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Content Validity Evidence of the Attitudes Scale for Measuring Financial and Statistical Literacy (EMELFE) via Classical Test Theory

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ABSTRACT

Background: The intersection of Statistical and Financial Education within the framework of Mathematics Education is fundamental for developing critical analysis and grounding economic choices. **Objectives:** To describe the construction process and the search for content validity evidence of the Attitudes Measurement Scale for Financial and Statistical Literacy (EMELFE). **Design:** A psychometric study based on Classical Test Theory (CTT), utilizing the Content Validity Index (CVI-I, S-CVI/Ave, and S-CVI/UA) and the Modified Kappa Coefficient. **Setting and Participants:** The instrument was submitted for evaluation by seven expert judges (researchers) with a view toward future application among high school students. **Data Collection and Analysis:** Agreement among the seven judges was analyzed regarding 80 original items, observing the language and conceptual relevance of the statistical and financial literacy constructs. **Results:** Validity indices were high, with the Modified Kappa ranging between 0.83 and 0.98 ("excellent") and an S-CVI/Ave of 0.90. However, the S-CVI/UA was below 0.80 in the Attitude and Behavior dimensions, requiring the qualitative reformulation of 16 items. The Financial Knowledge dimension demonstrated full robustness (S-CVI/UA = 0.95). **Conclusions:** Following the refinements, the EMELFE presents satisfactory evidence of content validity, establishing itself as a suitable instrument for measuring statistical and financial literacy within the target population.

Keywords: Financial literacy; Statistical literacy; High school; Attitude Scale; Content Analysis.

Evidências de Validade de Conteúdo da Escala de Atitudes de Mensuração do Letramento Financeiro e Estatístico (EMELFE) via Teoria Clássica dos Testes

RESUMO

Contexto: A articulação entre Educação Estatística e Financeira, no âmbito da Educação Matemática, é fundamental para o desenvolvimento da análise crítica e a fundamentação de escolhas econômicas. **Objetivos:** Descrever o processo de

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construção e busca de evidências de validade de conteúdo da Escala de Atitudes de Mensuração do Letramento Financeiro e Estatístico (EMELFE). **Design:** Estudo psicométrico fundamentado na Teoria Clássica dos Testes (TCT), utilizando o Índice de Validade de Conteúdo (IVC-I, S-IVC/Média e S-IVC/CU) e o Coeficiente Kappa Modificado. **Ambiente e Participantes:** O instrumento foi submetido à avaliação de sete juízes (pesquisadores especialistas) visando a aplicação futura em alunos do Ensino Médio. **Coleta e Análise de Dados:** Analisou-se a concordância entre sete juízes sobre 80 itens originais, observando a linguagem e a pertinência conceitual dos construtos de letramento estatístico e financeiro. **Resultados:** Os índices de validade foram elevados, com Kappa Modificado entre 0,83 e 0,98 ("excelente") e S-IVC/Média de 0,90. Contudo, o S-IVC/CU foi inferior a 0,80 nas dimensões de Atitude e Comportamento, o que exigiu a reformulação qualitativa de 16 itens. A dimensão Conhecimento Financeiro demonstrou robustez plena (S-IVC/CU = 0,95). **Conclusões:** Após os refinamentos realizados, a EMELFE apresenta evidências de validade de conteúdo satisfatórias, configurando-se como instrumento apto para mensurar o letramento estatístico e financeiro no público-alvo.

Palavras-chave: Letramento Financeiro; Letramento Estatístico; Ensino Médio; Escala de Atitudes; Análise de conteúdo.

INTRODUCTION

Statistical Education (SE) is understood as an investigative field that analyzes the dynamics of appropriating statistical, probabilistic, and combinatorial knowledge. Its scope ranges from the analysis of subjects' subjective and cognitive aspects to the production of pedagogical materials aimed at developing these concepts.

According to Campos (2007) and Campos, Wodewotzki, and Jacobini (2011), SE must go beyond the mastery of procedures, focusing on the development of statistical literacy, reasoning, and thinking within a social and critical perspective. Complementing this view, Batanero (2001) defines it as the scientific study of teaching and learning Statistics and Probability, aiming to foster statistically literate citizens.

Furthermore, Trento and Braum (2020) state that Financial Education (FE) has gained increasing global focus, reflecting a concern, not only by governments but also by individuals, regarding the population's level of knowledge. FE can be understood as the combination of awareness, knowledge, skills, attitudes, and behaviors necessary to make sound financial decisions to achieve financial well-being (Organization for Economic Co-operation and Development – OECD, 2011).

This suggests the possibility of articulating Statistical Education and Financial Education under the umbrella of Mathematics Education, given their

relevance in enabling informed financial choices. The primary link between these fields is the capacity for critical data analysis, which allows for the interpretation of economic reality.

Thus, for Kistemann and Souza (2021) and Perin and Campos (2021), FE and SE are strongly associated and complementary, especially within the context of Mathematics Education. They are crucial for individuals to develop critical reasoning and the ability to make informed decisions in daily life. In summary, SE is fundamental for a grounded analysis of financial data and situations, empowering students to make critical judgments and effective financial decisions.

The relevance of developing attitude scales in SE and FE is emphasized, given their ability to transmute subjective and behavioral aspects into measurable numerical data. This instrumental validation process is fundamental to the field, as it translates subjective elements into concrete indicators, strengthening the evidentiary basis of educational interventions and scientific studies in these disciplines.

In this scenario, the application of psychometric techniques constitutes a fundamental strategy to ensure the scientific rigor of an assessment instrument. Such procedures aim to guarantee robust parameters of validity, defined as the construct's effectiveness in measuring the intended phenomenon, and reliability, which concerns the precision and stability of the obtained measures. Therefore, based on the assumptions of measurement theory applied to the sciences, rigorous technical guidelines are adopted for instrumental development and validation (Pasquali, 2009).

Notably for this study, some authors suggest that content validity comprises only the evaluation by a committee of experts (Dempsey & Dempsey, 1996; Fitzner, 2007). Other researchers understand it as a judgmental process composed of two distinct parts: the first involving the development of the instrument and the second involving its subsequent analysis by experts (Lynn, 1986; Polit & Beck, 2006). According to Pasquali (2013), content validity may also be ensured by the very procedure of the instrument's elaboration.

Consequently, the present study aimed to describe the construction process and the search for content validity evidence of the Attitude Scale for Measuring Financial and Statistical Literacy (EMELFE), designed for high school students. The theoretical framework was guided by the precepts of Classical Test Theory (CTT), which, as postulated by Pasquali (2013),

constitutes a fundamental model in psychometrics for explaining and estimating the measurement error inherent in educational assessment instruments.

Additionally, Cohen's Kappa coefficient (1960) was used as an analytical tool, given its relevance in measuring inter-rater agreement, a factor that corroborates the psychometric quality and reliability of the measurement intended by CTT (Rubio, Berg-Weger, Tebb, & Rauch, 2003; Alexandre & Coluci, 2011).

THEORETICAL FRAMEWORK

Coutinho and Almouloud (2020) emphasize that social practices are essential elements for Financial Education and Financial Literacy. However, these practices, given their complexity, are constructed not only within the school environment but throughout life, inherently carrying a critical perspective.

In discussing different types of literacy to compare Statistical Literacy (SL) and Financial Literacy (FL), Coutinho and Campos (2018) adopted the definition of mathemacy and those related to SL. They observed common ground with the definition proposed by Sena (2017), such as the development of criticality, skills for critical analysis, data-based decision-making, reading proficiency, and linguistic knowledge.

Regarding aspects focused on FL, Sena (2017) proposed a model that aligns with the SL model developed by Gal (2004, 2019), namely: i) the ability to read, analyze, and interpret financial situations; ii) knowledge of basic and necessary elements of financial mathematics relevant to the subjects' context; iii) the capacity to adopt a well-founded critical stance; iv) the ability to consider variables and the implications of one's actions; and v) conscious decision-making aimed at individual and social financial well-being.

Furthermore, Coutinho (2021) warns that although convergence is perceived within the functional literacy categories proposed by the 2018 Functional Literacy Indicator (INAF) report, noting that a financially literate subject is considered functionally literate, the converse is not necessarily true. That is, meeting the conditions for functional literacy does not guarantee that the conditions for FL are met.

When considering the mapping conducted by Sharma (2017), similarities can be noted with the most advanced level of functional literacy adopted by INAF (2018). Coutinho (2021) argues that the conditions for SL are

more comprehensive and rigorous; thus, a statistically literate individual may be considered functionally literate, but the reverse is not always valid.

Furthermore, to identify the elements necessary for SL, this study considers the model introduced by Gal (2004) and revisited in Gal (2019), which comprises cognitive and dispositional elements: literacy skills, statistical knowledge, mathematical knowledge, context knowledge, and critical questions, as well as beliefs, attitudes, and a critical stance.

