

Menberu, Abebe Walle

Article

Technology-mediated financial education in developing countries: a systematic literature review

Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Menberu, Abebe Walle (2024) : Technology-mediated financial education in developing countries: a systematic literature review, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-38, <https://doi.org/10.1080/23311975.2023.2294879>

This Version is available at:

<https://hdl.handle.net/10419/325938>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Technology-mediated financial education in developing countries: a systematic literature review

Abebe Walle Menberu

To cite this article: Abebe Walle Menberu (2024) Technology-mediated financial education in developing countries: a systematic literature review, *Cogent Business & Management*, 11:1, 2294879, DOI: [10.1080/23311975.2023.2294879](https://doi.org/10.1080/23311975.2023.2294879)

To link to this article: <https://doi.org/10.1080/23311975.2023.2294879>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 06 Feb 2024.



Submit your article to this journal [↗](#)



Article views: 5352



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 11 View citing articles [↗](#)

Technology-mediated financial education in developing countries: a systematic literature review

Abebe Walle Menberu 

Accounting and Finance, Bahir Dar University, Ethiopia

ABSTRACT

Financial education mediated by technology has the potential to reduce disparities in financial literacy in developing countries. Technology-mediated financial education provides numerous advantages, such as scalability, cost-effectiveness, adaptability and the capacity to reach underserved populations. Nevertheless, it is important to acknowledge the existence of certain obstacles in this context. These challenges encompass issues such as insufficient infrastructure, disparities in access, language and cultural barriers, as well as the exclusion of marginalized communities. This research article critically examines the existing body of literature on Technology mediated financial education in developing countries and highlights three significant domains that warrant further investigation: comprehensive evaluations of long-term effects, comparative analyses of different delivery approaches and the development of inclusive research methodologies. The research also provides suggestions for policymakers, educators and practitioners, which encompass investing in digital infrastructure, engaging in collaborative efforts with stakeholders, designing customized interventions and implementing comprehensive monitoring and evaluation frameworks.

ARTICLE HISTORY

Received 27 July 2023
Revised 7 December 2023
Accepted 11 December 2023

KEYWORDS

Financial literacy;
technology-mediated
financial education;
developing countries

REVIEWING EDITOR

David McMillan, Bahir Dar
University, Accounting
and Finance Ethiopia

SUBJECTS

Economics; Finance;
Business, Management
and Accounting

Introduction

Financial literacy plays a pivotal role in fostering financial inclusion and promoting economic advancement, particularly in developing nations characterized by limited availability of formal financial services and products (Kefela, 2010). The utilization of technology to facilitate financial education has emerged as a promising strategy to address the disparity in financial knowledge and empower individuals in these specific areas (Olsen & Whitman, 2011). So, the objective of this systematic literature review is to investigate the current body of research pertaining to technology-mediated financial education programs in developing nations. The review assess the efficacy, impact and critical factors contributing to the success of such programs.

Research findings indicate that individuals who have received financial education demonstrate a greater propensity for possessing elevated levels of financial literacy in comparison to those who have not undergone any form of financial education. Moreover, the results indicate that individuals with lower levels of education and income exhibit higher predicted probabilities in relation to financial education, thereby highlighting the particular significance of financial education for this specific demographic cohort (Wagner, 2019). The need for financial education within the American population is often demonstrated by alarming rates of bankruptcy, high levels of consumer debt, insufficient savings rates and a range of negative outcomes associated with suboptimal family financial management and limited financial literacy levels (Fox et al., 2005). Similarly, financial education plays a pivotal role in the advancement of developing nations due to various compelling rationales. These include but are not limited to poverty alleviation,

CONTACT Abebe Walle Menberu  abebebdu@gmail.com  Accounting and Finance, Bahir Dar University, Ethiopia.

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

enhancement of financial well-being, prevention of wasteful expenditure, instilling the significance of financial literacy, fostering accessibility to financial resources and facilitating effective financial planning (Kefela, 2010; Kokkizi et al., 2017; Lusardi, 2019). Despite this, the state of financial education remains nascent in numerous countries, exhibiting limited efficacy in enhancing the practical application of financial skills among young individuals (Jerrim et al., 2022).

It is important to note that financial literacy is a multifaceted subject, as is financial education, that exhibits variations depending on regional and demographic factors (He, 2020; Klapper et al., 2015; Lusardi & Mitchell, 2011). Financial literacy, as defined by the Organization for Economic Cooperation and Development/International Network on Financial Education (OECD/INFE), encompasses a comprehensive set of attributes including awareness, knowledge, skills, attitudes and behavior that are essential for individuals to make informed and prudent financial choices, ultimately leading to the attainment of personal financial well-being. The impact of financial literacy extends to various aspects of individuals' financial choices, both in the short term and in the long term. Research has shown that countries with lower levels of financial literacy tend to exhibit suboptimal spending habits, inadequate financial planning and a greater reliance on costly borrowing methods and ineffective debt management strategies (Lusardi, 2019; Lusardi & Mitchell, 2011). Efforts are being made to establish the financial sector in developing countries with the aim of promoting financial literacy among their customers (Kefela, 2010). Financial literacy tends to be comparatively lower in developing nations when compared to developed and advanced economies, particularly in Western Europe and English-speaking countries (University of Illinois System, 2023). The selection of technology-mediated financial education by developing nations is influenced by various factors. These factors commonly include the desire to overcome physical infrastructure obstacles and reach a wider population, the cost-effectiveness compared to traditional methods, the ability to reach remote areas and marginalized populations lacking access to traditional education systems, and the capacity to customize the education to address the specific needs and challenges faced by developing nations (World Bank, 2022). Another crucial determinant is the COVID pandemic.

The utilization of digital technology and online platforms for financial education amidst the COVID-19 pandemic has yielded favorable outcomes. Sabirov et al. (2022) discovered that the utilization of digital technology enhanced educational discourse settings and augmented students' enthusiasm and engagement in the learning process. In a study conducted by Agasisti et al. (2022) at an Italian high school, it was discovered that participating in an online financial education course had a considerable positive impact on students' financial knowledge. Similarly, in a study conducted by Choi et al. (2023), a digital financial education program for college students was assessed. The findings revealed that the program enhanced individuals' confidence in managing their finances and also alleviated the negative effects of financial difficulties caused by the COVID-19 pandemic. The study conducted by Makhoulf and Alani (2022) examined the influence of e-learning on accounting education. It revealed that although there were certain difficulties, the utilization of technology had a beneficial effect on the effectiveness of teaching and the prospects of accounting education. These publications indicate that leveraging technology and online platforms for financial education during the COVID-19 pandemic has proven to be efficacious in enhancing financial literacy and competencies.

The swift progression of digital technology and the extensive integration of mobile phones in developing nations present distinct possibilities for delivering financial education through innovative means (Andrews et al., 2011). According to Valencia et al. (2018), the utilization of technology in financial education has the capacity to extend its reach to a wider demographic, encompassing individuals residing in remote or underserved regions. Furthermore, technology-mediated financial education can be modified to accommodate diverse cultural and linguistic contexts.

The study centers on the importance of technology-mediated financial education (TMFE) in resolving the obstacles encountered by developing nations in delivering conventional financial education initiatives, as shown by the gathered scholarly articles. Birochi and Pozzebon (2016) highlights the significance of customized critical financial education that utilizes information and communication technologies (ICTs) to enhance financial inclusion and promote social empowerment among micro-entrepreneurs with low incomes. The research indicates that the utilization of information and communication technology (ICT) in financial education has the potential to alleviate conflicts arising from the usage of standardized ICT applications and facilitate societal change. In his seminal work, Greenspan (2003) draws attention to the

interconnectedness of education, financial literacy and the adoption of emerging financial technology. The findings of the study indicate a positive correlation between greater levels of education and the utilization of electronic financial services. This highlights the significance of financial and economic education in facilitating well-informed decision-making. In the study conducted by Temizel and Özgüler (2015), the author critically evaluates the importance of financial education within modern communities and investigates various global efforts aimed at enhancing financial literacy. Gaining a comprehensive understanding of the current state of research in this particular field can provide valuable insights for policymakers, practitioners and researchers, enabling them to make informed decisions regarding optimal strategies, potential obstacles and avenues for future exploration.

In light of the growing enthusiasm surrounding technology-mediated financial education initiatives, it is imperative to evaluate the efficacy and results of such interventions within developing nations. The efficacy of the program may exhibit variability contingent upon factors such as program design, levels of digital literacy, cultural norms and accessibility to digital devices (Choudhary & Bansal, 2022).

The following studies collectively provide evidence on the fundamental scientific justification for using technology-mediated financial education in developing nations. For example, Mori (2021) emphasizes the capacity of technology to expand the reach of financial education and foster financial resilience. Financial education is regarded as a means to foster financial progress, enhance financial judgment, encourage financial inclusivity and bolster economic advancement (Nicolăescu & Toderăşcu, 2023). According to Vincenzo and Jayadi (2023), the utilization of financial education applications has a beneficial impact on investment choices and this relationship is mediated by an increase in financial knowledge. Furthermore, there is a necessity to enhance the caliber of education in financial technology to fulfill the requirements of the job market and promote transformative advancements in the economy (Tsyganov et al., 2020). The findings as a whole substantiate the notion that technology-facilitated financial education can have a pivotal impact on advancing financial development and inclusion in developing nations. Conducting a systematic literature review is imperative to synthesize and consolidate the available body of knowledge, discern areas where knowledge is lacking and furnish evidence-based insights that can inform the development of future programs.

This study aimed to evaluate several research gaps, including the long-lasting effects of technology-enhanced financial education, the comparison of different delivery methods, the use of inclusive methodologies and equity considerations, cross-national investigations, comprehensive assessment of financial literacy and the cultural relevance of financial education. The following paragraphs will address these research shortcomings.

