Citation:

Yasin, H. (2025), "From classroom to cash: exploring financial literacy in Indonesian students", *Asian Education and Development Studies*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/AEDS-03-2025-0111

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From Classroom to Cash: Exploring Financial Literacy in Indonesian Students

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No studies have been found to investigate students' financial literacy in a large-scale context in Indonesia. This study investigates how financially literate Indonesian students are, and how Indonesian students' attitudes toward financial matters are, based on the data of the Program for International Student Assessment (PISA) 2018. Analyzing responses from 3158 15-year-old students across 43 items for the Financial Literacy Cognitive Assessment and 7001 respondents across 85 items for the Financial Literacy Survey, the study employs the Rasch Partial Credit Model in WINSTEPS 3.73 for analysis. Results indicate a varied performance among students, with scores ranging from -4.20 logit to 2.26 logit and an average score of -0.82 logit. Approximately 48.5% of students scored above this average, highlighting a need for targeted financial education, particularly in complex areas like company profit and repayment scores. Despite familiarity with concepts like "wage" and aspirations for entrepreneurship, concerns arise about insufficient financial education from parents and teachers, indicating a necessity for enhanced financial management skills and awareness among students, regardless of gender. These findings suggest the importance of tailored interventions and curriculum improvements in promoting financial literacy among Indonesian students.

Keywords: financial education, financial literacy, Indonesian students, PISA 2018, large-scale assessment

Introduction

During my primary school years in the early 2000s, my mother would give me cash for lunch or snacks, as meals were not provided at school. I would decide how to spend it, on food, snacks, or toys, or save it for after-school hangouts with friends. This illustration is an example of how an individual started to encounter financial decisions. Similar cases and other cases related to financial literacy happen throughout childhood until adulthood and for the rest of their life. Yet, none of these were educated at school in Indonesia. However, it is important to think of knowing how to manage money as something everyone deserves and needs, not just a special skill for a few people who have extra information about it (Lusardi, 2019).

Hence, there should be education that can help students become financially literate to prepare for their adult life, where they will mostly deal with financial interactions and transactions (Lusardi, 2019). One of the considerations from Lusardi's (2019) study is that the financial literacy level is in crisis beyond countries, especially in Europe and North America. Most of the countries have similar financial literacy levels, indicating that their knowledge of financial matters is relatively less. Another concern is that an individual makes substantially more financial decisions throughout his/her life. This shows that financial literacy matters more than we think it does. With these considerations, financial education is necessary as early as possible.

To that matter, the Organisation for Economic Co-operation and Development (OECD) suggests that education on financial matters should start in school (OECD, 2005). This suggestion was according to the need to prepare for financial knowledge and skills to help students be ready for their future life, instead of adjusting in their adulthood. Studies by Shim et al. (2010) and Allgood and Walstad (2016) suggest a similar idea that early financial socialization can lead to financial behavior. The

indication is that if the students start to be aware of financial matters, they will be likely to survive financially in the future. In line with its recommendation, the OECD initiated an assessment of Financial Literacy in its well-known large-scale assessment, PISA.

The fifth cycle of PISA, the 2012 cycle, innovated to measure students' financial literacy as an optional domain for countries to be assessed. From this point on, the following cycles also assessed Financial Literacy, with the latest result having been published in cycle 2018 (OCDE, 2023; OECD, 2013, 2017, 2019). This innovation can be seen as an effort to address the need for data about young adults' financial literacy. Additionally, PISA defines financial literacy as:

> …knowledge and understanding of financial concepts and risk, and the skills, motivation, and confidence to apply such knowledge and understanding to make effective decisions across a range of financial contexts to improve the financial well-being of individuals and society and to enable participation in economic life…

This definition covers several points, including cognitive dimensions as well as behaviors in a financial context that point to the financial security of an individual. In other words, financial literacy means knowing about money-related ideas and dangers and having the ability, desire, and belief in oneself to use this knowledge to make good choices about money in different situations. This helps people and communities become more financially secure and take part in economic activities.

Financial literacy construct in PISA 2018

As mentioned in the OECD publication, the construct of financial literacy in the Programme for International Student Assessment (PISA) 2018 is multifaceted, with distinct elements within the content, process, and context domains (OECD, 2019). In terms of content, individuals are assessed on their comprehension of fundamental aspects, including money transactions, planning and managing finances, evaluating

risks and rewards, and understanding the broader financial landscape (see Table 1). These components collectively provide a comprehensive framework for evaluating financial literacy.

Table 1 PISA's financial literacy construct

	Domain	Indicators	Number of items
Cognitive Assessment	Content	Money and transactions	11
		Planning and managing finance	16
		Risk and reward	11
		Financial landscape	5
	Process	Identifying financial information	7
		Analyzing information in a financial context	11
		Evaluating financial issues	11
		Applying financial knowledge and understanding	14
	Context	Education and work	4
		Home and family	14
		Individual	21
		Societal	4
Non-cognitive/Survey		Access to information and education	44
		Access to money and financial products	10
		Attitudes towards and confidence about financial matters	19
		Spending and saving behaviour	12

Source: compiled from OECD (2019). PISA 2018 Assessment and Analytical Framework. Paris: OECD Publishing.

The process aspect of financial literacy involves a series of cognitive skills (OECD, 2019). This includes identifying relevant financial information from diverse sources, analyzing information within a financial context, evaluating financial issues by weighing pros and cons, and applying acquired financial knowledge to make informed decisions in practical scenarios (as shown in Table 1). These cognitive processes are crucial in assessing an individual's ability to navigate complex financial situations.

Within the context domain, financial literacy is examined with various life aspects (OECD, 2019). This includes education and work, where individuals are expected to understand financial implications related to student loans, salary negotiations, and retirement planning. The home and family context involves applying financial literacy skills to manage household finances, comprehend family budgeting, and make decisions impacting overall financial well-being. On an individual level, financial literacy extends to personal financial management, encompassing budgeting, investments, and goal setting. Moreover, financial literacy is viewed through a societal lens, encouraging an understanding of broader economic trends and responsible participation in the economy (OECD, 2019).

In addition to cognitive components, PISA 2018 incorporates non-cognitive items to provide a holistic assessment (OECD, 2019). These non-cognitive items include access to information and education, examining the availability and accessibility of financial information and educational resources. Access to money and financial products evaluates the ease of access to financial services. Attitudes towards and confidence about financial matters delve into individuals' beliefs and confidence levels in dealing with financial issues. Lastly, spending and saving behavior explores patterns and behaviors related to money management, offering insights into factors influencing these financial behaviors.

In essence, the construct of financial literacy in PISA 2018 is designed to comprehensively evaluate individuals' knowledge, skills, and attitudes across various financial domains. By considering cognitive processes and contextual factors, alongside non-cognitive elements, the assessment aims to provide a nuanced understanding of an individual's financial literacy in diverse real-world scenarios.

Financial literacy and socio-economic and cultural influence.

While the PISA 2018 framework offers a comprehensive perspective on the cognitive and non-cognitive dimensions of financial literacy, it is crucial to acknowledge that financial knowledge, skills, and behaviors are not developed in isolation. Rather, they are deeply embedded within broader socio-economic and cultural contexts (Ahunov & Van Hove, 2020; Ben Belgacem et al., 2024; Dewi, 2022; Garg & Singh, 2018; Kadoya & Khan, 2020; Riitsalu & Põder, 2016).

Studies conducted in diverse settings such as Japan (Kadoya & Khan, 2020), South Africa (Oke & Benedict, 2024), and Indonesia (Dewi, 2022) reveal that socioeconomic status (SES) indicators, including gender, age, income level, and educational attainment, consistently influence financial literacy levels. Cultural dimensions, such as power distance and individualism, have also been found to explain cross-national differences in financial literacy (Ahunov & Van Hove, 2020). Moreover, research by Riitsalu and Põder (2016) shows that even within similar education systems, cultural and linguistic differences can lead to variations in financial literacy outcomes, underlining the complex interplay between social background and financial capability. Recent work also draws attention to the evolving role of financial technology (FinTech) as a potential, although limited, moderator in bridging financial literacy gaps across demographic groups (Ben Belgacem et al., 2024). Taken together, these findings underscore the importance of not only examining cognitive competencies but also critically exploring how socio-economic and cultural factors shape the development of financial literacy across different populations.

Building on these global insights, it becomes evident that financial literacy cannot be fully understood without considering the broader socio-economic and cultural frameworks that individuals navigate. This understanding is particularly important for

Indonesia, a country marked by rich cultural diversity, wide socio-economic disparities, and varying access to financial education. Dewi (2022) provides empirical support for this complexity through her study of Indonesian faculty members, which revealed that socio-economic indicators were found to moderate the relationship between financial awareness and financial skills, illustrating that financial literacy is deeply intertwined with an individual's economic capacity and lifestyle. These findings underscore that to advance financial capability in Indonesia, it is essential to move beyond a one-size-fits-all approach and instead adopt context-specific strategies that acknowledge the nuanced roles of demographic and economic variables in shaping financial behaviors.

Theoretical framework: financial socialization and behavioral economics

This study draws on two theoretical perspectives, financial socialization and behavioral economics, to interpret Indonesian students' financial literacy and attitudes as assessed through PISA 2018 data. These frameworks offer complementary lenses for understanding how financial knowledge, behavior, and decision-making develop and vary among students.