Coutinho (2021) highlights the comparison between Gal's (2004, 2019) SL model and the functional literacy categories proposed by the INAF (2018) report, noting that statistical knowledge is not a component of the latter. According to Coutinho (2021), the INAF (2018) report evaluates mathematical and Portuguese language knowledge through the reading and comprehension of media texts, such as advertisements. This mathematical knowledge, when mobilized to solve statistical problems or more complex mathematical issues, is not considered a requirement for functional literacy.

Since this is not a closed issue, a broader discussion of Financial Education aspects is permitted, addressing all elements of the model proposed by Sena (2017). The critical stance described goes beyond analyzing the consistency of results; it involves analyzing the context discussed in the problem statement (such as values and square footage of an apartment) and serves as a foundation for a highly critical discussion to be proposed by the teacher, focusing on the development of critical capacity.

Still considering Coutinho (2021), a theoretical exercise highlighted that, beyond the cognitive elements in Gal's (2004) model, there is the influence of dispositional elements, as cited in Table 1. In other words, the activity illustrates the potential contributions of SL to the development of FL. Finally, the necessity of functional literacy, as defined by the INAF (2018) report, is emphasized for the mobilization of both SL and FL.

Table 1

Comparison between Statistical Literacy and Financial Literacy (Coutinho, 2021, p. 39)

Statistical Literacy (Gal, 2004)	Financial Literacy (Sena, 2017)
Literacy skills (1) Statistical knowledge Mathematical knowledge (2) Context knowledge (2) Critical question (4) Beliefs and attitudes (5) Critical stance (3)	Skills to read, analyze, and interpret financial situations (1) Knowledge of basic and essential elements of Financial Mathematics relevant to the subjects' context (2) Ability to adopt a grounded critical stance (3) Ability to consider variables and the implications of one's actions (4) Conscious decision-making aimed at individual and social financial well-being (5)

Statistical Literacy (SL), according to Gal (2004), refers to an individual's capacity to interpret and critically evaluate statistical information and data-based arguments that permeate daily life. Similarly, Financial Literacy (FL), as defined by Sena (2017), is the individual's ability to process information, analyze situations, and make financial decisions aimed at well-being and financial sustainability, both at individual and social levels.

Furthermore, the associations between Gal's (2004) model for SL and Sena's (2017) model for FL are evident across five primary dimensions:

1. Data Reading and Interpretation: The foundation for understanding texts, tables, and graphs, essential for analyzing financial documents and data.
2. Mathematical and Contextual Grounding: Mastery of statistical and mathematical concepts and tools applied to real-world scenarios, such as calculating interest, inflation, etc.
3. Critical Analysis: The capacity to rigorously question and evaluate the validity and source of information (specifically financial information).
4. Assessment of Variables and Risks: The ability to identify and weigh risk factors, uncertainty, and the potential consequences of decisions (e.g., investments, loans).
5. Action and Well-being: The disposition and motivation to utilize acquired knowledge to act in an informed manner, aiming for positive long-term outcomes.

Ultimately, the convergence between SL and FL within the scope of the National Common Curricular Base (BNCC) (Brazil, 2018) is grounded in the integration of these themes as cross-cutting axes. This integration aims to foster citizens capable of exercising critical thinking in personal and social spheres. In High School, this articulation is consolidated through statistical instrumentation, utilizing tables, graphs, and measures of central tendency, applied to the rigorous examination of financial variables, such as inflation and profitability. Conversely, situations inherent to FL provide empirical contexts that offer concreteness and meaning to the application of statistical concepts.

Thus, the BNCC establishes that both literacies are crucial for holistic citizenship, preparing individuals to live and act critically and consciously in a world increasingly driven by data and economic complexities.

THE FINANCIAL AND STATISTICAL LITERACY MEASUREMENT ATTITUDE SCALE (EMELFE) FOR SECONDARY SCHOOL STUDENTS

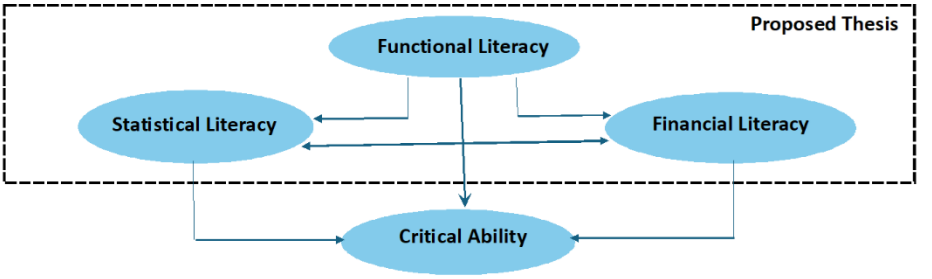
As an unobservable construct, attitude must be evaluated based on empirical indicators (McDonald, 2013), which, in this context, consist of responses to scale items. Consequently, the first and most crucial step in developing such a scale is the detailed semantic definition of the construct. Since the variable in question is composed of other variables, it is essential to previously understand, analyze, and specify these relationships. This initial definition is fundamental for the subsequent study of the measurement instrument's validity (Muñiz & Fonseca-Pedrero, 2009).

Thus, considering the specification of the components of the Financial and Statistical Literacy Measurement Attitude Scale (EMELFE) for high school students, the relationships established between the literacy models discussed in Table 1 and the categories proposed by the INAF report (2018) are illustrated in Figure 2. This reinforces the thesis that the development of statistical literacy contributes to the development of financial literacy, both of which are related to the functional literacy categories proposed by INAF (2018).

Based on Figure 1, one can discuss the mutual influences between statistical and financial literacy, as well as their impact on the constitution of students' critical capacity, thereby satisfying the principles of Critical Mathematics Education according to Skovsmose (2000).

Figure 1

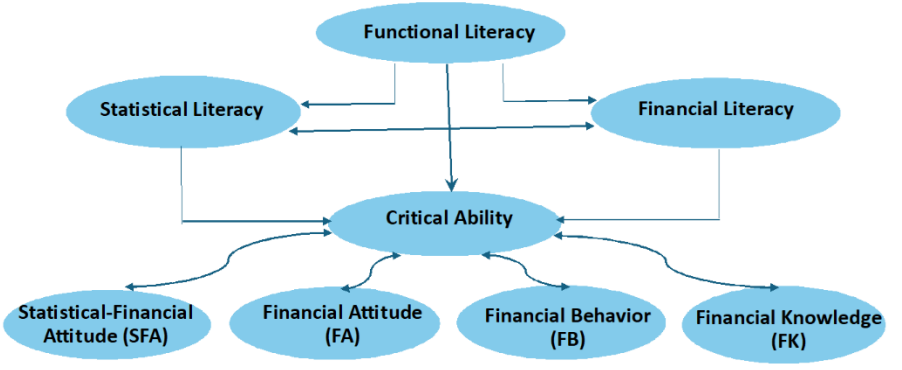
Relationships between statistical and financial literacies (Adapted from Coutinho & Campos, 2018)



Drawing from the framework proposed by Coutinho and Campos (2018) and later adapted by Coutinho (2021), which addresses the intersections between statistical and financial literacies as core components of a citizen's functional literacy, this study associates these literacies with critical capability based on four dimensions: 1) statistical-financial attitude; 2) financial attitude; 3) financial behaviour; and 4) financial knowledge. This conceptual mapping is grounded in the principles of Critical Mathematics Education (Figure 2).

Figure 2

Relationships between statistical and financial literacies and critical capacity (Developed by the authors)



Thus, the development of the EMELFE attitude scale was based on the arguments established by the OECD International Network on Financial Education (OECD/INFE, 2018). The scale focuses on the following core

pillars: definition and family finances, financial products, financial attitude, financial behavior, and financial knowledge.

Furthermore, in line with these guidelines, the OECD (2013) defines Financial Literacy (FL) as the combination of awareness, skills, knowledge, attitudes, and behaviors necessary to make sound financial decisions. In summary, while the central focus of Financial Education is knowledge, FL encompasses knowledge as well as an individual's financial behavior and attitude.

This study also considered the work of Rogers, Rogers, and Santos (2018), who validated a measurement model for Financial Attitude and Behavior. Their research developed a structural model to verify potential sociodemographic variables that moderate the relationship between these two constructs, targeting university students from various undergraduate programs.

In that study, 578 responses were obtained through questionnaires based on the models by Potrich, Vieira, and Ceretta (2013). The Financial Behavior model was validated through the factors of "Spending Control" and "Savings Maintenance," which is justifiable from both statistical and theoretical perspectives. Regarding the Financial Attitude model, the results were similar to the reference study, requiring only minor adjustments to the identified unifactorial model. Concerning moderating variables, a significant interrelation was found between Spending Control, Savings Maintenance, Financial Attitude, and the fact that the student both works and studies.

