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Analysis of students' problem solving abilities with symbolic representation through the implementation of the case method

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ABSTRACT

This study aims to analyze the student's problem-solving abilities and their symbolic representative through the implementation of the case method in economic learning. The research is a qualitative descriptive approach. The reseacrh was conducted with 50 student in first-semester who enrolled in Mathematics Economic , economic education department , Musamus University. The sampling technique in this study was purposive sampling to select participants representing each performance category, with particular consideration given to those who obtained the lowest scores. Data were collected though observation, tests, and interviews. The analysis of problem-solving followed Polya's stage, while the symbolic representation analysis referred to Fatqurhohman's framework. The results show that most of students have very low levels of problem-solving and symbolic representative abilities. 15 students are categorized in very low, 13 students low are categorized , 14 students are categorized in good enough levels, 5 students are categorized in good levels, and 3 in very good levels. These findings indicate that students still facing the difficulties in transforming problems in to mathematical symbols, verifying calculations, and connecting symbolic results with graphical representations. The results highlight the urgency for lecturers to design more innovtive learning models that integrate the case method with visual and symbolic representative to strengthen analytical and mathematical reasoning skills among students of economic education.

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Introduction

Problem-solving ability is considered a core competency in 21st-century education because it represents higher-order thinking that integrates knowledge, reasoning, and decision-making. Problem-solving ability is also an essential skill for students in economics education because it reflects their capacity to apply conceptual understanding in analyzing real-world economic issues. In the current era of complex and dynamic economic challenges, students are expected not only to master theoretical knowledge but also to be able to identify, formulate, and solve problems analytically. However, several studies have shown that students' problem-solving abilities, especially in higher education institutions located in eastern Indonesia, are still relatively low due to limited exposure to contextual learning and weak symbolic representation skills (Situmorang & Kaize, 2024; Mahrani et al., 2022).

In other case, symbolic representative helps a student in understanding the problems. Symbolic representative refers to the using of symbols, formulas, or abstract notations to express quantitative relationships or conceptual structures within a problem. It allows learners to translate verbal or contextual information into mathematical or formal expressions that can be analyzed logically.

According to Cahaya,et all (2022), symbolic representation is one of the essential systems of internal representation that enables individuals to encode, manipulate, and communicate mathematical ideas efficiently. He defines it as "the transformation of problem information into symbolic or algebraic form to facilitate reasoning and computation."

Similarly, explain that symbolic representation serves as a bridge between verbal understanding and analytical reasoning, allowing students to integrate multiple representations—verbal, pictorial, and symbolic—to achieve deeper comprehension. In their study, the combination of formulas and textual explanations was shown to improve accuracy in problem solving and conceptual understanding.

In the context of economics learning, symbolic representation includes expressing relationships between variables such as price, demand, and supply (e.g., Qd = 400 – 2P; Qs = 50 + 3P). These symbols help students move from qualitative descriptions to quantitative analysis. symbolic representation supports all stages of Polya's framework (Umaroh, 2020) is understanding the problem , recognizing relationships between equations and determining appropriate operations, carrying out the plan , looking back for verifying and interpreting symbolic results in context.

The implementation of the *case method* in International Trade courses improved students' critical thinking and decision-making abilities, yet many still struggled to apply economic formulas accurately when confronted with real-life cases. This indicates that conceptual understanding alone is insufficient without representational competenceThe case method has been widely recognized as one of the learning models that can bridge theoretical understanding and practical problem-solving skills. Through real or simulated cases, students are encouraged to analyze problems, discuss solutions collaboratively, and construct knowledge based on evidence and reasoning (Hodijah et al., 2022). Nevertheless, its effectiveness largely depends on how well students can represent economic problems symbolically—translating verbal or contextual information into mathematical or graphical forms (Żąd□o-Treder, 2021; Fatqurhohman & Susetyo, 2022). Without adequate symbolic representation, the potential of the case method to develop analytical thinking cannot be fully realized.