Financial socialization refers to the lifelong process through which individuals acquire financial knowledge, attitudes, and behaviors, primarily during childhood and adolescence (LeBaron & Kelley, 2021). Among the most influential agents of this process are parents, whose impact often outweighs that of formal education and work experience (Shim et al., 2010b). This influence occurs through mechanisms such as parental modeling, open discussions about money, and hands-on financial experiences. Studies confirm that financial socialization contributes significantly to financial knowledge, behavior, and overall well-being, not just financial but also relational and mental (LeBaron & Kelley, 2021; Mohamed, 2017). Further evidence suggests that the effectiveness of financial socialization can vary by cultural and familial context. For

instance, Hudson et al. (2017) found that in the African American community, self-directed learning led to higher financial knowledge than passive forms of socialization. Similarly, Zhao and Zhang (2020) and Bucciol et al. (2022) demonstrate that parental education levels and early family financial engagement are closely linked to later financial decision-making, especially among females. Other factors such as media exposure, school involvement, and owning a bank account also influence adolescents' financial literacy (Grohmann et al., 2015; Sohn et al., 2012).

Behavioral economics adds another dimension to this analysis by emphasizing the psychological and social underpinnings of financial decision-making. This field departs from classical economic theories that assume humans make rational choices; instead, it acknowledges the effects of cognitive biases, heuristics, and emotional responses (Chen, 2024; Choudhury Sen & Verma, 2024). Concepts like bounded rationality and prospect theory help explain why individuals often deviate from optimal financial behavior. In the context of financial literacy, behavioral economics critiques the assumption that simply increasing knowledge will change behavior (Altman, 2013). Instead, it advocates for financial education programs that incorporate behavioral insights, such as nudging, personalization, and attention to psychological drivers (Ferreira, 2021; Ilugbusi & Adisa, 2024). These approaches recognize that financial decisions are shaped by context and individual limitations, not just information access. Together, these two frameworks offer a meaningful basis for understanding students' financial literacy and attitudes. Financial socialization helps explain how early experiences, particularly those shaped by family and school, contribute to students' financial knowledge and behaviors. On the other hand, behavioral economics draws attention to the psychological and situational factors that may influence how students make financial decisions, even when they have the necessary knowledge.

In this study, I draw on both perspectives to interpret Indonesian students' responses and performance in the PISA 2018 financial literacy assessment. This theoretical approach allows for a deeper exploration of the findings, going beyond test scores to consider the broader social, educational, and behavioral influences that shape how students relate to financial matters.

A global perspective of financial literacy through PISA

The Program for International Student Assessment (PISA) has become a key instrument for understanding financial literacy among adolescents worldwide. Since its introduction in 2012, the PISA financial literacy assessment has enabled researchers to explore not only student performance but also the contextual, educational, and socio-cultural factors influencing financial understanding and behavior.

A seminal contribution to this area is provided by Lusardi (2015), who introduced findings from the first international survey on financial literacy among high school students and underscored the importance of integrating financial literacy into educational curricula. Lusardi's work, along with Bottazzi and Lusardi (2021), also highlighted persistent gender disparities in financial literacy among Italian youth, linking them to parental background and regional socio-cultural dynamics.

Other scholars have leveraged PISA data to investigate the relationship between financial literacy and education delivery. Cordero et al. (2022) and Salas-Velasco et al. (2021), for instance, conducted cross-country analyses using PISA 2012 data, demonstrating that the inclusion of financial education in school curricula, particularly when delivered by specialists or integrated into mathematics or business subjects, can positively impact student performance. However, these studies also noted that the

effects of such interventions are often marginal compared to broader individual and school-level factors.

Complementing this, Ozkale and Ozdemir Erdogan (2022) explored the interplay between mathematical and financial literacy using PISA tasks, revealing that conceptual overlap between the two literacies suggests potential for curricular integration. Meanwhile, Cavalcante and Huang (2022) conducted a praxeological analysis of Chinese financial literacy success, emphasizing the role of well-structured mathematics curricula and textbook design in supporting financial numeracy.

In a Finnish context, Silinskas et al., (2021) examined the role of financial learning environments and dispositional traits, such as competitiveness and meta-cognition, in shaping financial literacy. They found that internal factors like student motivation and learning strategies had a stronger association with financial literacy scores than parental involvement. Similarly, Pulk and Riitsalu (2024) incorporated national cultural dimensions into their analysis, demonstrating how individualism positively correlates with student financial literacy outcomes across 20 countries.

Riitsalu & Põder (2016) took a closer look at the Estonian context, where financial education was not systematically provided. Their findings highlighted how differences in language, cultural background, and home environments can significantly influence financial literacy, even within a single country.

Unlike prior studies that emphasize cross-country comparisons, gender gaps, or curricular delivery methods, this study offers a nationally focused and psychometrically robust analysis of financial literacy in Indonesia, a country underrepresented in the literature. Combining cognitive and attitudinal measures with Rasch modeling, it provides nuanced insights into the strengths and gaps in Indonesian students' financial

understanding and behavior, highlighting a critical need for contextually relevant educational interventions.

Financial literacy research in Indonesia

The search for articles on financial literacy education affiliated with Indonesia yielded only 66 documents from the Scopus database. A review of the articles related to financial literacy reveals that most of them investigate or explore associations between or among various variables. This indicates that more experts are interested in how financial literacy is associated with other aspects. For example (Radianto et al., 2020) investigated whether financial literacy is influenced by parents in relation to young entrepreneurs.

Similarly, Widagdo & Roz (2022) explored the association between financial literacy and investment intention. Other studies consider financial literacy as a mediating variable that affects different outcomes. This type of research often employs Structural Equation Modeling, such as the study by Saptono, (2018). Some studies focus on comparing demographic differences in financial literacy (Dewi, 2022; Febriana & Damayanti, 2017; Nosita et al., 2020; Sahabuddin & Hadianto, 2023). There are also other examples of research that examine various associations involving financial literacy.

However, I also found several studies that address financial literacy in the context of education. The educational settings vary, for instance, one study focuses on higher education (Wulandari & Narmaditya, 2018), while another examines elementary school (Rizkiwati et al., 2022). Both explore the possibility of developing a learning model for teaching financial literacy. These findings indicate that financial literacy is a topic of growing interest among researchers. This aligns with the view that financial literacy is an important aspect of an individual's life (Kezar & Yang, 2010; Lusardi &

Mitchell, 2011; Tomášková et al., 2011). Although many researchers have studied this topic, I have not found any that aim to portray the financial literacy of a large population, especially within a specific age group or geographic area. This research is intended to be a pioneering effort to examine how financially literate Indonesian students are.

To explore Indonesian students' financial literacy, this study explores the condition and situation of Indonesian students' financial literacy to see how urgent it is to have financial education at the school level. It delves into the results of both cognitive and survey yielded from PISA 2018. Consequently, two research questions frame the present study.

- How financially literate are Indonesian students?
- How are Indonesian students' attitudes towards financial matters?

By exploring these questions, it is expected that some information about the urgency of financial education will be revealed to inform a policy on financial literacy at the school level in Indonesia.

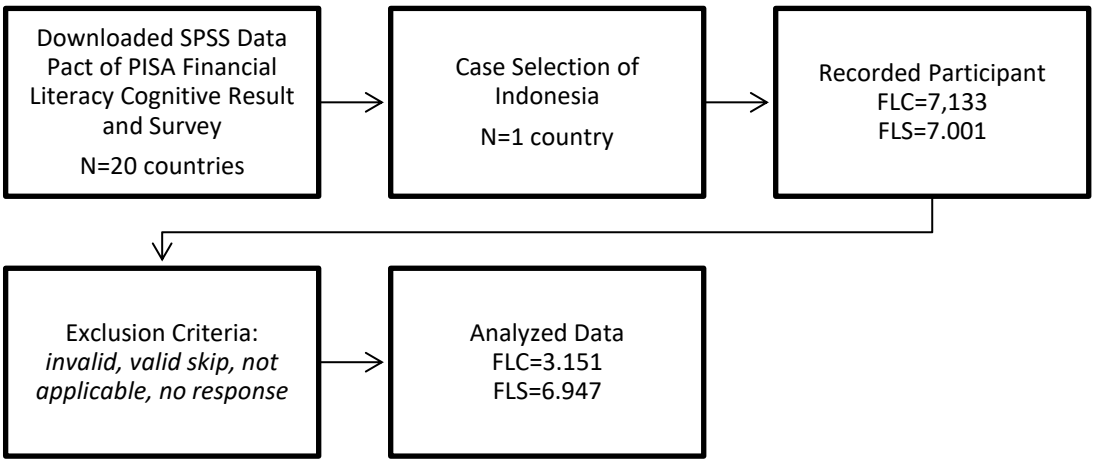
Materials and Methods

This study employs non-experimental research since no manipulation is involved in portraying 15-year-old Indonesian students' financial literacy through the Program for International Students Assessment (PISA). This design is effective in exploring a phenomenon in a naturalistic setting (Farris, 1969). This design is also widely used in addressing and exploring problems and phenomena in the educational context, especially in studies that do not account for association with manipulation. This was evidenced by the search results in the Scopus database within the titles, abstracts, and keywords that yielded not less than a thousand articles with the "non-experimental" and "education" keywords.

Data extraction

This research draws upon the rich dataset provided by the Program for International Student Assessment (PISA) 2018, specifically focusing on the Financial Literacy Cognitive Assessment and the Financial Literacy Survey. Both components play pivotal roles in addressing the two overarching research questions that guide this study. Initially, the dataset encompassed responses from a substantial 7133 participants for both the cognitive assessment and survey sections, laying the foundation for a comprehensive examination of financial literacy. However, to ensure the reliability and accuracy of the analysis, a meticulous data-cleaning process was undertaken (see Figure 1 for the flow chart of data extraction). After this process, 3158 records remained for the cognitive assessment, and 7001 records were retained for the survey, creating a refined dataset ready for in-depth exploration.

