



FINANCIAL LITERACY OF FIRST-SEMESTER UNIVERSITY STUDENTS: INSIGHTS FROM PISA FINANCIAL TASKS IN INDONESIA

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Abstract

This study examines the financial literacy competencies of first-semester university students, focusing on their ability to interpret authentic financial documents such as pay slips and bank statements. Using the PISA financial literacy framework, the study employed a qualitative descriptive design involving 32 students from Universitas Jambi. Data were collected through open-ended tasks and semi-structured interviews, with three representative cases analyzed in depth. The findings show that most students could perform basic calculations, including identifying gross and net income, but experienced difficulties in more complex financial reasoning. Common errors involved misunderstanding recurring administrative fees and ignoring prior balances when calculating final account totals. Interviews revealed that students often relied on estimation rather than systematic reasoning, indicating a stronger procedural than conceptual understanding of financial information. The study highlights the importance of pedagogical approaches that promote interpretive and analytical reasoning beyond computation. It recommends the use of contextualized, open-ended financial tasks based on the PISA framework and encourages interdisciplinary collaboration between mathematics and economics education to strengthen students' financial literacy and decision-making skills.

Keywords: Financial Literacy, Higher Education, Mathematical Reasoning, PISA Framework, Qualitative

Abstrak

Penelitian ini mengkaji kompetensi literasi keuangan mahasiswa semester pertama, khususnya dalam menafsirkan dokumen keuangan autentik seperti slip gaji dan rekening bank. Dengan menggunakan kerangka literasi keuangan PISA, penelitian ini menerapkan desain deskriptif kualitatif yang melibatkan 32 mahasiswa Universitas Jambi. Data dikumpulkan melalui tugas terbuka dan wawancara semi-terstruktur, dengan tiga kasus representatif dianalisis secara mendalam. Hasil penelitian menunjukkan bahwa sebagian besar mahasiswa mampu melakukan perhitungan dasar, seperti mengidentifikasi pendapatan kotor dan bersih, namun masih mengalami kesulitan dalam penalaran keuangan yang lebih kompleks. Kesalahan yang umum ditemukan meliputi kesalahpahaman terhadap biaya administrasi rutin dan pengabaian saldo sebelumnya saat menghitung total saldo akhir. Data wawancara juga menunjukkan bahwa mahasiswa cenderung mengandalkan perkiraan dibandingkan penalaran sistematis, yang mencerminkan pemahaman prosedural lebih dominan daripada konseptual terhadap informasi keuangan. Penelitian ini menekankan pentingnya pendekatan pembelajaran yang mendorong kemampuan interpretatif dan analitis di luar sekadar perhitungan. Penelitian ini merekomendasikan penggunaan tugas keuangan kontekstual berbasis kerangka PISA serta kolaborasi interdisipliner antara pendidikan matematika dan ekonomi untuk memperkuat literasi keuangan dan kemampuan pengambilan keputusan mahasiswa. Abstrak dibuat dalam 2 bahasa, yaitu bahasa Indonesia dan bahasa Inggris. Abstrak dalam bahasa Indonesia merupakan terjemahan dari abstrak dalam bahasa Inggris dengan format sama seperti abstrak dalam bahasa Inggris.

Kata kunci: Literasi Keuangan, Pendidikan Tinggi, Penalaran Matematis, Kerangka PISA, Kualitatif

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INTRODUCTION

Despite the rapid expansion of digital financial services and increasingly diverse financial products, many young adults continue to experience difficulties in making informed financial decisions. Recent evidence from the OECD/INFE International Survey of Adult Financial Literacy indicates that younger age groups consistently demonstrate lower levels of financial knowledge, financial behavior, and financial decision-making than older adults (OECD, 2023). Likewise, successive cycles of the Programme for International Student Assessment (PISA) have shown that many students struggle to interpret financial information and apply their knowledge to authentic financial situations (OECD, 2019). These findings highlight that financial literacy remains a global educational challenge, particularly as young people transition into higher education and begin managing financial responsibilities more independently (Lotter, 2024).

Over the past decade, the concept of financial literacy has also evolved considerably. Earlier studies primarily viewed financial literacy as knowledge of financial concepts and products (Goyal & Kumar, 2021). More recent perspectives, however, emphasize that financial literacy involves the ability to apply financial knowledge in authentic contexts, interpret quantitative information, reason with numerical evidence, and make sound financial decisions in everyday life (Lusardi & Mitchell, 2014; Lusardi, 2019; OECD, 2019). This shift reflects a broader understanding that financial competence depends not only on what individuals know, but also on how they use that knowledge when confronted with complex financial situations (Stolper & Walter, 2017).

From this perspective, mathematical reasoning becomes an integral component of financial literacy (Ozkale & Ozdemir Erdogan, 2022). Financial decisions rarely involve straightforward calculations alone; instead, they require individuals to interpret financial information, connect numerical evidence with contextual information, evaluate possible alternatives, and justify their decisions (Tommasi et al., 2021). Consequently, success in financial literacy depends on the ability to integrate mathematical thinking with contextual reasoning rather than simply applying mathematical procedures mechanically (Makonye, 2020; Manferda Kolar & Hodnik, 2021).

Previous research has consistently demonstrated that financial literacy plays an important role in shaping financial behavior, decision-making, and long-term financial well-being (Cordero et al., 2022; Klapper & Lusardi, 2020; Eniola & Entebang, 2017). Nevertheless, evidence from international studies continues to show that students experience considerable

difficulty when financial problems require interpretation, reasoning, and application of knowledge beyond routine computation (OECD, 2019; Ozkale & Aprea, 2023; Cavalcante & Savard, 2021). Indonesia represents a particularly meaningful context for investigating these issues. As one of the world's largest emerging economies, Indonesia has experienced rapid growth in digital financial services while simultaneously facing persistent challenges in developing financial competencies among young adults (Moorena et al., 2020). Moreover, as a participating country in the OECD PISA assessment, findings from Indonesia contribute not only to national educational improvement but also to broader international discussions concerning financial literacy in developing countries undergoing similar socioeconomic transitions.

