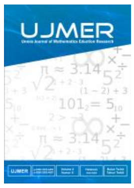
UJMER 11 (1) (2021) 64 - 70

Unnes Journal of Mathematics Education Research

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



Problem Solving Ability Judging from Adversity Quotient on Problem Based Learning Model Assisted by Ethnomathematics Module

Petronela Ivoni Susanty ✉, Zaenuri Zaenuri, Iqbal Kharisudin

Universitas Negeri Semarang, Indonesia

Article Info

Article History:
Received :
10 March 2022
Accepted:
12 April 2022
Published:
30 June 2022

Keywords:
Problem Solving Ability, Adversity Quotient, Problem Based Learning, Ethnomathematics

Abstract

The purpose of this study is to characterize students' problem-solving skills based on the adversity quotient in the PBL model learning supported by the ethnomathematics module. This form of research is an explanatory sequential model with mixed methods. The participants in this study were eighth graders from SMP Negeri 1 Nita during the 2020/21 academic year. The experimental class employs a problem-based learning model with an ethnomathematics module, while the control class employs a problem-based learning model alone. Before beginning the study, students in the experimental class were given a questionnaire to establish their adversity quotient category: quitter, camper, or climber. Two students were chosen for qualitative analysis of each category. Results from problem-solving aptitude tests, interviews, questionnaires, and documentation were used to collect data. The average completeness test, classical completeness test, average difference test, different percentage test, and influence test were used to analyze quantitative data. The results of the study reveal that the adversity quotient of pupils influences their problem-solving skills. The ability of research volunteers from each adversity quotient category to solve problems differs. Q1 subjects achieved two problem-solving indicators, while Q2 subjects achieved three problem-solving indicators. CA1 subjects attained three problem-solving indicators, while CA2 subjects attained four problem-solving indicators. Subjects CL1 and CL2 obtained four problem-solving indications in the climber category.

✉Correspondence:
Kampus Pascasarjana Unnes, Jl. Kelud Utara III Semarang 50237, Indonesia
E-mail: ivonisusanty@gmail.com

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

INTRODUCTION

Mathematics is the foundation of all fields of science, and students should acquire mathematical proficiency through studying mathematics. This is consistent with Lee's (2017) assertion that mathematics is the mother of all scientific disciplines and the cornerstone of all sciences, as solving most scientific and engineering problems requires mathematics. According to Junaedi and Asikin (2012), mathematics education must be structured to encourage pupils to develop mathematical skills. The relevant mathematical skills include the capability to understand, communicate, connect, reason, and solve mathematical problems.

In mathematics education, including at SMP Negeri 1 Nita, the ability to solve problems is still a major issue. According to the findings of interviews with mathematics teachers, students struggle to solve problems and feel despondent if the questions are slightly different from the examples provided by the teacher. Students have difficulties comprehending challenges and developing solutions for problem-solving. This is consistent with Kostopoulos and Lee's (2012) assertion that most errors in problem solving come during the initial stages of understanding. The teacher also showed that pupils' reluctance to persevere if they did not comprehend the challenges posed in the questions were a barrier to studying mathematics. Students tend to bypass questions deemed difficult in favor of those deemed simple. This is consistent with Sakrani's (2014) assertion that students prefer to give up when they cannot find the final answer to a particular problem because they believe it is beyond their capabilities.

Students' ability to overcome obstacles is a factor that can affect their academic progress. Adversity Quotient is a novel idea that has been developed by Paul Stoltz (AQ). Stoltz (Sugiarti, 2020) describes a person's adversity quotient as their capacity to overcome obstacles. The adversity quotient has three types: (1) climbers, the type of people who generally do not know the term "giving up" in the face of difficulties; they always seek solutions and are very capable of surviving in the face of severe difficulties; (2) camper types of people who still have the desire to face the challenges that exist, but do not do it wholeheartedly or to the best of their ability; (3) quitters, the type of people who are unable to survive adversity, generally they will stay away and leave the difficulty, easily give up, give up easily, and tend to be passive.(Khumairoh, 2020).