Figure 1 Flow chart of data extraction



Source: author's own work

With the clean data in hand, the next step involved its transformation and formatting for effective analysis. The consolidated and refined dataset was converted into an Excel file, and specific formatting procedures were applied to enhance compatibility with WINSTEPS, the chosen analytical tool. This step was crucial in

preparing the data for Rasch modeling, as it ensured that the intricacies of financial literacy skills among study participants were accurately captured. WINSTEPS, renowned for its capabilities in Rasch analysis, was then employed to delve into the nuances of the formatted data. This analytical software serves as a robust platform for implementing the Rasch model, providing valuable insights into individual item and respondent characteristics within the realm of financial literacy.

In essence, the utilization of PISA 2018 financial literacy data, coupled with a meticulous cleaning process and strategic formatting, lays the groundwork for a rigorous analysis. This approach enables a comprehensive exploration of financial literacy skills among participants, with WINSTEPS serving as the conduit for unraveling the complexities inherent in the dataset. The convergence of these elements ensures that the findings derived from this research are not only grounded in a solid dataset but are also subjected to thorough analysis, contributing to the broader discourse on financial literacy among students.

Analysis

To examine the psychometric properties of the financial literacy data, the Rasch model, specifically the Partial Credit Model, was employed. The Partial Credit Model is particularly suitable for analyzing datasets with multiple response categories, accommodating both dichotomous and polytomous items (Bond & Fox, 2015). Given that the financial literacy assessment comprises a mixture of these response structures, the Partial Credit Model provides a robust framework for capturing the nuanced nature of the responses. The mathematical model of this analysis method is below:

$$P_{i1}(\theta) = \frac{P_{i1}(\theta)}{P_{i0}(\theta) + P_{i1}(\theta)} = \frac{exp(\theta_n - \delta_{i1})}{1 + exp(\theta_n - \delta_{i1})}$$

With:
θ_n = individual level trait

δ_{i1} = item location parameter

The choice of the Partial Credit Model is justified by the diverse nature of the data, encompassing items with varying levels of difficulty and response formats. The inclusion of both dichotomous and polytomous items necessitates a model that can accommodate the partial credit given to each response option (Masters & Wright, 1997). This model allows for a more nuanced understanding of respondents' proficiency, capturing the incremental differences in their financial literacy levels.

Utilizing the Rasch model is particularly pertinent for analyzing secondary data, ensuring the quality and validity of the instrument. This model aids in establishing the reliability of the assessment tool and guarantees that the data used are robust and valid. By employing the Rasch model, the analysis aims to provide a comprehensive and accurate assessment of the financial literacy levels of Indonesian students based on the PISA 2018 data.

Additionally, it is particularly suitable for this study because it goes beyond measuring right or wrong answers. It helps identify deeper patterns in how students understand and respond to financial situations, which can reflect their personal experiences, habits, and social influences. By placing both students and items on the same scale, Rasch's modeling allows us to explore variations in financial literacy levels more clearly. This approach is useful for revealing not just performance, but also the underlying traits or profiles that shape students' financial decision-making, especially in a diverse context like Indonesia.

While the Rasch model offers a solid foundation for psychometric analysis, one key consideration is the extent to which the sample represents the broader population of Indonesian students. Given the country's vast socio-economic and geographic diversity, differences in access to financial education and school resources may influence students' responses (Maemunah, 2022). These contextual factors are not fully captured

in the model but could play a significant role in shaping financial literacy. Recognizing these limitations is important for interpreting the findings accurately and ensuring that any policy recommendations are grounded in the realities of Indonesia's educational landscape.

Additional tools

IBM SPSS 26 was employed to extract the PISA 2018 financial literacy data. Subsequently, the data were transferred to Microsoft Excel 2019 for calibration into a suitable format for Rasch modeling. The analysis was carried out using WINSTEPS 3.73, a software specifically designed for implementing Rasch models (Linacre & Wright, 2000). This multi-step process ensures meticulous preparation and rigorous examination of the data, maintaining the integrity of the analysis

Findings

PISA measurement of financial literacy

Before presenting the result of the analysis to answer the research questions, the PISA measurement of financial literacy needs to be addressed. Summary statistics, item measures, and the rating scale are elaborated in this section for both Financial Literacy as a cognitive domain and the background survey. This is important to address and to determine how well the data drawn from PISA 2018 resembles the financial literacy of Indonesian students. In other words, this section is an attempt to elaborate on the tools that PISA utilized in measuring Indonesian students' experience related to money matters.

Summary statistics of cognitive measures

Table 2. Summary statistics of person cognitive measures

SUMMARY OF 3151 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	16.0	42.2	-.82	.37				
S.D.	7.6	3.1	.90	.09				
MAX.	41.0	43.0	2.26	2.00				
MIN.	.0	1.0	-4.20	.31	.58	-2.9	.17	-1.9
REAL RMSE	.39	TRUE SD	.81	SEPARATION	2.06	Person RELIABILITY	.81	
MODEL RMSE	.38	TRUE SD	.82	SEPARATION	2.17	Person RELIABILITY	.82	
S.E. OF Person MEAN = .02								

Person RAW SCORE-TO-MEASURE CORRELATION = .98 (approximate due to missing data)
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .85 (approximate due to missing data)

Source: author's own work

According to Table 2, the data being analyzed comprise 3158 individuals responding to 43 items. However, due to invalid responses, the reported analysis focuses on 3151 participants. The person measure, representing the location of individuals on the latent trait continuum, is estimated at -0.82 logits, indicating a tendency towards lower abilities among the participants since it is less than the average of 0,0 logit (Sumintono & Widhiarso, 2014). It means that, on average, Indonesian adolescents are less knowledgeable about financial matters. The separation index, a measure of the test's ability to discriminate between individuals with different levels of the latent trait, is reported as 2.06, suggesting a moderate level of discrimination. The person reliability, a metric indicating the consistency or precision of the person measures, is found to be 0.81, reflecting a reasonably reliable measurement of individual abilities. The standard error, quantifying the precision of the person measures, is noted as 0.02, indicating a high level of measurement precision. Additionally, Cronbach's alpha, assessing the internal consistency of the items, is reported at 0.85, denoting a strong degree of coherence among the items in the test.

Table 3. Summary statistics of item cognitive measures

SUMMARY OF 43 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	1172.6	3089.7	.00	.05	1.00	-.9	1.02	-.4
S.D.	542.0	29.4	1.12	.02	.14	5.7	.26	6.0
MAX.	2367.0	3125.0	3.72	.15	1.58	9.9	2.11	9.9
MIN.	49.0	3007.0	-2.20	.03	.74	-9.9	.52	-9.9

REAL RMSE	.05	TRUE SD	1.12	SEPARATION 22.24	Item RELIABILITY 1.00
MODEL RMSE	.05	TRUE SD	1.12	SEPARATION 22.58	Item RELIABILITY 1.00
S.E. OF Item MEAN = .17					

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.90 (approximate due to missing data)
132838 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 142778.61 with 129646 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .4394
Capped Binomial Deviance = .2220 for 120466.0 dichotomous observations

Source: author's own work

In addition, as shown in Table 3, several key metrics provide insights into the characteristics of the 43 items . The item separation, a measure of the ability of the items to discriminate between individuals with varying levels of the latent trait, is reported as remarkably high at 22.24. This exceptionally elevated separation underscores the robust discriminatory power of the individual items, emphasizing their effectiveness in distinguishing between participants of different abilities. Item reliability, an indicator of the consistency or precision of the item calibrations, is found to be 1.00. The item reliability, reaching a perfect score of 1.00, signifies a flawless level of consistency and precision in the measurement of the items' characteristics. Additionally, the standard error associated with the items is reported as 0.17 logits, reflecting a moderate level of measurement precision. In general, the test items are significantly qualified in measuring cognitive financial literacy.

Summary statistics of survey measures

Table 4 shows a summary of the PISA financial literacy survey conducted among Indonesian adolescents including a substantial sample size of 7001 persons, with responses collected on 85 items. Despite encountering invalid responses leading to the exclusion of 54 persons from the analysis, the reported response rate stands at 6947

persons. The person measure, reflecting the average ability or trait level in financial literacy, is reported as -0.87 logit, indicating that, on average, respondents have a level below the mean ability. The separation value of 2.12 suggests a moderate to high level of discrimination in survey responses, signifying the survey's ability to differentiate between individuals with varying levels of financial literacy. Additionally, the person reliability of 0.82 demonstrates a reasonably high level of consistency in the measurement, and Cronbach's Alpha of 0.96 attests to the strong internal consistency among the survey items. With a low standard error of 0.01, the survey provides a precise measurement of financial literacy.

Table 4. Summary statistics of person survey measures

SUMMARY OF 6947 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	164.0	82.3	-.87	.18				
S.D.	28.9	11.2	.56	.13				
MAX.	260.0	85.0	2.77	2.12				
MIN.	2.0	1.0	-7.38	.16	.00	-8.7	.00	-6.5
REAL RMSE	.24	TRUE SD	.50	SEPARATION	2.12	Person RELIABILITY		.82
MODEL RMSE	.23	TRUE SD	.51	SEPARATION	2.25	Person RELIABILITY		.83
S.E. OF Person MEAN = .01								

Person RAW SCORE-TO-MEASURE CORRELATION = .59 (approximate due to missing data)
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .96 (approximate due to missing data)

Source: author's own work

Moreover, Table 5 illustrates a summary of items used in the PISA financial literacy survey conducted among Indonesian teenagers. The separation value of 65.15 indicates an exceptionally high ability of the survey items to distinguish between respondents with different levels of financial literacy. This suggests a robust discriminatory power at the individual item level, contributing to the overall effectiveness of the survey. The item reliability, reported as a perfect 1.00, signifies flawless internal consistency among the survey items. This implies that each item consistently measures the same underlying construct, emphasizing the reliability of the

individual items in capturing financial literacy. The standard error of 0.16 reflects a moderate level of imprecision in the item-level measurement, indicating some variability.