Despite the growing body of literature, important research gaps remain. First, most previous studies have measured financial literacy through questionnaires, self-reported measures, or standardized achievement scores, approaches that primarily describe students' levels of financial literacy rather than revealing how they reason while solving financial problems (Klapper & Lusardi, 2020; Lusardi, 2019). Such approaches provide limited understanding of how students interpret financial information, combine quantitative evidence, perform financial calculations, and construct decisions when confronted with authentic financial documents. As a result, the underlying sources of students' reasoning difficulties remain insufficiently understood, limiting the development of instructional strategies that address these difficulties directly.

Second, although financial literacy has been widely studied at the secondary school level, especially through large-scale assessments such as PISA (OECD, 2019), research at the higher education level in Indonesia remains limited and insufficiently specific. Existing studies involving university students tend to emphasize financial attitudes, behavior, or general literacy levels (Bamforth et al., 2018; Ahmad et al., 2024), rather than focusing on how students engage with contextualized financial problems that require analytical reasoning.

First-semester university students provide a particularly valuable population for addressing these gaps because they represent the transition between secondary education and higher education. At this stage, students begin making financial decisions more independently while their reasoning abilities still largely reflect the competencies acquired during secondary school. Examining students at this point therefore offers an opportunity to evaluate how effectively prior learning has prepared them to interpret authentic financial information and solve real-world financial problems before higher education substantially influences their

learning experiences. Such evidence is valuable for identifying students' reasoning difficulties at an early stage and informing timely educational interventions.

The PISA financial literacy framework offers an appropriate context for investigating these issues. Although originally designed to assess the financial literacy of 15-year-old students, the framework evaluates transferable competencies rather than curriculum-specific knowledge. It emphasizes the interpretation of authentic financial information, quantitative reasoning, and informed decision-making, competencies that remain highly relevant during the transition from school to university and into adult life (OECD, 2019). Nevertheless, relatively little research has explored how first-semester university students respond to authentic PISA financial literacy tasks, particularly within the Indonesian context.

The scientific novelty of this study lies in moving beyond the measurement of financial literacy levels to examine the reasoning processes that underlie students' responses to authentic PISA-based financial literacy tasks. Rather than relying solely on scores or self-reported measures, this study identifies the reasoning errors that emerge when first-semester university students interpret financial documents, perform financial calculations, and apply mathematical procedures in authentic financial situations. Accordingly, this study aims to identify and analyze the reasoning errors demonstrated by first-semester university students when solving authentic PISA-based financial literacy tasks involving financial documents such as bank statements and pay slips.

The findings are expected to contribute to several areas of research. For financial literacy, this study provides deeper evidence of why students experience difficulties in authentic financial situations by revealing the reasoning processes underlying their responses. For financial numeracy, it illustrates how mathematical procedures are successfully applied, misapplied, or disconnected from financial reasoning when students engage with authentic financial documents. Finally, from the perspective of mathematics education, the study demonstrates that procedural competence alone is insufficient for effective financial problem solving, emphasizing the importance of instructional approaches that integrate mathematical reasoning with authentic financial contexts to support meaningful financial decision-making.

METHODS

Research Type and Subject

This study employed a qualitative multiple-case study design to examine how first-semester university students reasoned when solving authentic financial literacy tasks. Rather

than evaluating responses solely as correct or incorrect, the study focused on understanding how students interpreted financial information, performed financial calculations, applied mathematical procedures, and justified their decisions in authentic financial contexts. This design enabled an in-depth exploration of students' reasoning across selected cases (Creswell, 2013; Yin, 2018).

The participants were 32 first-semester undergraduate students enrolled in the Economic Education Study Program at Universitas Jambi, Indonesia. Since they had recently completed secondary education and had not yet received university instruction related to financial literacy, they provided an appropriate context for examining the application of prior mathematical knowledge in authentic financial situations. After all participants completed the written tasks, three students were purposively selected as maximum variation cases based on differences in interpreting financial information, calculation strategies, and mathematical procedures. These cases were selected to capture diverse reasoning patterns rather than to represent the sample statistically (Miles & Huberman, 2014).

Research Procedure

All participants completed open-ended financial literacy tasks derived from the OECD PISA 2018 Financial Literacy Assessment. Their written responses served as the primary source of data for identifying reasoning patterns in solving contextual financial problems.

Following an initial review of the responses, three participants representing different reasoning patterns were invited for semi-structured interviews. The interview questions were developed based on each participant's written responses and were intended to clarify their interpretations, calculation strategies, and decision-making processes. Because the interviews functioned as a means of confirming the written responses, they were relatively brief. Participants' explanations were documented through direct note-taking during the interviews and were immediately incorporated into the analytical process.

Data Collection and Analysis

Data were collected through students' written responses to open-ended financial literacy tasks derived from the OECD PISA framework. These tasks presented realistic financial scenarios that required interpretation, reasoning, and problem-solving. Subsequently, semi-structured interviews were conducted with the three purposively selected students to probe deeper into their cognitive processes, clarify uncertainties, and investigate their attitudes toward financial decisions.

The analysis process involved reviewing and organizing the data to find differences in

how the students solved problems and understood financial ideas. First, the researchers filtered the data to focus on the most relevant parts of the written answers and interviews. Then, the selected data were arranged clearly in the form of transcripts and images of the students' work, making it easier to compare and interpret. Finally, by looking closely at these materials, the researchers drew conclusions about the students' financial literacy. The researchers cross-checked the information from the written responses and interviews to make sure their findings were accurate and reliable. This thorough approach helped uncover not only the strengths but also the misunderstandings students had when applying financial concepts in everyday situations.

Data were collected through two complementary sources: students' written responses and follow-up semi-structured interviews. The written responses constituted the primary data, while the interviews were used to clarify and verify the reasoning underlying students' solutions.

The research instrument consisted of contextual financial literacy tasks taken from the OECD PISA 2018 Financial Literacy Assessment, involving a pay slip and a bank statement. These tasks required students to interpret financial information, perform financial calculations, apply mathematical procedures, and justify their decisions in authentic financial contexts.

