

Financial Education in the Digitalization Era: A Bibliometric Analysis

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Abstract: In the era of digitalization, financial education is essential because it is one of the most critical skills a tech-savvy generation z can acquire. Seeing the rapid change in financial access from traditional to digital today, with bibliometric approach seeks to present how financial education is needed in digital finance. It is increasingly evolving so that Generation Z does not fall into digital traps such as credit and impulsive purchases. Based on the Scopus database, 137 documents have been published from 1999 to 2022. Journals, authors, countries, articles, themes, and publication trends have been used to identify influential works, describe financial education in the era of digitalization, and identify gaps. The United States is the leading producing country with 69 documents and is also the most in citations. In addition, bibliometric analysis shows that the journal of financial counseling is the most productive journal researchers often go to on financial education; next, there is Journal of Consumer Affair. Of the 332 keywords used in the document, financial literacy, financial knowledge, and financial behavior are often identified. Recent themes identified in the last three years include financial inclusion, digital finance, and financial technology. This study provides a comprehensive overview of the state of research on financial education in digital finance for generation z in the transition period to lead to financial well-being. The results are particularly relevant for children studying financial education, given the rising levels of credit and impulsive purchases for Generation Z in the digital financial age, which exposes individuals to fast financial services and requires informed decision-making. This study helps academic researchers know the core of financial education and identify relevant areas that need to be investigated in future research.

Keywords: financial education, digital financial, generation-z, scopus database, bibliometric analysis

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Introduction

Every stage of human life requires financial resources to fulfill our needs, from birth to old age. Technological advancements and globalization have provided people with easier access to financial products and services, but this also complicates financial decision-making. To avoid financial mistakes, individuals must be digitally finance-savvy. Proper understanding and management of finances contribute to a more prosperous life. Good financial knowledge is essential for effective financial management. Many criminal activities occur today due to financial struggles, often resulting from a lack of sound financial knowledge. Hence, financial education in both formal and non-formal settings is crucial, and it should start at a young age to instill positive financial habits.

At the highest global policy level, governments have prioritized youth as a target for financial education efforts (OECD 2012). Past research has shown that financial education in elementary schools can improve student financial literacy, especially when delivered through innovative methods like a simulated classroom economy (Batty et al., 2020). Comparing financial education in schools, the primary finding is that "investing in the implementation of school financial education curricula does indeed impact financial knowledge, and to a smaller extent financial behavior" (Kaiser & Menkhoff, 2020). Financial education programs for young people have significant and robust effects on financial knowledge, behavior, related preferences, and personality traits associated with financial behavior. Overall, the evidence supports school-based financial education programs as highly effective in increasing financial knowledge among children and youth (Frisancho, 2020).

This study examines the influence of financial education from an early age on life's welfare. As finance has become increasingly digital, this research also explores digital finance in today's world. In this context, children and teenagers quickly adopt financial technology trends. There has been no prior research specifically investigating the dynamics of financial education for children and adolescents in the digital era. This paper seeks to address the following research questions: 1. What are the publication trends in financial education related to digital finance, considering authors, countries, citations, and keywords? 2. What research themes are influential in this area? 3. How has research on financial education and digital finance evolved in recent years, and what are the current trends? 4. What are the gaps and recommendations for future research?

Drawing from the data sources and methodologies described, this article investigates the significance of financial education in schools for preparing children for financially independent lives. Young people who achieve financial independence can enhance the well-being of their parents. The article concludes by summarizing the primary findings, along with outlining conclusions and potential directions for future development.