Symbolic representation plays a critical role in helping students interpret and structure problems. According to Fatqurhohman and Susetyo (2022), external representations such as symbols or equations support learners in organizing information, identifying key variables, and reducing cognitive load during problem solving. When students can express a problem symbolically, they are more capable of recognizing patterns and selecting appropriate strategies. Furthermore, Fatqurhohman and Susetyo (2022) highlight that many students struggle to solve problems not because they lack conceptual knowledge, but because they are unable to represent the problem symbolically. Their research found that students who could accurately transform verbal or numerical data into symbolic equations demonstrated stronger reasoning and higher success rates in finding solutions.

Symbolic representation therefore acts as a mediating tool between understanding a problem and executing the steps of solution. It allows students to visualize relationships, predict outcomes, and check consistency within a structured symbolic system.

In the context of Musamus University, preliminary observations during Economic Mathematics revealed that many students tend to solve numerical problems directly without transforming the given data into symbolic or graphical forms. This indicates a lack of connection between conceptual understanding and symbolic representation, which ultimately affects their problem-solving performance. Therefore, there is an urgent need to investigate how students' problem-solving abilities manifest when the case method is implemented, particularly in relation to their symbolic representation process.

Based on this rationale, this study aims to analyze students' problem-solving abilities through symbolic representation within the implementation of the case method in economics learning. The findings are expected to provide insights for lecturers in developing learning strategies that enhance both analytical reasoning and representational competence among economics education students. By combining the case method with symbolic representation, the learning process becomes more interactive and in-depth

Table 1. Symbolic Representation Indicators in Solving Problems

Indicator	Description
Identifying the Problem	Identify the problem after reading the question Create a problem solving plan
Transforming Information	Translating information into mathematical symbolic form
Integrating the count	Verifying and performing arithmetic operations through symbolic manipulation Change or simplify arithmetic operations
Showing relationships	Making conjectures from a number pattern. Connecting symbolic calculations to pictorial illustrations or vice versa Connecting translated parts Shows the relationship/connection of the translation results to ensure everything Iscorrect.

Source: (Fatqurhohman and Susetyo 2022)

Method

This study is a qualitative descriptive approach to analyze students' problem-solving abilities and symbolic representations in economics learning. The research was conducted in the Department of Economic Education, Musamus University, involving first-semester students of the 2023 academic year who had completed the Economic Mathematics course. A total of 50 students participated in the learning process. From this group, 5 representative respondents were selected for in-depth analysis based on the completeness and accuracy of their test responses in relation to the established indicators. The selection followed a purposive sampling technique, aiming to capture a range of performance levels and problem-solving behaviors rather than statistical generalization.

The research utilized four instruments for data collection: observation, tests, interviews, and documentation of students' post-test responses. The test consisted of one open-ended question on the topic of price equilibrium, which students completed within 20 minutes. The question required students to identify demand and supply functions, calculate the equilibrium price and quantity, and present the result graphically.

To evaluate students' problem-solving abilities, the analysis followed Polya's four-stage framework understanding the problem, devising a plan, carrying out the plan, and looking back. The assessment of symbolic representation referred to the indicators proposed by Fatqurhohman and Susetyo (2022), which include identifying the problem, transforming information, integrating computations, and showing relationships.

The scoring guidelines and analytical procedures used in this study are presented in Table 2, which details the criteria for evaluating students' performance at each stage of problem-solving and symbolic representation. The data were analyzed descriptively by comparing students' results across stages and interpreting their responses to identify patterns of reasoning and representational ability.

In collecting data, a test sheet was given on price equilibrium consisting of 1 question with a time of 20 minutes, the questions can be seen in table 1. Guideline sheet for analyzing the ability to solve problems at the Polya stage on the material of real number sequences. The data analysis technique for the value of problem solving ability (KPM) for each question can be obtained using the formula: Question value (1) Based on the value obtained, the problem solving ability of students at the Polya stage and symbolic representation analysis with the approach (Fatqurhohman & Susetyo, 2022). The following is explained in table 2 below.