The literature indicates that technology can be used to provide financial education. Long-term investigations are crucial to evaluate the enduring effects of technology-driven financial education efforts. This study aims to determine if these treatments have long-lasting effects on knowledge acquisition and behavior (Hammer & Siegfried, 2023).

Despite the wide range of technological tools used in financial education, such as mobile apps, online platforms and interactive voice response systems, there is a lack of comparative efficacy analyses for these technologies. Further research should provide evidence-based recommendations for choosing the most efficient distribution tactics, taking into account the attributes of the target audience and the specific contextual needs (Kim et al., 2017).

The academic discourse emphasizes the importance of creating inclusive approaches that address the needs of excluded individuals. Nevertheless, further inquiry is necessary to address difficulties pertaining to computer literacy, linguistic proficiency and cultural suitability. Researching the effectiveness of solutions to tackle the digital divide and promote digital inclusion is crucial (Kede & Zogning, 2022).

Financial literacy holds worldwide significance, although there is a dearth of comparative research across many nations. These endeavors can illuminate the relationship between financial education and financial literacy in multiple countries, offering valuable understanding of how cultural and socio-economic factors impact financial literacy (Jerrim et al., 2022).

The review assesses the influence of the digital divide on the level of financial knowledge in disadvantaged communities. However, due to a lack of information, it is necessary to conduct more research on how limited access to technology affects people's understanding of financial matters. Further inquiries should examine methods for rectifying this discrepancy (Wright, 2019). The analysis emphasizes that

financial literacy is intricate, influenced by factors such as income, education and resources. Future research may aim to provide a comprehensive framework for assessing financial literacy by considering multiple characteristics, thereby providing a more thorough comprehension of an individual's financial literacy (Wagner, 2019). The review emphasizes the significance of integrating cultural relevance into financial education. Additional research might explore the effects of cultural contexts on financial education initiatives and the impact of culturally sensitive content on financial literacy (Birochi & Pozzebon, 2016). To fill these gaps, the research will be guided by the following research questions.

This literature review, therefore, intends to discuss the following questions.

1. What is the present status of research pertaining to technology-mediated financial education programs in developing nations?
2. What are the primary subjects and motifs explored in scholarly literature pertaining to technology-facilitated financial education within these geographical areas?
3. What are the primary determinants of success and obstacles encountered in the implementation of technology-mediated financial education programs in developing nations?
4. What is the influence of technology-facilitated financial education on the outcomes of financial literacy in developing nations?
5. In what ways do technology-mediated financial education programs tackle the distinct cultural, linguistic and contextual obstacles encountered in developing nations?

The primary aims of this systematic literature review are as follows:

1. to identify and analyze pertinent literature on technology-based financial education initiatives in developing nations.
2. to systematically classify and integrate the primary themes and discoveries found in the existing body of literature pertaining to technology-facilitated financial education.
3. to evaluate the efficacy and influence of technology-based financial education initiatives on enhancing financial literacy outcomes in developing nations.
4. to ascertain the primary factors contributing to the success and obstacles encountered when implementing technology-based financial education interventions in the aforementioned regions.
5. to offer empirically supported suggestions for policymakers, practitioners and researchers to develop and execute technology-driven financial education initiatives in developing nations.

Methodology

The current investigation undertakes a comprehensive analysis of existing scholarly literature to identify and evaluate relevant research papers concerning the utilization of technology in financial education within developing nations. The methodology comprises the following stages:

To respond to these inquiries, an extensive review of the existing literature was conducted to identify relevant studies pertaining to technology-based financial education methods, with particular focus on their application in developing countries. In order for an article to meet the criteria for inclusion in our review, it is imperative that its primary emphasis is on financial education as a central variable or subject matter. A comprehensive inquiry was conducted, incorporating a range of esteemed scholarly databases including ABIInform, EBSO Host, Emerald, Google Scholar, Science Direct, ProQuest and Web of Science. The search was performed using the specific keywords 'financial literacy', 'technology-mediated financial education' and 'developing countries'. Furthermore, a thorough analysis was conducted on the bibliographies of all the obtained articles to determine whether any additional scholarly sources were overlooked during our initial database search.

The review undertaken in this study encompasses a clearly defined temporal scope of 18 years, specifically ranging from 2005 to 2023. The significance of the year 2005 lies in the publication of a scholarly article by Fox et al. (2005), which introduced a comprehensive framework for evaluating financial education programs. This framework encompasses five distinct tiers. The article made a significant contribution

by presenting a comprehensive framework that can be utilized for the evaluation of financial education initiatives.

A thorough examination has been undertaken on a collective of 170 scholarly journals that focus on technology-mediated financial education and financial literacy. The sample encompassed a variety of scholarly articles, including empirical papers, conceptual papers and literature reviews. After analyzing the patterns identified in these publications, it is apparent that the year 2010 represented a notable milestone in the field of financial education with regards to technology. Before this time, it predominantly existed as a theoretical notion, but subsequently developed into a discrete field of study.

The literature review findings

Introduction

The importance of financial literacy for individuals and societies

Financial literacy plays a pivotal role in contemporary society, conferring substantial advantages upon both individuals and broader communities. This section presents a comprehensive examination of the significance of financial literacy and its ramifications for both individuals and societies, based on pertinent scholarly sources.

Several scholarly investigations have elucidated the favorable correlation existing between financial literacy and the financial welfare of individuals (Fernandes et al., 2014; Hastings et al., 2013; Lusardi & Mitchell, 2014). According to Bucher-Koenen et al. (2017), individuals who possess financial literacy are more inclined to make well-informed choices pertaining to saving, investing and borrowing, thereby resulting in improved financial outcomes. According to Lusardi and Tufano (2015), individuals belonging to this group demonstrate elevated levels of saving. Additionally, Remund (2010) finds that they are less prone to experiencing financial stress. Furthermore, Lusardi and Mitchell (2007) observe that they exhibit enhanced retirement planning abilities. Additionally, there is a correlation between financial literacy and heightened levels of financial confidence and empowerment, as demonstrated by the research conducted by Hastings et al. (2013).

In addition to its personal advantages, financial literacy holds considerable societal ramifications. According to Klapper et al. (2012), possessing sufficient financial knowledge has the potential to positively impact economic stability and foster growth. There is evidence to suggest that individuals who possess a strong understanding of financial matters are more inclined to engage with the formal financial system. This, in turn, has the potential to foster greater financial inclusion and contribute to overall economic development (Beck et al., 2004; Demirgüç-Kunt & Klapper, 2012). Furthermore, there is a correlation between financial literacy and enhanced consumer protection outcomes, as individuals possess a greater ability to comprehend and effectively engage with financial products and services (Lusardi et al., 2011).

In addition, it is important to acknowledge that financial literacy serves as a crucial factor in addressing socioeconomic disparities. Individuals who are experiencing economic disadvantage face heightened susceptibility to financial difficulties and exploitative financial behaviors (Hilgert et al., 2003). The empowerment of marginalized populations can be achieved through the enhancement of financial literacy, which involves providing them with the necessary knowledge and skills to make informed financial decisions and ultimately improve their financial well-being (Fernandes et al., 2014).

To leverage these advantages, the promotion of financial literacy has garnered attention from policymakers, educators and financial institutions on a global scale (OECD, 2020; World Bank Group, 2014). Financial literacy initiatives encompass a range of strategies, such as educational programs, workplace interventions and technology-mediated approaches, with the goal of enhancing financial knowledge and skills among diverse populations.

Need for effective financial education programs in developing countries

Financial education programs play a crucial role in addressing the distinct challenges and requirements of individuals residing in developing nations. This section presents a comprehensive examination of the

necessity for proficient financial education programs in these particular contexts, based on pertinent scholarly sources.

Developing nations encounter unique financial obstacles, such as restricted availability of formal financial services, elevated poverty rates and inadequate financial infrastructure (Demirgüç-Kunt & Klapper, 2012; World Bank Group, 2014). The aforementioned challenges highlight the increased necessity for the implementation of efficient financial education initiatives. These programs aim to equip individuals with the knowledge and skills required to make well-informed financial choices, enhance their financial welfare and ultimately contribute to the broader economic advancement.

There is a widespread presence of limited levels of financial literacy in numerous developing nations (Lusardi & Mitchell, 2014; OECD, 2020). Previous research has indicated that there is a notable deficiency in financial knowledge and comprehension, particularly within marginalized communities (Bucher-Koenen et al., 2017; Fernandes et al., 2014). Insufficient knowledge and understanding of financial matters can result in adverse financial conduct, including excessive debt, inadequate savings and susceptibility to exploitative financial schemes (Hilgert et al., 2003; Lusardi et al., 2011).

Efficient financial education programs have the capacity to tackle these obstacles by providing individuals with the requisite knowledge and skills to effectively navigate the complex financial terrain. These programs have the capacity to encompass a variety of subjects, such as budgeting, saving, credit management, investment and entrepreneurship. These programs seek to enhance individuals' financial well-being by equipping them with a solid understanding of financial literacy, thereby improving their capacity to make prudent financial choices.

Additionally, the implementation of financial education programs has the potential to enhance financial inclusion within developing nations. According to Beck et al. (2004), the implementation of these programs can foster an enhanced comprehension of formal financial services, such as banking and insurance, thereby motivating individuals to engage with and make use of these services. Individuals who have access to financial services are more capable of effectively managing financial risks, accumulating assets and engaging in economic endeavors. This, in turn, leads to a reduction in poverty levels and promotes overall economic growth (Demirgüç-Kunt & Klapper, 2012).

The development and implementation of financial education programs in developing nations encounter distinct obstacles. The challenges encompassed in this context are characterized by constraints in resources, barriers arising from cultural and linguistic differences, as well as the necessity for content and delivery methods that are contextually appropriate (OECD, 2020; World Bank Group, 2014). In addition, effectively engaging with marginalized populations, including rural communities and women, necessitates the implementation of tailored strategies that take into account their distinct requirements and contexts (Bucher-Koenen et al., 2017; Fernandes et al., 2014).