Table 5. Summary statistics of item survey measures

Table 4 SUMMARY OF 85 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	13400.6	6723.0	.00	.02	1.00	-1.5	1.04	-.6
S.D.	3746.8	41.7	1.49	.01	.21	7.7	.24	8.5
MAX.	21259.0	6861.0	4.00	.05	1.77	9.9	1.79	9.9
MIN.	7163.0	6637.0	-1.93	.02	.72	-9.9	.73	-9.9
REAL RMSE	.02	TRUE SD	1.49	SEPARATION 65.15	Item	RELIABILITY 1.00		
MODEL RMSE	.02	TRUE SD	1.49	SEPARATION 67.72	Item	RELIABILITY 1.00		
S.E. OF Item MEAN = .16								

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.89 (approximate due to missing data)
571265 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 1023898.50 with 564258 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .6404

Source: author's own work

Item measure of cognitive measures

Table 6 illustrates the item measure for cognitive assessment that involves evaluating the difficulty levels of individual items within a test. In this particular case, a varied distribution of item difficulties has been achieved, with 21 items falling below the average difficulty level and 22 items above it. This balanced distribution ensures that the test encompasses a range of difficulty levels, catering to individuals with varying cognitive abilities. The standard deviation of 1.12 provides insight into the spread of item difficulties around the mean. In statistical terms, a standard deviation of 1.12 indicates that the majority of items cluster within approximately one standard deviation from the mean. This suggests that the test comprises distinct groups of items, with the majority falling within a reasonably predictable range of difficulty, contributing to the reliability and validity of the cognitive measure.

Table 6. Item measure of cognitive measures

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item	G
3	49	3123	3.72	.15	.96	-.2	.82	-.9	.18	.11	98.4	98.4	Q3	D
38	83	3045	3.15	.11	.95	-.4	.52	-3.7	.24	.15	97.3	97.3	Q38	D
22	430	3110	1.29	.05	1.01	.2	1.11	1.9	.26	.29	86.6	86.3	Q22	D
19	508	3120	1.07	.05	1.08	2.5	1.15	2.8	.22	.31	83.3	84.0	Q19	D
15	529	3037	.99	.05	.95	-1.6	.92	-1.6	.36	.31	84.5	83.0	Q15	D
28	571	3115	.91	.05	1.12	4.0	1.34	6.6	.17	.32	81.0	82.2	Q28	D
21	620	3100	.79	.05	.98	-.8	1.09	2.1	.32	.33	82.0	80.7	Q21	D
20	637	3086	.75	.05	1.05	1.7	1.06	1.4	.28	.33	80.1	80.2	Q20	D
24	642	3104	.74	.05	1.15	5.4	1.44	9.3	.13	.33	79.1	80.1	Q24	D
4	1193	3114	.69	.03	.92	-3.0	.92	-1.9	.49	.45	67.9	68.1	Q4	0
41	1229	3099	.66	.03	1.12	3.9	1.24	5.7	.36	.45	66.4	67.6	Q41	0
23	701	3104	.62	.05	1.00	-.2	1.06	1.7	.33	.34	79.2	78.5	Q23	D
37	714	3094	.58	.05	1.07	3.1	1.21	5.2	.24	.34	77.5	78.1	Q37	D
34	806	3113	.41	.04	1.03	1.5	1.16	4.5	.30	.35	76.8	75.9	Q34	D
31	815	3113	.39	.04	.91	-4.5	.83	-5.5	.46	.35	77.2	75.7	Q31	D
5	864	3091	.29	.04	.78	-9.9	.68	-9.9	.59	.36	79.3	74.4	Q5	D
35	1487	3066	.18	.03	1.58	9.9	2.11	9.9	.19	.51	53.9	62.9	Q35	0
9	955	3118	.14	.04	.92	-4.3	.87	-5.0	.45	.36	74.1	72.7	Q9	D
26	1999	3111	.08	.03	1.05	2.4	1.05	2.0	.45	.48	58.3	56.8	Q26	0
39	971	3038	.07	.04	.84	-9.4	.75	-9.9	.55	.37	75.6	71.9	Q39	D
8	987	3014	.04	.04	1.03	1.9	1.01	.5	.34	.37	69.7	71.4	Q8	D
36	1014	3098	.03	.04	.88	-7.1	.83	-6.9	.50	.37	75.7	71.4	Q36	D
16	1055	3106	-.04	.04	.99	-.6	1.03	1.1	.37	.37	73.0	70.7	Q16	D
17	1121	3116	-.15	.04	1.32	9.9	1.43	9.9	.04	.38	56.9	69.8	Q17	D
29	1147	3111	-.19	.04	1.08	4.8	1.10	4.4	.29	.38	67.0	69.4	Q29	D
40	1135	3072	-.19	.04	.89	-7.3	.89	-4.9	.49	.38	75.2	69.4	Q40	D
13	1165	3104	-.22	.04	.97	-2.2	.96	-1.8	.41	.38	70.7	69.1	Q13	D
18	1210	3051	-.32	.04	1.13	8.4	1.17	7.6	.24	.38	62.7	68.3	Q18	D
6	1354	3072	-.53	.04	.74	-9.9	.69	-9.9	.66	.38	81.0	66.9	Q6	D
32	1375	3107	-.55	.04	1.15	9.9	1.19	9.6	.22	.38	58.9	66.9	Q32	D
11	1393	3108	-.57	.04	.92	-5.9	.90	-5.5	.47	.38	70.8	66.8	Q11	D
7	1442	3007	-.70	.04	.96	-2.6	.95	-2.7	.42	.38	67.5	66.3	Q7	D
30	1547	3124	-.80	.04	.98	-1.9	.97	-1.5	.41	.38	67.2	66.2	Q30	D
10	1560	3125	-.82	.04	.88	-9.3	.85	-8.8	.51	.38	72.2	66.2	Q10	D
43	1608	3054	-.94	.04	1.17	9.9	1.22	9.9	.20	.38	57.6	66.2	Q43	D
12	1650	3093	-.98	.04	.88	-9.6	.84	-9.2	.52	.38	72.6	66.3	Q12	D
33	1690	3086	-1.04	.04	.91	-7.1	.89	-5.9	.48	.38	71.5	66.5	Q33	D
25	1782	3114	-1.16	.04	.79	-9.9	.74	-9.9	.60	.38	78.2	67.0	Q25	D
2	1833	3074	-1.27	.04	.99	-.7	1.00	-.1	.38	.38	68.1	67.5	Q2	D
42	1971	3087	-1.48	.04	1.03	1.8	1.06	2.3	.33	.37	68.0	69.1	Q42	D
14	2055	3061	-1.64	.04	.98	-1.3	.98	-.8	.38	.36	72.1	70.8	Q14	D
27	2159	3094	-1.79	.04	.89	-6.0	.86	-5.2	.47	.35	76.3	72.5	Q27	D
1	2367	3077	-2.20	.05	.94	-2.4	.86	-3.9	.40	.33	78.6	77.8	Q1	D
MEAN	1172.6	3089.7	.00	.05	1.00	-.9	1.02	-.4			73.7	73.0		
S.D.	542.0	29.4	1.12	.02	.14	5.7	.26	6.0			9.4	8.3		

Source: author's own work

Item measure of survey measures

The item measure in a survey measures the difficulty level of each item, providing insights into the respondents' ability to answer questions. Table 7 illustrates the fair distribution of item difficulties which is crucial for obtaining reliable and informative results. In this particular survey, there are 55 items, encompassing both dichotomous (yes/no) and polytomous (Likert-like) questions. Notably, more than half of the items, specifically 55%, fall below the average difficulty level, suggesting a balanced representation of relatively easier questions. Conversely, 30 items are positioned above

the average difficulty level, predominantly consisting of dichotomous questions. The standard deviation of 1.49 indicates the degree of variability in item difficulties. A higher standard deviation suggests a wider range of difficulty levels among the items. For the survey of financial literacy, this distribution implies that respondents will be exposed to a diverse set of questions, allowing for a comprehensive assessment of their financial knowledge. The inclusion of both easy and challenging items contributes to the survey's effectiveness in capturing a broad spectrum of respondents' financial literacy skills.