Table 2. Scoring guidelines for the Polya stage problem solving ability test

question	**Problem Solving Analysis Stage**	**Symbolic Representation**	**Completion Indicator**
CV. Waninggap led by Mr. Gebze and Kaize produces Noken. They want to know the balance of the Noken market and obtained the following data: a. The demand function for the camshaft is Qd = 400-2P b. The supply function for noken is Qs=50 + 3P Determine: a. Noken equilibrium price b. How many noken were sold at that equilibrium? c. Draw the equilibrium graph. Notes: P in thousands	P1: Understanding Problem P2: Planning Completion P3: Implementing the Solution P 4: Recheck	R1: Identifying the Problem R2: Transforming Information R3: Integrating counts R4: Shows the relationship	1. If writing is known: Qd=400-2P Qs=50+3P (score 10) 2. If you write Asked: a. P value=…? b. Q value=…? c. Graph Qd=Qs=…? (score 15) 3. If writing the answer: a. Qd=Qs 400-2P=50+3P -2P-3P=50-400 -5P = -350 P =-350/-50 P = 70 **(score 15)** If, writing the conclusion: So, the price of noken is Rp. 70,000.00 **(score 5)** b. Counting the number of noken sold P=70 then Qd=400-2P =400 – 2(70) =400 – 140 =260 Or Qs = 50+3P =50 + 3(70) =50 + 210 =260 (score 15) If writing conclusion: So, the equilibrium point is 210 (score 5)

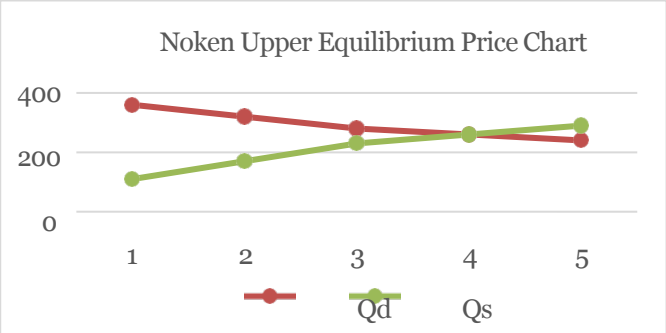

Figure 1. Graphic Sketch (score 35)

Based on the values obtained, students' problem solving and Symbolic Representation abilities are qualified according to Table 3 below.

Table 3. Table of Problem Solving and Symbolic Representation Ability Qualifications

Mark	**Qualification**
$80 < x \leq 100$	Very Good
$65 < x \leq 80$	Good
$55 < x \leq 65$	Enough
$40 < x \leq 55$	Bad
$0 < x \leq 40$	Very Bad

Source: (Supriatnaningsih 2021)

The observation checklist is described in table 3 below

Table 4. Observation checklist of Problem-solving abilities and symbolic representative

Observed Aspect	**Observation Indicator**	**Description of Observed Behavior**	**Rating Scale**
Understanding the Problem	The student is able to identify the information provided and what is being asked in the case.	The student writes down the case data (demand and supply functions) and explains the economic meaning of the information.	1 = Not observed, 2 = Bad, 3 = Enough, 4 = Good, 5 = Excellent
Devising a Plan	The student designs problem-solving steps using relevant strategies.	The student develops a solution plan using mathematical models or graphical approaches before performing calculations.	1–5
Carrying Out the Plan	The student translates the plan into systematic mathematical calculations or graphical representations.	The student performs substitution and computation based on the given economic functions.	1–5
Looking Back (Verification)	The student reviews the results and evaluates their consistency with the case context.	The student provides logical reasoning for the results obtained and formulates a clear conclusion.	1–5
Symbolic Representation – Problem Identification (R1)	The student is able to interpret the problem in symbolic form.	The student rewrites verbal information into symbolic	1–5
Symbolic Representation – Information Transformation (R2)	The student converts numerical information into mathematical equations.	The student correctly connects the relationship between the variables P and Q.	1–5
Symbolic Representation – Computation	The student performs symbolic manipulation or computation accurately.	The student simplifies equations and performs calculations with logical	1–5

Observed Aspect	Observation Indicator	Description of Observed Behavior	Rating Scale
Integration (R3)		results.	
Symbolic Representation – Showing Relationships (R4)	The student connects symbolic results with visual representations.	The student draws the price equilibrium graph and explains the relationship between the demand and supply curves.	1–5

for strengthen the tests and observation checklist, the researcher interviewed 4 participiants to get a deep analysis