Data analysis followed the interactive model of Miles & Huberman (2014), consisting of coding, data condensation, data display, and conclusion drawing and verification. Initially, written responses and interview notes were coded according to students' interpretation of financial information, calculation strategies, and application of mathematical procedures. The coded data were then condensed and organized into matrices to facilitate cross-case comparison and identify recurring reasoning patterns and reasoning difficulties. Conclusions were drawn by integrating evidence from the written responses and interview data.

To enhance the trustworthiness of the findings, methodological triangulation was conducted by comparing written responses with interview notes. During the interviews, participants were also asked to confirm the researchers' interpretations of their responses, thereby strengthening the credibility of the findings (Coleman, 2022).

Open-Ended Task in Financial Problem

The study employed open-ended financial literacy tasks taken from the OECD PISA 2018 Financial Literacy Assessment. In this study, an open-ended task refers to a contextual financial problem that requires students to construct their own responses and explain the reasoning underlying their decisions rather than selecting predetermined answers. Such tasks

provide insight into how students interpret financial information, perform calculations, apply mathematical procedures, and connect mathematical reasoning with financial decision-making.

The instrument consisted of two contextual tasks involving a pay slip and a bank statement, both representing authentic financial situations commonly encountered in everyday life. Prior to implementation, the suitability of the instrument for the study objectives was reviewed by experts in mathematics education. An example of the task is presented in Figure 1.

PAY STUB

Each month, Jane's salary is paid into her bank account.

This is Jane's pay stub for July.

EMPLOYEE PAY STUB: Jane Green	
Position: Manager	July 1 to July 31
Gross salary	2,800 zeds
Deductions	300 zeds
Net salary	2,500 zeds
Gross salary to date this year	19,600 zeds

How much money did Jane's employer pay into her bank account on July 31?

- A 300 zeds
- B 2,500 zeds
- C 2,800 zeds
- D 19,600 zeds

(a)

Each week, Mrs Citizen transfers 130 zeds into her son's bank account.

In Zedland, banks charge a fee for each transfer.

Mrs Citizen received this statement from her bank in November 2011.

ZEDBANK				
Statement for: <i>Mrs Citizen</i>		Account type: <i>Current</i>		
Month: <i>November 2011</i>		Account number: <i>Z0005689</i>		
Date	Transaction details	Credit	Debit	Balance
1-Nov	Opening balance			1780.25
5-Nov	Wages	575.00		2355.25
5-Nov	Transfer		130.00	2225.25
5-Nov	Transfer fee		1.50	2223.75
12-Nov	Wages	575.00		2798.75
12-Nov	Transfer		130.00	2668.75
12-Nov	Transfer fee		1.50	2667.25
13-Nov	Withdrawal		165.00	2502.25
19-Nov	Wages	575.00		3077.25
19-Nov	Transfer		130.00	2947.25
19-Nov	Transfer fee		1.50	2945.75
26-Nov	Wages	575.00		3520.75
26-Nov	Transfer		130.00	3390.75
26-Nov	Transfer fee		1.50	3389.25
27-Nov	Withdrawal		180.00	3209.25
27-Nov	Withdrawal (Rent)		1200.00	2009.25
30-Nov	Interest	6.10		2015.35

Question 1

What were the total fees charged by the bank in November?

Question 2

The next transactions occurred on 3 December:

- Wages of 575 zeds were deposited into Mrs Citizen's account.
- Mrs Citizen transferred 130 zeds into her son's account.

Mrs Citizen made no other transactions on 3 December.

What was her new bank balance at the close of business on 3 December?

Balance in zeds:|

(b)

Figure 1. Financial Literacy Tasks Given to Students

RESULT AND DISCUSSION

As stated in the methodology section, the task analysis was conducted using a qualitative approach comprising three sequential phases. The initial phase focused on data reduction, in which students' responses were systematically selected based on variations in their answer choices and the mathematical strategies employed. Analysis of the students' written responses and follow-up interviews revealed a consistent pattern across the three cases. While most students were able to identify numerical information and perform routine

calculations accurately, they differed substantially in how they interpreted the relationships among financial transactions and used this information to reach financial decisions. This distinction suggests that success in routine computation does not necessarily indicate a deeper understanding of financial documents, highlighting the different roles of procedural and conceptual understanding in financial literacy. The detailed examination of responses from the three selected participants is discussed below, referred to as Student Response 1 (SR-1), Student Response 2 (SR-2), and Student Response 3 (SR-3).

Student Response-1 (SR-1)

SR-1 demonstrated a clear understanding of the salary components presented in the pay stub. This comprehension was reflected in his ability to identify gross income and accurately calculate the applicable deductions, rather than simply aggregating them. Such understanding was further evidenced by SR-1's precision in determining the net income based on the detailed deduction information provided, as illustrated in Table 1.

Table 1. SR-1 Understanding of Mathematical Procedures in Calculating Employee Pay Stub

Students' Answer (Indonesian Version)	English Version									
Slip gaji karyawan : Jane Green posisi : manager 1 Juli hingga 31 Juli gaji kotor 2.800.. potongan 300 gaji bersih 2.500 gaji kotor hingga tahun ini <u>19.600</u> berapa banyak uang yang diterima Jane ke rekening bank pada tgl 31 Juli ? jawab : B. 2.500. $\begin{array}{r} 2800 \\ - 300 \\ \hline 2500 \\ \hline \end{array}$ karena Jane menerima gaji 31 Juli sebesar 2.500 gaji kotor dgn potongan diterima: neto di tgl 31 Juli Jane menerima pekeran gaji 2.500	Pay Stub Employee Pay Slip: Jane Green Position: Manager Period: July 1 – July 31 <table><tr><td>Gross</td><td>Salary:</td><td>2,800</td></tr><tr><td>Deductions:</td><td></td><td>300</td></tr><tr><td>Net</td><td>Salary:</td><td>2,500</td></tr></table> Total Gross Salary for the Year: 19,600 Question: How much money did Jane receive in her bank account on July 31? Answer: B. 2,500	Gross	Salary:	2,800	Deductions:		300	Net	Salary:	2,500
Gross	Salary:	2,800								
Deductions:		300								
Net	Salary:	2,500								

Calculation:

$$2,800 - 300 = 2,500$$

Since Jane's gross salary was reduced by deductions, she received a net salary of 2,500 on July 31.