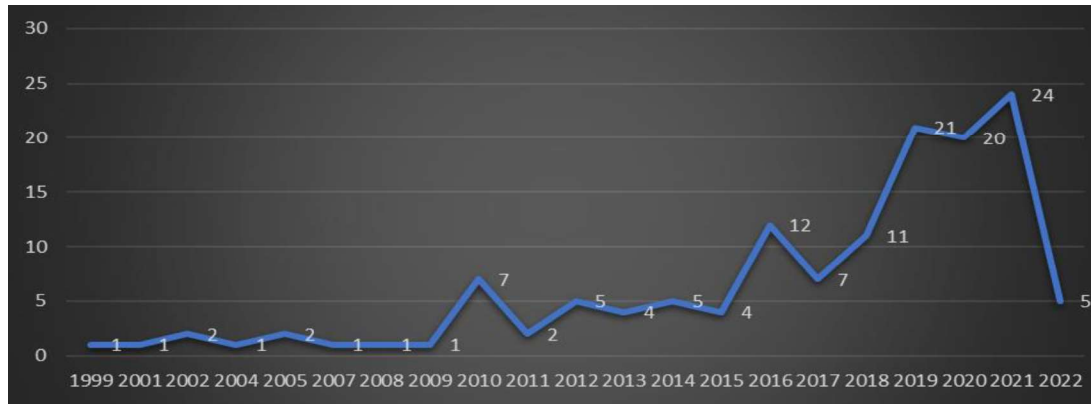


Fig. 1 Historical evolution of the article's publication, data source Scopus.

Method

The bibliometric approach examines specific scientific research by utilizing bibliographic data for performance analysis (Noyons, Moed, and Luwel 1999) and is often employed to evaluate research within a particular domain (Liao et al., 2018). As such, bibliometric analysis serves as a valuable instrument for academics or scholars to examine citations, keywords, co-citations, countries, and article authors in a specific research field.

In the initial phase of this systematic review, a literature keyword search was conducted to minimize potential biases from researchers. The chosen terms included "financial education," "digital financial," "financial literacy," "generation z," and "high school," covering all years. The final sample comprised 137 articles in total. Subsequently, a bibliometric mapping method using VOS Viewer software (van Eck & Waltman, 2010) was employed, allowing for the visualization of various networks derived from co-authorship, co-occurrence, and co-citation analyses.

Results and Discussion

Number of publications

An upward trend was observed in the number of publications analyzed. Fig.1 displays the progression of the annual count of academic articles on financial education, digital finance, and financial literacy for Generation Z and high school students. After the first article (Peng et al., 2007), this research area received relatively limited attention for the next decade. However, a noticeable growth trend emerged in 2016, with a significant increase in the number of publications. Another surge was observed in 2019, with the highest number of publications recorded in 2021 (n=24). Various studies (Kangwa, Mwale, and Shaikh, 2021); (Sconti, 2022); (Jain & Raman, 2022); (Yin Yin, Yusof, and Abe, 2022) have explored the connection between finance and digitalization, as the Covid-19 pandemic has transformed the landscape into a fully digital environment.

Publication by Author

A total of 340 distinct authors contributed to the 137 articles. As evident in Table 1, Danes emerges as the most prolific author. In four of his studies, he collaborates with multiple authors from the same institution, indicating strong networking within this research community. Lastly, it is worth noting that the United States stands as the most represented country.