Table 5. Interviewed Sheet

Interview Question	Purpose
How do you understand the problem presented in the given case question?	To explore how students interpret information and identify the main problem (Polya's Stage 1).
What is the first step you think of when attempting to solve the problem?	To identify students' initial strategies and planning approaches (Polya's Stage 2).
How do you transform the data or information in the problem into symbolic or formulaic form?	To assess students' ability in symbolic representation (R1 and R2).
What main difficulties do you encounter when performing calculations or drawing graphs?	To identify challenges in integrating and visualizing symbolic representations (R3 and R4).
After obtaining your answer, how do you ensure that it is correct and relevant to the problem context?	To evaluate students' ability to reflect on and verify their solutions (Polya's Stage 4).
In your opinion, does learning through the case method help you understand economic concepts better? Why?	To examine students' perceptions of the effectiveness of the case method in enhancing conceptual understanding and analytical skills in economics.

Results and Discussions

General Overview of Students' Problem-Solving Performance

Based on the test and observation results, students' problem-solving abilities were found to vary considerably. From 50 students, 23 (46%) were categorized as very bad, 15 (30%) as bad, 9 (18%) as enough, 2 (4%) as good, and 1 (2%) as very good. These findings indicate that most students still experience difficulties in solving contextual economic problems. This pattern is consistent with the initial assumption that symbolic representation skills significantly influence students' ability to reason and solve problems.

The low performance of most students suggests that their understanding is still confined to procedural knowledge — they tend to memorize formulas and computation steps without comprehending the underlying conceptual relationships. This aligns with Mayer's (2024) cognitive theory, which emphasizes that effective problem solving requires integration between verbal, symbolic, and visual representations.

Analysis of Problem-Solving Stages Based on Polya's Framework and Symbolic Representative Understanding the Problem

At this stage, only a few students (approximately 20%) could clearly identify what was known and what was asked in the problem. Most students merely restated the question without recognizing the logical relationship between variables in the demand and supply functions. Cognitively, this indicates low conceptual encoding students process information superficially without translating it into meaningful symbolic structures. This result shows that students' inability to construct internal representations of a problem leads to weak problem comprehension.

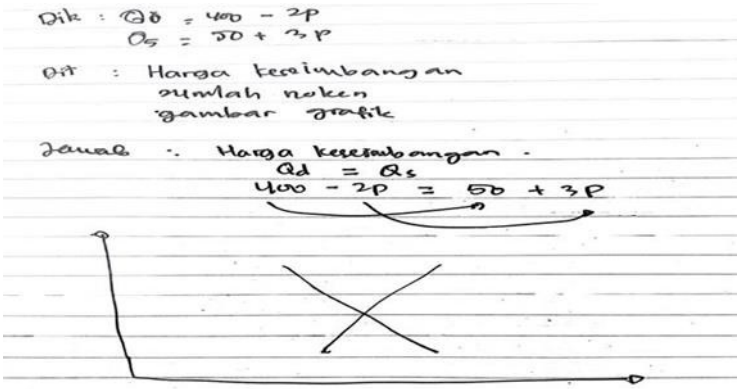

figure 2. Analysis of Problem-solving abilities with symbolic representatve in very bad category only understanding the Proble And below is the observation results

Table 6.Observation results of very bad category only understanding the problem

Aspect	***Observation Notes***
Understanding The Problem	The student struggled to interpret the given economic problem. They copied the demand and supply functions from the case but were unable to explain their economic meaning or identify the relationship between the variables.
Devising a Plan	The student did not formulate a clear plan or select an appropriate problem-solving strategy. Their written response showed random attempts to insert numbers into the equations without understanding the purpose of each step.
Carrying Out the Plan	The student performed several calculation errors and was unable to substitute variables correctly. The mathematical process lacked logical sequence, and no attempt was made to visualize the result through a graph.
Looking Back (Verification)	The student did not check or reflect on the result obtained. Their final answer was incomplete, and no justification or conclusion was provided.
Symbolic Representation (R1–R4)	The student showed very limited ability to represent the problem symbolically. They failed to correctly transform verbal information into mathematical symbols (R1–R2), could not perform accurate symbolic manipulation (R3), and did not attempt to connect symbolic expressions to graphical forms (R4).

To strengthen the findings above, the following section presents the results of interviews with the respondents.

L: "How did you understand the problem presented in the case question?"

R: "I just read it, but I wasn't sure what it was asking. I saw the demand and supply equations but didn't really know what to do with them."

L: "What was the first step you thought of when trying to solve it?"