Additionally, the study by Banthia and Dey (2022) indicates that FL has gained prominence in recent years, becoming a critical global issue. It is essential for individuals to possess adequate financial knowledge and awareness to optimize their financial resources. In the case of India, due to its massive population, low literacy levels, poverty, regional language disparities, diverse cultures, and significant socioeconomic gaps, the path toward financial literacy is challenging.

Moreover, individual behavior and attitudes are influenced by a wide variety of cultures, beliefs, religions, and customs across different states. Under such circumstances, Banthia and Dey (2022) found a negative effect of financial behavior on FL levels. While financial knowledge is positively related to both financial behavior and financial attitude, the relationship between financial attitude and financial behavior was found to be negative.

Consequently, for the constructs comprising the Scale for Measuring Financial and Statistical Literacy (EMELFE), the following definitions and supporting theoretical frameworks were adopted:

1. Financial Attitude: Demonstrates the individual's degree of belief in financial planning, their propensity to save, and their propensity to consume. Financial attitude is considered a predictor of financial behavior (Atkinson & Messy, 2011; Richins, 2011; Diniz, 2013; Agarwalla, Barua, Jacob, & Varma, 2013; Potrich, 2014; Potrich, Vieira, Coronel, & Bender Filho, 2015).
2. Financial Behavior: Refers to decision-making actions, depicting how individuals act in financial situations regarding credit use, personal financial planning, and spending habits (Diniz, 2013; Potrich, Vieira, Coronel, & Bender Filho, 2015; Potrich, Vieira & Kirch, 2015; Baglioni, Colombo, & Piccirilli, 2018).
3. Financial Knowledge: Serves as a resource for financial well-being (Grable & Jo, 2006) and an element that develops proficiency in managing financial assets. It enables individuals to be decisive and, consequently, capable of long-term planning (Verdinelli, Lizote, & Olivares, 2014).

According to the OECD (2018), financial knowledge significantly assists individuals in comparing financial products and services, acting as a powerful and fundamental ally in determining whether a subject is financially illiterate. As stated by Atkinson and Messy (2012), a financially literate person possesses a basic understanding of core financial concepts, meaning they have the competence to apply mathematical skills within financial contexts. In the scope of this study, this includes statistical skills.

Thus, the construct of statistical-financial attitude was added in parallel to the financial knowledge, behavior, and attitude of high school students. Statistics is considered to have a significant relationship with finance, as it establishes the quantitative, explanatory, and predictive measures of the object of finance, namely, value creation.

The development of this construct is justified based on Ignácio (2011), who asserts that statistics is responsible for interpreting data for result analysis, thereby minimizing risks within a company, particularly regarding financial aspects. Furthermore, the author states that in the financial market and banking institutions, statistical methods are employed for financial and economic modeling to map the behavior of credit, delinquency, stock movements, and interest rate forecasts, enabling the establishment of loan granting strategies that maximize profits.

Once the scale components were defined, the process of developing and refining potential items to evaluate each aforementioned component began. To this end, all items from the aforementioned attitude measurement scale were listed and classified.

Using this procedure, an initial list of items was drafted and categorized according to the scale components, assigning an equivalent weight (in terms of the number of items) to each component. Specifically, the item format consists of the statements mentioned above and a 5-point Likert scale, evaluating responses from "strongly disagree" (1 point) to "strongly agree" (5 points).

The vocabulary used was varied, incorporating different aspects of each component or context. Both positively phrased items (e.g., "I understand it is important to learn the different uses of statistics associated with financial information in newspapers, TV, and the internet, in the media in general") and negatively phrased items (e.g., "I believe that statistics do not provide benefits for guiding my financial decisions") were included to mitigate acquiescence bias (Morales, Urosa & Blanco, 2003).

Thus, Table 2 presents the items for each dimension of critical capacity to associate statistical and financial literacies for the Attitude Scale for Measuring Financial and Statistical Literacy (EMELFE) for high school students.

Table 2

Proposed items for the Financial and Statistical Literacy Attitude Measurement Scale – EMELFE – for High School students (Source: Prepared by the authors).

STATISTICAL-FINANCIAL ATTITUDE (SFA)
SFA1) I understand it is important to learn the different uses of statistics associated with financial information in newspapers, TV, and the internet—in the media in general.
SFA2) I am aware that statistics are used for me to monitor (spreadsheet/notes) my expenses.
SFA3) I believe that many financial problems could be easily solved using statistics.
SFA4) I find it important to understand almost all statistical terms when I see financial information in newspapers, magazines, TV, and the internet.
SFA5) I consider that I do not use statistics to guide my financial decisions.
SFA6) I consider that statistics do not provide benefits for guiding my financial decisions.
SFA7) I think that knowing statistics is not important for building a monthly expense plan.
SFA8) I think that statistics are not beneficial for carrying out my financial controls.
SFA9) I think statistical thinking is applicable when I have to decide between making a purchase in cash or in installments.
SFA10) I consider that statistics have nothing to do with my financial life.
SFA11) I think it is necessary to know a little statistics to manage my money.
SFA12) I can interpret charts of financial information in newspapers and magazines.
SFA13) I consider that tables in newspapers catch my attention because I know very well how to interpret them when they are associated with financial information.
SFA14) I think I have no difficulty accepting the statistics presented to learn about conscious consumption.
SFA15) I think I have no difficulty discussing financial matters through statistics.
SFA16) I consider that I know what the average consumption of monthly expenses means.
SFA17) I like to use statistics to perform the monitoring (spreadsheet/notes) of my monthly expenses.
SFA18) I think statistics may be necessary for me to save money that will ensure financial stability for me in the future.
SFA19) I think statistical skills provide support to guide my financial decisions.
SFA20) I consider that most people need to learn statistics as a way of thinking financially.

FINANCIAL ATTITUDE (FA)

FA1) I think it is important to have a monthly expense plan.
FA2) I try to inform myself about prices and discounts before buying something.
FA3) I believe that the way I manage my money will affect my future positively.
FA4) I think saving money will ensure financial stability for me in the future.
FA5) I think it is difficult to build a monthly expense plan.
FA6) I believe it is important to set financial goals for the future.
FA7) I find it more satisfying to spend money than to save for the future.
FA8) I think that after planning about money, I tend to worry about the decision I made.
FA9) I think I don't worry about the future; I only live for the present.
FA10) I like to buy things because it makes me feel good.
FA11) I find it interesting to spend money on things I want to buy.
FA12) I believe that saving is possible for me currently.
FA13) I think it is important to follow a monthly expense plan.
FA14) I believe that the way I manage my money will affect my future negatively.
FA15) I tend to live for today and let tomorrow take care of itself.
FA16) I find it more rewarding to spend money than to save it in the long run.
FA17) I think money exists to be spent.
FA18) I think it is necessary to learn how to manage money.
FA19) I think it is important to learn about conscious consumption.
FA20) I am comfortable with the way I manage my money.

FINANCIAL BEHAVIOR (FB)

FB1) I compare prices when making a purchase.
FB2) I record and monitor my personal expenses (e.g., monthly income and expense spreadsheet).
FB3) If there is any money left at the end of the month, I usually spend it.
FB4) I buy things even knowing I might not be able to pay for them.
FB5) I consider that I know exactly what my monthly expenses are.
FB6) I analyze the invoices (receipts, tax coupons) of my purchases.
FB7) I go more than a month without monitoring (spreadsheet/notes) my expenses.
FB8) I buy on impulse.
FB9) I have a financial reserve that can be used in unexpected situations.
FB10) I can save more money if I maintain better control of my finances.
FB11) I set goals to guide my financial decisions.
FB12) I analyze my financial controls before making a purchase.
FB13) I usually spend money before I have it.
FB14) I save part of my income every month.
FB15) I pay my bills without delay.
FB16) If there is any money left at the end of the month, I usually save it.
FB17) I prefer to make purchases with full payment (cash/one-time payment).
FB18) I prefer to make purchases using installments/credit.
FB19) I consider that in recent months I have managed to save money.
FB20) I pay for my purchases in full to avoid interest charges.

FINANCIAL KNOWLEDGE (FK)

FK1) I am confident in using basic numerical calculations.
FK2) I know how to calculate values in the case of simple interest.
FK3) I know how to calculate values in the case of compound interest.
FK4) I know the difference between simple and compound interest.
FK5) I am aware that to obtain higher profits, it is necessary to take higher risks.
FK6) I think that I know high inflation leads to an increase in the cost of living.
FK7) I consider that I know the value of money changes over time.
FK8) I am confident in using electronic banking transactions.
FK9) By having a good credit score, it is possible to obtain a lower interest rate.
FK10) When inflation rises each month, products in the market become more expensive than they were before.
FK11) I believe that if I have bad credit, I can still get a low interest rate when buying a video game.
FK12) I think that anyone can get a great loan to buy a car if they have a job.
FK13) Taking out student loans to finance education is considered "bad debt" (defaulted debt).
FK14) Getting credit at your favorite store to make purchases is considered positive.
FK15) Using a debit card is the same as using a credit card.
FK16) Using a credit card will not have lasting effects on my personal finances.
FK17) I consider that transportation costs incurred in purchasing products do not affect sales.
FK18) I consider that high production and high inventory levels cause product prices to increase.
FK19) I believe that if inflation rises, the cost of the basic food basket will decrease.
FK20) I believe that inflation is not part of our daily lives; in other words, the price of rent does not interfere with the inflation rate.