Facing students who are easily discouraged from problem-solving requires a unique approach to education that can inspire students to be diligent and never give up while constructing ideas and using their knowledge and skills. According to Kharisudin and Cahyati (2020), it is vital to teach problem-solving skills utilizing a defined procedure while teaching mathematics. Problem-Based Learning or PBL is learning that employs genuine (authentic) situations that are not structured (ill-structured) and are open as a framework for students to develop problem-solving and critical thinking abilities and construct new knowledge (Kemendikbud, 2013). Students can actively participate in the learning process, acquire direct experience, and develop their own knowledge using modules. According to Febriyanti (2021), a module is a sort of teaching material that is packed with a comprehensive and systematic manner, containing a series of learning experiences meant to assist students master specific learning objectives. With the use of modules, the PBL model of learning encourages students to be active and free to explore based on their ability.

According to Zaenuri and Dwidayati (2018), mathematics is not simply a subject, but also a human activity directly tied to local culture. According to Utami (2021), pupils find it easier to address difficulties when they are exposed to familiar scenarios. Conceptually, ethnomathematics refers to the study of mathematics that emphasizes the local culture. Ethnomathematics is the application and development of mathematical concepts and procedures inside a particular cultural group to solve daily problems.

For example, the Sikka people have traditional units of grouping many fruits, namely *tali*, *liwut*, and *subur*, where 1 *tali* = 2 pieces, 1 *liwut* = 4 piece, and 1 *subur* = 40 piece. In addition, the traditional unit for measuring the length and width of an object is the paga or span. This paga unit is also often used by weaving craftsmen to measure the length and width of their woven products. The woven products of the Sikka community are *utan* (sarong for women), *lipa* (sarong for men), and *sembar* (sarong for women).

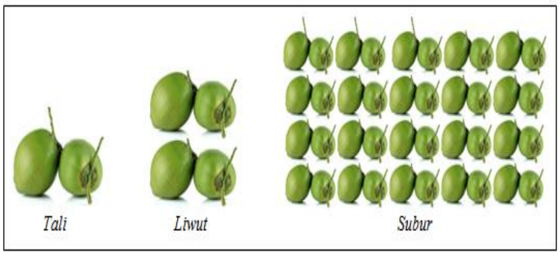


Figure 1 Number of coconuts according to the unit *Tali, Liwut, and Subur*

Figure 2 Utan, Lipa, and Sembar

The ethnomathematics module is a mathematics teaching material containing a series of learning exercises that have been systematically and culturally customized for the students. It is anticipated that the implementation of the ethnomathematics module will foster an individual learning process and offer students with experience identifying the optimal solution method for a mathematical problem. This study seeks to characterize students' problem-solving skills based on the adversity quotient in problem-based learning models supported by the ethnomathematics module.

METHOD

The research method utilized is a sequential explanatory mix method. A pretest-posttest control group design was utilized. The participants in this study were eighth graders from SMP Negeri 1 Nita during the 2020/21 academic year. The sample was selected using a cluster random sampling method. Class VIII A as the experimental class employs the PBL learning model with the assistance of the ethnomathematics module, whereas class VIII B as the control class employs the PBL learning model. Before beginning the study, an AQ exam was administered to experimental class students to determine their AQ category, namely quitter, camper, or climber. Then, two students were chosen for qualitative analysis in each category.

Utilizing a test of problem-solving abilities, quantitative data gathering approaches were conducted. Using questionnaires, interviews, and documentation to collect qualitative data. The technique for quantitative data analysis begins with item analysis, followed by basic data analysis and hypothesis testing. The initial data analysis was conducted to establish if the two sample groups had the same initial ability, and it was determined that the initial ability of students in both classes was identical. In the meanwhile, hypothesis testing consists of individual and traditional completeness tests, average difference tests, various percentage tests, and influence tests. Tests for normality, homogeneity, average completeness, proportion completeness, and average difference were performed on quantitative data. Before testing the hypothesis, SPSS 16.0 was used to conduct two necessary tests: the normality test using the Kolmogorov-Smirnov test and the homogeneity test using the Levene test. Following the Miles and Hubermen model, qualitative data analysis includes data reduction, data presentation, and drawing conclusions (Sugiyono, 2016).

RESULTS AND DISCUSSIONS

Initial data analysis revealed that the study population was normally distributed, had the same variance, and that there was no significant difference between the average abilities of students in the experimental class and those in the control class. Table 1 displays the final data, mainly the value of the problem-solving skill of the two classes.