R: "I tried to calculate something by substituting numbers, but I didn't know if it was right or not."

L: "How did you transform the information in the question into formulas or symbols?"

R:" I didn't really change it. I just used the equations as they were written."

L:"What difficulties did you face when performing the calculations or drawing the graph?"
R: "I got confused with the plus and minus signs. And I wasn't sure how to make the graph because I forgot how to find the equilibrium point."

L:"After you obtained a result, how did you ensure that it was correct?"
R: "I didn't check it again because I wasn't confident with my answer."

L:"Do you think using the case method helped you understand the material?"
R**:** "Maybe a little, but it was still difficult for me because I didn't know what steps to follow."

The results indicate that Respondent A demonstrated *very bad problem-solving and symbolic representation skills*. The student lacked the ability to interpret economic relationships symbolically and failed to connect mathematical operations with conceptual understanding. Cognitively, this suggests difficulty at the

representation and planning stages (Polya's Stages 1–2) and weaknesses in symbolic encoding. The respondent's behavior also reflects low metacognitive awareness, as shown by the absence of verification or reflection (Stage 4). These findings highlight the need for guided scaffolding and visual modeling during case-based learning to support students with limited representational fluency.

Devising a Plan

Students with limited symbolic understanding struggled to select the correct strategy for determining equilibrium price and quantity. They tended to immediately substitute numbers without conceptual planning. From a pedagogical standpoint, this reflects algorithmic thinking rather than analytical reasoning. The absence of symbolic translation prevents students from visualizing the relationship between price and quantity, making it difficult to construct logical problem-solving steps. In contrast, students in the good and very good categories demonstrated systematic planning by writing equations (Qd = Qs) before performing calculations. This demonstrates the metacognitive awareness emphasized in Polya's second stage.

And below is the observation results

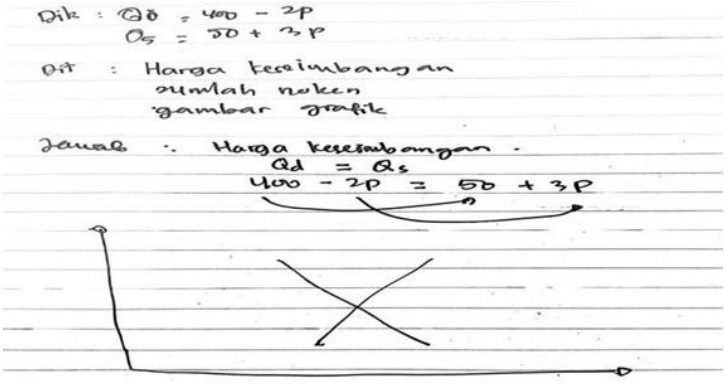

figure 2. Analysis of Problem-solving abilities with symbolic representatve in bad category only
Understanding the Problem And below is the observation results

Table 7. Observation Checklist of Bad Category

Aspect	Observation Notes
Understanding The Problem	The student was able to recognize that the problem involved demand and supply functions but misinterpreted some of the information. They could identify the known variables but struggled to clarify what was being asked in the question.
Devising A Plan	The student attempted to outline a solution plan but did not organize the steps logically. Their written plan contained partial formulas without clear justification or explanation of how these formulas related to the case.
Carrying Out The Plan	The student substituted values into the equations but made computational errors and skipped several key steps. They reached an incomplete result and failed to represent it graphically.
Looking Back (Verification)	The student briefly reviewed their result but was unsure whether it was correct. There was no written reflection or comparison between the obtained result and the economic meaning of equilibrium.
Symbolic Representation (R1–R4)	The student demonstrated limited ability to express information symbolically. They were able to rewrite the demand and supply equations (R1–R2) but had difficulty manipulating them mathematically (R3). They did not attempt to link the symbolic result to a graphical form (R4).

To strengthen the findings above, the following section presents the results of interviews with the respondents.

L:"How did you understand the case problem given in the test?"

R: "I understood that it was about finding the equilibrium between demand and supply, but I was not sure how to start solving it."

L:"What was the first step you thought of to solve it?"

R:" I wrote the two equations, Qd and Qs, but I was confused about which one I should use first or how to

make them equal."

L:"How did you change the data in the problem into formulas or symbols?"