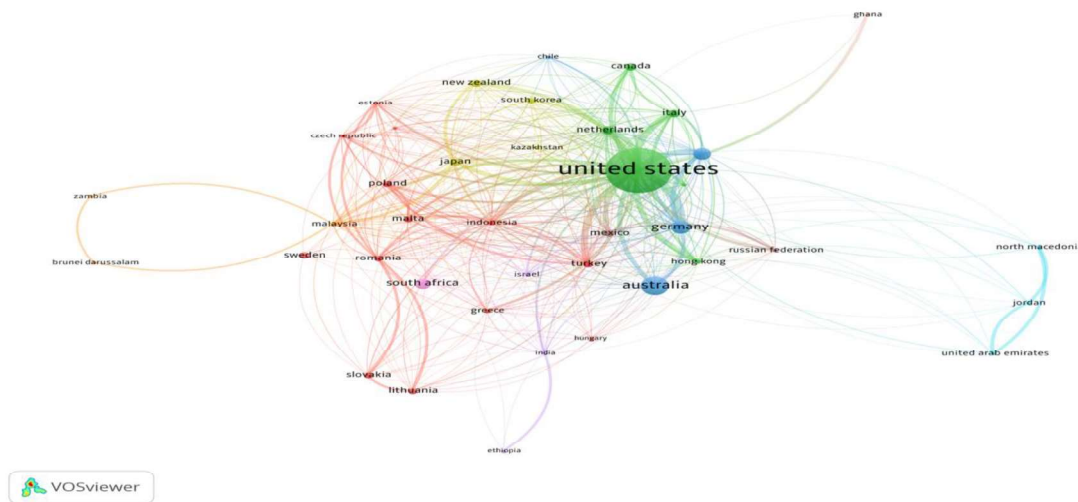


Fig. 2. Bibliographic coupling by country. Using VOSviewer software

Table 1. Most prolific authors in financial education and financial literacy

Rank	Name of Author	Country of Author	University/Institution	Number of publications
1	Danes S.M	USA	University of Minnesota	4
2	Gracia S	Mexico	UCC Business School	3
3	Xiao	USA	University of Rhode Island	3
4	Asarta	USA	University of Delaware	3
5	Walstad	USA	University of Nebraska - Lincoln	3
6	Bhattacharya	USA	California state University at Fullerton	3
7	Gill A	USA	California state University at Fullerton	3
8	Lucey T. A	USA	Illinois State university	3
9	Lusardi A	USA	George Washington University School of Business	3

Most cited articles

Table 2 presents the papers with the highest number of citations in absolute terms (>100). The most relatively cited paper, Lusardi and Mitchell (2010), can be used as a reference for literature reviews on this topic. Two of the most cited papers discuss the joint determination of financial education implementation in high schools. Peng et al. (2007) examine the impact of personal finance education provided in high schools and colleges, while Walstad, Rebeck, and MacDonald (2010) demonstrate that a well-designed and appropriately executed financial education program can positively and significantly enhance the financial knowledge of high school students, aligning with previous research findings.

Table 2. The 10 most frequently cited publications. Source: Author's

Rank	Title	Authors	Year	Source title	Cited by
1	Financial literacy among the young	Lusardi A., Mitchell O.S., Curto V.	2010	Journal of Consumer Affairs	547
2	Financial Socialization of First-year College Students: The Roles of Parents, Work, and Education	Shim S., Barber B.L., Card N.A., Xiao J.J., Serido J.	2010	Journal of Youth and Adolescence	298
3	The impact of financial literacy education on subsequent financial behaviour	Mandell L., Klein L.S.	2009	Journal of Financial Counselling and Planning	214
4	Understanding Economic Abuse in the Lives of Survivors	Postmus J.L., Plummer S.-B., McMahon S., Murshid N.S., Kim M.S.	2012	Journal of Interpersonal Violence	142
5	The impact of personal finance education delivered in high school and college courses	Peng T.-C.M., Bartholomae S., Fox J.J., Cravener G.	2007	Journal of Family and Economic Issues	128
6	The effects of financial education on the financial knowledge of high school students	Walstad W.B., Rebeck K., MacDonald R.A.	2010	Journal of Consumer Affairs	115
7	Consumer financial education and financial capability	Xiao J.J., O'Neill B.	2016	International Journal of Consumer Studies	104
8	Financial literacy of high school students	Mandell L.	2008	Handbook of Consumer Finance Research	101

Rank	Title	Authors	Year	Source title	Cited by
9	Financial planning curriculum for teens: Impact evaluation	Danes S.M., Huddleston-Casas C., Boyce L.	1999	Journal of Financial Counselling and Planning	86
10	Financial Education and the Debt Behaviour of the Young	Brown M., Grigsby J., Van Der Klaauw W., Wen J., Zafar B.	2016	Review of Financial Studies	81

Author’s Country

Table 3 reveals that the majority of the authors are affiliated with universities in the United States, with representation from other countries such as Germany, Mexico, and England. While many of the most influential institutions are American, the research focus in this area is relatively low. This suggests that interest in this topic is widespread among teams with diverse affiliations within these institutions, and as will be discussed later, there are some highly prolific authors.

