Numeracy Literacy Skills of Introverted and Extroverted Students in Solving Linear Program Problems

Muhammad Hilmi Zakaria [1], Noviana Dini Rakhmawati [2]*, Dhian Endahwuri[3], Arif Wibisono[4]

[1,2,3]Program Studi Pendidikan Matemtika Universitas PGRI Semarang, Indonesia
[4]Sejong University, Seoul, Republic of Korea

*Corresponding Author. E-mail: hilmiezakaria2811@gmail.com[1],
novianadini@upgris.ac.id[2], arifwibisono@sju.ac.kr[4]
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Abstract

This study aims to determine the numeracy literacy skills of introverted and extroverted students in solving linear programming problems. The method used in this research is descriptive qualitative. The subjects taken were two students of class XI MIPA-2 MA Banat Tajul Ulum Brabo with details of one introvert student and one extrovert student. Data collection techniques were carried out using questionnaires, written tests, and interviews. Retrieval of research data through written tests and interviews. Based on the results of this study, it shows that introverted subjects fulfill all indicators of numeracy literacy skills, namely solving problems using various numbers and symbols related to mathematics; analyze the information presented in various descriptions (graphs, tables, charts, diagrams and so on); and trap the results of that analysis to make predictions and decisions. Meanwhile, the extrovert subject did not fulfill one of the three indicators of numeracy literacy, namely the confidentiality of the results of the analysis to make predictions and decisions.

Keywords: numerical literacy ability, linear programming, introvert, extrovert

INTRODUCTION

The requirement for literacy and numeracy abilities is significant in today's culture. The capacity to read, write, comprehend, and use information successfully in a variety of circumstances is a component of literacy abilities (Carr et al., 2019; Purpura et

al., 2017; Solikah & Himmah, 2019). The capacity to comprehend, use, and interpret numbers, facts, and mathematical ideas in daily life is referred to as having numeracy skills (Rakhmawati & Mustadi, 2022; Soler-Hampejsek et al., 2018).

Being able to read, write, and do math well allows one to engage actively in society. Effective communication, access to information, and understanding of instructions are all made possible by strong reading and writing abilities (Setiana et al., 2020). One can handle funds, comprehend statistics, and reason logically with the help of strong numeracy abilities (Bitterly et al., 2022; Ghazali, 2020). A solid foundation in math and literacy is crucial for education (Rum & Juandi, 2022; Ubaidah et al., 2022). While good numeracy skills are required for studying math, science, and other fields of study that use data and numbers, good reading skills support comprehension of material across a wide range of subjects (Huang et al., 2017; King & Purpura, 2021). Modern careers frequently require strong literacy and numeracy abilities. In an ever-changing workplace, the capacity to efficiently process information, evaluate data, and apply fundamental computing tools is becoming more and more crucial. One's chances of landing a better job and advancing in their career are also increased by having strong literacy and numeracy skills.

One can build critical and analytical thinking through the use of literacy and numeracy abilities (Fisher et al., 2017; Rakhmawati & Mustadi, 2022; Soler-Hampejsek et al., 2018). Making more deliberate decisions is made possible by having the ability to read critically, assess information, and comprehend its ramifications. One can read facts, comprehend dangers and opportunities, and make wise judgments with the help of strong literacy and numeracy skills.

Governments, educational institutions, communities, and individuals all have responsibilities for enhancing reading and numeracy abilities. In order to adapt to changes and seize opportunities in the face of rapid technological and informational advancements, it is crucial for people to continuously improve their reading and numeracy skills. The capacity to use different numbers and symbols from fundamental mathematics to solve real-world issues, assess data, and come to choices is known as numeracy literacy (Yanuarto et al., 2021; Kurniawan et al., 2022). The following are examples of numeracy literacy indicators: (1) Solve mathematical problems using a variety of numbers and symbols(Colwell & Enderson, 2016; Ensar, 2014); (2) Analyze data presented in a variety

of images (graphs, tables, charts, diagrams, and so on)(Rum & Juandi, 2022); and (3) Interpret the findings of the analysis to make predictions and decisions (Fang & Chapman, 2020; Moschkovich, 2015).