Table 7. Item measure of survey measures

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item	G
34	7163	6779	4.00	.05	1.03	.7	1.41	6.7	-.04	.11	94.3	94.3	Q34	2
74	7280	6736	3.62	.05	1.05	1.3	1.43	8.7	-.07	.13	91.9	91.9	Q74	2
81	7507	6664	3.11	.04	1.09	3.1	1.45	9.9	-.13	.16	87.4	87.4	Q81	2
39	7618	6701	3.02	.04	1.07	2.6	1.34	9.8	-.06	.16	86.4	86.4	Q39	2
75	7750	6712	2.87	.03	1.10	4.1	1.39	9.9	-.13	.17	84.5	84.6	Q75	2
37	7792	6702	2.81	.03	1.09	4.0	1.37	9.9	-.10	.17	83.8	83.8	Q37	2
78	8111	6702	2.49	.03	1.09	4.6	1.24	9.9	-.05	.19	78.7	79.1	Q78	2
2	8238	6807	2.49	.03	1.09	4.7	1.24	9.8	-.04	.19	78.6	79.1	Q2	2
35	8379	6682	2.24	.03	1.08	5.0	1.18	9.0	-.02	.20	73.9	74.9	Q35	2
46	8483	6733	2.20	.03	1.06	3.9	1.14	7.4	.02	.20	73.2	74.3	Q46	2
50	8732	6711	1.99	.03	1.08	5.5	1.15	8.8	-.01	.21	68.3	70.5	Q50	2
36	8692	6672	1.99	.03	1.08	5.5	1.14	8.3	.00	.22	67.8	70.3	Q36	2
3	8863	6755	1.94	.03	1.09	6.4	1.15	9.4	-.01	.22	66.2	69.5	Q3	2
77	8826	6687	1.91	.03	1.12	8.8	1.20	9.9	-.09	.22	65.1	68.8	Q77	2
45	8929	6754	1.89	.03	1.02	1.2	1.03	1.8	.13	.22	66.2	68.6	Q45	2
1	9038	6834	1.89	.03	1.11	8.4	1.20	9.9	-.06	.22	64.5	68.6	Q1	2
76	8945	6692	1.83	.03	1.05	3.7	1.10	6.6	.05	.22	64.6	67.3	Q76	2
80	9349	6676	1.55	.03	1.06	5.6	1.09	7.4	.01	.23	56.0	62.5	Q80	2
24	9323	6819	1.31	.02	1.50	9.9	1.53	9.9	.13	.26	64.3	66.3	Q24	4
79	9947	6681	1.19	.02	1.04	3.6	1.05	4.5	.02	.24	50.3	58.8	Q79	2
38	10228	6637	.99	.02	.99	-.8	1.00	.0	.07	.25	54.2	58.7	Q38	2
47	10407	6736	.98	.02	.95	-4.5	.96	-3.8	.14	.25	57.6	58.7	Q47	2
25	10275	6752	.90	.02	1.43	9.9	1.50	9.9	.06	.30	42.9	53.6	Q25	4
51	10708	6690	.76	.02	.95	-3.8	.96	-3.1	.07	.25	59.2	60.1	Q51	2
5	11040	6809	.68	.02	1.77	9.9	1.79	9.9	-.04	.25	40.8	61.1	Q5	2
48	10937	6709	.65	.02	.92	-6.4	.93	-5.7	.09	.25	62.3	61.4	Q48	2
49	11223	6695	.47	.02	.84	-9.9	.84	-9.9	.16	.25	68.3	63.7	Q49	2
26	11782	6769	.45	.02	1.44	9.9	1.44	9.9	.15	.33	37.3	43.9	Q26	4
27	12289	6726	.29	.02	1.46	9.9	1.46	9.9	.16	.34	38.6	42.7	Q27	4
4	11963	6861	.20	.02	1.71	9.9	1.73	9.9	.00	.26	51.9	67.5	Q4	2
12	11025	6714	-.04	.02	1.02	1.6	1.00	.3	.38	.29	50.0	50.8	Q12	3
13	11182	6695	-.11	.02	.98	-1.5	.97	-2.2	.37	.30	50.8	50.5	Q13	3
9	11365	6714	-.17	.02	.97	-2.0	.96	-2.7	.37	.30	51.6	50.3	Q9	3
42	14335	6680	-.23	.02	1.30	9.9	1.30	9.9	.37	.37	39.0	41.4	Q42	4
60	11804	6769	-.29	.02	1.18	9.9	1.22	9.9	-.06	.30	47.3	50.1	Q60	3
44	15135	6712	-.40	.02	1.27	9.9	1.26	9.9	.39	.37	40.9	42.0	Q44	4
66	15174	6676	-.42	.02	.79	-9.9	.80	-9.9	.44	.37	49.6	42.0	Q66	4
7	12317	6732	-.49	.02	.88	-9.1	.88	-9.2	.44	.31	53.4	50.2	Q7	3
70	15477	6664	-.50	.02	.75	-9.9	.76	-9.9	.48	.37	50.1	42.5	Q70	4
67	15609	6695	-.51	.02	.76	-9.9	.76	-9.9	.49	.37	50.1	42.5	Q67	4
72	15642	6702	-.52	.02	.84	-9.9	.84	-9.9	.45	.37	47.8	42.5	Q72	4
22	12345	6692	-.52	.02	.96	-3.4	.95	-4.0	.44	.31	49.1	50.3	Q22	3
23	12295	6655	-.52	.02	.96	-2.9	.95	-3.4	.44	.31	49.4	50.3	Q23	3
11	12403	6712	-.53	.02	.92	-5.9	.92	-5.7	.49	.31	49.1	50.3	Q11	3
61	12495	6753	-.53	.02	.95	-3.5	.98	-1.4	-.02	.31	59.7	50.3	Q61	3
71	15663	6649	-.55	.02	.81	-9.9	.82	-9.9	.48	.37	47.9	42.7	Q71	4
63	15887	6745	-.55	.02	.81	-9.9	.81	-9.9	.50	.37	47.6	42.7	Q63	4
41	15907	6719	-.57	.02	1.13	8.8	1.14	8.8	.41	.37	44.0	42.9	Q41	4
40	16060	6758	-.58	.02	1.26	9.9	1.26	9.9	.45	.37	40.4	43.1	Q40	4
65	16008	6693	-.61	.02	.73	-9.9	.74	-9.9	.50	.37	50.0	43.1	Q65	4
32	12768	6755	-.62	.02	.95	-3.9	.97	-2.3	.31	.32	52.2	50.4	Q32	3

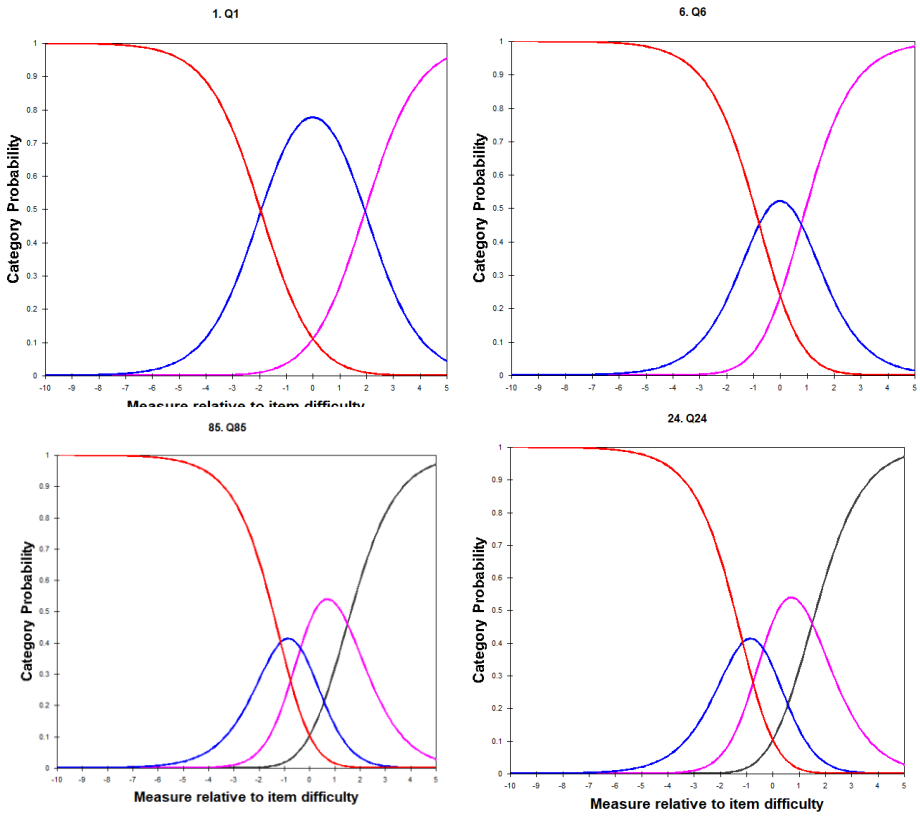
62	12855	6724	-.67	.02	.92	-6.0	.95	-4.0	.00	.32	62.2	50.4	Q62	3
69	16417	6719	-.69	.02	.84	-9.9	.85	-9.9	.48	.37	47.2	43.8	Q69	4
64	16476	6709	-.71	.02	.74	-9.9	.74	-9.9	.52	.37	50.0	44.0	Q64	4
31	12951	6718	-.71	.02	.93	-5.2	.95	-4.1	.32	.32	53.4	50.5	Q31	3
73	16438	6681	-.71	.02	.84	-9.9	.84	-9.9	.50	.37	48.4	44.1	Q73	4
58	16671	6731	-.74	.02	1.22	9.9	1.24	9.9	.20	.37	39.0	44.3	Q58	4
10	13212	6727	-.79	.02	.87	-9.9	.87	-9.9	.52	.32	50.3	50.5	Q10	3
68	17228	6702	-.88	.02	.82	-9.9	.82	-9.9	.53	.37	51.3	46.0	Q68	4
59	17334	6729	-.89	.02	1.22	9.9	1.23	9.9	.30	.37	42.0	46.0	Q59	4
84	17337	6719	-.90	.02	.84	-9.9	.87	-8.9	.12	.37	45.1	46.1	Q84	4
33	13615	6742	-.91	.02	.86	-9.9	.86	-9.9	.37	.32	56.2	50.4	Q33	3
43	17551	6742	-.94	.02	1.16	9.9	1.16	9.9	.43	.37	38.6	46.6	Q43	4
82	18798	6761	-1.23	.02	.75	-9.9	.76	-9.9	.32	.37	58.4	49.4	Q82	4
30	14566	6725	-1.23	.02	.77	-9.9	.78	-9.9	.42	.32	59.2	49.7	Q30	3
28	14812	6814	-1.25	.02	.76	-9.9	.76	-9.9	.41	.32	60.3	49.6	Q28	3
6	14985	6805	-1.32	.02	.95	-3.4	.95	-3.3	.54	.32	46.3	49.5	Q6	3
29	14972	6755	-1.35	.02	.76	-9.9	.76	-9.9	.43	.32	59.8	49.4	Q29	3
21	14985	6675	-1.42	.02	.85	-9.9	.84	-9.9	.58	.32	52.1	49.5	Q21	3
57	19490	6740	-1.42	.02	1.18	9.9	1.18	9.9	.46	.36	42.8	50.6	Q57	4
56	19671	6769	-1.45	.02	1.15	8.9	1.15	8.8	.46	.36	42.6	50.7	Q56	4
54	19682	6717	-1.49	.02	.83	-9.9	.85	-9.5	.29	.36	61.0	50.9	Q54	4
8	15320	6713	-1.51	.02	.95	-3.3	.94	-4.0	.55	.32	49.2	49.7	Q8	3
20	15256	6680	-1.51	.02	.90	-7.0	.89	-7.7	.57	.32	51.6	49.7	Q20	3
83	19896	6725	-1.54	.02	.72	-9.9	.73	-9.9	.35	.36	65.0	51.0	Q83	4
14	15507	6723	-1.56	.02	.86	-9.9	.85	-9.9	.57	.32	55.1	49.9	Q14	3
52	20186	6756	-1.59	.02	.82	-9.9	.82	-9.9	.40	.36	64.9	51.1	Q52	4
16	15592	6708	-1.61	.02	.94	-4.2	.93	-5.2	.58	.32	52.6	50.1	Q16	3
19	15562	6687	-1.61	.02	.92	-5.5	.90	-6.8	.58	.32	53.2	50.1	Q19	3
17	15714	6709	-1.65	.02	.87	-9.4	.85	-9.9	.60	.32	57.2	50.4	Q17	3
53	20472	6726	-1.70	.02	.78	-9.9	.78	-9.9	.41	.35	62.7	51.2	Q53	4
15	16202	6736	-1.81	.02	.89	-7.9	.86	-9.4	.59	.32	62.1	52.1	Q15	3
55	20970	6702	-1.86	.02	.78	-9.9	.77	-9.9	.42	.35	64.5	51.0	Q55	4
18	16354	6701	-1.90	.02	.98	-1.3	.95	-3.0	.54	.31	61.1	53.4	Q18	3
85	21259	6720	-1.93	.02	.85	-8.9	.86	-8.7	.34	.35	59.7	50.9	Q85	4
MEAN	13400.6	6723.0	.00	.02	1.00	-1.5	1.04	-.6			56.8	55.6		
S.D.	3746.8	41.7	1.49	.01	.21	7.7	.24	8.5			12.7	12.9		