R:"I copied the formulas from the question and tried to calculate the price, but I didn't check whether the equations were correct."

L:"What difficulties did you face when performing the calculations or drawing the graph?"

R: "The calculation part was confusing because I made mistakes with the signs. I didn't make a graph because I wasn't sure how to label it."

L:"After getting your result, how did you check whether it was correct?"

R: "I didn't really check it. I thought my answer might be wrong, but I didn't know how to fix it."

L:"Do you think using the case method helped you understand the material?"

R**:** "It helped a bit because it showed how the formulas work in real life, but I still need more explanation and practice to understand the process."

The data show that Respondent B possessed bad problem-solving and symbolic representation skills, though with some partial understanding of the case context. The student was able to identify key elements of the problem but was unable to integrate them into a coherent plan or symbolic reasoning process. Cognitively, the respondent demonstrated partial understanding at Polya's Stages 1 and 2, yet experienced difficulties during execution and reflection (Stages 3 and 4). In terms of representational ability, the student could perform basic symbolic identification (R1–R2) but lacked procedural fluency in symbolic manipulation and graphical interpretation (R3–R4). This indicates that while the student had a basic conceptual awareness of equilibrium, they struggled to translate conceptual understanding into symbolic and procedural forms. Pedagogically, these findings suggest the need for scaffolded problem-solving exercises and explicit modeling of symbolic transformations to strengthen students' representational competence within the case method framework.

Carrying Out the Plan

At this stage, most students could perform arithmetic operations but often made symbolic manipulation errors. For example, many failed to properly isolate variables when equating the demand and supply functions such incomplete symbolic transformation, students execute computations mechanically without understanding the symbolic meaning of each term. This finding reinforces that computational accuracy alone is not an indicator of genuine problem-solving skill; it must be supported by conceptual understanding of symbols used in the process.

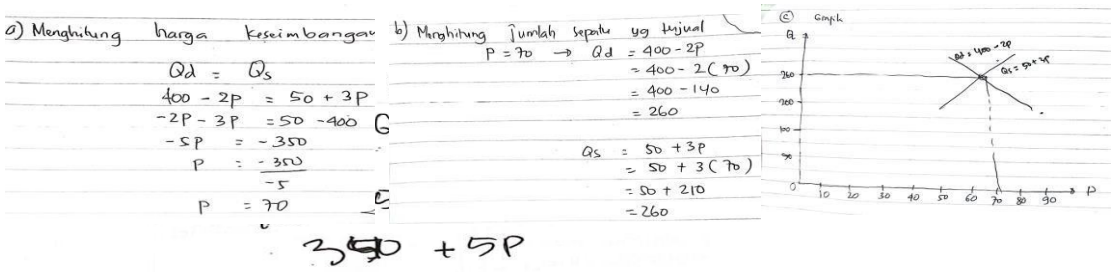

figure 4. Analysis of Problem-solving abilities with symbolic representatve in good category in Carrying Out the Plan And below is the observation results

Table 8. Observation result of Problem-solving abilities with symbolic representatve in good category in Carrying Out the Plan

Aspect	*Observation Notes*
Understanding The Problem	The student was able to identify the key elements of the problem, including the demand and supply functions and what was being asked. However, they needed additional time to interpret the meaning of each variable and to restate the problem in their own words.
Devising A Plan	The student formulated a general plan to find the equilibrium price and quantity by setting demand equal to supply. The plan was logically structured but lacked detail in terms of mathematical procedures and verification steps.

Carrying Out The Plan	The student performed the substitution and calculations correctly at the beginning but made minor arithmetic errors in later steps. The overall solution was coherent, though the process was not fully efficient.
Looking Back (Verification)	The student reviewed their result and compared it with the problem context but did not provide a detailed justification for why the result made economic sense. Their reflection was limited to checking whether both equations were balanced.
Symbolic Representation (R1–R4)	The student demonstrated moderate ability in symbolic representation. They could rewrite verbal information into symbolic form (R1), correctly manipulate equations to find equilibrium (R2–R3), but had difficulty linking symbolic results with visual representation on a graph (R4).

To strengthen the findings above, the following section presents the results of interviews with the respondents.

L:"How did you understand the case problem in the test?"