This list of 80 statements was submitted to seven experts in Statistical and Financial Education to evaluate the formulation of the items. The evaluators assessed the items regarding their adequacy in identifying High School students' attitudes toward SL and FL. Furthermore, they examined the clarity and objectivity of the wording to ensure participant comprehension. The experts were also requested to provide considerations regarding the relevance of the items in relation to learning strategies.

Consequently, the initial version of the scale consisted of a questionnaire with various items organized on a five-point Likert scale. The

response options were: 1) Strongly agree; 2) Partially agree; 3) Neither agree nor disagree; 4) Partially disagree; and 5) Strongly disagree.

According to Vieira (2009), the Likert scale functions as a visual-analog tool in which respondents select the point that represents their position. It is particularly used to measure opinions, attitudes, and evaluations, where the respondent assesses a phenomenon through a scale that typically offers five alternatives (Gühnter, 2003).

METHODOLOGICAL PROCEDURES

Content validity refers to the degree to which an instrument's content adequately reflects the construct being measured (Polit, 2015); that is, it evaluates how representative a sample of items is of a defined universe or content domain (Polit & Beck, 2011).

Since no specific statistical test exists to evaluate content validity, a qualitative approach is generally employed through a committee of experts (Kimberlin & Winterstein, 2008). It is important to note that, according to Polit and Beck (2006) and Polit, Beck, and Owen (2007), the recommended number of experts and its implications for the acceptable cutoff point of the Content Validity Index (CVI) is at least six judges and a CVI ≥ 0.83.

Thus, the CVI was initially utilized, representing the proportion or percentage of judges in agreement regarding the theoretical relevance of an item. To calculate this index, seven experts with specific domain expertise in the construct identified attitudes related to potential relationships between statistical and financial literacy by completing an online questionnaire. These experts evaluated each instrument item based on its theoretical relevance to the construct under study.

Following Yusoff (2019), the experts were asked to rate the relevance of each item using the following 4-point scale: i) 1 = not relevant; ii) 2 = item requires revision to assess relevance; iii) 3 = relevant, needs minor changes; iv) 4 = absolutely relevant.

It should be noted that this research was submitted to and approved by the Research Ethics Committee of *Plataforma Brasil* at the Federal University of ABC (UFABC) under CAAE number: 76290923.3.0000.5594.

The I-CVI (Item-level Content Validity Index) was then calculated, established by the total number of "3" and "4" ratings from all reviewers divided by the total number of reviewers (Yusoff, 2019). Critically, prior to calculating the I-CVI, relevance ratings must be recoded as 1 (relevance scale 3 or 4) or 0

(relevance scale 1 or 2). An I-CVI equal to 1 indicates universal consensus for item acceptance, while a value of 0 indicates universal consensus for rejection.

Furthermore, Yusoff (2019) outlines the following indices and procedures regarding different content validity metrics:

- S-CVI/Average (Scale-level Content Validity Index based on the Average method): the average of the I-CVI scores for all items on the scale or the average proportion of relevance rated by all experts. Proportional relevance is the average relevance rating provided by each expert.
- S-CVI/UA (Scale-level Content Validity Index based on the Universal Agreement method): the proportion of items on the scale that achieve a relevance rating of 3 or 4 by all experts. The Universal Agreement (UA) score is assigned as 1 when the item achieves 100% agreement among experts; otherwise, the UA score is 0.

For the CVI to be considered acceptable, Polit, Beck, and Owen (2007) and Yusoff (2019) recommend minimum values for three or more experts: I-CVI ≥ 0.78, S-CVI/Average ≥ 0.90, and S-CVI/UA ≥ 0.80. When content validity indices do not reach the cutoff points established by Polit, Beck, and Owen (2007) or Yusoff (2019), the instrument enters a "psychometric fragility zone." This may imply: i) Lack of Representativeness: items may be ambiguous, irrelevant, or insufficient to explain the phenomenon; ii) Measurement Bias: the results obtained from the questionnaire will not be reliable.

The same authors indicate that when this fragility is identified, there are three fundamental paths: i) Elimination: excluding items with low inter-rater agreement; ii) Revision: reformulating the text, language, or concept of the item and submitting it to a new evaluation round (Delphi technique); iii) Re-validation: increasing the number of expert judges to reduce the statistical margin of error. In summary, being in the fragility zone is a warning sign that the instrument requires structural adjustments before actual data collection.

In the present study, we opted to reformulate items that did not reach total consensus among judges, adjusting the language (negative or positive framing) or the concepts related to Statistical Literacy (SL) and/or Financial Literacy (FL).

ANALYSIS OF THE EMELFE ATTITUDE SCALE THROUGH CONTENT VALIDITY

To initiate the presentation of the content analysis results for the EMEMFE scale, the content validity indices for the Statistical-Financial Attitude (SFA) component were calculated. This stage aimed to quantify the level of agreement among experts regarding the relevance of the items comprising the construct.

As systematized in Table 3, the data are derived from the evaluations of seven independent judges. To ensure the robustness of the analysis, three complementary metrics were employed:

- i) I-CVI (Item-Level Content Validity Index): used to verify the individual relevance of each statement;
- ii) S-CVI/Ave (Scale-Level Content Validity Index, Average Calculation Method): reflecting the average proportion of items considered relevant by the expert panel;
- iii) S-CVI/UA (Scale-Level Content Validity Index, Universal Agreement Method): the most rigorous criterion, which accounts only for items that achieved maximum agreement (unanimity) among the evaluators.

The application of these indices allows for the identification of the need for refinement, exclusion, or retention of the SFA component items, ensuring that the instrument possesses adequate psychometric properties to measure the intended phenomenon.

Based on the procedures detailed in Table 3, the following values were observed: I-CVI (average proportion of items considered relevant by the judges) = 0.86; S-CVI/Ave = 0.9; and S-CVI/UA = 0.75.

The fact that both the I-CVI (0.86) and S-CVI/Ave (0.90) are within established standards demonstrates that the items are individually relevant and the overall average quality of the instrument is robust. However, the S-CVI/UA (0.75) fell below the recommended threshold (0.80). This indicates that while the average relevance is high, there is a lack of unanimous or "universal" agreement among the seven judges regarding a significant portion of the items. This suggests a fragmentation of opinion within the instrument: some experts may be evaluating different dimensions or interpreting the construct differently for specific items.

Table 3

Item-level relevance classifications by seven experts for the Statistical-Financial Attitude (SFA) component of the EMELFE scale

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Agreement among experts	I-CVI	UA
SFA1	1	1	1	1	1	1	1	7	1.0	1
SFA2	1	1	1	1	1	1	1	7	1.0	1
SFA3	1	1	1	1	1	1	1	7	1.0	1
SFA4	1	1	1	1	1	1	1	7	1.0	1
SFA5	0	1	1	1	0	1	1	5	0.7	0
SFA6	0	0	1	1	0	1	0	3	0.5	0
SFA7	0	0	0	1	0	1	0	2	0.3	0
SFA8	0	0	0	1	0	1	0	2	0.3	0
SFA9	1	1	1	1	1	1	1	7	1.0	1
SFA10	0	0	0	1	0	1	1	3	0.3	0
SFA11	1	1	1	1	1	1	1	7	1.0	1
SFA12	1	1	1	1	1	1	1	7	1.0	1
SFA13	1	1	1	1	1	1	1	7	1.0	1
SFA14	1	1	1	1	1	1	1	7	1.0	1
SFA15	1	1	1	1	1	1	1	7	1.0	1
SFA16	1	1	1	1	1	1	1	7	1.0	1
SFA17	1	1	1	1	1	1	1	7	1.0	1
SFA18	1	1	1	1	1	1	1	7	1.0	1
SFA19	1	1	1	1	1	1	1	7	1.0	1
SFA20	1	1	1	1	1	1	1	7	1.0	1
								S-CVI/Average	0.9	
Relevant Proportion	0.75	0.80	0.85	1.00	0.75	1.00	0.85	S-CVI/UA		0.75
								Mean proportion of items considered relevant by experts	0.86	

It is indicated that this section of the instrument, the Statistical-Financial Attitude (SFA) component of the EMELFE scale, presents satisfactory evidence of content validity in terms of average relevance yet fails the criterion for universal agreement rigor. Since the S-CVI/UA threshold was not met, we opted to reformulate the items in this component that did not achieve universal agreement from all seven judges, namely: SFA5, SFA6, SFA7, SFA8, and SFA10 (described in Table 2).