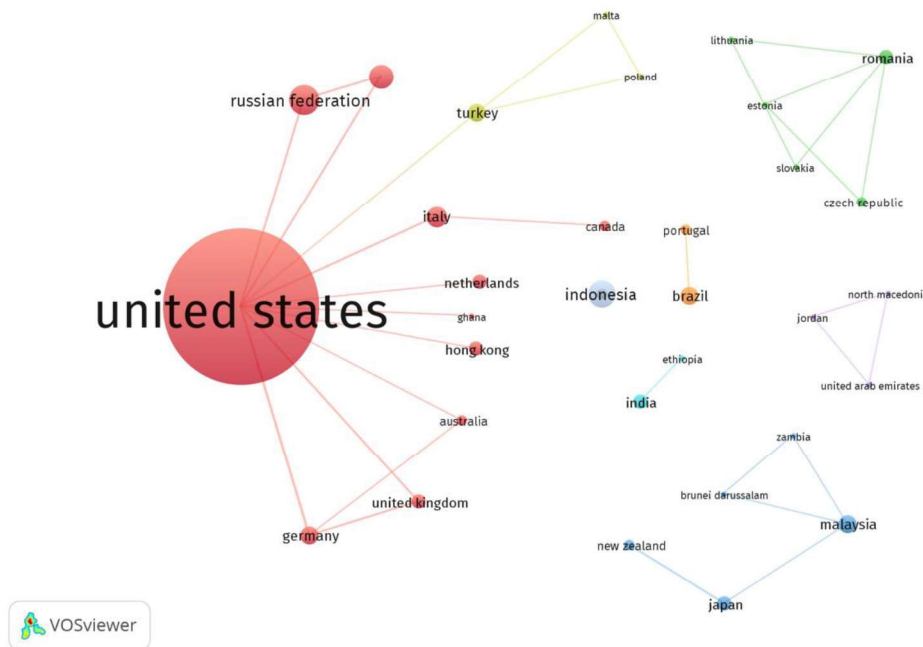


Fig. 3. Co-authorship by country, using VOSviewer software

Figure 3 displays that among the 44 countries of author origin, the largest cluster comprises 14 countries, represented by the red cluster. These include the United States, Germany, the United Kingdom, Australia, Hong Kong, Ghana, the Netherlands, Italy, Canada, the Russian Federation, Turkey, Malta, and Poland.

Table 3. Distribution of articles by most influential countries with the greatest total link strength.

Country	Document	Citations	Total Link Strength
United State	69	2709	16
Germany	4	134	6
Mexico	6	26	4
Romania	3	22	4
Russian Federation	8	7	4
United Kingdom	3	101	4
Italy	5	36	3
Japan	3	37	3
Malaysia	4	6	3
Turkey	4	27	3

Focusing on the most prolific journals, Figure 4 presents the sources with the highest number of articles on the research topic, along with the main areas to which the articles are connected. The journals are linked with various research areas, including economics, finance, counseling, family issues, and consumer affairs. Therefore, financial education and digital finance studies currently sit at the intersection of financial counseling, consumer affairs, and economic behavior. It is evident that there are no specialized publications exclusively dedicated to financial education and digital finance, indicating a potential gap to be addressed in future research.