To tackle these challenges, financial education programs in developing nations frequently utilize innovative strategies, such as interventions facilitated by technology. The utilization of technology, specifically mobile phones and online platforms, has the potential to address challenges related to accessibility, extend services to remote populations and facilitate the widespread dissemination of financial education (Klapper et al., 2012; OECD, 2020). The utilization of technology-mediated strategies has demonstrated potential in enhancing financial knowledge and behavior across diverse settings, rendering them notably pertinent within the framework of developing nations.

Introduction to technology-mediated financial education

The utilization of technology in financial education has emerged as a promising strategy to enhance individuals' understanding of financial matters and ultimately improve their financial outcomes. This section presents a comprehensive examination of technology-mediated financial education and its importance, based on pertinent scholarly sources.

The concept of technology-mediated financial education pertains to the utilization of digital technologies, including mobile applications, online platforms and interactive tools, for the purpose of disseminating financial education content and fostering the process of learning (Atkinson & Messy, 2012). According to the OECD (2019), the utilization of this approach presents various benefits in comparison to conventional methodologies, such as enhanced accessibility, scalability and customization. The

widespread availability of mobile devices and internet connectivity has led to the emergence of technology-mediated methods that have the capacity to reach wider demographics, including individuals residing in remote locations and marginalized communities (Klapper et al., 2012; Morawczynski & Pickens, 2009).

Multiple research studies have provided evidence supporting the efficacy of technology-mediated financial education in enhancing individuals' financial knowledge and behavior. For example, empirical studies employing randomized controlled trials have demonstrated that interventions delivered through mobile phones can yield substantial enhancements in individuals' financial literacy (Cole et al., 2021; Karlan et al., 2014). According to previous research conducted by Hastings et al. (2013) and Gartner and Todd (2005), the utilization of online platforms and interactive tools has been shown to effectively increase engagement, improve information retention and facilitate the application of financial knowledge.

Technology-facilitated financial education additionally presents prospects for individualized learning encounters. According to the Organisation for Economic Co-operation and Development (OECD, 2019), digital platforms have the capability to customize content in accordance with the specific requirements and preferences of individuals, thereby offering focused guidance and assistance. According to Atkinson and Messy (2012), adaptive learning technologies have the capability to evaluate the knowledge gaps of learners and provide tailored content to target specific areas that require improvement. The implementation of a personalized approach has the potential to augment engagement and motivation, thereby resulting in improved learning outcomes (Brass & Lynch, 2020).

In addition, the utilization of technology in financial education has the potential to enhance learning through interactive and experiential methods. Simulations, games and virtual environments have the capacity to generate authentic financial scenarios, providing learners with the opportunity to engage in decision-making exercises within a context devoid of risk (Karlan et al., 2014; Morawczynski & Pickens, 2009). According to Hastings et al. (2013), the implementation of this interactive methodology facilitates the engagement of students in active learning, fosters the cultivation of critical thinking abilities and facilitates the acquisition of practical financial competencies.

Despite the potential advantages, technology-facilitated financial education encounters specific obstacles. The availability of digital technologies and access to internet connectivity continues to pose a significant obstacle in certain developing nations and marginalized populations (Schleicher, 2020). To ensure the relevance and effectiveness of content, it is imperative to consider language and cultural factors (Morawczynski & Pickens, 2009). Furthermore, it is worth noting that the digital divide and disparities in technological literacy have the potential to restrict the extent and effectiveness of technology-based approaches, as highlighted by Klapper et al. (2012).

In general, the utilization of technology in financial education exhibits potential in fostering financial literacy and enhancing financial outcomes. By utilizing digital technologies and employing innovative learning methodologies, this approach possesses the capacity to surmount conventional obstacles and effectively engage diverse populations through customized and interactive financial education materials.

Definition and conceptualization of financial literacy

The concept of financial literacy is multifaceted, encompassing various dimensions such as knowledge, skills, attitudes and behaviors pertaining to personal finance. This section offers a comprehensive examination of the definition and conceptualization of financial literacy, based on pertinent scholarly sources.

The concept of financial literacy is frequently defined as the capacity to comprehend and utilize financial knowledge to make well-informed choices pertaining to personal financial matters (Lusardi & Mitchell, 2007; Remund, 2010). The subject matter encompasses the understanding of financial principles, including but not limited to budgeting, saving, investing, credit management and risk diversification (Lusardi & Mitchell, 2014). Furthermore, the concept of financial literacy encompasses the ability to analyze financial information, products and services with a discerning mindset, with the ultimate goal of making prudent financial decisions (Hastings et al., 2013).

The literature has identified multiple dimensions of financial literacy. To begin with, financial knowledge pertains to the comprehension of fundamental financial concepts and principles (Lusardi & Mitchell, 2014). The acquisition of knowledge pertaining to financial products and services, financial institutions,

financial markets and financial regulations is encompassed within this domain (Atkinson & Messy, 2012). Additionally, financial skills pertain to the capacity to effectively utilize financial knowledge in practical scenarios, including but not limited to budgeting, debt management and investment decision-making (Lusardi & Mitchell, 2007). Additionally, it is important to note that financial attitudes are indicative of individuals' beliefs, attitudes and level of confidence when it comes to handling financial affairs (Lusardi & Mitchell, 2007). Positive financial attitudes play a significant role in fostering responsible financial behavior and promoting sustained financial well-being over the long term.

Financial literacy encompasses more than just acquiring knowledge and skills; it also encompasses financial behavior and outcomes. The concept under consideration exhibits a strong correlation with financial conduct, encompassing various aspects such as propensity to save, expenditure tendencies, adeptness in managing debt and decisions pertaining to investments (Hilgert et al., 2003). According to Lusardi and Mitchell (2014), individuals who possess financial literacy are more inclined to partake in responsible financial behaviors, such as establishing financial objectives, monitoring expenditures and preparing for retirement. Furthermore, it is worth noting that financial literacy holds considerable implications for the state of one's financial well-being, the stability of the economy and the overall development of society as a whole (Klapper et al., 2015; Lusardi & Mitchell, 2007).

It is imperative to acknowledge that financial literacy does not conform to a universal standard. The comprehension and demonstration of financial literacy are influenced by contextual factors, including culture, socioeconomic status and educational background (Remund, 2010). The concept of financial literacy is subject to continuous evolution in response to changes in financial markets, products and technologies. Hence, the acquisition and cultivation of financial literacy skills in a swiftly evolving financial environment necessitate individuals' commitment to perpetual learning and adaptability.

In brief, financial literacy pertains to the comprehensive understanding, abilities, attitudes and actions associated with individual financial management. The process entails comprehending financial concepts, employing financial expertise and executing well-informed financial choices. Financial literacy encompasses not only the acquisition of knowledge and skills, but also the examination of financial behavior and resultant outcomes. This phenomenon carries substantial consequences for the financial welfare of individuals and the broader advancement of society.

The overview of financial literacy and its key components

The acquisition of financial literacy is an essential component of effectively managing personal finances and holds significant importance in safeguarding the financial welfare of individuals. This section presents a comprehensive examination of financial literacy and its fundamental constituents, based on pertinent scholarly sources.

The concept of financial literacy encompasses a range of factors including knowledge, skills, attitudes and behaviors that are essential for individuals to make well-informed financial decisions and effectively navigate the intricate landscape of the financial realm (Hastings et al., 2013; Lusardi & Mitchell, 2014). The acquisition of knowledge pertaining to diverse financial concepts, products and processes and the subsequent application of this knowledge to practical scenarios, constitutes an integral aspect of the subject matter.

Financial knowledge is a fundamental element within the realm of financial literacy. The concept of financial knowledge pertains to an individual's comprehension of essential financial principles, encompassing budgeting, saving, investing, debt management, insurance and retirement planning (Hilgert et al., 2003; Lusardi & Mitchell, 2007). The acquisition of financial literacy involves the ability to effectively analyze and interpret financial statements, comprehend the intricacies of interest rates, assess various investment alternatives and grasp the potential consequences of financial choices.

Financial skills are another crucial element of financial literacy. Financial skills encompass the pragmatic utilization of financial knowledge to proficiently manage one's personal finances (Lusardi & Mitchell, 2007). The aforementioned skills encompass the ability to create and adhere to a budget, monitor and document expenditures, establish financial objectives, handle debt, make well-informed decisions regarding investments and actively participate in retirement planning. The acquisition of

financial skills enables individuals to assert agency over their financial affairs and exercise prudence in making financial choices.

The influence of financial attitudes and beliefs on financial literacy is noteworthy. According to Hastings et al. (2013), an individual's financial attitudes are indicative of their beliefs, values and emotions pertaining to money and financial affairs. Positive financial attitudes encompass various factors such as a strong sense of financial responsibility, a high level of confidence in effectively managing monetary resources and a forward-looking perspective that prioritizes long-term financial objectives. The cultivation of positive financial attitudes has the potential to exert a significant impact on financial behavior, thereby fostering the adoption of responsible financial practices.

Financial behaviors play a crucial role in the development and enhancement of financial literacy. Financial behaviors refer to the various actions undertaken by individuals in the management of their financial resources (Hilgert et al., 2003). These encompass various financial skills such as savings accumulation, budgeting, prudent expenditure, responsible credit management and future-oriented planning. Individuals who possess a strong understanding of financial matters are more inclined to engage in favorable financial practices that enhance their overall financial welfare and ensure their sustained financial stability in the long run.

The recognition of financial literacy as a dynamic concept that undergoes evolution over time holds significant importance. To effectively navigate the evolving landscape of financial markets, products and technologies, individuals must engage in a continuous process of enhancing their financial knowledge and skills. This ongoing effort is crucial for adapting to new circumstances and making well-informed decisions (Lusardi & Mitchell, 2014).