In Table 1, SR-1 demonstrated a coherent understanding of the salary information presented in the pay stub. Rather than simply extracting numerical values, the student correctly identified the relationship between gross salary, deductions, and net salary, indicating an understanding of how each salary component contributed to the final amount received. By recognizing that the deduction directly reduced the gross salary to produce the employee's take-home pay, SR-1 was able to apply the required subtraction accurately and determine the correct net salary of 2,500 zeds. This response suggests that the student's success was supported not only by procedural calculation but also by a conceptual understanding of the financial meaning of salary deductions within an authentic payroll document.

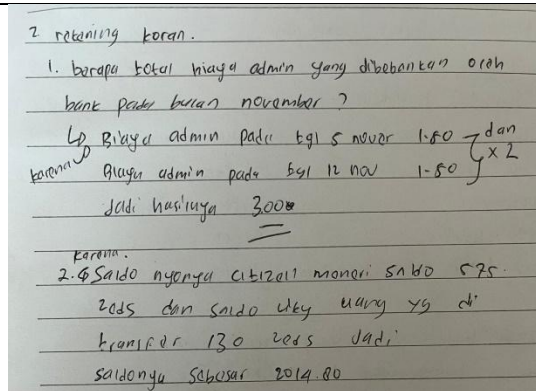
Rather than simply indicating that SR-1 obtained the correct answer, this response reveals why the student succeeded. The pay stub presents information in a linear and explicitly organized format, allowing the student to directly connect gross salary, deductions, and net salary. Because the relationships among these values are clearly displayed, procedural calculation is naturally supported by conceptual understanding. In this situation, mathematical procedures and financial interpretation reinforce one another, enabling the student to reach an accurate conclusion.

Next, the question related to the bank statement can be seen in Tabel 2 below.

Table 2. SR-1 Understanding of Mathematical Procedures in Calculating Bank Statement

Table 2. SR-1 Understanding of Mathematical Procedures in Calculating Bank Statement

Students' Answer (Indonesian Version)	English Version
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Bank Statement

1. What is the total administrative fee charged by the bank in November?

The administrative fee on November 5 was 1.50 zeds, and the administrative fee on November 12 was also 1.50 zeds. Therefore, the total is 3.00 zeds.

2. Because the balance of Mrs. Citizen received a balance of 575 zeds and the balance of the money transferred was 130 zeds so the balance was 2014.80 zeds.

In Table 2, This question was designed to evaluate students' financial literacy skills, particularly their ability to interpret financial documents such as bank statements. Students were expected to identify the bank fees listed on the statement and to apply basic arithmetic operations to determine the total amount charged. The correct answer was 6.00 zeds, as the bank imposed four separate administrative fees of 1.50 zeds each.

However, SR-1's response was inaccurate. The student identified only two administrative fees 1.50 zeds on November 5 and 1.50 zeds on November 12 and calculated the total as 3.00 zeds. This response indicates that SR-1 partially understood the task by successfully locating the relevant entries but failed to recognize all the fee transactions recorded for the month.

The error demonstrates a partial comprehension of document interpretation, where the student could extract numerical data but overlooked the frequency and cumulative nature of similar transactions. This suggests a tendency to focus on individual figures without considering the broader structure of financial records.

From a financial literacy perspective, SR-1's response highlights the importance of attention to detail and holistic document analysis when interpreting real-world financial information. Although the student demonstrated basic computational competence, the inability to synthesize all relevant data resulted in an incorrect total. This finding reinforces the need for instructional emphasis on systematic information scanning and contextual understanding in reading financial documents such as bank statements.

The second question aimed to assess students' ability to determine the final bank

balance based on a series of financial transactions, including deposits, withdrawals, and transaction fees. This item required students to perform multiple arithmetic operations while considering the effect of transaction fees on the final account balance. The correct answer was 2458.85 zeds, calculated as follows:

$$2015.35 + 575 - 130 - 1.50 = 2458.85$$

Full credit was awarded to students who accurately accounted for all relevant operations, including the transaction fee. Partial credit was given to those whose answers fell within the range of 2458–2459 zeds (due to rounding or minor errors) or who omitted the transaction fee but otherwise demonstrated correct reasoning (2460.35 or 2460).

However, SR-1's response "Because the balance of Mrs. Citizen received a balance of 575 zeds and the balance of the money transferred was 130 zeds so the balance was 2014.80 zeds" was incorrect and conceptually inconsistent with the requirements of the question. The response revealed a misunderstanding of the initial balance and a failure to integrate all relevant transactions into the calculation. Instead of updating the balance by adding the deposit and subtracting both the transfer and transaction fee, SR-1 appeared to reuse the previous balance (2014.80 zeds) without recalculating the new total.

The interview results further revealed that the student still demonstrated uncertainty in explaining their answer:

R: "Could you explain how you obtained the result of 2014.80 zeds as the final balance?."

S: "Because Mrs. Citizen received 575 zeds and there was an outgoing transfer of 130 zeds, so I calculated the balance to be 2014.80 zeds."

R: "Did you calculate the balance in detail based on the previous balance and the transactions provided in the question?."

S: "Not really, I only estimated it because I saw there was an incoming amount and a transfer, without calculating the transaction fee."