According to the OECD's announcement of the 2018 PISA study findings, Indonesian pupils' reading and math skills achieved an average (mean) score of 379 compared to an average OECD score of 487. We can determine this by looking at how poorly pupils learn maths. In accordance with this, early data indicates that Madrasah Aliyah (MA) Banat Tajul Ulum Brabo students still have low numeracy literacy skills. According to the findings of an interview with a mathematics instructor at MA Banat Tajul Ulum Brabo, some students continue to struggle with addressing problems involving numeracy and literacy that are relevant to daily life, particularly in linear program content. Some students are still having trouble deciphering the information from the problem and having trouble turning it into a mathematical form.

There is no doubt that each student's traits are unique(Facci et al., 2023; Opoku et al., 2023). The distinction between introverted and extroverted personality types is based on how each person behaves, reacts, and conducts connections with other people (Ahmar, 2021; Tsaniya et al., 2022; Yolawati et al., 2022). Personality types also indicate where people are in regard to an activity.

Students with introverted personalities perform better academically than those with extroverted personalities (Fonseca, 2021; Kurniawati & Noviani, 2022; Ruf, 2021). Both, however, have an equal chance to enhance student learning outcomes. Students with extroverted personalities perform better in the psychomotor domain of mathematics learning than introverted students do in the affective and cognitive domains (Reis et al., 2021; Sinatra et al., 2021; Suleman et al., 2022).

Based on the problem description above, considering the importance of numeracy literacy skills for students. The formulation of the problem studied in this study is how the numeracy literacy skills of introverted students in solving linear program problems and the numeracy literacy skills of extroverted students in solving linear program problems.

METHODS

The type of research used is descriptive qualitative. The research was conducted in class XI MIPA-2 MA Banat Tajul Ulum Brabo. Data collection was carried out on

February 25, 2023-March 4, 2023 with linear program material. Taking subjects in this study using purposive sampling. The research subjects were 34 students, then one student with low introverted personality and one extroverted student with strong personality were taken. The data collection methods used were questionnaires, written tests and interviews. Data analysis techniques used in this study are data reduction, data presentation and conclusion drawing (Miles Matthew et al., 2014; Nassaji, 2015; Taylor et al., 2015).

The determination of subjects is based on a questionnaire with the aim of obtaining personality type category data. The questionnaire model used is based on the personality type test according to Carl Gustav Jung with a total of 70 items. After determining the subject then used the written test method of numeracy literacy skills to determine the numeracy literacy skills of students with their personalities. The written test in this study uses indicators of numeracy literacy according to Han et al., (2017), namely: solve problems using various numbers and symbols related to mathematics; analyze information presented in various images (graphs, tables, charts, diagrams and so on); and interpret the results of the analysis to make predictions and decisions. Then from the test results analyzed and then conducted interviews to understand in depth about the validity of the written test results. Furthermore, an analysis was carried out based on the results of the numeracy literacy test and interviews to draw conclusions based on the formulation of the problem. The data validity used in this research is triangulation technique, which is to test the credibility of data or material by verifying information from the same source using different techniques, by looking at and comparing the written test results and interview test results (Sugiyono, 2019).

RESULTS AND DISCUSSION

The research data are questionnaires, written tests of numeracy literacy skills, and interviews. Questionnaires were given to 34 students. Introverted and extroverted subjects determine by giving 1 point for each "yes" answer to the extroverted statement and 0 points for the "no" answer to the statement contained in the extroverted statement. Conversely, giving 0 points for each "yes" answer to the introvert statement and 1 point for the "no" answer to the introvert statement. This questionnaire consists of 36 extroverted statements and 34 introverted statements so that students with scores ≥ 36 include students with extroverted personalities, while students with scores ≤ 35 include students with introverted personalities.