R: "I read the demand and supply functions and realized that I needed to find where they were equal. I understood the goal, but sometimes I got confused about what the symbols meant."

L:"What was the first step you thought of when solving the problem?"

R:" I made the two equations equal to each other to find the equilibrium price. After that, I planned to substitute the value back to find the equilibrium quantity."

L:"How did you change the data into formulas or symbols?"

R: "I used the given equations and rewrote them clearly. I used P for price and Q for quantity, so it was easier to see the relationship."

L:"What difficulties did you face when calculating or drawing the graph?"
R: "I made a small mistake in calculation because I forgot to multiply one term. For the graph, I knew how to draw the lines but wasn't sure about the exact scale or intersection point."

L:"After obtaining the result, how did you verify it?

R: "I substituted the price back into the demand and supply equations to see if the quantities matched. It worked, but I didn't explain why it made sense economically."

L:"Do you think learning through the case method helped you understand the concept?"
R: "Yes, because it helped me apply the formula to a real situation. But sometimes I still need examples and more explanation from the lecturer to understand why certain steps are taken."

The data indicate that Respondent C possessed a moderate (fair) level of problem-solving and symbolic representation ability. The student was able to interpret the problem and apply appropriate strategies following Polya's first three stages: understanding, planning, and executing. Minor weaknesses appeared in the reflection stage (Stage 4), where the student could verify the mathematical correctness but not the conceptual meaning of the result. From the perspective of symbolic representation, the student demonstrated fluency in rewriting and manipulating equations (R1–R3) but showed limited ability to integrate symbolic outcomes into graphical or conceptual forms (R4). This suggests a procedural rather than conceptual orientation that the students could perform calculations correctly but lacked deeper reasoning about their economic implications. These findings highlight the importance of reinforcing conceptual reflection and symbolic interpretation in the application of the case method, ensuring that students not only perform calculations but also connect symbolic representations to real-world economic contexts.

Looking Back (Verification Stage)

Only a few students rechecked their answers or related the final result to the economic context of the problem. Most stopped after obtaining numerical results without interpreting whether the price and quantity values were realistic or consistent with market logic. From a cognitive perspective, this reflects weak self-regulation and limited reflective thinking. verification is a higher-order process that requires connecting prior knowledge, procedural results, and contextual meaning — a skill that still needs to be strengthened in this student group.

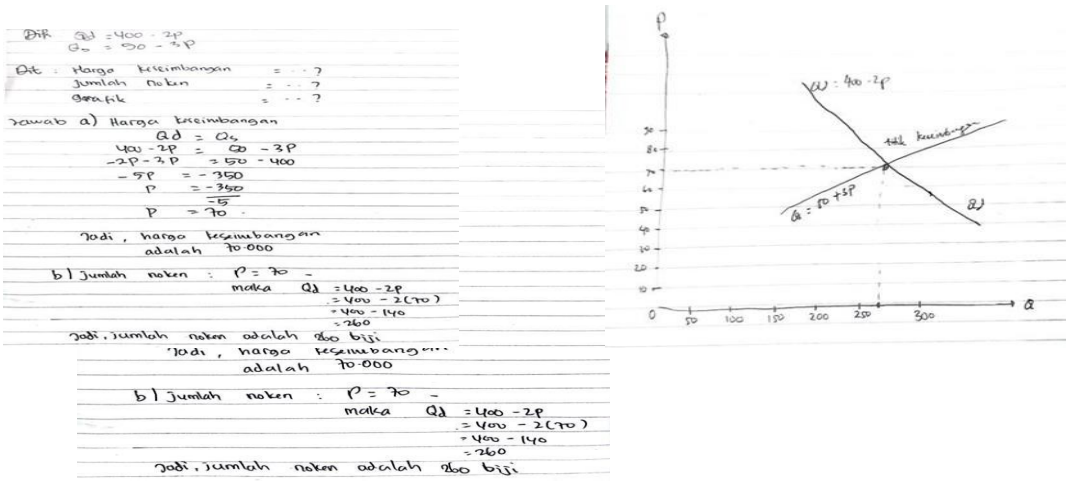

figure 4. Analysis of Problem-solving abilities with symbolic representatve in excellent category in verification stage Below is the observation results