Table 1 Student Problem Solving Ability Data

Description	Experiment Class	Control Class
Number of	32	32
Stundents	78.31	74.28
Average	7.26	7.77
Standard Deviation	89	89
Maximum	60	60
Minimum		

Assessment of learning outcomes showed that TKPM findings were normally distributed with a sig.= 0.200 values and homogeneous with a sig.=0.902 values. The calculation of the average completeness test of the experimental class using the t-test yielded tcount = 8.05 and ttable = 1.695. Since tcount > ttable, H0 was rejected, and it can be concluded that the average problem-solving ability in the class taught using the PBL model and the ethnomathematics module is greater than 68. Calculations using the proportion test yield the values zcount = 2.68 and ztable = 1.64. Since zcount>ztable, then H0 is rejected, and it can be concluded that more than 75 percent of students in classes taught using the PBL model and the ethnomathematics module are considered complete.

tcount = 2.75 was the result of applying the t-test formula to calculate the average difference test. When the significance threshold is 5% and dk = 62, ttable = 1.669% is calculated. tcount>t table, then H0 is rejected, and it can be inferred that the problem-solving skill of students in the class taught with the PBL model supported by the ethnomathematics module is superior to that of students in the class taught with the PBL model.

The calculation of the difference in proportion test using the z test formula yielded zcount = 2.75 and ztable = 1.64 as the results of the test. zcount>ztable, then H0 is rejected, and it can be inferred that the proportion of students' comprehensive mathematical problem-solving abilities in classes taught with the PBL model assisted by the ethnomathematics module is greater than in classrooms taught with the PBL model.

The linearity test conducted with SPSS yielded a significance value of 0.000 = 0%, thus H0 was rejected. This indicates that the adversity quotient has a considerable impact on students' ability to solve mathematical problems. Based on SPSS calculation findings, the simple linear regression model between AQ and experimental class problem-solving ability yielded a = 56.484 and b = 0.196, resulting in the regression equation Y = 56.484 + 0.196X. In the Model Summary table, the R square value is 0.743. This indicates that the effect of adversity quotient on the capacity to solve mathematical problems is 74.3%, whereas 25.7% is influenced by other variables.

According to research conducted by Prabawa and Zaenuri (2017), ethnomathematical problem-based learning (PBL) is beneficial in developing problem-solving abilities. According to Abdullah et al. (2015), the problem-solving abilities of students who received PBL learning models with ethnomathematical subtleties were superior to those of students who received PBL learning models. To explain the adversity quotient of students based on each category — quitter, camper, and climber — qualitative research was undertaken. Table 2 displays the results based on the adversity quotient questionnaire responses from the experimental class.

Table2.Classification of Experimental Class Students based on AQ

AQ Category	Number of Students	Percentage
Quitter	5	15.625%
Camper	11	34.375%
Climber	16	50%
Total	32	100%

Problem Solving Ability of Quitter Student

In the first stage of problem-solving employing the Polya step, subjects Q1 and Q2 had a firm understanding of the problem. Subjects Q1 and Q2 were only able to plan problem solving effectively for problems 1 and 2 in the second stage. Question number three, subjects Q1 and Q2 put a problem-solving strategy on the answer sheet, but only half of them did so for Q2. Question 4: The topic of Q1 cannot construct a plan for problem-solving, whereas the subject of Q2 can. The third stage, subject Q1 and subject Q2 were only able to successfully answer questions 1 and 2. Subjects Q1 and Q2 were unable to complete the third question. Subject Q1 was unable to answer question 4, whereas subject Q2 was able to do so. Subjects Q1 and Q2 did not recheck all answers in the fourth stage.

A few errors notwithstanding, in the questions with the first NCTM problem solving indicator, quitter students can think methodically and organize their knowledge to solve problems. This demonstrates that students can acquire new mathematical knowledge by solving problems. The second indicator is that Q1 and Q2 subjects can apply and adapt a variety of problem-solving procedures. Even if there is only one strategy and there are errors in the calculating process, the subjects of Q1 and Q2 have sufficient understanding regarding the usage of strategies in problem solving. Thirdly, Q1 and Q2 subjects were unable to complete the test because they did not comprehend the questions and were unable to devise the correct strategy. The subject of Q2 was able to solve the problem effectively, however the subject of Q1 made an error during the planning stage, as he was unable to calculate and simplify the equation, preventing him from completing the assignment.

Quitter students have many difficulties to solve the problem-solving problems. This is in accordance with the results of research from Yani (2016), Darojat & Kartono (2016), Rinawati et al (2019) which states that quitter students have difficulty solving problems. NCTM problem solving indicators that can be achieved by Q1 subjects are two indicators and Q2 subjects are three indicators.