The selection of research subjects was based on student questionnaire results. One introvert student with the lowest score and one extrovert with the highest score were selected to further analyze numeracy literacy skills. The results of the selection of research subjects are as Table 1.

Table 1. Research Subjects

Number	Student Code	Personality Type
1	IN	*introvert*
2	EK	*Ekstrovert*

Based on table 1, students with the name Aulia Salamah with low introverted personality type and Kunti Fauzi'ah with high extroverted personality type were obtained. Furthermore, the selected subjects were given a written test of numeracy literacy skills consisting of two linear program problems. And the interview test used consists of several questions about the indicators of numeracy literacy skills. The following is a discussion of the analysis:

Introvert Subject (IN)

Here are the written test results:

Figure 1. Written Test Results IN 1

Figure 2. Written Test Results IN 2

Here are the results of the interview test:

P : "How do you draw conclusions from the problem and explain?"

IN: "So the profit obtained by the farmer is Rp. 260,000,000.00 from corn getting 80,000,000 and chili getting 18,000,000"

IN subject concluded by adding up the profit from planting corn and chili. IN subject concluded that the maximum profit is Rp. 260,000,000.00. IN subjects can solve and analyze the problems given, IN subjects always try to solve the problems given well. Introverted personality characteristics are careful in doing things, trustworthy, sometimes serious, reliable and make decisions thoughtfully. In line with research conducted by Habibi (2016) who argues that the characteristics of introverts are always careful in planning things and making decisions, as serious as possible in dealing with existing problems, and have a very good memory.

Extroverted Subject (EK)

Here are the written test results:

Figure 3. Written test results EK 1

Figure 4. Written test results EK 2

Here are the results of the interview test:

P : "How do you draw conclusions from the problem and explain?"

EK : "The profit from planting corn is 80,000,000 because per plot in planting corn is 4,000,000 and the profit in planting corn is 20 plots. So, 4,000,000 times 20 plots yields 80,000,000 in profit from planting corn. After that, the profit of planting chili peppers is 60,000,000 and the profitable result is 30 plots with a yield of 240,000,000. The maximum profit is 320,000,000"

Subject EK concluded by adding up the profit from planting corn and chili. Subject EK concluded that the maximum profit is 320,000,000. Subject EK has good numeracy

literacy skills and meets two of the three indicators, namely solving problems using various numbers and symbols related to mathematics; analyzing information presented in various images (graphs, tables, charts, diagrams and so on). From the analysis results, subject EK can understand the problem well. However, subject EK is less careful in performing calculations on the indicator of interpreting the analysis results to make predictions and decisions. Extroverted personality characteristics are lack of focus, easy to make decisions without thinking first. In line with research conducted by Rahayu & Fauziah (2017) which argues that students with extroverted personalities have lower inference skills in solving problems than students with introverted personalities.

Discussion

Introvert Student

Overall, IN respondents actually knew what to do and how to accomplish it, as evidenced by the fact that they answered the researcher's questions during the interview but were unable to put their understanding into writing when instructed to do so. They created a comprehensive mathematical model for the IN topic as a whole, which would be applied when generating conclusions. For subject IN, who has an extroverted personality type, the stage was passed in a different way. Subject IN still has issues with information analysis. While IN subjects are capable of drawing conclusions from the problems presented, they still frequently err in their calculations. This is despite the fact that they comprehend the problems presented, know how to respond to them, and can follow the correct steps to complete the solution.

Mathematical problem-solving is facilitated for introverted pupils by a number of advantages. Students who are introverted have the ability to concentrate. Students who are introverted are typically able to concentrate well in a quiet environment. They like working alone and are capable of focusing on arithmetic issues without being distracted by social interactions or busy situations. This permits students to concentrate intently on difficult math tasks.

Introverted students have excellent analytic abilities. Typically, introverted students have strong analytic skills. They prefer to focus on specifics, recognize patterns, and conduct in-depth analyses of information. Math difficulties frequently require problem solving and logical reasoning, which are talents possessed by introverted pupils.