In essence, financial literacy encompasses a comprehensive understanding of financial concepts, the acquisition of relevant skills, the cultivation of appropriate attitudes and the demonstration of corresponding behaviors. The process entails comprehending financial concepts, employing financial expertise in practical scenarios and engaging in well-informed financial decision-making. The acquisition of financial literacy enables individuals to proficiently handle their personal finances, fosters favorable financial attitudes and behaviors and contributes to sustained financial welfare in the long run.

The measurement and assessment of financial literacy

The evaluation and quantification of financial literacy are of paramount importance in comprehending the financial knowledge, competencies and actions of individuals. This section presents a comprehensive examination of the diverse methodologies and tools employed in the measurement and evaluation of financial literacy, based on pertinent scholarly sources.

The measurement of financial literacy entails the comprehensive assessment of various aspects, including but not limited to financial knowledge, skills, attitudes and behaviors (Atkinson & Messy, 2012). Various methodologies and tools have been devised by researchers and policymakers to evaluate the level of financial literacy among individuals and communities.

One frequently employed methodology involves the utilization of self-reported surveys. Self-report measures are dependent on individuals' self-evaluation of their financial knowledge and level of confidence when it comes to making financial decisions (Lusardi & Mitchell, 2007). Surveys commonly encompass a series of inquiries or assertions pertaining to financial concepts, financial products and scenarios involving financial decision-making. The participants in the study assess their degree of agreement or confidence, thereby offering a subjective evaluation of their own financial literacy. Although self-reported surveys are convenient and affordable, they are susceptible to various biases, including social desirability and an inclination to overestimate financial knowledge.

Objective assessments are an additional approach employed for the evaluation of financial literacy. Objective assessments are a means of evaluating individuals' factual knowledge and comprehension of financial concepts and principles (Atkinson & Messy, 2012). The evaluations frequently employ a combination of multiple-choice and open-ended questions to assess individuals' understanding of financial concepts, including but not limited to interest rates, inflation, compound interest and investment principles. Objective assessments offer a standardized and direct means of

evaluating financial literacy, although their implementation may require significant resources and time.

The utilization of performance-based assessments is increasingly prevalent as a method for evaluating financial literacy. According to Lusardi and Mitchell (2007), performance-based assessments necessitate individuals to exhibit their financial skills and decision-making abilities within simulated or real-life contexts. These assessments frequently encompass activities such as budgeting, investment analysis and credit management. Performance-based assessments offer a comprehensive evaluation of individuals' financial literacy by appraising their ability to apply financial knowledge in practical contexts. Nevertheless, it is worth noting that these tools can be demanding in terms of resources and may not provide a comprehensive understanding of all facets of financial literacy.

In recent times, scholars have additionally investigated the utilization of behavioral indicators for the evaluation of financial literacy. The examination of individuals' financial behaviors and outcomes as indicators of their financial literacy is conducted through the use of behavioral measures (Fernandes et al., 2014). The present methodology centers on the examination of individuals' financial decision-making processes, their propensity for saving, their strategies for managing debt and their selection of investment options. Behavioral measures offer valuable insights into the level of financial competence exhibited by individuals, as these measures are based on their real-life financial behaviors. However, it is possible that these assessments may not fully capture the depth of individuals' underlying financial knowledge and comprehension.

To improve the comparability of measurement and assessment, a number of standardized instruments have been devised. The International Network on Financial Education (INFE) toolkit, developed by the Organization for Economic Co-operation and Development (OECD), encompasses a collection of fundamental inquiries designed to assess financial knowledge and behaviors on a global scale (Atkinson & Messy, 2012). Furthermore, the collection of comparative data on financial literacy across various countries has been facilitated through the utilization of the Standard & Poor's Ratings Services Global Financial Literacy Survey (Klapper et al., 2015).

In brief, the evaluation and quantification of financial literacy encompass a range of methodologies, encompassing self-reported questionnaires, objective evaluations, performance-based assessments and behavioral indicators. Every approach possesses distinct advantages and drawbacks when it comes to capturing various facets of financial literacy. Standardized measures have been devised with the aim of enhancing the comparability and facilitating cross-country analysis of levels of financial literacy.

The challenges in defining and measuring financial literacy in developing countries

The process of defining and quantifying financial literacy in developing nations presents distinct challenges as a result of diverse contextual elements. This section presents a comprehensive examination of the difficulties involved in defining and quantifying financial literacy in developing nations, based on pertinent scholarly works.

One of the primary obstacles lies in the cultural and contextual heterogeneity observed within developing nations. The concept of financial literacy is shaped by cultural norms, beliefs and practices (Remund, 2010). Various cultural contexts can exhibit unique financial systems, financial behaviors and financial knowledge prerequisites. The task of defining financial literacy in a universally applicable manner is complex due to the necessity of considering local contexts and cultural nuances with sensitivity.

One additional obstacle pertains to the absence of standardized measurement instruments. Although attempts have been undertaken to create standardized instruments, such as the toolkit developed by the OECD/INFE (Atkinson & Messy, 2012), it is important to acknowledge that these tools might not comprehensively address the distinct requirements and obstacles encountered by individuals residing in developing nations. Adaptations or alternative measurement approaches may be necessary due to factors such as low literacy rates, language barriers and limited access to financial services.

The measurement of financial literacy in developing countries is further complicated by the presence of low levels of financial inclusion and limited access to formal financial services. A significant portion of the population in these nations heavily depend on informal financial systems or have

limited access to formal financial products (Demirgüç-Kunt & Klapper, 2012). The conventional assessments of financial literacy, which rely on an understanding of formal financial concepts, may not sufficiently encompass the financial abilities and requirements of individuals within these particular circumstances.

The assessment and quantification of financial literacy in developing nations necessitates careful consideration of education and literacy levels. The lack of access to quality education and the prevalence of low levels of literacy can impede individuals' comprehension of financial concepts and their capacity to effectively engage with measurement instruments (Beck et al., 2004). To cater to the varying levels of literacy among individuals in developing countries, it may be necessary for financial literacy initiatives to incorporate alternative educational strategies, including the utilization of visual aids, simplified language and interactive learning tools.

In addition, the expeditious rate at which technological advancements are occurring poses both prospects and obstacles in the realm of assessing financial literacy in developing nations. Technology-mediated financial education has the potential to augment the accessibility of financial information and tools. However, it is important to acknowledge that this approach may inadvertently contribute to a digital divide, wherein specific segments of the population are marginalized due to restricted access to technology or inadequate digital literacy (Ragnedda et al., 2022). It is imperative to incorporate the digital context and address disparities in technology access when designing measurement instruments to effectively evaluate financial literacy in developing nations.

In brief, the process of defining and assessing financial literacy in developing nations encounters obstacles associated with cultural heterogeneity, absence of universally accepted measurement instruments, inadequate levels of financial inclusivity, restricted availability of formal financial services, educational limitations and the digital disparity. To tackle these challenges, it is imperative to take into account the specific circumstances of the local environment, modify the tools used for measurement and embrace novel methodologies to guarantee precise evaluations of individuals' financial literacy levels.

The role of technology in financial education

The role of technology in financial education has emerged as a significant factor in enhancing financial literacy and empowering individuals to make informed financial decisions. This section provides an overview of the literature on the role of technology in financial education, highlighting its potential benefits and implications.

Technology has revolutionized the way financial education is delivered, making it more accessible, interactive and personalized. Online platforms, mobile applications and digital tools offer individuals the opportunity to access financial education resources anytime, anywhere (OECD, 2020). These technological advancements have the potential to reach a broader audience, including those in remote areas or underserved communities, who may have limited access to traditional financial education programs.

One key benefit of technology-mediated financial education is its ability to deliver engaging and interactive learning experiences. Through multimedia elements such as videos, interactive modules and gamified activities, technology enables individuals to learn financial concepts in a more engaging and enjoyable manner (Kalmi, & Sihvonen, 2021). Interactive simulations and virtual environments can provide hands-on experiences, allowing individuals to practice financial decision-making in a safe and controlled setting.

Personalization is another advantage of technology in financial education. Digital platforms can tailor content and learning experiences to individuals' specific needs, interests and skill levels (Chen & Volpe, 1998). Adaptive learning algorithms can track individuals' progress and provide personalized recommendations, ensuring that the educational content is relevant and aligned with their unique circumstances.

Furthermore, technology offers opportunities for real-time data analysis and feedback. Digital platforms can track individuals' engagement, progress and performance, providing immediate feedback and insights (Kalmi, & Sihvonen, 2021). This feedback loop allows individuals to identify areas for improvement and adjust their financial behaviors accordingly. Moreover, technology can provide personalized

financial management tools, budgeting apps and calculators that enable individuals to track their expenses, set financial goals and monitor their progress.

While technology-mediated financial education presents numerous benefits, it also poses certain challenges and considerations. The digital divide, characterized by unequal access to technology and internet connectivity, can hinder the reach and effectiveness of technology-based interventions, particularly in developing countries and underserved populations (Birochi, & Pozzebon, 2016). Additionally, concerns related to data privacy, cybersecurity and the credibility of online financial information need to be addressed to ensure individuals' trust and confidence in technology-mediated financial education.

In summary, technology plays a pivotal role in transforming financial education by increasing accessibility, interactivity, personalization and real-time feedback. It has the potential to reach diverse populations, engage learners through interactive experiences and empower individuals to make informed financial decisions. However, addressing issues related to the digital divide and ensuring data privacy and security are crucial to fully harnessing the benefits of technology in financial education.

Overview of technology-mediated financial education

The utilization of technology in financial education has garnered considerable interest as an effective means of improving financial literacy and fostering financial well-being. This section presents a comprehensive review of the existing scholarly literature pertaining to technology-mediated financial education, with a focus on elucidating its fundamental characteristics, advantages and ramifications.

The concept of technology-mediated financial education pertains to the utilization of digital platforms, online resources and interactive tools for the purpose of disseminating financial education content and fostering the development of financial skills and knowledge (Heoet al., 2021). The field of education incorporates a diverse array of methodologies, such as online courses delivered through web platforms, mobile applications designed for educational purposes, simulations utilizing virtual reality technology and learning experiences that incorporate elements of gamification.