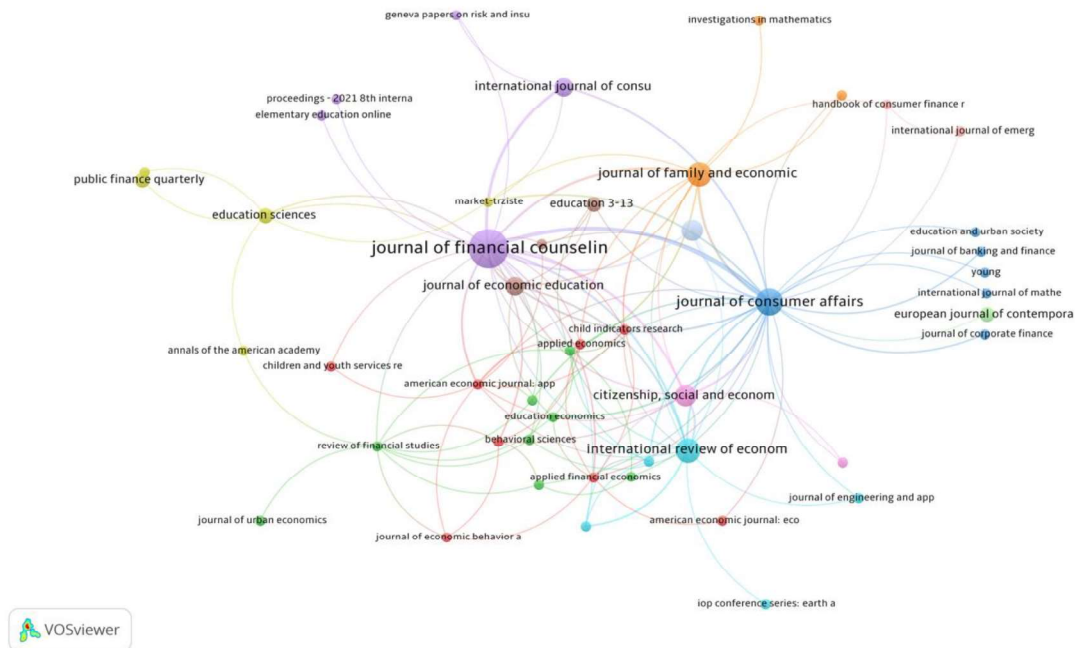


Fig. 4. Citation network of source, using VOSviewer software.

Thematic of the reached field

In our analysis of the 137 articles, we identified 332 keywords, of which 56 met the threshold of at least two occurrences. The most frequently occurring keywords are "financial literacy" (70 occurrences, 121 total link strength), "financial education" (38 and 73), "high school" (6 and 11), and "generation z" (5 and 9), while "digital financial" does not appear in the core set.

The "financial education" node in the red cluster exhibits a thicker line with "financial literacy" and a thinner line with "personal finance," "high school," "college student," "consumer education," "generation z," and "financial technology." This node is also closely linked to "economic education," "curriculum," "financial mathematics," "financial knowledge," and "financial behavior," which belong to the green cluster. The "savings" node in the purple cluster is also closely related to "money management," indicating that these two keywords are an integral aspect of the financial literacy and financial education literature.

The green cluster pertains to research fields associated with financial education. Therefore, words such as "attitudes towards money," "teen finances," and "evaluation" are highlighted as they are related to one another. The words in the red cluster are particularly noteworthy as they elucidate the impact of financial education when it is integrated with Generation Z to equip them with the necessary skills to achieve financial independence.

