ANALYSIS OF STUDENTS MATHEMATICAL REPRESENTATION ABILITIES IN COMPLEX ANALYSIS COURSES IN TERMS OF INITIAL ABILITIES

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ABSTRAK

Rendahnya kemampuan siswa dalam representasi matematis, seperti mengungkapkan konsep atau ide matematis dan mencoba menyelesaikan masalah, terlebih lagi pada mata kuliah analisis komplek kemampuan representasi matematis sangat dibutuhkan. Penelitian ini bertujuan untuk menganalisis kemampuan representasi mahasiswa ditinjau dari kemampuan awal. Penelitian ini dilakukan di program studi tadris matematika Universitas Islam Negeri K.H. Abdurrahman Wahid Pekalongan pada mata kuliah Analisis Kompleks. Jenis penelitian yang digunakan dalam penelitian ini adalah metode deskriptif dengan pendekatan kualitatif. Pengumpulan data yang digunakan dalam penelitian ini menggunakan pretest untuk mengetahui kemampuan awal dan wawancara untuk mengatahui kemampuan representasi mahasiswa. Sampel penelitian adalah mahasiswa tadris matematika angkatan 21. Pengumpulan sampel dilakukan dengan metode purposive berdasarkan persyaratan tertentu, dan validasi data dilakukan dengan tringulasi metode. Analisis data meliputi analisis kondensasi, penyajian data, dan penarikan kesimpulan, yang menghasilkan gambaran kemampuan representasi mahasiswa ditinjau dari kemampuan awal. Hasil dari penelitian secara keseluruhan didapatkan persentase rata-rata kemampuan representasi matematis mahasiswa berada pada kategori sedang. Penelitian ini dapat memberikan pemahaman yang lebih baik tentang hubungan antara kemampuan representasi matematis mahasiswa dengan kemampuan awal mereka dalam mata kuliah Analisis Kompleks.

Kata kunci : representasi matematis, kemampuan awal, analisis kompleks

ABSTRACT

Low mathematical representation skills of students such as revealing mathematic ideas or ideas that are presented and attempts to find solutions to problems, moreover in complex analysis courses the ability to represent mathematics is much needed. The study aims to analyze the representative ability of the student reviewed from the initial ability. This research was conducted in the mathematical tadris

study program of Islamic State University K.H. Abdurrahman Wahid Pekalongan on the course of Complex Analysis. The type of research used in this research is a descriptive method with a qualitative approach. The data collection used in this study uses pretests to determine early skills and interviews to identify student representation skills. The sample of the research was a tadris student of mathematics of the 21st generation. Sampling using purposive sampling with specific criteria and data validation using triangulation techniques. Data analysis includes condensation analysis, data presentation, and conclusion drawings, which produce an overview of the student's reviewed representation abilities from the initial abilities. The results of the overall research obtained average percentage of the student's mathematical representation ability is in the middle category. This research could provide a better understanding of the relationship between students' mathematical representation abilities and their early skills in complex analysis courses.

Keywords: mathematical representation, complex analysis

INTRODUCTION

Mathematics is one of the most important subjects in education, this is evidenced from elementary school to college there are mathematics lessons. In everyday life, it is also inseparable from mathematical concepts that are interconnected with one another (Hardianti & Effendi, 2021: 1093-1094). Mathematics is also a subject that can change and foster students' logical thinking patterns in order to foster curiosity and relate it to real life (Musafaah & Wahidin, 2021: 1093-1094); (Musafaah & Wahidin, 2022: 117).

The National Council of Teachers of Mathematics (NCTM) states that there are 5 standards for basic mathematics skills that students must master, namely problem solving, reasoning and proof, communication, connection, and representation (Sarrasanti, 2021: 61). Based on the NCTM opinion, students' ability to make representations is part of the standard mathematics learning process, so students must have mathematical representation skills.

Mathematical representation ability is the basis or foundation for a student to understand and use mathematical ideas in solving mathematical problems (Rohana et al 2021: 680). To see the mathematical representation skills possessed by students, indicators are needed that describe the extent to which students can use representations in solving problems (Hardianti & Effendi, 2021: 1094). The indicators of mathematical representation ability that will be used in this study are the indicators proposed by Mudzakir, namely visual representation (presenting data or information of a problem in the representation of images, diagrams, graphs or tables), symbolic representation (using mathematical expressions to solve problems), and verbal representation (using words to write problem solving steps). All three of the markers of mathematical representation ability can be effectively displayed by students with strong mathematical representation ability (Herdiana, 2019).

Several studies that have been conducted explain that students' mathematical representation skills are still lacking, because students are only able to fulfill one or two of the three mathematical representation indicators (Hardianti & Effendi, 2021: 1094). Gaffar et al (2017) revealed that students' mathematical representation skills in visual representation were low. In line with Sulastri et al

(2017) who stated that students with low representation skills only fulfill the indicators of symbolic representation (using mathematical expressions to solve problems) and verbal representation (using words in the steps of solving mathematical problems)..

According to Zuyyina et.al. (2018) the initial ability of students is one that determines the success of mathematics learning. Every person has unique learning capacities. The initial capacity of pupils is the capacity that they possessed prior to receiving instruction. It also shows the readiness of students in receiving new material delivered by the teacher.

From the above explanation, the thought arises to conduct research in analyzing students' mathematical representation abilities in complex analysis courses in terms of initial abilities. The purpose of this research is to analyze students' answers and determine students' mathematical representation abilities in complex analysis courses.