Source: author's own work

Rating scale (partial credit)

Some items in both cognitive tests and surveys of financial literacy comprise rating scales. With that, validity analysis of the rating scale becomes urgent. One of the ways to look at the validity of the rating scale is by looking at the category probability. The following are samples of category probability from different items (items Q1, Q6, Q85, and Q24). Figure 2 illustrates the visible top of each hill-like response. This indicates that the scales used in this rating scale are significant.

Figure 2. Category probability of four different items in rating scales



Source: author's own work

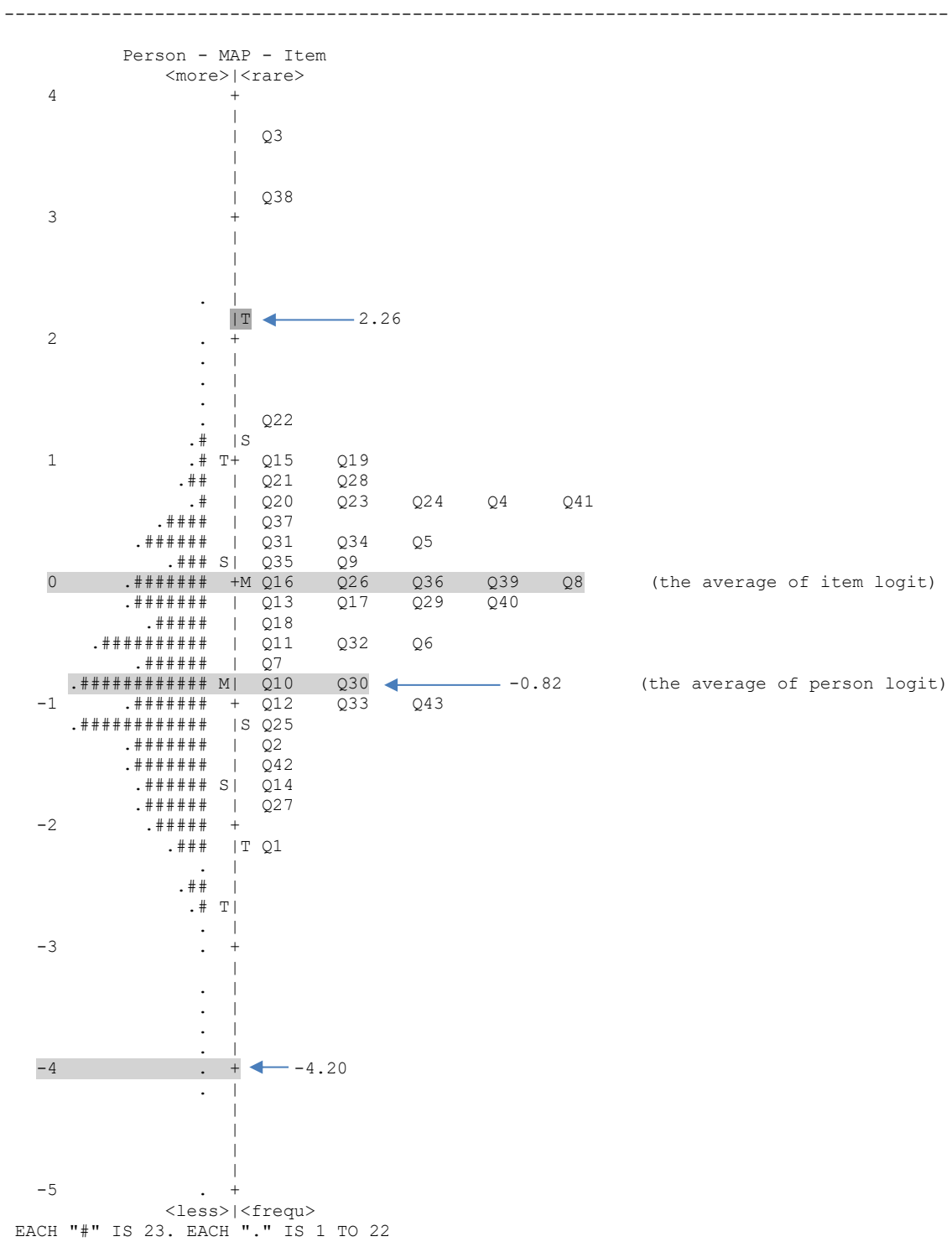
In conclusion, it is essential to address the PISA measurement of financial literacy before we delve into the analysis results. This section breaks down summary statistics, item measures, and the rating scale applied to both the Financial Literacy cognitive domain and the background survey. The purpose is to thoroughly understand and validate the representation of Indonesian students' financial literacy in the data extracted from PISA 2018. In essence, this part serves as a detailed exploration of the tools employed by PISA to assess the financial experiences of Indonesian students.

R.Q.1: how financially literate are Indonesian students?

This question will be answered using the result of the cognitive test on financial literacy extracted from PISA 2018. Person Measure and the Wright Map are elaborated in a way

that they can contribute to the understanding of how far Indonesian students are aware of financial matters.

Figure 3. A Wrightmap of Indonesian students' response to the PISA financial literacy cognitive test



Source: author's own work

The Person Measures of Financial Literacy test results for Indonesian students in the PISA 2018 assessment reveal a diverse range of performance levels (see Figure 3 for the Wright Map). The minimum score attained by students is -4.20 logit, suggesting that some individuals struggled significantly with the financial literacy concepts assessed in the test. Conversely, the maximum score of 2.26 logit indicates that there were students who demonstrated a strong grasp of financial literacy topics, achieving a relatively high level of proficiency.

With an average point of -0.82 logit, the overall performance of the participant group falls below the midpoint of the logit scale. This average reflects a collective score that leans towards the lower end, underscoring the need for attention to financial literacy education among Indonesian students.

Out of the 3151 participants, 1528 (48.5%) students scored above the average point, indicating that a substantial portion of the cohort performed better than the group's overall average. The remaining 51.5% of students, comprising the majority, scored below the average point. This distribution highlights the existence of both proficient and struggling students in the realm of financial literacy.

The disparity between low financial literacy and high financial literacy scores, coupled with the distribution of students around the average point, signifies a considerable variability in the financial literacy levels among Indonesian students. This diversity in performance underscores the importance of educational interventions to address the specific needs of students. Policymakers, educators, and stakeholders can utilize these insights to design targeted strategies aimed at enhancing financial literacy education and ensuring a more equitable distribution of skills among students.

In addition to that, the response of Indonesian students to the PISA financial literacy assessment provides valuable insights into their familiarity and comprehension

of various financial topics. Among the topics explored, it is evident that shopping, as represented by Q1, emerges as the most familiar and relatable subject for Indonesian students. This familiarity could be attributed to the daily involvement of individuals in purchasing goods and services, making shopping a commonplace and easily understandable financial activity.

Conversely, the topics that appear most challenging or unfamiliar to Indonesian students are company profit and repayment scores. The intricacies of understanding corporate profits and repayment scores may pose difficulties for students, indicating potential gaps in their financial knowledge in these specific areas.

The assessment results also explore the financial topics that the average Indonesian students find familiar. Making a budget, mobile phone insurance, family holidays, and jacket sales are among the topics that resonate with a substantial portion of the student population. These topics likely align with common financial situations and decisions encountered in everyday life, contributing to a more widespread understanding among students.