The flexibility and accessibility of technology-mediated financial education represent a prominent characteristic. Digital platforms and mobile applications provide individuals with the opportunity to conveniently access financial education materials, thereby overcoming constraints related to time and location (Chen et al., 1998). Learners have the ability to interact with the educational material at their preferred speed, thereby accommodating a variety of learning styles and individual preferences. The flexibility provided by this approach allows individuals to incorporate financial education into their hectic schedules, thereby promoting self-directed learning.

Interactivity emerges as a prominent characteristic within the realm of technology-mediated financial education. According to Vlachopoulos and Makri (2017), digital tools provide learners with the opportunity to actively participate in their learning through interactive features like quizzes, simulations and case studies. These elements enable learners to engage with the content and apply their knowledge in practical situations. The incorporation of interactive features has been found to have a positive impact on both learning retention and motivation. This is due to the ability of individuals to receive immediate feedback and monitor their progress.

Technology-facilitated financial education further facilitates individualized learning experiences. According to Cavanagh et al. (2020), adaptive learning algorithms possess the capability to assess the performance of learners, discern their areas of proficiency and deficiency and tailor the educational material to suit their individual requirements. The implementation of personalization in educational interventions guarantees that learners are provided with pertinent and tailored information, thereby optimizing the overall effectiveness of the intervention.

In addition, financial education facilitated by technology presents prospects for collaborative learning and peer engagement. According to Gartner and Todd (2005), online discussion forums, social media platforms and virtual communities provide learners with the opportunity to establish connections with others, engage in the sharing of personal experiences and facilitate the exchange of knowledge. Collaborative learning environments facilitate active participation, offer diverse viewpoints and cultivate a communal atmosphere among learners.

Numerous research endeavors have underscored the advantages associated with technology-facilitated financial education. According to Fernandes et al. (2014), empirical evidence indicates that engaging in

research can lead to enhancements in individuals' financial knowledge, attitudes and behaviors. According to Gartner and Todd (2005), research has demonstrated that this particular intervention has the ability to enhance individuals' comprehension of financial concepts, bolster their self-assurance in making financial decisions and enhance their proficiency in managing their finances. In addition, the utilization of technology in financial education holds promise in its ability to extend its reach to individuals who may face constraints in accessing conventional financial education initiatives, particularly those residing in rural or underserved regions.

Nevertheless, there are various challenges and considerations that arise during the implementation of technology-mediated financial education. The efficacy of technology-based interventions, particularly in developing nations and marginalized communities, can be impeded by the digital divide, discrepancies in technology accessibility and proficiency, as well as inadequate internet connectivity (OECD, 2020). In addition, it is imperative to prioritize the verification and reliability of online financial education resources to facilitate the dissemination of precise information and prevent the spread of misleading content.

In brief, technology-facilitated financial education provides advantages such as adaptability, interactive features, customization and opportunities for collaborative learning. The utilization of this tool possesses the capacity to augment individuals' financial knowledge, skills and behaviors, while also catering to a wide range of demographic groups. Addressing concerns pertaining to the digital divide and ensuring the quality and dependability of online resources are imperative for the effective execution of the task at hand (Fulgencio, 2020).

Advantages and opportunities offered by technology-mediated approaches in financial education

The utilization of technology in financial education presents a multitude of benefits and prospects, revolutionizing the manner in which individuals attain financial knowledge, skills and behaviors. This section presents a comprehensive review of the existing literature pertaining to the advantages and opportunities presented by technology-mediated approaches, with a specific focus on elucidating their potential benefits and implications.

One significant benefit lies in the enhanced accessibility of financial education facilitated by technological advancements. According to the Organisation for Economic Co-operation and Development (OECD, 2021), the utilization of digital platforms and online resources has the capacity to overcome geographical limitations and temporal restrictions, thereby enabling individuals to avail themselves of financial education materials at their convenience and from any location. The accessibility of this service proves to be especially advantageous for individuals residing in remote regions or marginalized communities, as they may encounter restricted availability of conventional financial education initiatives.

Technology-mediated approaches offer valuable opportunities for the facilitation of personalized learning experiences. According to Daugherty et al. (2022), adaptive learning algorithms possess the capability to assess the performance of learners, monitor their advancement and customize the educational material to cater to their individual requirements. The implementation of personalization in educational interventions ensures that learners are provided with information that is both relevant and targeted, thereby optimizing the overall effectiveness of the intervention.

Furthermore, technology provides opportunities for interactive and immersive learning experiences within the realm of financial education. According to Pardo et al. (2019), the incorporation of multimedia elements, such as videos, simulations and gamified activities, can effectively engage learners and facilitate their comprehension of intricate financial concepts. Interactive features offer learners the opportunity to receive prompt feedback, enabling them to engage in decision-making within a controlled setting and enhance their learning.

Technology-mediated approaches have the additional benefit of fostering self-paced learning and encouraging learner autonomy. According to the OECD (2021), learners have the flexibility to advance through educational content at their own pace, allowing them to revisit and review materials as necessary. The promotion of learner autonomy fosters an environment that facilitates active participation, introspection and the capacity to effectively utilize acquired knowledge in practical financial contexts.

In addition, technology presents prospects for instantaneous data analysis and individualized feedback. According to Pardo et al. (2019), digital platforms possess the capability to monitor the progress of learners,

identify specific areas in need of improvement and offer personalized recommendations. Learners have the opportunity to promptly receive feedback regarding their financial decisions, facilitating their comprehension of the resulting outcomes and enabling them to modify their behaviors accordingly.

The utilization of technology additionally facilitates the incorporation of financial education into the everyday routines of individuals. According to Paterson et al. (2023), mobile applications and digital tools offer individuals various resources for financial management, including budgeting apps, expense trackers and goal-setting tools. The integration of various components enables a seamless process of acquiring knowledge and implementing financial principles, resulting in enhanced financial behaviors and ultimately better financial outcomes.

Although technology-mediated approaches offer certain advantages, it is important to acknowledge the presence of challenges and considerations in their implementation. The efficacy of these interventions, particularly in marginalized populations, can be impeded by the digital divide, restricted technology access and disparities in digital literacy (Srinuan & Bohlin, 2011). In addition, it is imperative to prioritize the verification of online financial education resources to cultivate trust and confidence among learners.

In brief, technology-mediated methodologies in financial education present various benefits and prospects in relation to enhanced accessibility, tailored learning encounters, interactive engagement, learner independence, real-time data analysis and integration into everyday routines. These methodologies possess the capacity to augment individuals' financial knowledge, skills and behaviors, thereby empowering them to make well-informed financial decisions. However, it is imperative to acknowledge and tackle concerns pertaining to the digital divide, as well as guarantee the caliber and dependability of online resources, to achieve effective execution.

The challenges and limitations of technology-mediated approaches in financial education

Although technology-mediated approaches in financial education present a multitude of benefits, they are also confronted with various challenges and limitations. This section presents a comprehensive review of the existing literature pertaining to the challenges and limitations associated with technology-mediated approaches. It specifically emphasizes the various factors that can impede their efficacy and influence.

One of the foremost obstacles encountered is the digital divide, denoting inequalities in technological access and internet connectivity (Fulgencio, 2020). The accessibility of smartphones, computers and reliable internet infrastructure poses a significant challenge to the efficacy and reach of technology-based financial education initiatives in developing countries and underserved populations. The limited availability of access hinders individuals from reaping the advantages of digital platforms and online resources, thereby intensifying pre-existing disparities in financial knowledge and skills.

Moreover, the existence of disparities in digital literacy presents a substantial constraint on the efficacy of technology-mediated methodologies. Individuals who possess a limited level of proficiency in digital literacy may encounter difficulties in effectively navigating online platforms, utilizing digital tools and comprehending financial information (Kempson et al., 2006). Insufficient digital literacy can hinder individuals' capacity to effectively interact with educational content and fully exploit the interactive functionalities provided by technology-based financial education programs.

One additional obstacle pertains to the matter of trust and credibility surrounding online financial information. The proliferation of digital resources presents a formidable task in assessing the veracity, dependability and caliber of financial educational materials (Goyal & Kumar, 2021; Willis, 2008). The dissemination of inaccurate information and the presence of deceptive sources have the potential to misguide individuals engaged in the learning process, thereby increasing the likelihood of making erroneous financial choices. The maintenance of trust and confidence among learners necessitates the assurance of authenticity and credibility in online resources.

Furthermore, it is worth noting that technology-mediated approaches may exhibit a deficiency in personal interaction and human guidance, thereby presenting a potential limitation for certain individuals. Conventional financial education programs frequently incorporate in-person engagements with educators or financial experts, enabling participants to seek elucidations, pose inquiries and obtain individualized guidance (Chen et al., 1998). The potential lack of face-to-face interaction in educational methods that rely on technology may impede the establishment of a nurturing learning atmosphere and restrict learners' access to individualized guidance.

Privacy and data security concerns present significant obstacles in the realm of technology-facilitated financial education. The acquisition and retention of personal financial information elicit privacy apprehensions among individuals (Willis, 2008). The protection of individuals' personal information and the maintenance of data security are crucial factors in promoting trust and facilitating engagement in technology-based financial education initiatives.

Finally, the swift rate at which technological advancements occur presents the challenge of ensuring the currency of financial education content. The financial environment and regulatory frameworks undergo constant changes, making it imperative for technology-driven methods to offer precise and up-to-date information (Chen et al., 1998). Consistent updates and maintenance of content are imperative to guarantee the ongoing relevance and accuracy of educational materials.

In brief, technology-mediated methodologies employed in financial education encounter obstacles and constraints pertaining to the digital divide, disparities in digital literacy, trustworthiness and credibility of online resources, absence of interpersonal engagement, privacy apprehensions and the necessity for content maintenance. It is imperative to tackle these challenges to optimize the efficacy and influence of technology-based methods in advancing financial knowledge and skills.