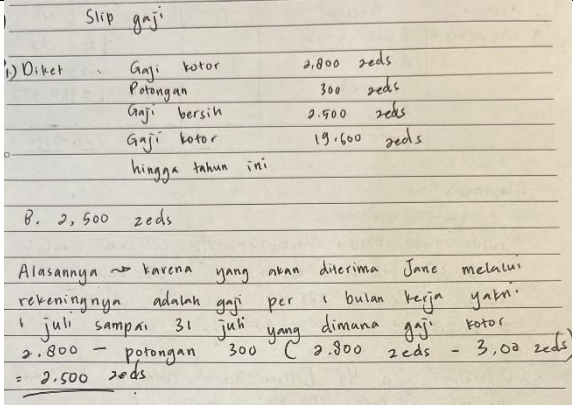
The difficulty experienced by SR-1 was not primarily computational. Instead, it stemmed from the way financial information was interpreted. Although the student successfully recognized individual transactions, these entries were treated as isolated numerical values rather than as interconnected events within a continuous financial record. As a result, the student failed to integrate deposits, withdrawals, and transaction fees into a coherent calculation of the final balance. This finding suggests that limited conceptual understanding constrained the effective use of procedural knowledge.

From an educational perspective, SR-1's response highlights the importance of helping students develop a deeper conceptual understanding of how financial transactions are interconnected within authentic financial documents. Although the student recognized the deposit and transfer transactions, these pieces of information were interpreted separately rather than as components of a continuous financial record. As a result, the student was unable to integrate all relevant transactions into an accurate calculation of the final balance. This finding suggests that procedural calculation alone is insufficient unless it is supported by conceptual understanding of the relationships among financial transactions.

Student Response-2 (SR-2)

SR-2 also demonstrated an adequate understanding of the salary components presented in the pay stub. This was evident from the student's ability to recognize the distinction between gross income and deductions, as well as to perform the corresponding calculations correctly. However, SR-2 showed minor inaccuracies in interpreting the deduction details, which affected the precision of the final computation. Nonetheless, the response indicates a developing understanding of how to determine net income based on the financial information provided, as illustrated in Table 3.

Table 3. SR-2 Understanding of Mathematical Procedures in Calculating Employee Pay Stub

Students' Answer (Indonesian Version)	English Version
 Slip gaji 1) Diket: Gaji kotor 2.800 zeds Potongan 300 zeds Gaji bersih 2.500 zeds Gaji kotor 19.600 zeds hingga tahun ini B. 2.500 zeds Alasannya karena yang akan diterima Jane melalui rekeningnya adalah gaji per 1 bulan kerja yakni 1 juli sampai 31 juli yang dimana gaji kotor 2.800 - potongan 300 (2.800 zeds - 300 zeds) = 2.500 zeds	Pay Stub 1. Given: Gross salary: 2,800 zeds Deductions: 300 zeds Net salary: 2,500 zeds Gross salary to date: 19,600 zeds Answer: B. 2,500 zeds Reasoning: Because the amount Jane will receive in her

Students' Answer (Indonesian Version)	English Version
	bank account is the salary for one month of work, from July 1 to July 31, where the gross salary is 2,800 zeds and the deductions are 300 zeds. Therefore, $2,800 - 300 = \mathbf{2,500 \text{ zeds}}$.

In the table 3, students were asked to determine the amount of salary received by Jane for the period of July 1 to July 31, based on the information provided in a pay stub. The pay stub included key salary components such as gross income (2,800 zeds), deductions (300 zeds), and net income (2,500 zeds). The correct answer was 2,500 zeds, representing the amount transferred to Jane's bank account after the deduction was applied.

SR-2's response was accurate and clearly reasoned. The student correctly identified the relationship between gross income, deductions, and net income, demonstrating the ability to interpret and apply financial information presented in the pay stub. SR-2 explicitly stated that Jane's monthly salary was for the period from July 1 to July 31 and that the net salary was obtained by subtracting the deductions (300 zeds) from the gross amount (2,800 zeds), resulting in 2,500 zeds.

This response indicates a sound conceptual understanding of how deductions affect take-home pay and reflects the student's ability to connect numerical data to real-world financial contexts. SR-2 successfully applied basic arithmetic within the structure of financial documentation, aligning with essential financial literacy competencies such as interpreting pay-related information and calculating net income.

Moreover, SR-2 provided a clear justification for the answer, demonstrating both procedural and conceptual fluency. The reasoning shows not only computational accuracy but also comprehension of the underlying purpose of deductions in a pay stub.

From an educational perspective, SR-2's response illustrates a strong grasp of applied mathematics in personal finance, representing an advanced level of understanding compared to responses that focus solely on numerical calculation without contextual interpretation. This suggests that SR-2 is capable of integrating mathematical reasoning with financial decision-making concepts, a skill fundamental to developing real-world financial literacy.

Following the analysis of the pay stub task, the second question focused on students' ability to interpret a bank statement. This task aimed to evaluate how students applied their

understanding of financial transactions such as deposits, withdrawals, and administrative fees to determine the final account balance at a specific point in time.

Table 4. SR-2 Understanding Mathematical Procedures in Calculating Bank Statements

Students' Answer (Indonesian Version)

English Version

Pertanyaan 1: total biaya admin yang dibebankan oleh Bank pada bulan November?

Tanggal	Debit	Ket
5 - Nov	1,50 zeds	Beban admin
12 - Nov	1,50 zeds	Beban admin
19 - Nov	1,50 zeds	Beban admin
26 - Nov	1,50 zeds	Beban admin
Total	6,00	

→ total biaya admin nya 2 zeds

Pertanyaan 2:

Tanggal	Transaksi	D	K	Saldo
3 desember	Saldo awal			2015,35
	Gaji	575,00		2590,35
	Transfer		130,00	2460,35
	Biaya admin			
	Total			2460,35

Alasannya:

• Saldo awal bulan desember Hy. Citizen adalah 2015,35 kemudian disetorkan ke gaji rekening beliau sejumlah 575,00 zeds
 $\rightarrow 2015,35 + 575,00 = 2590,35$

• Dipotong gaji Hy Citizen untuk transfer ke anak beliau sejumlah 130,00 + biaya admin
 $\rightarrow 2590,35 - 130,00 = 2460,35$ zeds

Saldo Akhir 2460,35 zeds

Question 1: What was the total administrative fee charged by the bank in November?