Problem Solving Ability of Camper Student

CA1 and CA2 subjects were able to comprehend the problem well throughout the initial phase of problem-solving with the Polya step. Both CA1 and CA2 subjects were able to create an effective problem-solving strategy during the second stage. Most questions in the third level can be answered correctly, while some math techniques are incorrect. In the final phase, respondents CA1 and CA2 reexamined the responses to a limited number of questions and were less inclined to do so.

CA1 and CA2 subjects have been able to acquire new mathematical knowledge through problem solving in the first problem solving indication. The ability of students to think systematically about all possible outcomes and organize their knowledge to solve issues demonstrates this. CA1 and CA2 subjects were able to apply and adapt to a variety of problem-solving techniques, even while using only one strategy and not attempting to conceive of others. This is consistent with the findings of Rosita and Rochmad (2016), who found that campers like to be in their comfort zone and are content when they do something but not to their full potential.

In terms of the third indicator, CA1 and CA2 subjects were able to solve mathematical problems from mathematics and other fields with few errors. The CA1 subjects' problem-solving technique was nearly accurate, but when they discovered an error when re-checking their solutions, they did not attempt to improve. The subject CA2 troubleshooting procedure was successfully addressed, but it has not been re-checked. This is consistent with what Hidayat and Sariningsih's (2018) research revealed, namely that students with the camper's personality type tend to perform better than quieter students; nevertheless, camper students are less able to re-examine well, thus they cannot discover errors. CA1 subjects can accomplish three NCTM problem solving indicators, while CA2 subjects can obtain four indicators or all indicators.

Problem Solving Ability of Climber Student

In the preliminary stage of problem-solving utilizing the Polya step, subjects CL1 and CL2 were able to comprehend the issue well. CL1 and CL2 subjects were able to plan issue solving well throughout the planning step. At the stage of applying the problem-solved plan, most problems can be answered correctly, however there are a few wrong calculations. At each step of the problem-solving process, the re-examination stage is conducted with attention. Subjects CL1 and CL2 have effectively utilized Polya's problem-solving methods to arrive at the correct solution.

CL1 and CL2 students were able to acquire new mathematical knowledge through problem solving, as measured by the first indicator. In terms of the second indicator, CL1 and CL2 speakers were able to adopt and adapt diverse problem-solving strategies. Students' capacity to employ many strategies demonstrates this point. In the third indicator, subjects CL1 and CL2 can answer mathematical issues arising in domains other than mathematics. In the last phase, participants CL1 and CL2 additionally examined and reflected on the problem-solving process to convince themselves that the solution was accurate. High-strength CL1 and CL2 subjects organize their knowledge to solve problems and think logically about all possibilities.

Based on the preceding description, it can be stated that CL1 and CL2 have strong problem-solving skills. According to research conducted by Muna (2014) and Sunandar et al (2018), climber students can articulate problem-solving stages effectively. NCTM problem solving indicators that can be attained by CL1 and CL2 subjects include four or all indicators.

CONCLUSION

The results indicated that the adversity quotient of the students influenced their problem-solving abilities. The ability of research subjects from each adversity quotient category to solve problems differs. Q1 subjects achieved two problem-solving indicators, while Q2 subjects achieved three problem-solving indicators. CA1 subjects attained three problem-solving indicators, while CA2 subjects attained four problem-solving indicators. Subjects CL1 and CL2 obtained four problem-solving indications in the climber category.

REFERENCES

Abdullah, D.I., Z. Mastur., & H. Sutarto. 2015. "Keefektifan Model Pembelajaran Problem Based Learning Bernuansa Etnomatematika Terhadap Kemampuan Pemecahan Masalah Siswa Kelas Viii." *Unnes Journal of Mathematics Education.* 4(3): 285–91.

Darojat, Latifah., & Kartono. 2016. "Kemampuan Pemecahan Masalah Siswa Dalam Menyelesaikan Soal Open Ended Berdasarkan Aq Dengan Learning Cycle 7E." *Unnes Journal of Mathematics Education Research* 5(1): 1–8.

Febriyanti, Dyara Atmy., & Ain, S. Q. 2021. "Pengembangan Modul Matematika Berbasis Etnomatematika Pada Materi Bangun Datar Di Sekolah Dasar." *Jurnal Basicedu* 5(3): 1683–88.