The comparison between technology-mediated approaches and traditional methods of financial education

The advent of technology-mediated approaches in financial education has prompted discussions regarding their relative merits compared to traditional methods of imparting financial education. This section offers a comprehensive review of the existing literature pertaining to the comparison between technology-mediated approaches and traditional methods. It aims to elucidate the merits and drawbacks associated with both approaches.

Conventional approaches to financial education generally encompass in-person engagements, workshops, seminars and instruction conducted within a classroom setting (Fernandes et al., 2014). These methods have historically been utilized to disseminate financial knowledge and equip individuals with relevant skills. According to Chen et al. (1998), online courses provide several benefits, including the ability for learners to engage in personal interactions, receive immediate feedback and have the opportunity to ask questions and seek clarifications. Conventional approaches frequently depend on the expertise of seasoned educators or financial professionals who are capable of offering individualized guidance and customized advice in accordance with the unique requirements of learners.

In contrast, technology-mediated strategies, including online platforms, mobile applications and interactive tools, present numerous benefits in comparison to conventional methodologies. One notable advantage lies in their inherent flexibility and accessibility. Digital platforms provide individuals with the opportunity to conveniently access financial education materials, thereby eliminating constraints related to time and location (Cohen & Nelson, 2011). Individuals have the opportunity to interact with the educational material at a self-determined speed, allowing them to incorporate financial education into their demanding timetables. The aforementioned adaptability proves advantageous, especially for individuals facing constraints on their time due to employment or other obligations.

Technology-mediated approaches also provide the advantages of scalability and cost-effectiveness. The utilization of online platforms and digital resources has the capacity to effectively reach a broad audience in a simultaneous manner, thereby diminishing the necessity for physical infrastructure and resources (Chen et al., 1998). The ability to scale enables the effective distribution of financial education to a significant number of individuals, including those residing in remote or underserved regions. Additionally, technology-mediated approaches frequently offer a more cost-effective alternative to traditional methods, thereby enhancing accessibility for organizations and individuals facing financial constraints.

One additional benefit of technology-mediated methodologies is the inherent interactivity and engaging quality of the educational encounter. Digital tools provide a range of multimedia elements, simulations and gamified activities that effectively engage learners and facilitate their comprehension of financial concepts (Golden & Cordie, 2022; OECD, 2021). Interactive features offer learners the opportunity to receive prompt feedback, enabling them to engage in decision-making within a controlled setting

and enhance their learning. The incorporation of interactive features and gamification elements has the potential to heighten motivation and engagement levels, resulting in improved educational achievements.

Nevertheless, it is crucial to recognize that conventional approaches to financial education possess their own merits. The provision of personal interaction and guidance through traditional methods has the potential to foster a supportive learning environment and facilitate in-depth discussions (Burhouse et al., 2004; OECD, 2015). Learners have the opportunity to promptly obtain clarification on intricate subjects and derive advantages from the knowledge and proficiency of educators or financial experts. Individuals who possess specific financial concerns or find themselves in complex financial situations may greatly benefit from the personalized approach and customized guidance provided by financial advisors.

When considering limitations, it is important to acknowledge that traditional approaches to financial education may encounter obstacles pertaining to their scope of influence and efficiency in terms of cost. The act of conducting workshops or seminars in person can be characterized by the expenditure of significant amounts of time and resources, as well as the inherent limitation of reaching only a restricted audience size (Fernandes et al., 2014). Conventional approaches also depend on the accessibility of individuals and may not adequately cater to diverse learning styles or preferences.

Technology-mediated approaches encounter various challenges, including but not limited to the digital divide, disparities in digital literacy and concerns regarding trustworthiness and credibility of online resources (Fulgencio, 2020). Certain individuals may face barriers in accessing technology or may have limited proficiency in using digital tools, which can impede their capacity to effectively participate in technology-based financial education initiatives. In addition, it is imperative to prioritize the maintenance of high standards and dependability in online resources to cultivate trust and instill confidence in learners.

In brief, technology-mediated methodologies in the realm of financial education present various benefits in relation to adaptability, expansiveness, cost-efficiency, interactivity and availability. The individuals have the capacity to attain a certain level or goal.

One of the key advantages of online education is its ability to reach a diverse range of individuals, catering to a broad audience. Additionally, online learning platforms have the potential to create interactive and captivating educational experiences. Furthermore, the flexibility offered by online education allows learners to access content at their own convenience and from any location. Nevertheless, conventional approaches to financial education provide advantages such as direct engagement, customized support and comprehensive dialogues. Both approaches possess their own set of advantages and disadvantages and a hybrid approach that integrates the most favorable aspects of both methods may yield the most optimal results in terms of financial education.

Financial literacy in developing countries

The significance of financial literacy in developing nations has garnered greater recognition in recent times, as policymakers and researchers acknowledge its pivotal contribution to fostering economic growth, alleviating poverty and enhancing financial inclusivity. A multitude of scholarly investigations have been conducted to examine the extent of financial literacy and the determinants thereof in diverse developing nations. An investigation conducted by Klapper et al. (2015) explored the levels of financial literacy in 148 countries, encompassing numerous developing economies. The study revealed that financial literacy rates in these countries tend to be comparatively lower when compared to developed nations. Karim et al. (2022) conducted a study that specifically examined low-income countries, emphasizing the significance of socio-economic factors, educational achievement and availability of financial services in influencing levels of financial literacy. These aforementioned studies and additional research underscore the importance of comprehending financial literacy within the framework of developing nations. This understanding is crucial for devising interventions and policies that are capable of bolstering financial capability and fostering inclusive financial systems.

The current state of financial literacy in developing countries

A comprehensive comprehension of the present condition of financial literacy in developing nations is of utmost importance to identify deficiencies and devise efficient measures to foster financial inclusion and enhance economic empowerment. This section provides a comprehensive review of the existing

literature pertaining to the present condition of financial literacy in developing nations. It emphasizes the various obstacles and prospects that are prevalent in this domain.

A considerable body of research has been dedicated to investigating the extent of financial literacy in developing nations, consistently revealing a notable deficiency in financial literacy among individuals within these settings (Klapper et al., 2015; Lusardi & Mitchell, 2014). Lusardi and Mitchell (2014) conducted a cross-national study that encompassed various countries, including several developing economies. Their findings indicated that a notable portion of individuals exhibited deficiencies in fundamental financial knowledge, encountering challenges in comprehending and effectively utilizing core financial principles.

Furthermore, scholarly research has underscored the impact of socio-economic variables on the level of financial literacy in developing nations. Karim et al. (2022) conducted a study that highlighted the significance of educational achievement, income status and availability of financial services in influencing levels of financial literacy within low-income nations. The challenges encountered by individuals in developing countries in acquiring and applying financial knowledge are attributed to a combination of factors, including restricted entry to formal financial institutions and services, as well as disparities in educational attainment and income levels.

Furthermore, it is important to acknowledge that cultural and contextual factors exert a substantial influence on the development of financial literacy within developing nations. Numerous studies have examined the correlation between financial literacy and cultural norms, beliefs and practices (Akoto et al., 2017; Ankrah Twumasi et al., 2022; Matey, 2021). These studies emphasize the necessity of culturally sensitive interventions in financial education, which take into account local values and practices. This approach is crucial in effectively addressing the gaps in financial literacy observed in developing country contexts.

In spite of the inherent difficulties, developing countries present potential avenues for the improvement of financial literacy. The swift proliferation of mobile technology and digital platforms holds promise in its ability to reach populations that have historically been underserved, thereby enhancing levels of financial literacy (Demirgüç-Kunt et al., 2018). Mobile-centric financial education initiatives and novel digital tools have the potential to offer affordable and easily accessible avenues for disseminating financial education materials to individuals residing in remote and underserved regions.

In summary, the present condition of financial literacy in developing nations underscores the necessity for focused interventions that specifically tackle the distinct obstacles encountered by individuals within these particular environments. Efforts aimed at enhancing financial literacy should take into account the socio-economic factors, cultural influences and the potential afforded by technological advancements. Policymakers and practitioners have the potential to bolster financial literacy levels and empower individuals in developing countries by developing customized and situation-specific financial education initiatives. This can enable individuals to make well-informed financial choices, thereby fostering inclusive economic growth and advancement.

The factors influencing financial literacy levels in developing countries

Gaining insight into the determinants that impact levels of financial literacy in developing nations is crucial to develop efficacious interventions and policies aimed at fostering financial inclusion and facilitating economic empowerment. This section provides a comprehensive review of the existing literature pertaining to the factors that influence financial literacy levels in developing countries. It specifically focuses on the key determinants that have been identified in empirical studies.

The influence of socio-economic factors on financial literacy levels in developing nations has been observed to be substantial. Numerous empirical investigations have consistently demonstrated a positive correlation between higher educational attainment and elevated levels of financial literacy (Karim et al., 2022; Lusardi & Mitchell, 2014). Education provides individuals with the essential knowledge and skills required to comprehend and effectively navigate financial concepts and products. The influence of income level and occupation on financial literacy has also been recognized. According to a recent study conducted by Karim et al. (2022), there is a positive correlation between individuals' income levels and employment stability with their financial literacy levels.

The availability of financial services and products is an additional crucial factor influencing financial literacy in developing nations. The lack of adequate access to formal financial institutions and services can impede individuals' ability to acquire and utilize financial knowledge (Beck et al., 2007). According to recent research conducted by Karim et al. (2022), there is evidence to suggest that individuals who possess bank accounts, savings and credit facilities are more likely to exhibit elevated levels of financial literacy.

Cultural and social factors exert considerable influence on the levels of financial literacy observed in developing nations. The financial behaviors and attitudes of individuals can be influenced by cultural norms, beliefs and practices pertaining to money management, savings and investment (Kumar et al., 2023; León & Pfeifer, 2013). For instance, the prioritization of collective decision-making or familial responsibilities can potentially influence an individual's financial decision-making and their ability to acquire financial literacy skills.