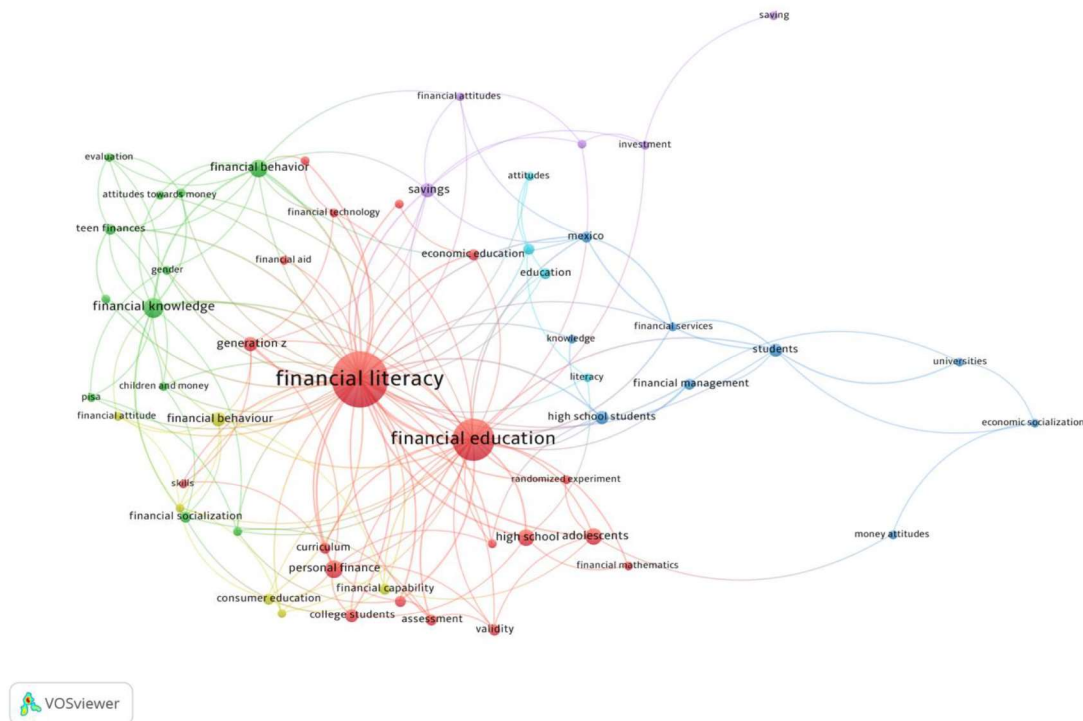


Fig. 5. Co-word analysis. Prepared using VOSviewer software

Lastly, the blue keyword group can be linked to financial education, as "students," "universities," "economic socialization," and "money attitude" are the most prominent keywords. The presence of these comparatively lower-frequency keywords suggests the potential for further development in this area of study.

Recent research trends

To identify the latest research trends and prominent topics, we conducted an in-depth analysis of articles published on the subject in 2021-2022, extracting the primary research themes, which we have summarized in Table 4.

Table 4. Research Trends 2021 & 2022

No	Reference	Title	Objective
1	(Khan et al. 2021)	Do financial literacy and financial education influence smoking behaviour in the United States?	Examines the ability of rational decision-making to reduce irrational behavior in smoking behavior in the United States, related to the effect of financial literacy and financial education
2	(Jiang et al. 2021)	The nexus between digital finance and economic development: Evidence from China	Investigate the influence of digital finance on economic growth and study the mechanisms of its influence
3	(Ahmad et al. 2021)	Digital financial inclusion and economic growth: provincial data analysis of China	Examines the impact of digital financial inclusion and human capital on China's regional economic growth.
4	(Shankar, Vinod, and Kamath 2022)	Financial well-being – A generation Z perspective using a Structural Equation Modelling approach	Assess the financial well-being of Indian Gen Z students concerning financial literacy, financial fragility, financial behaviour, and financial technology.
5	(Johan, Rowlingson, and Appleyard 2021)	The Effect of Personal Finance Education on The Financial Knowledge, Attitudes and Behaviour of University Students in Indonesia	They measured the impact of a 14-week personal finance education course on financial knowledge, attitudes, and behavior.
6	(Rodriguez-Raga and Martinez-Camelo 2022)	Game, guide or website for financial education improvement: Evidence from an experiment in Colombia schools	Evaluates the impact of a financial education program consisting of three different learning tools for children (6–18) in Bogota, Colombia, in 2018.
7	(Maldonado, de	The effects of parental involvement in	To provide causal evidence on

No	Reference	Title	Objective
	Witte, and Declercq 2022)	homework: two randomised controlled trials in financial education	parental involvement's effects on student outcomes in a financial education course based on two randomized controlled trials with a total of 2779 students from grades 8 and 9 in Flanders.
8	(Ling and Pang 2022)	A Vignette-Based Transformative Multiphase Mixed Methods Interventional Study Featuring Venn Diagram Joint Displays: Financial Education With Hong Kong Early Adolescent Ethnic Minority Students	To investigate the social justice problem of poverty in financial education with Hong Kong early adolescent ethnic minority students.
9	(Kaiser et al. 2021)	Financial education affects financial knowledge and downstream behaviours	Studying the rapidly growing literature on the causal effects of financial education programs in a meta-analysis of 76 randomized experiments with a total sample size of over 160,000 individuals.
10	(Kim, Lee, and Lee 2021)	Student Loans and Financial Satisfaction: The Moderating Role of Financial Education	Examined the relationship between holding a student loan and financial satisfaction and financial education's moderating role using the 2015 National Financial Capability Study dataset.
11	(Zhang, Lu, and Xiao 2021)	Can financial education improve consumer welfare in investment markets? Evidence from China	Examines the potential impact of financial education programs offered by financial institutions on individuals' investment diversification.
12	(Heo, Lee, and Rabbani 2021)	Mediation Effect of Financial Education between Financial Stress and Use of Financial Technology	Investigated the relationship between financial stress and financial technology and included the mediating role of financial knowledge based on the ABC-X model.
13	(de Beckker, de Witte, and van Campenhout	The effect of financial education on students' consumer choices: Evidence from a randomized experiment	Investigate this claim by analysing the impact of a financial education course on consumer choices made by 688