Date	Debit	Description
Nov 5	1.50 Zeds	Adm fee
Nov 12	1.50 Zeds	Adm fee
Nov 19	1.50 Zeds	Adm fee
Nov 29	1.50 Zeds	Adm fee
Total	6.00	

Question 2:

Date	Transaction	D	K	Balance
3 Dec	Opening Balance	-	-	2015.35
	Wages	575.00	-	2590.35
	Transfer	-	130.00	2460.35
	Adm fee	-	-	2460.35
	Total			2460.35

Explanation:

- The opening balance for Mrs. Citizen at the beginning of December was 2015.35 zeds, and her salary of 575.00 zeds was deposited into her account.
 $\rightarrow 2015.35 + 575.00 = 2590.35$
- Mrs. Citizen then transferred 130.00 zeds to her son's account and was also charged an administrative fee.
 $\rightarrow 2590.35 - 130.00 = 2,460.35$

Final Balance: 2460.35 zeds

In table 4, SR-2 demonstrated a strong ability to extract and systematically organize

quantitative information from financial records, as reflected in their responses to the bank statement tasks. In Question 1, SR-2 successfully identified each administrative fee transaction charged throughout November each amounting to 1.50 zeds and accurately computed the cumulative total of 6.00 zeds. This performance indicates SR-2's capacity to recognize recurring transactions and to apply basic arithmetic operations in a structured and consistent manner to achieve accurate results.

In Question 2, SR-2 exhibited procedural fluency in determining Mrs. Citizen's final account balance based on the chronological order of financial transactions. The student correctly added the deposited salary (575.00 zeds) to the opening balance (2015.35 zeds), obtaining an interim total of 2590.35 zeds. Subsequently, SR-2 subtracted the amount transferred to Mrs. Citizen's child's account (130.00 zeds) and accounted for the administrative fee deductions, arriving at a final balance of 2460.35 zeds.

The interview results reinforce these finding:

R: "Why did you arrive at a final balance of 2460.35 zeds?."

S: "I added the income received and subtracted the transfer amount, so I obtained that result."

R: "Did you include the administrative fee in your calculation?"

S: "No, I did not include the administrative fee. I assumed the calculation only involved the main income and expenditure, so I did not pay attention to the additional fee details."

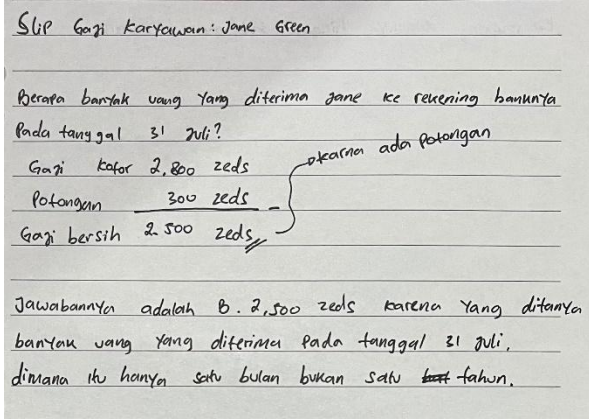
Overall, SR-2's response demonstrates not only the ability to perform the required arithmetic operations but also an understanding of how sequential financial transactions affect an account balance. However, SR-2 exhibited a lack of accuracy by failing to consider the transaction fee of 1.50 zeds, which should consistently be included in transfer calculations. This reasoning pattern reflects emerging competence in interpreting financial statements and performing step-by-step computations two essential components of financial literacy. Nonetheless, SR-2's reasoning remains largely procedural, emphasizing numerical precision rather than demonstrating a more comprehensive understanding of the broader financial implications of the transaction in real-world contexts.

Student Response-3 (SR-3)

SR-3 demonstrated a clear understanding of the salary components presented in the pay slip. This was evident in the student's ability to accurately distinguish between gross income and various deductions, and to correctly calculate the corresponding amounts. SR-3 also interpreted the deduction details appropriately, leading to an accurate determination of the final

net income. Overall, the response reflects a solid conceptual understanding of how to derive net income from the financial information provided, as illustrated in Table 5.

Table 5. SR-3 Understanding of Mathematical Procedures in Calculating Employee Pay Stub

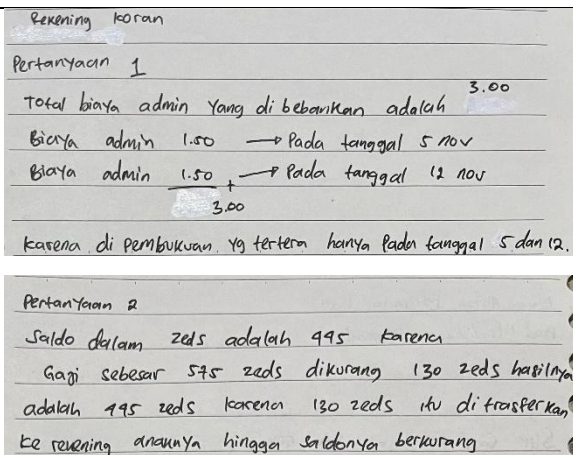
Students' Answer (Indonesian Version)	English Version
 Slip Gaji Karyawan: Jane Green Berapa banyak uang yang diterima Jane ke rekening banknya pada tanggal 31 Juli? Gaji kotor 2.800 zeds Potongan 300 zeds Gaji bersih 2.500 zeds Jawabannya adalah B. 2.500 zeds karena yang ditanya banyak uang yang diterima pada tanggal 31 Juli, dimana itu hanya satu bulan bukan satu tahun.	Question: How much money did Jane receive in her bank account on July 31? Gross salary: 2800 zeds Deduction: 300 zeds Net salary: 2500 zeds (because there are deductions) Answer: The answer is B. 2500 zeds because the question asks for the amount received on July 31, which refers to one month's payment, not a year's.

