Education and Information Technologies*, *27*(6), 8821–8839. https://doi.org/10.1007/s10639-022-10979-9

Arjudin, Sa'dijah, C., Sutarto, & Hastuti, I. D. (2020). Characteristic of the incomplete mathematical connections in understanding of algebraic problem. *International Journal of Scientific and Technology Research*, *9*(3), 4935–4940.

Baiduri, Putri, O. R. U., & Alfani, I. (2020). Mathematical connection process of students with high mathematics ability in solving PISA problems. *European Journal of Educational Research*, *9*(4), 1527–1537. https://doi.org/10.12973/EU-JER.9.4.1527

Bernard, M., & Senjayawati, E. (2019). Meningkatkan Kemampuan Koneksi Matematik Siswa SMP dengan Menggunakan Pendekatan Metaphorical Thinking Berbantuan Software Geogebra. *Jurnal Mercumatika : Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *3*(2), 79–87. https://doi.org/10.26486/jm.v3i2.558

Dewiyani, M. J. (2015). Improving Students Soft Skills using Thinking Process Profile Based on Personality Types. *International Journal of Evaluation and Research in Education (IJERE)*, *4*(3), 118–129.

Diana, N., Suryadi, D., & Dahlan, J. A. (2020). Analysis of students ' mathematical connection abilities in solving problem of circle material : transposition study. *Journal for the Education of Gifted*, *8*(2), 829–842.

https://doi.org/https://doi.org/10.17478/jegys.689673

Dolores-Flores, C., Rivera-López, M. I., & García-García, J. (2018). Exploring mathematical connections of pre-university students through tasks involving rates of change. *International Journal of Mathematical Education in Science and Technology*, *50*(3), 369–389. https://doi.org/10.1080/0020739X.2018.1507050

Fahrudin, F., Netriwati, N., & Putra, R. W. Y. (2018). Pembelajaran Problem Solving Modifikasi untuk Meningkatkan Kemampuan Pemahaman Konsep Matematis Siswa SMP. *Desimal: Jurnal Matematika*, *1*(2), 181. https://doi.org/10.24042/djm.v1i2.2556

Febriyanti, Bagaskorowati, R., & Makmuri. (2019). The Effect of The Realistic Mathematics Education (RME) Approach and The Initial Ability of Students on The Ability of Student Mathematical Connection. *International Journal for Educational and Vocational Studies*, *1*(3), 153–156. https://doi.org/https://doi.org/10.29103/ijevs.v1i3.2117

García-García, J., & Dolores-Flores, C. (2018). Intra-mathematical connections made by high school students in performing Calculus tasks. *International Journal of Mathematical Education in Science and Technology*, *49*(2), 227–252. https://doi.org/10.1080/0020739X.2017.1355994

Hardi, H., Wahyudi, W., Suyitno, H., & Krtono, K. (2020). Journal of Technology and Science Education. *Journal of Technology and Science Education*, *5*(3), 184–193.

Hasbi, M., Lukinto, A., & Sulaiman, R. (2019). International Journal of Innovation, Creativity and Change. www.ijicc.net Volume 5, Issue 3, 2019 Special Edition: *International Journal of Innovation, Creativity and Change*, *5*(3), 685–707.

Islami, M. D., Sunardi, & Slamin. (2018). The Mathematical Connections Process of Junior High School Students with High and Low Logical Mathematical Intelligence in Solving Geometry Problems. *International Journal of Advance Enginering Research and Science (IJAERS)*, *6495*(4), 10–18.

Jawad, L. F. (2022). Mathematical connection skills and their relationship with productive thinking among secondary school students. *Periodicals of Engineering and Natural Sciences*, *10*(1), 421–430.

Kartika, Y. K., Pujiastuti, E., & Soedjoko, E. (2019). The effectiveness of project based learning with creative mind-map tasks for improving mathematical connection ability and student curiosity. *Unnes Journal of Mathematics Education*, *8*(2), 145–151. https://doi.org/10.15294/ujme.v8i2.31937

Maya, N. (2018). Analisis Tipe Kepribadian Siswa Dan Pengaruhnya Matematika Menggunakan Model. *Pasunda Journal of Research in Mathematics Learning and Education*, *3*(1), 41–55.

Murphy, L., Eduljee, N. B., Croteau, K., & Parkman, S. (2020). Relationship between Personality Type and Preferred Teaching Methods for Undergraduate College Students To cite this article : Relationship between Personality Type and Preferred Teaching Methods for Undergraduate College Students. *International Journal of Research in Education and Science (IJRES)*, *6*(1), 100–109.

Prasetyo, A., Dwidayati, N. K., & Junaedi, I. (2017). Students's Mathematical Connection Ability and Disposition Reviewed by Keirsey Personality Type through Eliciting Activities Mathematics Learning Model. *Unnes Journal of Mathematics Education*, *6*(2), 190–197. https://doi.org/10.15294/ujme.xxxxxx

Purwaningsih, K., Zaenuri, & Hidayah, I. (2017). Analysis of Concept Understanding Ability in Contextual Teaching And Learning in Quadrilateral Materials Viewed from Students Personality Type. *Unnes Journal of Mathematics Education*, *6*(1), 42–51. https://doi.org/10.15294/ujme.v6i1.12642

Putri, D. A., Istihana, I., & Putra, R. W. Y. (2020). Pengaruh Pembelajaran Conceptual Understanding Procedures Berbantuan Modul Desain Didaktis Terhadap Kemampuan Pemahaman Konsep. *Prima: Jurnal Pendidikan Matematika*, *4*(1), 64–74. https://doi.org/10.31000/prima.v4i1.1652

Putri, E. R., Budiyono, & Indriati, D. (2020). POGIL model on mathematical connection ability viewed from self-regulated learning. *International Journal of Evaluation and Research in Education*, *9*(2), 394–400. https://doi.org/10.11591/ijere.v9i2.20321

Quilang, L. J. L., & Lazaro, L. L. (2022). Mathematical connections made during investigative tasks in statistics and probability. *International Journal of Evaluation and Research in Education (IJERE)*, *11*(1), 239–249. https://doi.org/10.11591/ijere.v11i1.2173

Rodríguez-Nieto, C. A., Font Moll, V., Borji, V., & Rodríguez-Vásquez, F. M. (2022). Mathematical connections from a networking of theories between extended theory of mathematical connections and onto-semiotic approach. *International Journal of Mathematical Education in Science and Technology*, *53*(9), 2364–2390. https://doi.org/10.1080/0020739X.2021.1875071

Winarti, Cahyono, B. Y., Nur Mukminatie, N. M., & El Khoiri, N. (2021). Collaborative writing using process writing approach: The effect of group size and personality types. *International Journal of Instruction*, *14*(4), 391–410. https://doi.org/10.29333/iji.2021.14424a

Yuwono, A. 2010. Profile of high school students in solving math problems in terms of personality type. Thesis. Surakarta: Eleven March University Postgraduate Program.

Zenging, Y. (2019). Development of mathematical connection skills in a dynamic learning environment. *Education and Information Technologies*, *24*(3), 2175–2219. https://doi.org/https://doi.org/10.1007/s10639-019-09870-x

Zubillaga-Guerrero, E., Rodríguez-Vásquez, F. M., & Romero-Valencia, J. (2021). Case Study on Intra-mathematical Connections when Solving Tasks Associated with the Classification of Groups of Prime Order. *Journal of Research in Mathematics Education*, *10*(3), 269–295. https://doi.org/10.17583/redimat.8794