No	Reference	Title	Objective
	2021)		students in the 8th and 9th grades.
14	(Feng, Zhang, and Li 2022)	Environmental decentralization, digital finance and green technology innovation	They analyze the impact of digital finance on green technology innovation.
15	(Amagir et al. 2022)	SaveWise: The impact of a real-life financial education program for ninth grade students in the Netherlands	Experimental study with a pre-post and follow-up design evaluates the financial education program "SaveWise" for ninth grade students in the Netherlands (n=713)
16	(Hartmann, de Cássia Pistóia Mariani, and Maltempi 2021)	Financial education in high school: An analysis of didactic activities related to uniform periodic series from the point of view of critical mathematics education [Educação Financeira no Ensino Médio: Uma análise de atividades didáticas relacionadas a séries periódicas uniformes sob o ponto de vista da Educação Matemática Crítica]	Identify and analyse didactic activities developed in High School which may involve decision making in economic-financial situations related to uniform periodic series.
17	(García-Santillán, Zamora-Lobato, and Molchanova 2021)	Money Management, Savings and Investment as Central Topics in Financial Education: How Do High School Students Perceive Them?	Analysing how high school students perceive the topics of money management, savings and investment.
18	(Lee et al. 2021)	The Money Smart for Older Adults Program: A Qualitative Study of the Participants' Financial Well-Being	Examine the financial circumstances of older adults in the program and explore how it could better support their financial well-being.
19	(Valenzuela Montoya, López Torres, and Aguilar Sandoval 2022)	Debt and financial education in university students [Endeudamiento y educación financiera en estudiantes universitarios]	Determining the relationship that indebtedness has with financial education.
20	(Luo, Luo, and Lv 2022)	Can Digital Finance Contribute to the Promotion of Financial Sustainability? A Financial Efficiency Perspective	Summarizes the theoretical mechanism of digital finance to improve financial efficiency and sustainability.
21	(lo Prete 2022)	Digital and financial literacy as	They are assessing the implication of

No	Reference	Title	Objective
		determinants of digital payments and personal finance	digitalization for individual investors who can access digital financial products and markets without financial literacy.
22	(Baulkaran 2022)	Personal bankruptcy and consumer credit delinquency: the case of personal finance education	Examine the impact of personal finance education on credit delinquency.
23	(Sconti 2022)	Digital vs. in-person financial education: What works best for Generation Z?	An experiment that involved implementing a financial education program called "Futuro Sicuro" with a sample of 650 High School students in Italy.
24	(Seebeck and Wolter 2022)	Financial education of founders, is it important? A case study of Jacobs Startup Competition	To examine the effect of founders' financial education on the quality of financial information provided to investors and on the founding team's perceived capabilities.
25	(Tian and Wang 2022)	Financial literacy education and high school students - overview, analysis, suggestions and implications	Analyses the importance and implications of financial literacy education by providing: 1) an overview of four countries' high school financial education and through empirical analysis; 2) identified the importance that financial literacy education plays in improving personal financial capabilities; 3) raised helpful suggestions to improve the outcomes of financial literacy education; 4) ends with a discussion on the implications of high school financial literacy education.
26	(Pakhnenko et al. 2021)	Digitalization of financial service in European countries: Evaluation and comparative analysis	Evaluate the level of digitalization of financial services (DFSI) based on three components: digital inclusion, financial inclusion, and digital financial services.
27	(López-	Financial education in Colombia:	They identified the opinions of the