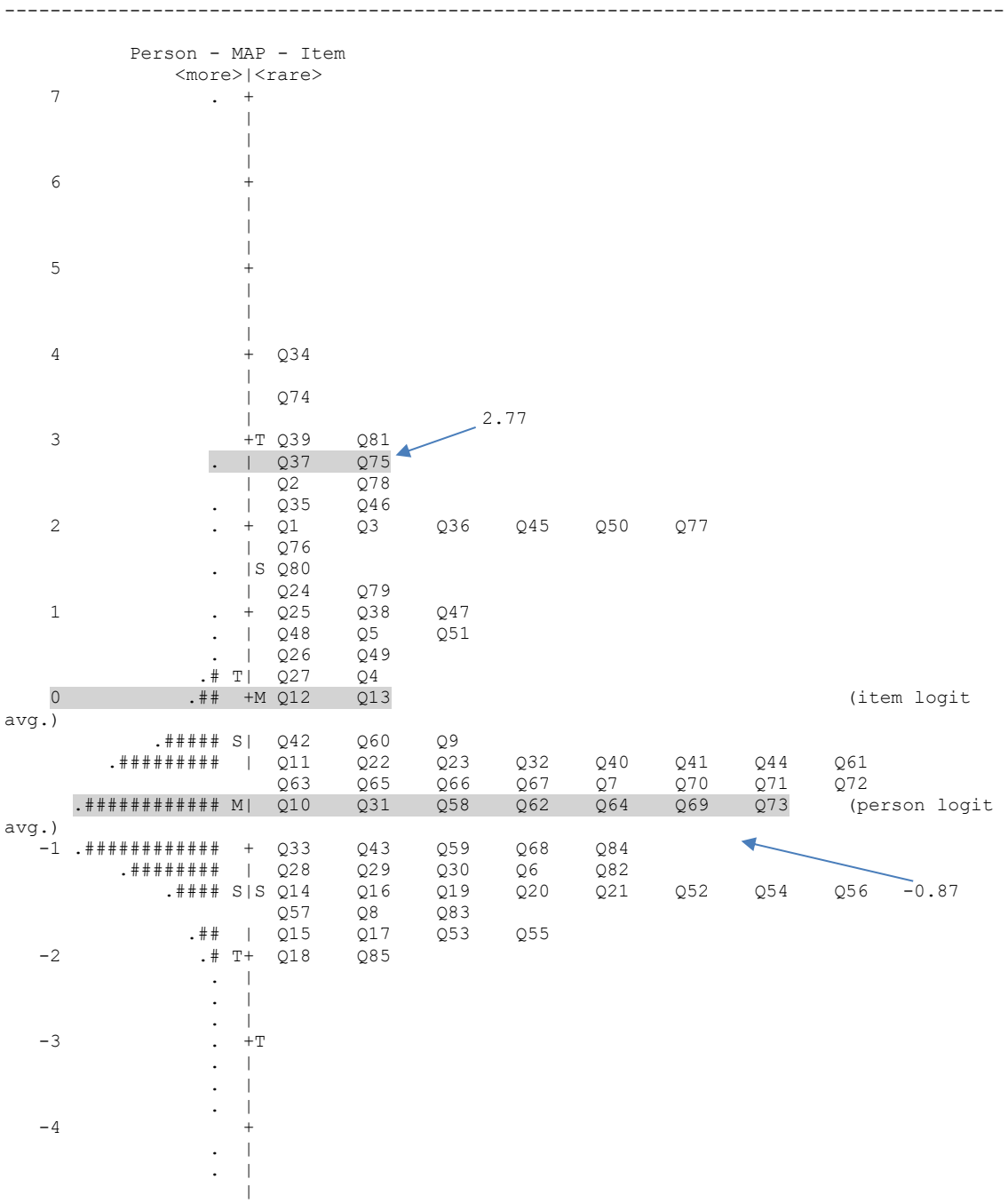
On the other hand, there are financial topics that only a few Indonesian students are acquainted with. Investing, laptop financing, changing value, and bank statements fall into this category. The limited familiarity with these topics suggests that there might be a need for targeted education and awareness campaigns to enhance students' understanding of more complex financial concepts.

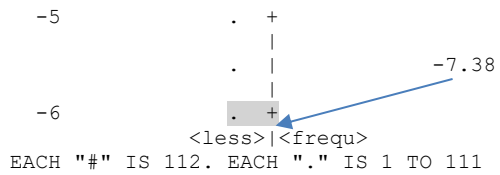
In summary, the responses to the PISA financial literacy assessment highlight both the strengths and areas for improvement in the financial knowledge of Indonesian students due to the lack of knowledge on particular parts of financial literacy.

R.Q.2: how are Indonesian students' attitudes towards financial matters?

To delve into Indonesian students' attitudes toward financial matters, a detailed analysis of questionnaire responses is examined including interesting items that are presented by the responses of the students. The following Table 8 is a Wright map of students' responses and items difficulty.

Figure 4. A Wrightmap of Indonesian students' response to the PISA financial literacy survey





Source: author's own work

From Figure 4, it can be seen that notably, the majority of students expressed strong agreement with the concept of knowing the term "wage," as indicated by their responses to question Q18. This suggests a certain level of familiarity and understanding among students regarding the concept of earnings or remuneration.

Interestingly, a significant trend emerged when students were asked about their aspirations for the future, revealing that a majority expressed a desire to run their businesses. This inclination toward entrepreneurship indicates a certain degree of ambition and independence among the student population, potentially influencing their financial goals and decision-making in the long term.

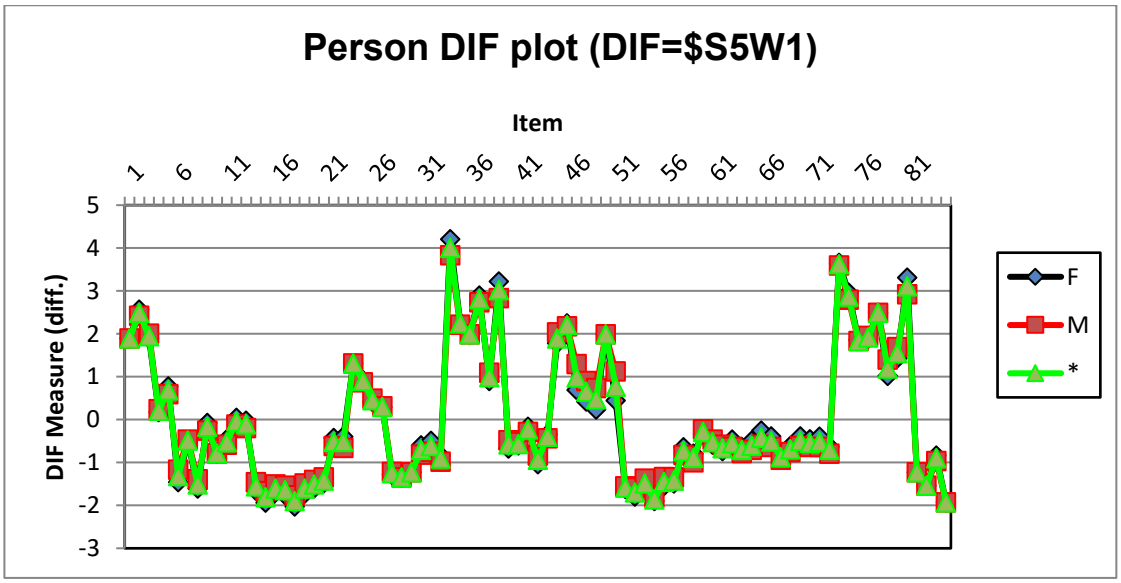
On the other hand, the survey uncovered areas where students appear to face challenges or have limited exposure. One of the responses indicates that a substantial number of students disagreed with the statement that they receive necessary information about money from their parents and teachers. This suggests a potential gap in financial education at home and in schools. The responses indicate that there might be a lack of parental involvement in teaching their children about financial matters, and there may be room for improvement in the curriculum or teaching methods related to financial literacy in schools.

Furthermore, a significant portion of students disagreed with the statement that they regularly check how much money they have. This observation implies a potential lack of awareness or consideration regarding personal finances among the student body. The data hints at the need for initiatives that promote financial management skills and responsible spending habits among students.

Similar trends were observed in responses related to money management practices, where only a few students indicated positive habits. Additionally, the lack of familiarity or engagement with voluntary work or choosing tasks with monetary rewards highlights a potential area for expanding students' experiences and perspectives on non-monetary incentives.

Moreover, when comparing different genders, it looks like there is no significant difference between their attitudes toward money, as illustrated in Figure 5.

Figure 5. A DIF graph of Indonesian students' response to the PISA financial literacy survey based on gender.



Source: author's own work

The graph illustrates that there are no substantial differences between male and female attitudes towards money matters. Figure 5 shows a remarkable similarity in the responses of both genders, indicating a lack of significant divergence in their perceptions or behaviors related to financial concerns. This pattern is particularly notable and may suggest that, during adolescence, gender-based distinctions in attitudes toward money matters tend to be less prevalent. The graph implies that, at this stage of

development, individuals of both genders share comparable perspectives and approaches to financial considerations, reflecting a level of uniformity in their attitudes. This finding challenges stereotypical assumptions about gender-based differences and underscores the importance of recognizing the commonalities in how adolescents, irrespective of gender, approach and engage with financial matters.

Discussion

This discussion addresses the findings and relates them to existing relevant studies. Three points of the findings are discussed, the quality of the instruments, the Indonesian students' financial literacy, and attitudes towards financial matters.