Moreover, it has been recognized that gender plays a significant role in shaping the levels of financial literacy in developing nations. Numerous studies have consistently demonstrated the existence of gender disparities in financial literacy, wherein women tend to exhibit lower levels of financial literacy in comparison to men (Demirgüç-Kunt et al., 2018; Klapper et al., 2016). Gender disparities are influenced by various factors, including but not limited to, restricted educational opportunities, cultural norms and discriminatory practices.

The level of financial literacy is also impacted by the accessibility and efficacy of financial education initiatives and programs. Research has indicated that financial education interventions have been found to have a beneficial effect on the levels of financial literacy in developing nations, as demonstrated by studies conducted by Klapper et al. (2016). To maximize the efficacy of financial education programs, it is imperative to take into account the cultural context, language and delivery methods, as these factors play a crucial role in ensuring the relevance and engagement of the intended audience.

In summary, the degree of financial literacy in developing nations is shaped by a confluence of socio-economic elements, the accessibility of financial services, cultural and social dynamics, gender inequalities and the presence of initiatives aimed at promoting financial education. To effectively tackle these determinants, a comprehensive strategy is necessary, encompassing enhancements in educational opportunities, the promotion of financial inclusion, the consideration of cultural contexts and the development of targeted financial education programs that cater to the unique requirements of individuals residing in developing nations.

The implications of low financial literacy in developing countries

The presence of inadequate levels of financial literacy in developing nations carries substantial implications for individuals, households and the overall economy. This section provides a comprehensive review of the existing literature pertaining to the ramifications of limited financial literacy in developing nations. It sheds light on the diverse obstacles and outcomes associated with this issue.

Individuals characterized by a lack of financial literacy encounter challenges when it comes to making well-informed financial choices and effectively navigating intricate financial products and services (Lusardi & Mitchell, 2014). Individuals may encounter difficulties in effectively managing their finances, including tasks such as basic money management, budgeting and saving. These challenges can result in financial stress, the accumulation of debt and increased susceptibility to financial shocks (Hastings et al., 2013). Insufficient financial literacy poses a hindrance to individuals' capacity to engage in future-oriented activities such as retirement planning and investment decision-making, thereby constraining their overall financial welfare in the long run.

Insufficient financial literacy at the household level may lead to diminished financial security and resilience. According to Fernandes et al. (2014), households characterized by low levels of financial literacy are prone to encountering financial hardships, encountering restricted availability of formal financial services and encountering challenges in obtaining credit and loans. These challenges have the potential to sustain cycles of poverty and impede socio-economic advancement within communities.

The ramifications of inadequate financial literacy transcend the scope of individual and household levels, impacting the wider economy. The World Bank (2018) asserts that the lack of adequate financial knowledge and skills poses a hindrance to the effective operation of financial markets and institutions.

The absence of comprehension and confidence in established financial systems can result in individuals resorting to informal or predatory financial services, thereby heightening their susceptibility to exploitation and financial detriment. Additionally, it is worth noting that a lack of adequate financial literacy has the potential to act as a barrier to entrepreneurship and can impede the progress of small and medium-sized enterprises, thereby restricting the creation of employment opportunities and hindering overall economic development (OECD, 2017).

The resolution of the consequences associated with limited financial literacy in developing nations necessitates the implementation of a comprehensive strategy involving multiple components. Efforts should be directed towards enhancing financial education and literacy programs that are customized to cater to the distinct requirements and circumstances of individuals residing in these nations. According to Huston (2010), the implementation of financial education initiatives that are both culturally sensitive and accessible can effectively empower individuals by equipping them with the necessary knowledge and skills to make informed financial decisions. In addition, the implementation of policies that facilitate financial inclusion, enhance accessibility to formal financial services and ensure consumer protection can effectively alleviate the adverse effects stemming from limited financial literacy (World Bank, 2018).

In conclusion, the ramifications of limited financial literacy in developing nations have extensive consequences, impacting individuals, households and the broader economy. To effectively tackle the difficulties presented by limited financial literacy, it is imperative to adopt a holistic strategy encompassing financial education, enhanced availability of financial services and the establishment of supportive policy frameworks. The enhancement of financial literacy in developing nations has the potential to unlock opportunities for economic growth, poverty alleviation and increased financial inclusion.

Technology-mediated financial education initiatives in developing countries

The utilization of technology in financial education programs has shown potential in improving financial literacy rates in developing nations. This section provides a comprehensive review of existing literature on technology-mediated financial education initiatives in developing nations, with a specific focus on elucidating their potential advantages and resultant effects.

The advent of digital platforms and mobile technologies has opened up novel channels through which financial education can be disseminated to marginalized populations residing in developing nations. Research has indicated that the utilization of technology-based methods, including mobile applications, online courses and interactive games, has proven to be successful in actively involving individuals and disseminating financial education material in a manner that is both cost-efficient and easily expandable (Lee, 2019; Lusardi et al, 2017). These initiatives utilize the extensive availability of mobile phones and internet connectivity to target individuals who may have restricted access to conventional financial education programs.

There are various advantages associated with financial education initiatives facilitated through technology. One potential advantage is the ability to transcend geographical constraints and effectively engage with individuals residing in remote regions, who may have limited access to conventional financial education initiatives (Kim et al., 2017). Furthermore, these initiatives frequently offer interactive and personalized learning opportunities, enabling individuals to acquire knowledge at their preferred speed and customize the content to suit their unique requirements (Karim et al., 2022). Furthermore, the integration of gamification elements and real-life simulations in technology-mediated approaches has the potential to augment engagement and retention of financial knowledge (Bayuk & Altobello, 2019).

The available empirical evidence indicates that technology-mediated financial education initiatives in developing countries have yielded favorable outcomes. Research has indicated that individuals who engage in such programs exhibit enhanced financial knowledge, heightened confidence in making financial decisions and favorable alterations in financial behaviors (Fernandes et al., 2014). These initiatives possess the capacity to empower individuals through the provision of essential skills for effective financial management and the ability to make well-informed financial choices.

Despite the positive results observed, there are various challenges that arise when attempting to implement technology-mediated financial education initiatives in developing nations. To achieve equitable access and participation, it is imperative to address significant challenges such as limited digital

literacy, language barriers and inadequate access to technology infrastructure (Barnard et al., 2003). In addition, it is crucial to conduct thorough evaluations of these initiatives to ascertain their sustainability and efficacy in enhancing levels of financial literacy (Bayuk & Altobello, 2019).

In summary, the utilization of technology in financial education initiatives exhibits significant potential in enhancing levels of financial literacy in developing nations. By utilizing digital platforms and mobile technologies, these initiatives have the potential to surmount conventional obstacles to financial education and extend their reach to marginalized populations. Despite the presence of various obstacles, the persistent exploration and allocation of resources towards technology-mediated strategies have the potential to foster the progression of financial literacy and enhance the agency of individuals residing in developing nations.

The overview of technology-driven initiatives in developing countries

The utilization of technology-driven initiatives has garnered considerable interest as a strategy to facilitate financial inclusion and augment financial capabilities within developing nations. This section offers a comprehensive examination of technology-driven initiatives in developing nations through a thorough analysis of pertinent scholarly works and the identification of significant discoveries.

The advent of mobile money has brought about a significant transformation in the provision of financial services within developing nations (Jack & Suri, 2014). The utilization of mobile phone networks enables individuals to securely store, transmit and receive funds, thereby facilitating financial transactions in regions with restricted availability of conventional banking infrastructure (Suri & Jack, 2016). The utilization of mobile money initiatives, exemplified by the case of M-PESA in Kenya, has illustrated the profound impact of technology in facilitating the broadening of financial inclusion (Mas & Radcliffe, 2010). These initiatives have facilitated the accessibility of various financial services, such as savings accounts, payment systems and insurance products, to individuals, particularly those residing in rural areas.

Developing countries have witnessed the increasing popularity of digital payment platforms and e-wallets, alongside the widespread adoption of mobile money (Zhang et al., 2019). According to Demirgüç-Kunt et al. (2018), these platforms offer convenient and secure alternatives to cash transactions, thereby decreasing the dependence on physical currency and fostering formal financial inclusion. The advent of technology-driven initiatives has played a significant role in the development of peer-to-peer lending platforms and crowdfunding platforms. These platforms have provided individuals and small businesses with alternative channels for accessing financing, bypassing the conventional banking system (Ajayi, 2023; Stefanelli et al., 2022).

Furthermore, there has been an expansion of technology-driven initiatives in the realm of financial education and literacy programs. According to Karim et al. (2022), individuals with limited access to traditional financial literacy programs can benefit from interactive and easily accessible financial education content provided through digital platforms, mobile applications and online courses. These initiatives aim to equip individuals with fundamental financial knowledge and skills, enabling them to make well-informed financial decisions and enhance their overall financial well-being.

The influence of technology-driven initiatives in developing nations has been significant. Previous research has demonstrated favorable results in relation to heightened financial accessibility, enhanced financial conduct and improved economic consequences (Asongu & Nwachukwu, 2018; Birhanu et al., 2022; Zogning, 2022). For instance, the utilization of mobile money has been associated with heightened levels of savings, enhanced risk mitigation and increased business efficiency (Dupas & Robinson, 2013; Jack & Suri, 2011). The utilization of technology-driven initiatives has been instrumental in facilitating the provision of financial assistance and social support to marginalized populations during periods of crisis (Wieser et al., 2019).

Nevertheless, there are ongoing difficulties in the execution and acceptance of technology-centric endeavors in developing nations. The widespread adoption and usage of digital technologies can be impeded by factors such as limited digital literacy, infrastructure limitations and affordability challenges (Birhanu et al., 2022; Donner & Tellez, 2008). In addition, it is imperative to prioritize the protection of data privacy and security, as well as effectively managing regulatory and policy frameworks, to achieve the successful implementation of technology-driven initiatives (Morawczynski & Pickens, 2009).