No	Reference	Title	Objective
	Rodríguez and López-Ordoñez (2022)	challenges from the perception of its population with socioeconomic vulnerability	vulnerable population in Colombia regarding money-saving based on the realities of their financial education.
28	(Kalmi and Rahko 2022)	The effects of game-based financial education: New survey evidence from lower-secondary school students in Finland	The effects of game-based financial education approaches using a sample of lower-secondary school students in Finland
29	(Gerrans 2021)	Undergraduate student financial education interventions: Medium term evidence of retention, decay, and confidence in financial literacy	To analyze teaching for delivering financial education through university students as they seek and gain independence, including financial independence.
30	(Agasisti et al. 2021)	Financial Education during COVID-19 - Assessing the effectiveness of an online programme in a high school	They are investigating the effectiveness of financial education intervention in an Italian high school conducted during the period of school closure due to COVID-19.
31	(Lin and Zhang 2022)	The impacts of digital finance development on household income, consumption, and financial asset holding: an extreme value analysis of China's microdata	To examine digital finance development's roles in household income, consumption, and financial asset holding from an extreme value theory perspective..
32	(Yue et al. 2022)	The rise of digital finance: Financial inclusion or debt trap?	The impact of digital finance on households, while digital finance has brought financial inclusion, it has also increased the risk of households falling into a debt trap.
33	(Wagner and Walstad 2022)	Gender differences in financial decision-making and behaviours in single and joint households	They investigate gender differences in household financial behavior using data from the 2018 National Financial Capability Study, a large and nationally representative survey about adults' financial behavior, knowledge, and attitudes.
34	(Ha 2022)	Effects of digitalization on financialization: empirical evidence from European countries	Examine the association of digital transformation and financial development.

No	Reference	Title	Objective
35	(Coda Moscarola and Kalwij 2021)	The Effectiveness of a Formal Financial Education Program at Primary Schools and the Role of Informal Financial Education	Examines the effectiveness of a formal financial education program for improving the financial literacy of primary school children and how this effectiveness is influenced by informal financial education provided by parents, such as giving pocket money and discussing money matters.
36	(Horwitz et al. 2021)	Workplace Financial Education and Change in Financial Knowledge: A Quasi-Experimental Approach	Investigate the relationship between adult participation in a comprehensive workplace financial education program and changes in financial knowledge levels.
37	(Santos, Rodrigues, and Lanza 2021)	Impacts of financial education on the reduction of economic vulnerability of low income elderly [Impactos da educação financeira na redução da vulnerabilidade econômica de idosos de baixa renda]	Conduct and evaluate the implementation of the Financial education program for adults, and see its effect on reducing the economic vulnerability of low-income elderly in Palmas_TO
38	(Delgadillo and Lee 2021)	Association between Financial Education, Affective and Cognitive Financial Knowledge, and Financial Behaviour	They examined the relationship between financial education participation and affective and cognitive financial knowledge.
39	(Ghafoori, Ip, and Kabátek 2021)	The impacts of a large-scale financial education intervention on retirement saving behaviours and portfolio allocation: Evidence from pension fund data	Analyse the causal impact of a large-scale financial education intervention on retirement saving behaviors and asset allocation decisions.
40	(Salas-Velasco, Moreno-Herrero, and Sánchez-Campillo 2021)	Teaching financial education in schools and students' financial literacy: A cross-country analysis with PISA data	Assessing the effectiveness of the Financial Education curriculum in schools in all countries participating in PISA 2012.

Conclusion

The results of our analysis indicate that financial education has been a topic of interest for high-level academics over the past 25 years, with a noticeable increase in publications during this time. However, the main limitation of this paper stems from the selection of documents for analysis. While we collected all publications in this

research stream from the Scopus database, some relevant studies may have been excluded, as some documents analyzed may not include keywords that could slightly alter the analysis results. The ongoing digitalization of finance is causing significant changes in financial management that could have long-term consequences for individuals and society. The question remains whether citizens are adequately prepared for this rapid process of change. Generation Z children will likely adapt more quickly to these changes, but can they manage their finances effectively? Will digitization make them more efficient or even more wasteful? The answers to these questions will significantly influence decisions and behavior as economic actors. Financial education plays an essential role in families and society. Children who study financial education will be better prepared for the future, and it will be easier for them to achieve financial independence. Learning about financial education from an early age can also improve parents' welfare. Moreover, there is a need for further research in the field of financial education and digital finance. Therefore, we hope that there will be a greater interest in discussing this topic in the future.

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