An analysis of these specific items reveals that all were originally phrased as negative or reverse-coded statements. They indicate the individual's degree of skepticism regarding the practical application of statistics in daily financial life. Agreement with these statements would demonstrate a low perception of the utility of statistical tools for personal money management. Consequently, the five items were reformulated into positive statements:

- SFA5) I use statistical data and indicators as a basis to support my financial decisions.
- SFA6) I recognize that statistics offers clear and valuable benefits for optimizing and guiding my financial choices.
- SFA7) I consider statistical knowledge an essential tool for building a detailed and efficient plan for my monthly expenses.
- SFA8) I believe that statistical tools are extremely advantageous for improving and maintaining rigor in my financial controls.

- SFA10) I understand that statistics is intrinsically linked to my financial life, helping me forecast trends and manage risks.

Proceeding with the analysis, Table 4 provides the relevance ratings on the item scale by seven experts/judges regarding the Financial Attitude (FA) component of the EMELFE scale, illustrating the calculation of the different CVI indices (I-CVI, S-CVI/Ave, and S-CVI/UA).

Table 4

Item-level relevance ratings by seven experts regarding the Financial Attitude (FA) component of the EMELFE scale (Developed by the authors)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Agreement among experts	I-CVI	UA
FA1	1	1	1	1	1	1	1	7	1.00	1
FA2	1	1	1	1	1	1	1	7	1.00	1
FA3	1	1	1	1	1	1	1	7	1.00	1
FA4	1	1	1	1	1	1	1	7	1.00	1
FA5	1	1	1	1	1	1	1	7	1.00	1
FA6	1	1	1	1	1	1	1	7	1.00	1
FA7	1	1	1	1	1	1	0	6	0.86	0
FA8	1	1	1	1	1	1	1	7	1.00	1
FA9	1	1	1	1	1	1	1	7	1.00	1
FA10	1	1	1	1	1	1	1	7	1.00	1
FA11	1	1	1	1	1	1	1	7	1.00	1
FA12	1	1	1	1	1	1	1	7	1.00	1
FA13	1	1	1	1	1	1	1	7	1.00	1
FA14	1	1	1	1	1	1	1	7	1.00	1
FA15	1	1	1	1	1	1	0	6	0.86	0
FA16	1	1	1	1	1	1	1	7	1.00	1
FA17	1	1	1	1	1	1	0	6	0.86	0
FA18	1	1	1	1	1	1	0	6	0.86	0
FA19	1	1	1	1	1	1	0	6	0.86	0
FA20	1	1	1	1	1	1	1	7	1.00	1
								S-CVI/Average	**0.96**	
Relevant Proportion	1.0	1.0	1.0	1.0	1.0	1.0	0.8	**S-CVI/UA**		**0.75**
							Mean proportion of items considered relevant by experts	**0.96**		

Based on the procedures outlined in Table 4, the following values were observed: I-CVI (mean proportion of items considered relevant by the judges) = 0.96; S-CVI/Ave = 0.96; and S-CVI/UA = 0.75.

The I-CVI of 0.96 indicates that, individually, nearly all items are perceived as highly relevant by the majority of the judges. However, the S-CVI/UA of 0.75 (Universal Agreement) reveals that in 25% of the instrument, at least one judge did not assign the maximum relevance score. Since the S-CVI/Ave is high (0.96), the disagreements are isolated, indicating that the items are not inherently flawed, but rather subject to specific "dissenting voices". In psychometric terms, the Universal Agreement (UA) criterion is the most rigorous, as it does not tolerate any score below 3 or 4 (on a 4-point Likert scale) for an item to be counted.

Analytically, the failure to meet the S-CVI/UA threshold suggests that the instrument still contains ambiguities or a lack of clarity in specific items,

preventing full consensus among the panel of seven experts. As part of the qualitative revision process, the items that hindered universal agreement (those receiving a score of 1 or 2 from only one or two judges) were listed: items FA7, FA15, FA17, FA18, and FA19 of the Financial Attitude (FA) component of the EMELFE scale.

Items FA7, FA15, and FA17 are considered "negative" or "reverse-scored" in relation to a healthy financial attitude. Furthermore, it is common to find respondents who agree on the importance of learning (FA18 and FA19) but, in practice, admit to preferring spending over saving (FA7). This divergence highlights the gap between cognitive attitude (what one deems correct) and affective/behavioral attitude (what one finds pleasurable).

Consequently, it was decided to perform semantic and theoretical adjustments based on the experts' suggestions, rephrasing aspects more positively and addressing the counterpoint between what is considered correct and what provides immediate pleasure:

- FA7) I find satisfaction in balancing the pleasure of enjoying my money today with the security of investing in my future dreams.
- FA15) I value the present and consciously seek to build the foundations for an even more peaceful and prosperous tomorrow.
- FA17) I understand that money is a powerful tool for providing experiences, comfort, and well-being for myself and those I love.
- FA18) I believe that mastering financial management is the path to achieving my freedom and reaching my greatest goals.
- FA19) I value conscious consumption as a way to align my spending with my values, taking care of both my finances and the world around me.

The paradigmatic transition lies in moving beyond the concept of deprivation in favor of deliberate choice. Under efficient financial management, resource allocation does not imply the cessation of consumption, but rather its strategic redirection toward assets and expenses of greater relevance and added value.

Continuing the analysis, Table 5 provides the relevance ratings on the item scale by seven experts/judges regarding the Financial Behavior (FB) component of the EMELFE scale to illustrate the calculation of different CVI indices (I-CVI; S-CVI/Ave; S-CVI/UA).

Table 5

Item-level relevance ratings by seven experts for the Financial Behavior (FB) component of the EMELFE scale (Prepared by the authors)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Agreement among experts	I-CVI	UA
FB1	1	1	1	1	1	1	1	7	1.00	1
FB2	1	1	1	1	1	1	1	7	1.00	1
FB3	0	1	1	1	0	1	1	5	0.71	0
FB4	0	0	0	1	0	1	1	3	0.43	0
FB5	1	1	1	1	1	1	1	7	1.00	1
FB6	1	1	1	1	1	1	1	7	1.00	1
FB7	0	0	0	1	1	1	1	4	0.57	0
FB8	0	0	0	1	1	1	1	4	0.57	0
FB9	1	1	1	1	1	1	1	7	1.00	1
FB10	1	1	1	1	1	1	1	7	1.00	1
FB11	1	1	1	1	1	1	1	7	1.00	1
FB12	1	1	1	1	1	1	1	7	1.00	1
FB13	0	0	0	1	1	1	1	4	0.57	0
FB14	1	1	1	1	1	1	1	7	1.00	1
FB15	1	1	1	1	1	1	1	7	1.00	1
FB16	1	1	1	1	1	1	1	7	1.00	1
FB17	1	1	1	1	1	1	1	7	1.00	1
FB18	1	1	1	1	1	1	1	7	1.00	1
FB19	1	1	1	1	1	1	1	7	1.00	1
FB20	1	1	1	1	1	1	1	7	1.00	1
								S-CVI/Average	0.90	
Relevant Proportion	0.75	0.8	0.8	1.0	0.9	1.0	1.0	S-CVI/UA		0.75
							Mean proportion of items considered relevant by experts	0.90		

Based on the procedures detailed in Table 5, the following values were observed: I-CVI (average proportion of items considered relevant by the judges) = 0.90, S-CVI/Average = 0.90, and S-CVI/UA = 0.75.

The fact that the S-CVI/UA (Universal Agreement) stands at 0.75, falling below the 0.80 cutoff point, while the average and individual items remain high, indicates the following:

1. Lack of Absolute Consensus: The S-CVI/UA is a rigorous index. It measures the proportion of items for which all judges agreed on relevance (rating 3 or 4). A value of 0.75 reveals that in 25% of the items, at least one judge diverged from the majority by not assigning the maximum relevance score.
2. Methodological Rigor: Although the instrument demonstrates satisfactory overall content validity (indicated by the 0.90 average), it fails the "Universal Agreement" criterion. This suggests that the instrument cannot yet be considered fully validated in its current form.

When the S-CVI/UA does not reach the minimum threshold, it is possible to identify which items lacked unanimous agreement; for this component, these are: FB3, FB4, FB7, FB8, and FB13. These items constitute a diagnostic of individual habits and propensities regarding money

management, aiming to measure the levels of Self-Control and Financial Planning.