Hidayat, Wahyu., & Sariningsih, R. 2018. "Kemampuan Pemecahan Masalah Matematis Dan Adversity Quotient Siswa SMP Melalui Pembelajaran Open Ended." *JUrnal JNPM (Jurnal Nasional Pendidikan Matematika* 2(1): 109–18.

Junaedi, I., & Asikin, M. 2012. "Pengembangan Pembelajaran Matematika Humanistik Untuk Meningkatkan Kemahiran Matematis." *Unnes Journal of Mathematics Education Research* 1(2).

Kemendikbud. 2013. *Materi Pelatihan Implementasi Kurikulum 2013*. Jakarta: Kemendikbud.

Kharisudin, I., & Cahyati, N. E. 2020. "Problem-Solving Ability Using Mathematical Modeling Strategy on Model Eliciting Activities Based on Mathematics Self-Concept." *Journal of Physics: Conference Series* 1567(3).

Khumairoh, Binta., Amin, S. M., & Wijayanti, P. 2020. "Penalaran Proporsional Siswa Kelas Menengah Dalam Menyelesaikan Masalah Matematika Ditinjau Dari Adversity Quotient." *Pedagogia: Jurnal Pendidikan* 9(1): 67–80.

Kostopoulos, D., & Lee, J. 2012. "A Naturalistic Study of Executive Function and Mathematical Problem Solving." *Journal of Mathematical Behavior* 31(2): 196–208.

Lee, Chien I. 2017. "An Appropriate Prompts System Based on the Polya Method for Mathematical Problem-Solving." *Eurasia Journal of Mathematics, Science and Technology Education* 13(7): 3621–39.

Muna, Istifadatul., & Mubarokah, L. 2014. "Proses Berpikir Siswa Climber Dalam Pemecahan Masalah Matematika Pada Sekolah Menengah Atas." *Jurnal Pendidikan Matematika STKIP PGRI Sidoarjo* 2(2): 143–50.

Prabawa, E. A., & Zaenuri. 2017. "Analisis Kemampuan Pemecahan Masalah Ditinjau Dari Gaya Kognitif Siswa Pada Model Project Based Learning Bernuansa Etnomatematika." *Unnes Journal of Mathematics Education Research* 6(1): 120–29.

Rinawati, Sulis., Waluya, B., & Hartono. 2019. "The Analysis of Student's Problem-Solving Difficulty Viewed from Adversity Quotient on Means-Ends Analysis Learning." 8(2): 165–72.

Rosita, Dian., & Rochmad. 2016. "Analisis Kesalahan Siswa Dalam Pemecahan Masalah Ditinjau Dari Adversity Quotient Pada Pembelajaran Creative Problem Solving." *Unnes Journal of Mathematics Education Research (UJMER)* 5(2): 106–13.

Sakrani. 2014. "Peningkatan Kemampuan Representasi Matematis Dan Adversity Quotient Siswa SMP Melalui Pendidikan Matematika Realistik." UPI Bandung.

Sugiarti, Rini., Nurlaili, A., & Febriani, U. F. 2020. "Pengaruh Adversity Quotient Terhadap Motivasi Berprestasi Pada Siswa Cerdas Istimewa." *PHILANTHROPY: Journal of Psychology* 4(1): 82.

Sugiyono. 2016. *Metode Penelitian Pendidikan*. Bandung: Alfabeta.

Sunandar, M. A., Zaenuri., & Dwidayati, N K. 2018. "Mathematical Mathematical Problem-Solving Ability of Vocational School Students on Problem Based Learning Model Nuanced Ethnomatematics Reviewed from Adversity Quotient." *Unnes Journal of Mathematics Education Research* 7(1): 1–8.

Utami, N. W., Sayuti, S. A., & Jailani. 2021. "Indigenous Artifacts from Remote Areas, Used to Design a Lesson Plan for Preservice Math Teachers Regarding Sustainable Education." *Heliyon* 7(3): 1–9.

Yani, Muhammad., Ikhsan, M., & Marwan. 2016. "Proses Berpikir Siswa Sekolah Menengah Pertama Dalam Memecahkan Masalah Matematika Berdasarkan Langkah-Langkah Polya." *Jurnal Pendidikan Matematika* 10(1): 43–58.

Zaenuri., & Dwidayati, NK. 2018. "Menggali Etnomatematika: Matematika Sebagai Produk Budaya." In *Prosiding Seminar Nasional Matematika*, 471–76.