Introverted pupils are more likely to contemplate and reflect on their educational experiences (Astuti, 2021). Before communicating their opinions with others, they may prefer to process mathematical material internally. This permits students to develop a profound knowledge and gradually construct mathematical concepts (Jameela& Destania, 2020).

Although the introvert stereotype is frequently associated with introverted and more introverted thinking tendencies, introverted students can also demonstrate high levels of creativity when solving mathematical problems. They have an inclination to think creatively, recognize intricate relationships, and devise original strategies for overcoming mathematical obstacles (Tsaniya & Fisher, 2022).

Typically, introverted students are comfortable learning independently (Trapsilasiwi et al., 2021). They can effectively manage time, identify successful learning methods, and create a learning environment that meets their needs. This skill allows individuals to effectively organize their time and math materials.

Although introverted students have a mathematical advantage, they must also find a balance between social interaction and collaboration. Collaboration with classmates or participation in study groups can facilitate the development of new views and a better knowledge (*The Introverted Student's Classroom Experience: A Qualitative Case Study*, n.d.).

Extrovert Student

Extroverted pupils also have various benefits that can aid them in mathematics learning. Students who are extroverts typically have strong communication skills and are comfortable interacting with others(Kurniawati et al., 2022). They can readily exchange ideas, pose questions to the instructor, and discuss mathematical concepts with others. Through the exchange of information and perspectives, this skill can facilitate a greater level of comprehension.

Extroverted pupils are frequently energized and inspired by social interactions (Harsasi et al., 2021). They may utilize study groups or classroom discussions to solve arithmetic difficulties together. In such scenarios, they can listen to differing perspectives, exchange thoughts, and obtain fresh insights that can enhance their comprehension of the arithmetic topic.

Some mathematical tasks involve collaborative problem-solving or group projects. Students who are extroverts typically feel at ease in such situations and can actively contribute by contributing ideas, clarifying topics, or assisting classmates (Bakar, 2021). Through teamwork, they can use their social intelligence to expand and deepen their mathematical understanding.

Students that are extroverts are typically receptive to change and new challenges. This can be useful in the context of mathematics, as they will be more able to attempt new techniques, investigate diverse methods, and tackle complex issues with an open mind. They may adapt more readily to various learning methodologies and find mathematics to be an engaging challenge.

Students who are extroverts typically have excellent verbal skills and can articulate their thoughts clearly and fluently. This can assist students in vocally describing mathematical concepts, creating complete responses, and communicating with teachers and peers about arithmetic challenges. This competency can enhance their mathematical comprehension and expression.

Even though extroverted students have an advantage in terms of social interaction and communication, it is essential to find a balance between time alone for reflection and comprehension. Individual time allows introverted students to process information, recognize patterns, and plan mathematical strategies.

Researchers can use extroverted and introverted personality types to characterize how students' numeracy literacy analytical process works. Students that have introverted personality types are more likely to be able to think critically—that is, to analyze information, devise solutions, and draw conclusions—in order to solve issues (Rudianti et al., 2021). This suggests that even though the two research subjects did not finish all phases of the numeracy literacy thinking process, it is still possible to understand problems, concepts, solve problems, and articulate ideas for solving various problems(Faridhatijannah et al., 2022). Introverted subjects take longer than extroverted subjects to complete both the offered difficulties and research questions.

CONCLUSION

In solving linear program problems, students with an introverted personality meet all indicators of numeracy literacy, namely solving problems using various numbers and

symbols related to mathematics, analyzing information presented in various images (graphs, tables, charts, etc.), and interpreting the results of the analysis to make predictions and decisions. In addressing linear program issues, students with an extroverted personality meet a number of characteristics, including the ability to solve problems utilizing a variety of mathematical symbols and numbers and to analyze information presented in a variety of images (graphs, tables, charts, diagrams and so on). From the presented conclusions, researchers are given recommendations, such as conducting additional research on the literacy skills of introverted and extroverted students in solving linear program problems by sorting the questionnaire results from introverts with high scores or extroverts with high scores to introverts with low scores or extroverts with low scores.

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