Additionally, it is postulated that such items exert a negative impact on the individual's "Financial Health." Consequently, high scores on these items denote a high-risk financial behavior profile, characterized by low applied financial literacy and a marked propensity for indebtedness. Conversely, low scores indicate a conservative and disciplined profile, with a greater aptitude for deferred gratification.

In Likert-type scales, these are referred to as "reverse-scored items" or "negative-direction items" if the scale's objective is to measure "Financial Responsibility," as higher participant agreement correlates with lower perceived responsibility.

Accordingly, a reformulation of these items focused on financial planning is indicated:

- FB3) I maintain the discipline of allocating any monthly surplus to reserves or investments.
- FB4) I evaluate my payment capacity and the impact on the budget before making any purchase.
- FB7) I monitor and record my expenses on a weekly or monthly basis.
- FB8) I practice conscious consumption, avoiding immediate purchases without prior planning.
- FB13) I plan my spending strictly based on my available and already received income.

Thus, regarding items FB4 and FB8, the "impulsivity" variable was replaced by the Reflection construct, prioritizing the analytical process preceding the consumption decision. Regarding item FB3, the focus shifted toward strategic resource allocation, favoring the creation of financial reserves over discretionary consumption, a fundamental element for individual economic stability.

As for items FB7 and FB13, the descriptions now encompass habits associated with autonomy in cash flow management, as opposed to passivity toward financial obligations. These methodological adjustments aimed to provide greater accuracy in measuring the respondent's level of financial maturity.

Finally, to illustrate the calculation of the different CVI indices previously presented, the relevance ratings on the item scale provided by seven experts/judges concerning the Financial Knowledge (FK) component of the EMELFE scale are presented in Table 6.

Table 6

Item-level relevance classifications for the Financial Knowledge (FK) component of the EMELFE scale (Source: Prepared by the authors)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Agreement among experts	I-CVI	UA
FK1	0	1	0	1	1	1	1	5	0.71	0
FK2	1	1	1	1	1	1	1	7	1	1
FK3	1	1	1	1	1	1	1	7	1	1
FK4	1	1	1	1	1	1	1	7	1	1
FK5	1	1	1	1	1	1	1	7	1	1
FK6	1	1	1	1	1	1	1	7	1	1
FK7	1	1	1	1	1	1	1	7	1	1
FK8	1	1	1	1	1	1	1	7	1	1
FK9	1	1	1	1	1	1	1	7	1	1
FK10	1	1	1	1	1	1	1	7	1	1
FK11	1	1	1	1	1	1	1	7	1	1
FK12	1	1	1	1	1	1	1	7	1	1
FK13	1	1	1	1	1	1	1	7	1	1
FK14	1	1	1	1	1	1	1	7	1	1
FK15	1	1	1	1	1	1	1	7	1	1
FK16	1	1	1	1	1	1	1	7	1	1
FK17	1	1	1	1	1	1	1	7	1	1
FK18	1	1	1	1	1	1	1	7	1	1
FK19	1	1	1	1	1	1	1	7	1	1
FK20	1	1	1	1	1	1	1	7	1	1
								S-CVI/Average	0.99	
Relevant Proportion	0.95	1.0	0.95	1.0	1.0	1.0	1.0	S-CVI/UA		0.95
							Mean proportion of items considered relevant by experts	0.99		

Thus, based on the data presented in Table 6, the following values were obtained: I-CVI (Item-level Content Validity Index) = 0.99; S-CVI/Ave (Scale-level Content Validity Index, Average Proportion) = 0.99; and S-CVI/UA (Scale-level Content Validity Index, Universal Agreement) = 0.95.

According to Table 6, the instrument's content validity indices exceed the rigorous parameters recommended in the literature (Polit, Beck, & Owen, 2007; Yusoff, 2019). An I-CVI of 0.99 indicates that the individual items reliably capture the intended construct. Furthermore, the S-CVI/Ave (0.99) and S-CVI/UA (0.95) values confirm excellent harmony among the seven experts, surpassing the minimum consensus threshold of 80% for universal agreement. Consequently, it is concluded that the instrument demonstrates robust evidence of content validity, requiring no significant adjustments and remaining fit for application.

Despite the harmonious results among the seven experts' evaluations, a single item did not reach absolute consensus: item FK1, which serves as an indicator of Financial Self-Efficacy and Basic Numeracy.

During the expert review process, few suggestions were made regarding item improvement. The only specific recommendation was provided by Expert 2 concerning item FK1 ("I am confident in using basic numerical calculations") within the Financial Knowledge (FK) component. The expert suggested replacing the term "basic numerical calculations" with "financial mathematics calculations."

Based on this suggestion, within the Financial Knowledge (FK) component, this item functions as a "prerequisite"; that is, without numerical confidence, it is unlikely that an individual can progress to complex concepts such as compound interest or inflation. To redesign item FK1, the goal was to capture both technical skill (Numeracy) and the belief in one's own ability to apply this knowledge in financial contexts (Self-Efficacy). Since this item emphasizes the individual's psychological security when dealing with numbers in daily life, the following reformulation is proposed: "I feel confident performing simple mathematical calculations to organize my finances."

Building upon the previous analyses, it is important to note that a primary criticism of the CVI is its failure to adjust for chance agreement among experts. For this reason, the Modified Kappa Coefficient (k*), or Fleiss' Kappa, was employed, as it is a statistic that adjusts the I-CVI for chance agreement (Polit & Beck, 2007).

Therefore, it should initially be emphasized that the Kappa coefficient is recommended for assessing agreement measures (Wynd & Schaefer, 2002). It is defined as the ratio of the proportion of times experts agree, corrected for chance agreement, to the maximum proportion of times they could agree, also corrected for chance (Siegel & Castellan, 2006; Hulley et al., 2015). This index is particularly useful when multiple raters classify objects or subjects into nominal categories; thus, it is applicable when data are categorical and measured on a nominal scale (Siegel & Castellan, 2006).

In this study, the Modified Kappa Coefficient (k*) was employed. According to Polit, Beck, and Owen (2007), this is a widely used statistical measure in methodological studies, specifically during the content validation process of research instruments (such as questionnaires or scales). Its purpose is to evaluate inter-rater agreement after adjusting for the agreement that might occur by chance.

According to Polit, Beck, and Owen (2007), k* is a variation of Cohen’s Kappa, adapted for binary categories (agree/disagree) or multiple categories collapsed into binary ones (e.g., 3 and 4 = agree; 1 and 2 = disagree)

used in content validation. It can be interpreted as the proportion of observed agreement that exceeds what would be expected by chance.

Furthermore, Landis and Koch (1977) and Polit, Beck, and Owen (2007) suggest that k* values equal to or greater than 0.74 are considered excellent, while values between 0.61 and 0.74 are substantial (good) for determining item adequacy. The index ranges from 0 (agreement equal to chance) to 1 (perfect agreement).

Table 7 presents the values obtained for the Modified Kappa Coefficient (k*), along with their interpretation within the context of the item evaluation for each component of the EMELFE scale. The Modified Kappa is particularly robust in validation processes involving multiple judges, as it adjusts the probability of chance agreement based on the number of raters and the number of classification categories.

Table 7

Indication of the Modified Kappa Coefficient (k) and its interpretation for each EMELFE scale component (Prepared by the authors)*

Component	Modified Kappa Coefficient (κ*)
Statistical-Financial Attitude (SFA)	0.8325
Financial Attitude (FA)	0.9577
Financial Behavior (FB)	0.8624
Financial Knowledge (FK)	0.9880

The content validation results, expressed by the *Modified Kappa Coefficient (k)**, revealed high levels of agreement among the seven expert judges. The Financial Knowledge (FK) component yielded the highest index (k* = 0.9880), followed by Financial Attitude (FA) (k* = 0.9577), Financial Behavior (FB) (k* = 0.8624), and Statistical-Financial Attitude (SFA) (k* = 0.8325).

According to the criteria established by Landis and Koch (1977) and the recommendations of Polit, Beck, and Owen (2007), k* values equal to or greater than 0.74 are classified as excellent, indicating that the observed agreement was significantly higher than what would be expected by chance.

Consequently, all components demonstrated satisfactory face and content validity, with agreement levels ranging from 'substantial' to 'almost perfect.' These results attest to the adequacy of the items for measuring the intended constructs.

As stated by Allen, Robson, and Iliescu (2023), face validity represents the degree to which an instrument appears to assess its intended construct. Face validity constitutes a legitimate psychometric property, evidenced by the clarity, relevance, difficulty, and sensitivity of a measure in relation to its target population.

CONCLUDING REMARKS

The present study fulfilled its purpose of illustrating the construction and content validation process of the EMELFE scale, designed to assess attitudes toward the measurement of Financial Literacy (FL) and Statistical Literacy (SL) among high school students, based on psychometric principles.