Table 9. Observation result of Problem-solving abilities with symbolic representatve in good category in verification stage

Aspect	Observation Notes
Understanding the Problem	The student demonstrated an excellent understanding of the case problem. They immediately identified the demand and supply functions, stated the known and unknown variables, and clearly articulated the economic goal of finding the equilibrium point. The explanation reflected both mathematical and conceptual comprehension.
Devising a Plan	The student developed a clear, structured plan aligned with Polya's second stage. They described each step logically, beginning with equating the two functions, simplifying the expressions, and determining the equilibrium price and quantity. The plan also included verification and graphical representation.
Carrying Out the Plan	The student executed the plan accurately and efficiently. Each calculation step was well-documented, and all algebraic manipulations were correct. The student provided clear reasoning for each step and demonstrated fluency in using mathematical symbols.
Looking Back (Verification)	The student thoroughly verified the obtained result by substituting values back into both equations and interpreting the meaning of equilibrium within the economic context. Their reflection linked the mathematical solution to real-world implications such as price adjustment and market balance.
Symbolic Representation (R1–R4)	The student exhibited advanced symbolic reasoning. They successfully transformed verbal and numerical information into precise symbolic equations (R1–R2), performed accurate symbolic manipulations (R3), and produced a clear, well-labeled graphical representation (R4) showing the intersection point of demand and supply curves with an insightful explanation.

To strengthen the findings above, the following section presents the results of interviews with the respondents.

L:"How did you understand the problem presented in the test?"

R:" I first identified the demand and supply functions and noted the parameters. I understood that the problem required finding the equilibrium where quantity demanded equals quantity supplied, which reflects the balance of the market."

L:"What steps did you plan to solve the problem?"

R: "My plan was to set Qd equal to Qs, simplify the equation to find the equilibrium price, then substitute it to determine the equilibrium quantity. I also planned to verify the result and illustrate it graphically to confirm the intersection point."

L:"How did you transform the given information into symbolic form?"

R: "I translated the verbal statements into equations using symbols for price (P) and quantity (Q). It helped me to see the relationship clearly and to identify how changes in P affect Q."

L:"What challenges did you encounter during the process?"

R:"Not many, but I had to double-check my arithmetic. My main focus was ensuring that the equations remained consistent with the economic meaning."

L:"How did you confirm that your result was correct?"

R: "I verified it mathematically by substituting the value of P back into both equations and checking whether Qd and Qs were equal. Conceptually, I reflected that at this price, the market would be in equilibrium, which matched the theoretical concept."

L:"How do you view the use of the case method in learning?"

R: "I find it very effective because it forces us to apply concepts rather than memorize formulas. It encourages analytical thinking and helps us connect theory with practical problems in economics."

The results show that Respondent E demonstrated a very high level of problem-solving and symbolic representation ability, mastering both procedural and conceptual aspects of the task. The student effectively followed and internalized all four stages of Polya's problem-solving process with clarity, accuracy, and reflection. Their symbolic representation skills (R1–R4) were advanced, as they could translate verbal information into symbolic form, manipulate equations correctly, and link symbolic expressions to visual graphs and real-world interpretations. This demonstrates representational fluency that's the ability to move seamlessly between different representational forms (verbal, symbolic, and graphical).

Conclusions

This study concludes that most students in the Economic Education Study Program at Musamus University possess low levels of problem-solving and symbolic representation abilities. Although a few students demonstrated adequate conceptual understanding and procedural fluency, the majority struggled to interpret economic problems symbolically, translate them into mathematical models, and verify their solutions within the context of real-world economic phenomena. The findings reveal that students' difficulties are primarily rooted in their limited ability to integrate verbal, symbolic, and graphical representations—a critical cognitive process emphasized in Polya's problem-solving stages. Symbolic misrepresentation often led to mechanical computations without conceptual comprehension, weakening students' analytical reasoning. Furthermore, the lack of reflection and verification in the final stage of Polya's framework indicates low metacognitive engagement.

The results also affirm that while the case method promotes contextual learning and encourages analytical discussion, its effectiveness largely depends on students' representational competence. Without adequate symbolic fluency, the method cannot fully bridge theory and application in economics education. Therefore, strengthening symbolic representation must become a pedagogical priority to enhance students' problem-solving performance.

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