Based on table 5, SR-3 demonstrated a clear and accurate understanding of the information presented in the employee pay slip. The student correctly identified the gross salary (2800 zeds), the deductions (300 zeds), and the resulting net salary (2500 zeds), reflecting a sound grasp of the distinction between gross income and take-home pay. The arithmetic computation was performed accurately, indicating procedural fluency in applying basic subtraction within a financial context. Furthermore, SR-3 provided a logical explanation that linked the calculated amount to the specific time frame mentioned in the question, clarifying that the amount received on July 31 referred to a single month's salary rather than an annual sum. This reasoning illustrates the student's developing conceptual understanding of how payroll deductions affect net income and how payment periods influence financial interpretation. Overall, SR-3's response demonstrates not only numerical accuracy but also an emerging ability to contextualize financial data meaningfully an essential component of financial literacy.

After analyzing the pay stub task, the second question examined students' ability to interpret information presented in a bank statement. This activity was designed to assess how well students could apply their knowledge of financial transactions including deposits,

withdrawals, and administrative charges to accurately calculate the final account balance.

Table 6. SR-3 Understanding Mathematical Procedures in Calculating Bank Statements

Students' Answer (Indonesian Version)	English Version
 <i>Berkening koran</i> Pertanyaan 1 Total biaya admin yang di bebarkan adalah 3.00 Biaya admin 1.50 → Pada tanggal 5 nov Biaya admin 1.50 → Pada tanggal 12 nov 3.00 Karena di pembukuan yg tertera hanya pada tanggal 5 dan 12. Pertanyaan 2 Saldo dalam zeds adalah 495 karena Gaji sebesar 575 zeds dikurang 130 zeds hasilnya adalah 445 zeds karena 130 zeds itu di transferkan ke rekening anaknya hingga saldonya berkurang	Bank Statement: Question 1: The total administrative fee charged are 3.00 Administrative fee 1.50 – on November 5 Administrative fee 1.50 – on November 12 Total 3.00 Because in the records, those listed are only on November 5 and 12. Question 2: The balance in zeds is 445 because a salary of 575 zeds was reduced by 130 zeds. The result is 445 zeds, because the 130 zeds were transferred to another account, causing the balance to decrease.

In the table above, the item was intended to assess students' financial literacy, with a particular focus on their competence in interpreting financial statements such as bank records. Students were required to identify the administrative charges presented in the document and to apply basic mathematical operations to compute the total fees incurred. The accurate response should have been 6.00 zeds, reflecting four separate administrative deductions of 1.50 zeds each.

Nevertheless, the response provided by student SR-3 was incorrect. The student acknowledged only two administrative fees 1.50 zeds on November 5 and another 1.50 zeds on November 12 resulting in a total of 3.00 zeds. This answer illustrates a partial understanding of the task, while the student managed to locate relevant information, they failed to recognize the complete set of fee transactions recorded within the statement.

This misconception reveals limited proficiency in document interpretation. Although the student successfully identified numerical data, they did not consider the repetitive and accumulative nature of similar transactions. Such a pattern reflects a tendency to process financial information in isolation rather than analyzing the document holistically.

The second question aimed to assess students' ability to calculate the final account balance based on a series of financial transactions, including deposits, transfers, and administrative fees. To arrive at the correct answer, students were required to perform systematic arithmetic calculations that incorporated all relevant financial activities affecting the balance. The correct answer was 2458.85 zeds, obtained from the computation $2015.35 + 575 - 130 - 1.50 = 2458.85$. Full credit was awarded to students who accurately accounted for all components, while partial credit was granted to those who made minor rounding or calculation errors.

However, the response provided by student SR-3 "the balance is 445 zeds because a salary of 575 zeds was reduced by 130 zeds" reflects both a conceptual and computational error. This answer indicates that the student only considered part of the transactions while neglecting the initial balance and additional fees that should have been included in the calculation. Although SR-3 successfully identified the deposit and withdrawal, they failed to integrate all transactions into a coherent computation of the final balance.

To further corroborate these findings, follow-up interviews were also conducted with the students. The excerpts below illustrate their responses:

R: *"Could you explain the process you used to calculate the account balance in the given task?"*

S: *"Initially, I referred only to the transactions that presented salary and transfer information."*

R: *"After reviewing the transactions provided in the question, what steps did you take?"*

S: *"I immediately added the transactions recorded for that month".*

R: *"Did you also include the previous balance in your calculation?"*

S: *"No, I did not. I was not aware that the ending balance from the preceding table needed to be included. I assumed that the calculation was based solely on the data presented in the question".*

This error suggests that SR-3 demonstrated a partial understanding of how sequential transactions affect a financial record. It highlights the need to strengthen students' transactional reasoning and financial literacy skills, enabling them to connect multiple financial elements cohesively when determining an accurate account balance.

Across the three cases, a consistent pattern emerged in students' responses to the financial literacy tasks. Most students demonstrated adequate procedural understanding when

solving problems that involved direct numerical operations, particularly in the pay stub task where the relationships among salary components were explicitly presented. However, their performance declined when they were required to interpret interconnected financial information in the bank statement task. In this context, students tended to focus on individual numerical values rather than on the relationships among transactions, resulting in incomplete calculations and inaccurate financial decisions. This pattern suggests that successful mathematical procedures alone were insufficient to support financial reasoning when conceptual understanding of the underlying financial context was limited.

The comparison across the three cases further revealed that the difference between the pay stub and bank statement tasks did not primarily lie in the level of mathematical difficulty, but in the cognitive demands required to interpret the financial information. The pay stub presented a linear relationship between gross salary, deductions, and net salary, enabling students to apply familiar arithmetic procedures. In contrast, the bank statement required students to integrate multiple transactions over time, recognize recurring administrative fees, and connect the opening balance with subsequent financial activities. These additional interpretative demands explain why students who successfully completed the pay stub task often encountered difficulties when solving the bank statement problems.

However, the bank statement task revealed two recurring error patterns rather than simple calculation mistakes. The first involved incomplete interpretation of the bank statement, where students identified only some of the administrative fee transactions. The second involved incomplete procedural application, as students failed to incorporate all relevant transactions into their calculations. Consequently, many students underestimated the total bank charges by considering only the fees recorded on November 5 and November 12, whereas the correct total was 6.00 zeds.

Furthermore, in the second question related to the bank statement, students miscalculated Ms. Citizen's final balance because they failed to consider her ending balance on November 30. Two students based their calculations solely on the salary deposit and Ms. Citizen's transfers to her child, neglecting to include the previous ending balance that should have been incorporated into the computation of the final account balance.