Firstly, the presented summary statistics of both cognitive assessment and survey and the item measures of both cognitive assessment and survey indicate that the instruments used to measure financial literacy in PISA 2018 have a high quality. It implies that the measurements yielded are unequivocal. This finding is in line with Meliá's (2016) study, which states that the instrument used by PISA is of good quality. In addition, the quality of the PISA test itself was proved by the accountability of the test by providing open-source reports that are available to anyone on its website. Each cycle has its framework, for instance, the report of OCDE (2023; OECD, 2013, 2017, 2019). These reports allow anyone to access information on everything, including content, theory, process, and other necessary information on how the PISA test was developed. For its quality, a range of studies have utilized PISA instruments to enhance measurement precision (Shin et al., 2021), internationally benchmark state performance standards (Phillips & Jiang, 2015), and developed science problem instruments for teaching (Andriani et al., 2019). Other similar examples are studies by Hijriati et al. (2021), who used the

PISA instrument as the basis of Physics test instruments for Optical topics in high school, and Rosana et al. (2020), who developed a measure for problem-solving and science literacy for junior high school modeling PISA tests. This implies that the items or instruments used by PISA are of sufficient quality. In conclusion, the rigorous analysis and high-quality item measures of PISA, supported by transparent reporting and widespread utilization in research, confirm the credibility and reliability of PISA's assessment framework for measuring financial literacy and other educational metrics.

Secondly, the disparity between low financial literacy and high financial literacy scores, coupled with the distribution of students around the average point, signifies a considerable variability in the financial literacy levels among Indonesian students. This diversity in performance underscores the importance of educational interventions to address the specific needs of students (Noor et al., 2020). The familiarity of certain topics can be attributed to the daily involvement of individuals in purchasing goods and services, making shopping a commonplace and easily understandable financial activity. This is also confirmed by a survey, especially in the case of online shopping (Kesuma et al., 2020; Kuswanto et al., 2019). Conversely, the topics that appear most challenging or unfamiliar to Indonesian students are company profit and repayment scores. The intricacies of understanding corporate profits and repayment scores may pose difficulties for students, indicating potential gaps in their financial knowledge in these specific areas. On the other hand, there are financial topics that only a few Indonesian students are acquainted with. Investing, laptop financing, changing value, and bank statements fall into this category. The limited familiarity with these topics suggests that there might be a need for targeted education and awareness campaigns to enhance students'

understanding of more complex financial concepts. A similar result was found that Indonesian students are only familiar with certain topics in financial matters (Firdausi & Kasri, 2022).

These findings have important implications for how financial literacy education is designed and implemented. The fact that students perform well in areas tied to everyday experiences, such as shopping, suggests that educational programs may benefit from grounding financial concepts in real-life situations that are already familiar to learners (Slavíčková & Regecová, 2018). Building on this foundation, more complex topics like investment and credit could be introduced gradually and with appropriate scaffolding. It would also be worthwhile for curriculum developers to consider how financial topics can be aligned with students' developmental stages and everyday realities. At the same time, areas where students struggle, such as corporate finance or interpreting bank statements, point to the need for more targeted instructional support. This could take the form of practical workshops, interactive learning tools, or school-based initiatives that address specific gaps.

Furthermore, research indicates that financial knowledge is strongly influenced by sociodemographic factors, family financial sophistication, and education (Lusardi et al., 2009). Moreover, efforts to improve financial literacy through education programs have shown promise, such as a study in Spain where a 10-hour program for 15-year-olds increased financial knowledge by up to one-third of a standard deviation (Hospido et al., 2015). By responding to the diversity in students' financial knowledge, policymakers and educators can develop more inclusive and responsive financial literacy programs that better reflect the needs of Indonesian learners since financial literacy can be viewed as an investment in human capital with broad policy implications (Lusardi & Mitchell, 2013; Mitchell & Lusardi, 2015). Viewing financial knowledge as a form of human capital has

important implications for education and training policy. As mentioned by Mitchell and Lusardi (2015) that poor financial decisions can lead to long-term economic hardship, not only for individuals but also for their families and, by extension, the wider economy. While improving financial literacy involves some costs, the potential benefits are significant. Strengthening financial understanding can support those most at risk of economic vulnerability, while also contributing to broader societal resilience.

In other words, nearly half scored above the average point in financial literacy, indicating a mix of proficient and struggling students. This distribution mirrors findings from related studies but warrants further investigation. Notably, shopping emerged as the most familiar topic, while areas like company profit and repayment scores posed challenges, highlighting potential knowledge gaps. Common financial situations like budgeting and family holidays resonated well, whereas topics like investing and bank statements were less familiar, suggesting a need for targeted education in these areas. These patterns suggest that grounding financial lessons in everyday experiences may enhance learning, while more complex topics should be introduced gradually with appropriate support. Overall, these insights underscore the variability in financial literacy levels among Indonesian students and emphasize the importance of tailored educational interventions that recognize financial literacy as a valuable investment in human capital.

Lastly, the majority of students expressed strong agreement with the concept of knowing the term "wage," as indicated by their responses to question Q18. This suggests a certain level of familiarity and understanding among students regarding the concept of earnings or remuneration. This finding is in line with the findings of Nurtjahjani et al., (2023) and Yuliarini et al., (2017). Interestingly, a significant trend emerged when students were asked about their aspirations for the future, revealing

that a majority expressed a desire to run their businesses. This inclination toward entrepreneurship indicates a certain degree of ambition and independence among the student population, potentially influencing their financial goals and decision-making in the long term (Koesoema & Septina, 2021). A substantial number of students disagreed with the statement that they receive necessary information about money from their parents and teachers. This suggests a potential gap in financial education at home and in schools (Amidjono et al., 2016). The responses indicate that there might be a lack of parental involvement in teaching their children about financial matters, and there may be room for improvement in the curriculum or teaching methods related to financial literacy in schools (Alamin et al., 2022). These findings point to the need for policies that promote stronger collaboration between families and schools in delivering financial education. For example, involving parents in school-based financial literacy programs or providing take-home materials could help bridge the knowledge gap as suggested by Kirmaci (2023). A significant portion of students disagreed with the statement that they regularly check how much money they have. This observation implies a potential lack of awareness or consideration regarding personal finances among the student body. The data hints at the need for initiatives that promote financial management skills and responsible spending habits among students. Similar trends were observed in responses related to money management practices, where only a few students indicated positive habits (Tawakkal et al., 2023). These findings could inform school-based interventions such as budget-tracking exercises or student savings programs to encourage daily financial awareness. Additionally, the lack of familiarity or engagement with voluntary work or choosing tasks with monetary rewards highlights a potential area for expanding students' experiences and perspectives on

non-monetary incentives. In response, curriculum designers and policymakers might consider integrating experiential learning activities, such as simulations or community service projects, that expose students to diverse forms of work and compensation (Tiessen, 2018). These experiences could help build both financial understanding and social responsibility.

Overall, these discussions can inform targeted interventions and educational strategies aimed at enhancing financial literacy, both at home and in the classroom, to better prepare students for sound financial decision-making in the future.

Implications and recommendations

This study carries several important implications. Theoretically, it enhances our understanding of student financial literacy and attitudes by applying the Rasch model and Wright map, which revealed a mismatch between students' abilities and item difficulties. Many students were confident with basic financial tasks but struggled with more complex concepts like profit and investment. This suggests financial education should be introduced progressively, aligning with students' developmental stages.

Practically, the findings call for stronger integration of financial literacy into Indonesian school curricula. Students' below-average performance signals a need for targeted instruction that not only builds knowledge but also fosters responsible attitudes. Teachers should be equipped with relevant training, and schools could enrich learning by linking financial concepts to real-life situations, such as entrepreneurship or budgeting activities.

For future research, longitudinal studies could track changes in student financial literacy over time, while comparative research might explore differences by region,

school type, or socioeconomic status. The minimal gender gap in financial attitudes is also worth deeper exploration through qualitative studies.

At a societal level, the limited financial guidance students receive from parents and teachers highlights the need for broader community involvement. Initiatives such as parent education, community workshops, or partnerships with religious and local organizations could support financial learning beyond school.

Finally, on the policy front, there is a clear need to prioritize financial literacy within national education strategies. Collaboration between schools, government bodies, and financial institutions can help ensure equitable access to resources and programs that empower students to make informed financial decisions.

Conclusion

In addressing the research questions regarding the financial literacy of Indonesian students and their attitudes toward financial matters, it is crucial to consider the PISA measurement of financial literacy. The PISA results indicate an average score that tends towards the lower end, underscoring the imperative for heightened focus on financial literacy education among Indonesian students. The distribution of scores further emphasizes the presence of both proficient and struggling students in the domain of financial literacy, revealing a diverse landscape of competencies. The students' familiarity with financial topics appears to be closely tied to their personal experiences, albeit limited to what they have been taught. Notably, the majority of students demonstrate interest primarily in specific financial topics, but practical application in real-life scenarios remains an area that requires greater attention. Interestingly, gender does not seem to play a significant role in shaping attitudes toward financial matters, as both genders accommodate similar responses. In conclusion, the findings underscore the importance of tailored financial education initiatives that not only address the existing

knowledge gaps but also enhance the practical application of financial concepts in the lives of Indonesian students.

Funding

This article received no financial support or funding from any external parties.

Acknowledgment

Special thanks to Bambang Sumintono, Ph.D., who guided and encouraged me to learn about the Rasch Model and large-scale assessment.

Data Availability

All data of PISA 2018 can be extracted from the PISA Database on this link: https://www.oecd.org/pisa/data/2018database/

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this manuscript. The authors have no affiliations, financial involvement, or personal interests in any organization or entity that could be perceived as influencing the content of this manuscript.

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