In this regard, psychometric assumptions were particularly useful in guiding the construction and validation of this scale. The search for validity evidence was informed by the Content Validity Index (CVI) and the Modified Kappa Coefficient, indicating that the items of the proposed scale are relevant and representative for measuring attitudes toward FL and SL in high school students.

Based on the analyses regarding the Content Validity Index (CVI) and the Modified Kappa Coefficient (k*), a summary is presented for each of the four components of the EMELFE attitude scale (Table 8).

Table 8

Summary of the seven experts' analyses regarding the Content Validity Index (CVI) and Modified Kappa Coefficient (k) for each component of the EMELFE scale (Developed by the authors)*

Component	Content Validity Index (CVI)	Modified Kappa Coefficient (κ*)
Statistical-Financial Attitude (SFA)	Considering I-CVI = 0.86 ≥ 0.78, S-CVI/Average = 0.90 ≥ 0.90, and S-CVI/UA = 0.75 ≤ 0.80, the results for I-CVI (0.86) and S-CVI/Average (0.90) confirm the individual relevance of the items and the robustness of the instrument's average quality. However, the S-CVI/UA (0.75) fell below the recommended threshold (0.80), indicating a lack of universal agreement among the seven experts. This disparity suggests interpretive fragmentation, where variations in the perception of the construct or the evaluated dimensions compromised full consensus across all items. Furthermore, since the S-CVI/UA criterion was not met, the items within this component that did not achieve universal agreement from all seven experts were reformulated, namely: SFA5, SFA6, SFA7, SFA8, and SFA0.	Content validation, grounded in the Modified Kappa Coefficient (k*), demonstrated high levels of agreement among the seven experts, with results ranging from 0.8325 to 0.9880 for the dimensions of Statistical-Financial Attitude (SFA), Financial Behavior (FB), Financial Attitude (FA), and Financial Knowledge (FK). Based on the criteria of Landis and Koch (1977) and Polit, Beck, and Owen (2007), these values exceed the cutoff for an "excellent" classification (≥ 0.74), falling within the substantial to almost perfect levels. Consequently, the face and content validity of the instrument are attested, confirming the technical robustness of the items for measuring the proposed constructs.
Financial Attitude (FA)	Based on the indices (I-CVI = 0.96; S-CVI/Average = 0.96; S-CVI/UA = 0.75), the results demonstrate strong individual item relevance. However, the S-CVI/UA of 0.75 indicates that 25% of the scale failed to reach full consensus among the seven experts. This suggests that while the instrument is psychometrically sound, localized ambiguities prevented total unanimity under stricter validation criteria. Following a qualitative review, items FA7, FA15, FA17, FA18, and FA19 were flagged as those precluding universal agreement, having received scores of 1 or 2 from at least one evaluator.	
Financial Behavior (FB)	Considering I-CVI = 0.90 ≥ 0.78, S-CVI/Average = 0.90 ≥ 0.90, and S-CVI/UA = 0.75 ≤ 0.80, although the Scale-level Content Validity Index (S-CVI/Average = 0.90) and individual assessments indicate satisfactory overall validity, the Scale-level Content Validity Index/Universal Agreement (S-CVI/UA) of 0.75, below the 0.80 cutoff, highlights a lack of absolute consensus among the judges. This result reveals that in 25% of the items, at least one evaluator diverged regarding maximum relevance. Under the methodological rigor of universal agreement, this indicates that the instrument still requires refinement to be considered fully validated. Furthermore, as the S-CVI/UA did not meet the minimum threshold, it was decided to reformulate the items that did not achieve unanimous agreement: FB3, FB4, FB7, FB8, and FB13.	
Financial Knowledge (FK)	Considering I-CVI = 0.99 ≥ 0.78, S-CVI/Average = 0.99 ≥ 0.90, and S-CVI/UA = 0.95 ≥ 0.80, the data attest to the psychometric robustness of the instrument. An I-CVI of 0.99 confirms the individual reliability of the items, while the S-CVI/Average (0.99) and S-CVI/UA (0.95) values demonstrate high consensus among the seven experts, exceeding the 80% threshold for universal agreement. This evidence confirms the tool's content validity, precluding the need for reformulations and qualifying it for immediate application. Furthermore, despite the harmonious results across the seven expert evaluations, a single item did not reach absolute consensus: item FK1, which serves as an indicator of Financial Self-Efficacy and Basic Numeracy.	

Content validation of the instrument was performed using the Content Validity Index (CVI) and the Modified Kappa Coefficient (k*), based on the evaluation of seven expert judges. Overall, the k* coefficient demonstrated high levels of agreement, with values ranging from 0.8325 to 0.9880. According to the criteria established by Landis and Koch (1977) and Polit, Beck, and Owen (2007), these indices exceed the cutoff for an "excellent" classification (≥ 0.74), attesting to the technical robustness and face validity of the items for measuring the proposed constructs.

Regarding specific components, the results reveal important nuances between individual relevance and universal agreement:

- i) Financial Knowledge (FK): demonstrated the most robust psychometric performance. With an I-CVI and S-CVI/Average of 0.99, and an S-CVI/UA of 0.95, surpassing the 0.80 threshold, a high consensus among judges was confirmed.
- ii) Statistical-Financial Attitude (SFA), Financial Attitude (FA), and Financial Behavior (FB): exhibited a similar response pattern. Although they achieved satisfactory I-CVI (≥ 0.78) and robust validity averages (S-CVI/Average between 0.90 and 0.96), all scored 0.75 for

the Universal Agreement index (S-CVI/UA), falling below the rigorous 0.80 criterion.

While the Financial Knowledge component is fully validated for immediate application, the Attitude and Behavior components underwent a qualitative review and item reformulation. These adjustments aim to resolve the perceptual disparities identified by the judges, ensuring the instrument meets methodological excellence before final application.

The CVI results ratify the relevance of the items within each component, supporting the need for a multidimensional approach to Financial Literacy (FL). This perspective aligns with Sena (2017) and its articulation with Statistical Literacy (SL) as postulated by Gal (2004, 2019). Furthermore, the observed agreement indices, significantly higher than chance probability, provide statistical robustness and reliability to the instrument. This methodological rigor ensures that the components accurately measure the dimensions advocated by the adopted theoretical model. Ultimately, validating this model is fundamental to fulfilling the BNCC guidelines (Brazil, 2018), which focus on fostering critical awareness and autonomy in citizens.

The study highlights the importance of the theme by illustrating the development and content validation of an instrument measuring FL and SL attitudes among high school students. There is a clear need for studies adopting contextualized and systemic approaches, contributing to the creation of validated and standardized tools. The search for validity evidence for the EMELFE scale will continue, as it will be subjected to internal structure validity tests and reliability measures.

Consequently, following this content analysis, the questionnaire will undergo pre-testing to verify item acceptance among high school students in the Baixada Santista region of São Paulo, Brazil. Students will complete the survey independently, considering the scale validation process. The scale's validity will be evaluated through Exploratory Factor Analysis (EFA) and its reliability through Cronbach's alpha and correlation analysis. This stage seeks to eliminate items that do not effectively contribute to identifying the Financial and Statistical Literacy of high school students.

Subsequently, after this initial validation, the EMELFE attitude scale will be reapplied to a larger sample of high school students for Confirmatory Factor Analysis (CFA) and further reliability testing (Cronbach's alpha and correlation) to measure the Financial and Statistical Literacy of high school students.

AUTHOR CONTRIBUTION STATEMENTS

APOJ contributed to the theoretical conceptualization of the study. The preparation of the original manuscript, development of the theoretical framework, methodology, and formal analysis were performed by APOJ and LSS. Both authors collaborated equally in data visualization, writing, critical review, and final editing of the work.

DATA AVAILABILITY STATEMENT

In compliance with ethical standards for scientific research, raw interview data are held exclusively by the primary author. This ensures the confidentiality and privacy of the information collected, as established in the informed consent form and investigative integrity protocols.

REFERENCES

Agarwalla, S. K., Barua, S. K., Jacob, J., & Varma, J. R. (2013). *Financial literacy among working young in urban India*. Indian Institute of Management Ahmedabad, WP.

Alexandre, N. M. & Coluci, M. Z. (2011). Validade de conteúdo nos processos de construção e adaptação de instrumentos de medidas. *Ciência & Saúde Coletiva*, 16(7), 3061-8.

Allen, M. S., Robson, D. A., & Iliescu, D. (2023). Face Validity: a critical but ignored component of scale construction in psychological assessment. European Journal of Psychological Assessment, 39(3), 153-156. https://doi.org/10.1027/1015-5759/a000777

Atkinson, A. & Messy, F. A. Assessing financial literacy in 12 countries: an OECD/INFE international pilot exercise. *Journal of Pension Economics & Finance*, 10(4), 657-665.