These statements suggest that the students lacked a holistic understanding of how transactions and balances are interconnected within a bank statement. Their reasoning reflects a procedural rather than conceptual comprehension of financial data focusing on visible figures without recognizing the continuity of financial records. This finding highlights the importance

of instructional approaches that combine mathematical computation with contextual financial literacy, enabling students to develop both numerical accuracy and conceptual understanding in real-life financial situations.

An important implication of these findings is that authentic financial documents should be viewed as more than contextual examples used to assess financial literacy. They represent a distinct form of financial information that requires individuals to coordinate mathematical procedures with conceptual interpretation. Unlike routine mathematical exercises, authentic financial documents present numerical information as interconnected financial events. Consequently, successful performance depends not only on computational accuracy but also on the ability to recognize relationships among transactions, balances, and financial consequences. This explains why several students who correctly solved the pay slip task encountered difficulties when interpreting the bank statement. These results reaffirm prior studies indicating that young adults, despite possessing adequate basic mathematical proficiency, often struggle to transfer these skills into real-life financial contexts (Lusardi & Mitchell, 2014; OECD, 2019; Ozkale & Aprea, 2023).

These findings also extend the distinction between procedural understanding and conceptual understanding. Students generally demonstrated procedural understanding when carrying out arithmetic operations, particularly in the pay slip task. However, successful interpretation of the bank statement required conceptual understanding, namely the ability to integrate multiple financial transactions into a coherent representation of account activity. The findings therefore suggest that conceptual understanding functions as the cognitive mechanism through which procedural knowledge can be applied effectively in authentic financial contexts.

Consistent with the PISA financial literacy framework, students in this study demonstrated relatively strong performance in identifying and computing explicit numerical information, such as determining net income from a pay slip which reflects a foundational procedural understanding of money and transactions. However, when confronted with tasks requiring more complex financial reasoning such as identifying recurring administrative fees or integrating multiple transactions to determine a final account balance students exhibited notable misconceptions. These difficulties indicate that while the students possess procedural fluency in isolated computations, they often lack a holistic understanding of how financial transactions are interconnected across time.

The interview data corroborate these findings, revealing that many students tended to focus on the superficial aspects of financial records rather than their underlying structure or

logic. Some students reported relying solely on visible data from December without taking into account previous balances, while others described estimating numerical values using tools such as rulers rather than applying systematic mathematical reasoning. Such responses demonstrate a predominantly procedural approach performing calculations step by step rather than a conceptual approach grounded in analytical financial reasoning (Kosyvas, 2016; Nieminen et al., 2022; Nusantara et al., 2021b). This pattern aligns with previous research indicating that students frequently perceive financial documents merely as arithmetic exercises rather than contextualized representations of economic activity (Sawatzki, 2017; Cavalcante & Savard, 2021).

These findings hold important implications for financial literacy instruction. Rather than focusing primarily on routine computational exercises, learning activities should engage students in interpreting authentic financial documents, such as pay slips and bank statements, that require them to connect multiple financial transactions and justify their reasoning. Such learning experiences can help students develop both procedural accuracy and conceptual understanding, enabling them to make informed financial decisions in real-life contexts. The use of contextualized, open-ended tasks such as those modeled after the PISA framework can encourage students to synthesize information, identify relationships among financial actions, and evaluate the broader implications of their decisions (Gravemeijer & van Eerde, 2009; Nusantara et al., 2021a; Savard, 2022). Particular attention should be directed toward strengthening students' *transactional reasoning*, which involves understanding how sequential deposits, deductions, and fees cumulatively affect account balances. This cognitive process appears to be underdeveloped among early university learners.

Beyond identifying students' misconceptions, this study contributes to the understanding of financial literacy by demonstrating that success in authentic financial tasks depends on the integration of procedural understanding and conceptual understanding rather than on computational ability alone. The findings indicate that students were generally able to perform mathematical calculations correctly when numerical relationships were explicit, yet they encountered difficulties when those calculations had to be interpreted within interconnected financial transactions. This extends existing perspectives on financial numeracy by highlighting that interpreting authentic financial documents constitutes a distinct cognitive process in which mathematical reasoning and financial interpretation operate simultaneously. Consequently, developing financial numeracy requires learning experiences that integrate mathematical concepts with meaningful financial contexts, enabling students to connect

computational accuracy with informed financial decision-making (Santos et al., 2022; Nusantara et al., 2024; Van den Heuvel-Panhuizen & Drijvers, 2020; Ozkale & Aprea, 2023).

CONCLUSION

This study investigated how first-semester university students interpreted authentic financial documents through open-ended tasks adapted from the PISA 2018 financial literacy framework. The findings demonstrate that students generally possessed adequate procedural skills for carrying out routine financial calculations, yet these skills did not consistently translate into conceptual understanding when they were required to interpret interconnected financial information within authentic financial documents. Difficulties in identifying recurring administrative fees, incorporating previous balances, and explaining the relationships among sequential transactions indicate that successful financial literacy depends not merely on computational accuracy but on the integration of procedural and conceptual understanding. These findings extend current perspectives on financial literacy by showing that authentic financial documents reveal aspects of students' reasoning that are not captured through conventional measures of computational performance alone.

These findings highlight the need to redesign financial literacy learning at the university level by embedding authentic financial documents, such as pay slips and bank statements, into classroom activities that require students to interpret relationships among financial transactions, justify their reasoning, and explain the meaning of their calculations rather than merely obtaining correct numerical answers. Such learning experiences may strengthen the integration of procedural and conceptual understanding, enabling students to apply mathematical reasoning more effectively in real-world financial decision-making. Future studies could extend this work by comparing students from different academic disciplines, examining differences between first-year and senior university students, or investigating how sustained exposure to authentic financial documents influences the development of conceptual understanding over time. Collectively, these directions may contribute to the development of more comprehensive models of financial literacy that better reflect the cognitive demands of everyday financial decision-making.

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