This study combines descriptive research with a qualitative methodology. The research was conducted on students majoring in tadris mathematics class of 2021 as many as 6 sources in the complex analysis course with purposive sampling selection with certain considerations. For data collection, researchers used tests and interviews with students, interviews and tests were conducted to determine students' mathematical representation abilities in the tests given to research subjects and were also used to identify students' initial abilities in complex analysis courses. The test and interview guidelines used indicators of mathematical representation consisting of 5 questions for test and 10 questions for interview.

Data validation uses triangulation by combining data that has been collected from both tests and interviews which are then tested for data credibility. Data analysis that researchers use in this study is condensation analysis, data presentation and conclusion drawing. Data condensation refers to the process of selecting, simplifying, abstracting, and or transforming data that is close to the whole part of written field notes, interview transcripts, documents, and other empirical materials. Furthermore, data presentation is carried out by displaying data in the form of descriptions with narrative text. In addition, the analysis of

conclusions from conclusions in qualitative research is expected to be new findings that have not existed before and are used as initial hypotheses (Sugiyono, 2016).

DISCUSSION

Of the 5 test questions given to 6 students with the level of categorising questions starting from low difficulty (Low Order Thinking Skill) question number 1, medium (Middle Order Thinking Skill) questions number 2 and 3, and high (Higher Order Thinking Skill) in question numbers 4 and 5.

Table 1. categories of students' initial ability and mathematical representation

Categories	Grade Criteria
High	$x > 75$
Medium	$75 \leq x \geq 50$
Low	$x < 50$

Description:

$x =$ student score

Based on the data obtained from interviews and tests given to a number of students, various information was obtained.

Table 2. Test results of students' initial ability and mathematical representation

Number of students	Maximum score	Minimum score	Average	Standard Deviation
6	60	40	56,67	18,26

Based on table 2 above, some students have been able to achieve a maximum score of 60, while the minimum score obtained by students is 40, with an average value of 56.67 and a standard deviation value of 18.26 This means that there are still some students in the low category. The mathematical representation ability of students is in the medium category, which means that students can already solve mathematical representation problems on complex number existence material. To use the suggested method to assess students' mathematical representation abilities in the high, medium, and low categories by Arikunto in Hardian & Effenndi (2021).

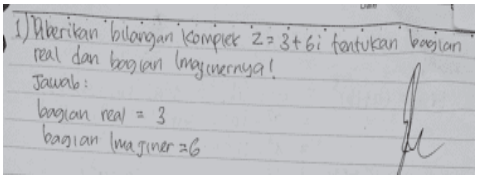
The following are the percentage results of high, medium, and low categories of students' mathematical representation abilities

Table 3. Percentage of Mathematical Representation Ability Criteria

Category	Score criteria	Number of students	Percentage
High	$x > 75$	0	0%
Medium	$75 \leq x \geq 50$	5	83,33%
Low	$x < 50$	1	16,67%
Total		6	100%

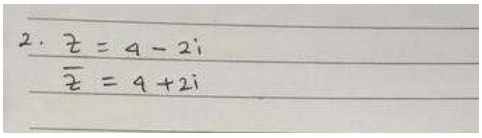
Based on table 3 above, there are no students in the category with a score greater than 75. Students whose mathematical representation skills are in the medium category are 5 people with a percentage of 83.33% and are in the value interval between 75-50, while students who have mathematical representation skills in the low category are 1 person with a percentage of 16.67% and a value interval of less than 50.

From the answers given by students starting from number one, namely identifying parts of complex numbers, 6 students have answered the question correctly where it is known that the representation of words or written text of students has been formed but with a low level of difficulty of the question.



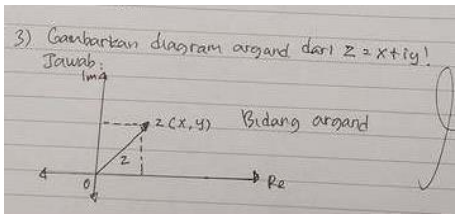
Problem number two which asked about the conjugate form where it presented the ability to represent equations or mathematical expressions, some students were

still wrong in interpreting the conjugate symbol which led to errors in the solution.

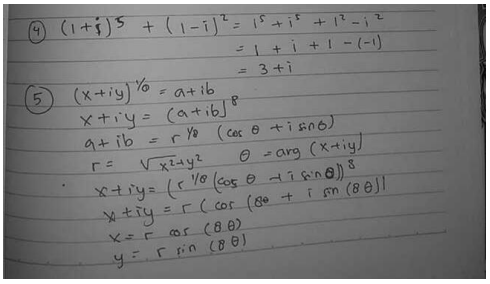


Problem number three was about pictorial representation where students were asked to graph the argand diagram of the complex number $z = x + iy$

Some students have answered correctly.



Problem numbers 4 and 5 describe the representation of equations or mathematical expressions with a high level of difficulty. Some students answered the questions but were wrong and some were unanswered.



In terms of students' initial ability in the complex analysis course, it was found that some of the students had experience in proof analysis which had been followed in the previous course, namely real analysis. Before taking the complex analysis course, students have the view that the complex analysis course is related to mathematical analysis or not much different from the real analysis course in the form of proof.

However, for the initial knowledge of students in distinguishing complex numbers and real numbers, some do not know in detail and some others answer that real numbers only consist of real numbers, while complex numbers are numbers consisting of real numbers and imaginary numbers.

In working on test questions given or assignments from lecturers, students have difficulty finding solutions which are then overcome by various methods such as

discussing with friends, watching learning videos on the YouTube platform or the internet.

CONCLUSION

Based on the presentation of the results and discussion of the research, it is concluded that the level of mathematical representation ability of students in complex analysis courses in terms of initial ability is categorised as moderate with a percentage of 83.33%.

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