Atkinson, A. & Messy, F. (2012). *Measuring financial literacy*: *results of the OECD / International Network on Financial Education (INFE) pilot study. OECD Publishing*. https://doi.org/10.1787/20797117

Banthia, D., & Dey, S. K. (2022). Impact of financial knowledge, financial attitude and financial behaviour on financial literacy: structural

equitation modeling approach. *Universal Journal of Accounting and Finance*, 10(1), 327-337.

Batanero, C. (2001). *Didáctica de la estadística.* Granada: Departamento de Didáctica de la Matemática (Universidad de Granada). https://www.ugr.es/~batanero/pages/ARTICULOS/didacticaestadistica.pdf

Brasil (2018). Ministério da Educação. *Base Nacional Comum Curricular*: Educação é a base. Brasília: Ministério da Educação.

Campos, C. R. (2007). *A Educação Estatística*: *uma investigação acerca dos aspectos relevantes à didática da Estatística em cursos de graduação*. 2007. 242 f. Tese (Doutorado em Educação Matemática) - Instituto de Geociências e Ciências Exatas, Universidade Estadual Paulista, Rio Claro, 2007.

Campos, C. R.; Wodewotzki, M. L. L.; Jacobini, O. R. (2011). *Educação Estatística: teoria e prática em ambientes de modelagem matemática*. Autêntica.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1), 37-46.

Coutinho, C. Q. S. (2021). Letramento Estatístico e Letramento Financeiro: uma reflexão sobre suas possíveis articulações. *Revista Chilena de Educación Matemática*, 13(1), 30-41.

Coutinho, C. Q. S. & Almouloud, S. A. (2020). Letramento financeiro e o perfil de professores que ensinam matemática na escola básica. In: Campos, C. R. & Coutinho, C. Q. S. (Org.), *Educação Financeira no contexto da Educação Matemática*: *pesquisas e reflexões* (pp. 77-106). Akademy.

Coutinho, C. Q. S. & Campos, C. R. (2018). Perspectivas em didática e educação estatística e financeira: reflexões sobre convergências entre letramento matemático, matemacia, letramento estatístico e letramento financeiro. In: Oliveira, G. P. (Org.), *Educação*

Matemática: *epistemologia, didática e tecnologia* (pp. 143-180). Livraria da Física.

Dempsey, P.A. & Dempsey, A. D. (1996). *Using nursing research*. Lippincott.

Diniz, A. P. C. (2013). *Bem-estar financeiro: uma análise multifatorial do comportamento maranhense* (150 f). Dissertação, Mestrado em Administração, Universidade Federal de Santa Maria, Santa Maria.

Fitzner, K. (2007). Reliability and validity. *Diabetes Educ*, 33(5), 775-780.

Gal, I. (2019). *Letramento estatístico*: *conceitos, importância, resultados de pesquisa e implicações*. Appris.

Gal, I. (2004). Statistical literacy: Meanings, components, responsibilities. In Garfield, J. B.; Ben-Zvi, D. (Eds.), *The challenge of developing statistical literacy, reasoning and thinking* (pp. 47-78). Springer.

Hulley, S. B. et al. (2015). *Delineando a pesquisa clínica*. Artmed.

Ignácio, S. A. (2011). *Importância da Estatística para o processo de conhecimento e tomada de decisão*. https://www.ipardes.pr.gov.br/ojs/index.php/revistaparanaense/article/view/89/645

INAF (2018). Indicador de Alfabetismo Funcional. *Relatório do Índice Nacional de Alfabetização Funcional.* https://acaoeducativa.org.br/wp-content/uploads/2018/08/Inaf2018_Relat%C3%B3rio-Resultados-Preliminares_v08Ago2018.pdf

Kimberlin, C. L. & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *American Journal Health System Pharmacy*, 65(23, 2276-84.

Kistemann, M. A. & Souza, F. dos S. (2021). (Orgs.), *Educação financeira e educação estatística*. Pantanal.

Landis, J. R. & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, 35(6), 382-385.

McDonald, R. P. (2013). *Test theory*: *a unified treatment*. Psychology Press.

Morales, P., Urosa, B., & Blanco, A. (2003). *Construcciones de escalas de actitudes tipo Likert*: *una guía práctica*. La Muralla.

Muñiz, J. & Fonseca-Pedrero, E. (2009). Construcción de instrumentos de medida para la evaluación universitaria. *Revista de Investigación en Educación*, 5, 13-25.

OCDE (2013). Organization for Economic Co-Operation and Development. *Financial literacy and inclusion: results of OECD/INFE survey across countries and by gender. OECD*. https://www.oecd.org/daf/fin/financial-education/TrustFund2013_OECD_INFE_Fin_Lit_and_Incl_SurveyResults_by_Country_and_Gender.pdf

OCDE (2018). Organization for Economic Co-Operation and Development. *Toolkit for Measuring Financial Literacy and Financial Inclusion*. OECD. http://www.oecd.org/financial/education/2018-INFE-FinLit-Measurement-Toolkit.pdf

Pasquali, L. (2009). Psicometria. *Revista da Escola de Enfermagem da USP*, 43, 992-999.

Pasquali, L. (2013). *Psicometria*. Editora Vozes.

Perin, A. P. & Campos, C. R. (2021). Educação Financeira: uma possibilidade de integração com a Educação Estatística. *Revista Sergipana de Matemática e Educação Matemática*, 6(1), 339–358.

Polit, D. F. (2015). Assessing measurement in health: beyond reliability and validity. *International Journal Nursing Studies*, 52(11), 1746-53.

Polit, D. F. & Beck C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research Nursing & Health*, 29, 489-497.

Polit, D. F. & Beck, C. T. (2011). *Fundamentos de pesquisa em enfermagem*: *métodos, avaliação e utilização*. Artmed.

Polit, D., Beck, T., & Owen, S. (2007). Focus on research methods is the CVI an acceptable indicator of content validity. *Research Nursing & Health*, 30, 459-467.

Potrich, A. C. G. (2014). *Alfabetização Financeira: integrando conhecimento, atitude e comportamento financeiro* (102 f). Dissertação, Mestrado em Administração, Universidade Federal de Santa Maria, Santa Maria.

Potrich, A. C. G., Vieira, K. M., Coronel, D. A., & Bender Filho, R. (2015). Financial literacy in Southern Brazil: Modelling and invariance between genders. *Journal of Behavioral and Experimental Finance*, 6, 1-12.

Potrich, A. C. G., Vieira, K. M., & Ceretta, P. S. (2013). Nível de Alfabetização Financeira dos estudantes universitários: afinal, o que é relevante? *RECADM – Revista Eletrônica de Ciência Administrativa*, 12(3), 1-20.

Potrich, A. C. G., Vieira, K. M., & Kirch, G. (2015). Determinantes da Alfabetização Financeira: Análise da Influência de Variáveis Socioeconômicas e Demográficas. *Revista Contabilidade & Finanças – USP*, 26(69), 362-377.

Richins, M. L. (2011). Materialism, transformation expectations, and spending: Implications for credit use. *Journal of Public Policy & Marketing*, 30(2), 141-156.

Rogers, P., Rogers, D., & Souza, G. S. (2018). Comportamento e Atitude Financeira: Refinamento de um Modelo de Medida e Exame de Relações Estruturais em Estudantes Universitários. In: *Anais do 5°*

Encontro Brasileiro de Economia e Finanças Comportamentais. São Paulo.

Rubio, D. M., Berg-Weger, M., Tebb, S., & Rauch, S. (2003). Objectifying content validity: conducting a content validity study in social work research. *Social Work Research*, 27(2), 94-105.

Sena, F. D. L. (2017). *Educação financeira e estatística*: *estudo de estrutura de letramento e pensamento*. 108 f. Dissertação (Mestrado em Educação Matemática) - Pontifícia Universidade Católica de São Paulo. São Paulo.

Sharma, S. (2017). Definitions and models of statistical literacy: a literature review. *Open Review of Educational Research*, 4(1), 118-133.

Siegel, S. & Castellan, H. J. (2006). *Estatística não paramétrica para ciências do comportamento*. Artmed.

Skovsmose, O. (2000). Cenários para investigação. *Boletim de Educação Matemática - Bolema*, 14, 66-91.

Trento, T. R. & Braum, L. M. dos S. (2020). Desenvolvimento e validação de conteúdo de uma escala de mensuração da alfabetização financeira: exemplo prático. In: *Anais do 14° Congresso Associação Nacional de Programas de Pós-graduação em Ciências Contábeis – ANPCONT* (pp. 1-18). Foz do Iguaçu, Paraná.

Vieira, S. (2009). *Como elaborar questionários*. Atlas.

Wynd, C. A. & Schaefer, M. A. (2002). The Osteoporosis Risk Assessment Tool: establishing content validity through a panel of experts. *Applied Nursing Research*, 16(2), 184-188.

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Resource,* 11(2), 49-54.