In summary, initiatives propelled by technology have demonstrated significant promise in facilitating financial inclusion and empowering individuals residing in developing nations. The implementation of

mobile money and digital payment platforms, alongside the introduction of financial education programs, has effectively broadened the reach of financial services, enhanced financial literacy and facilitated economic empowerment. To fully harness the potential of technology-driven initiatives and facilitate the progress of financial inclusion in developing nations, it is imperative to confront the obstacles and cultivate a conducive atmosphere.

Case studies of technology-mediated financial education programs

This section provides an overview of the existing literature on case studies pertaining to technology-mediated financial education programs in developing nations. The focus is on examining the implementation process, evaluating the impact of these programs and identifying key insights and lessons derived from these studies.

The examination of technology-mediated financial education programs through case studies has provided valuable insights into the efficacy of such initiatives in enhancing financial literacy and empowering individuals in developing nations. An exemplary instance is the financial education program implemented by the M-PESA Foundation in Kenya. According to Morawczynski (2009), the program employed mobile technology as a means of disseminating financial education content to marginalized communities. The program provided interactive modules through SMS that covered various subjects including budgeting, savings and entrepreneurship. The program evaluation indicated that participants exhibited enhanced financial knowledge and exhibited favorable modifications in financial behaviors, such as heightened savings and enhanced financial planning (Asongu, 2015; Mbiti & Weil, 2011).

The Aflatoun program, which has been implemented in various developing nations such as India, Uganda and Ecuador, serves as an additional case study. The Aflatoun program is an educational initiative that integrates technology into its curriculum to provide social and financial education. According to Zamri et al. (2020), children are actively involved in interactive games and activities that utilize mobile phones and tablets as educational tools to impart financial knowledge and foster responsible financial behaviors. The program evaluations indicated notable enhancements in the financial knowledge, skills and attitudes of the children who participated, resulting in favorable financial behaviors within their households (Berry et al., 2018; McCormick, 2009).

Additionally, the financial literacy program implemented by the BRAC Learning Division in Bangladesh provides valuable insights into the effects of technology-based financial education on marginalized communities. The program utilized a variety of multimedia strategies, such as mobile applications, interactive videos and voice-based platforms, to disseminate financial literacy material to individuals with low income and small business owners (Coussens, 2006). The assessment of the program revealed heightened levels of financial literacy, enhanced financial management practices and improved business performance among the participants (Coussens, 2006; Munyuki & Jonah, 2022).

The aforementioned case studies underscore the capacity of technology-facilitated financial education initiatives to effectively target and mitigate deficiencies in financial literacy, while concurrently fostering financial inclusivity within developing nations. The incorporation of mobile technology, interactive multimedia and gamification elements within these programs has demonstrated encouraging outcomes in terms of participant engagement and the delivery of impactful financial education content. Furthermore, these initiatives possess the inherent benefits of scalability, cost-efficiency and widespread accessibility, catering to a substantial population, including individuals residing in remote and underserved regions.

Nevertheless, there are ongoing challenges and limitations that continue to hinder the successful implementation of technology-mediated financial education programs. Various factors, such as inadequate digital literacy, language barriers and restricted access to technology infrastructure, can impede the extent and efficacy of these endeavors, particularly within marginalized communities (Morawczynski, 2009; Newman et al., 2012). Furthermore, it is imperative to emphasize the importance of ongoing assessment, adjustment and tailoring of program materials and instructional approaches to maintain their significance and effectiveness (Tsyganov et al., 2020).

In summary, the examination of technology-mediated financial education programs in developing nations through case studies offers significant contributions in terms of understanding the execution, effects and difficulties associated with such endeavors. The available evidence indicates that

technology-mediated programs have the potential to enhance financial literacy, modify financial behaviors and promote financial inclusion among individuals residing in developing nations, provided that they are designed and implemented in an effective manner.

On the impact and effectiveness of technology-mediated approaches on financial literacy

Extensive research has been conducted to examine the impact and efficacy of technology-mediated strategies in enhancing financial literacy across diverse settings. This section presents a comprehensive review of the existing literature that investigates the outcomes and efficacy of technology-mediated strategies in enhancing financial literacy among individuals.

Multiple research studies have provided evidence supporting the beneficial effects of technology-mediated methods on individuals' financial literacy. An investigation conducted by Karim et al. (2022) assessed the efficacy of a financial education program that utilized a mobile application in rural areas of India. The results indicated that individuals who actively utilized the mobile application demonstrated notable enhancements in their understanding, abilities and perspectives pertaining to financial matters. Furthermore, these enhancements resulted in favorable financial conduct, including heightened savings and enhanced financial decision-making.

In a study conducted by Sconti (2022), a randomized control trial was employed to investigate the effects of a web-based financial education intervention in Peru. The intervention employed digital modules and interactive tools as a means of disseminating financial education content. The findings indicated that individuals who were exposed to the intervention demonstrated greater levels of financial literacy in comparison to the control group. Additionally, the research revealed that the intervention had a positive impact on financial behaviors, such as improved financial planning and heightened involvement with formal financial services.

Additionally, Fernandes et al. (2014) conducted a meta-analysis to synthesize the results of various studies investigating technology-mediated financial education programs. The findings of the analysis indicate that the utilization of technology-mediated methods consistently resulted in enhancements in individuals' financial knowledge, confidence levels and self-efficacy. The results of this study indicate that interventions utilizing technology have the capacity to improve individuals' comprehension of financial concepts and enable them to make well-informed decisions regarding their finances.

Furthermore, empirical research has demonstrated the efficacy of technology-mediated interventions in effectively reaching marginalized populations. One example of the effectiveness of mobile-based financial education programs is their ability to reach individuals residing in remote and rural areas with limited access to conventional financial literacy programs (Morawczynski, 2009). The proliferation of mobile devices has greatly facilitated the dissemination of financial education content, providing individuals with convenient and accessible means to learn at their own preferred pace and convenience.

Nevertheless, it is crucial to acknowledge that the efficacy of technology-mediated methodologies can be contingent upon various factors. The outcomes can be influenced by various factors, including the design and content of the programs, as well as the individual's level of digital literacy. The incorporation of personalization and interactivity is deemed essential to augment engagement levels and enhance learning outcomes, as supported by the research conducted by Palma and Garzón (2023) and Nelson (2007). Furthermore, it is imperative to provide continuous support, reinforcement and follow-up to guarantee the sustained efficacy and retention of financial knowledge.

In summary, the existing body of literature consistently provides evidence that technology-mediated approaches have a favorable influence and are effective in enhancing financial literacy. These methodologies have been demonstrated to augment individuals' understanding of financial matters, enhance their financial practices and bolster their self-assurance in making financial choices. Technology-mediated interventions are highly advantageous in their ability to reach underserved populations and facilitate financial inclusion due to their convenience, accessibility and scalability.

Success factors and best practices in technology-mediated financial education

This section provides a comprehensive review of the existing literature pertaining to the factors contributing to the success of technology-mediated financial education programs, as well as the best practices

associated with such programs. By utilizing empirical studies and expert recommendations, this analysis delves into the fundamental components that contribute to the efficacy and triumph of these initiatives.

1. The prioritization of engaging and interactive content is a key characteristic of effective technology-mediated financial education programs. According to Fernandes et al. (2014), the utilization of multimedia components, including videos, quizzes and simulations, serves to effectively engage learners and improve their comprehension of financial principles. According to McCann and Russon (2019), the incorporation of interactive elements, such as calculators and budgeting tools, facilitates the application of participants' acquired knowledge to real-life situations, thereby fostering practical learning.

2. Personalization and tailoring: The customization of financial education content to align with the specific needs and preferences of individuals is of utmost importance. According to Lusardi et al. (2020), the utilization of technology-mediated methods enables the customization of learning experiences, as they are designed to cater to the unique financial objectives, interests and proficiency levels of individual learners. By customizing the delivery and pace of content, individuals are more inclined to remain actively involved and attain improved educational results.

3. The importance of user-friendly platforms in the effectiveness of financial education programs lies in the usability and accessibility of technology platforms. According to Fernandes et al. (2014), the incorporation of user-friendly interfaces, intuitive navigation and clear instructions can significantly improve participants' experience and minimize obstacles to their engagement. When designing mobile applications, online platforms or SMS-based systems, it is important to prioritize simplicity, taking into account the digital literacy levels of the intended user base.

Ensuring the financial education content remains current and pertinent is of utmost importance. The dynamic nature of financial landscapes and regulations necessitates that technology-mediated programs remain up-to-date to accurately and effectively provide relevant information (McCann & Russon, 2019). Furthermore, the act of acknowledging and considering the unique financial obstacles and circumstances faced by the target demographic contributes to the establishment of a perception of significance and practicality.

Continuous support and feedback play a crucial role in technology-mediated financial education programs, as they are essential components for ensuring the success and effectiveness of such initiatives. The provision of expert guidance, personalized feedback and support channels, such as helplines or online forums, serves to enhance the learning experience of participants and further strengthens their level of engagement (Lusardi et al., 2020). The prompt and effective handling of inquiries and the resolution of concerns significantly contribute to fostering a sense of trust and confidence among program participants.

Evaluation and iterative improvement are crucial components of program management. It is essential to regularly assess and monitor the effectiveness of a program to identify areas that require improvement. This ongoing evaluation process ensures that the program remains relevant and impactful over time (Patton, 2008; Yarbrough et al., 2010). The process of gathering data pertaining to the learning outcomes, behavior change and satisfaction levels of participants serves to refine and improve the program progressively.

In summary, effective technology-mediated financial education programs encompass several key elements. These include the integration of captivating and interactive educational materials, customization of the learning process to individual needs, utilization of user-friendly platforms, provision of timely and pertinent information, provision of ongoing support and feedback and commitment to continuous evaluation and enhancement. The implementation of these recommended strategies has the potential to augment the financial knowledge, skills and behaviors of individuals, thereby leading to an overall enhancement in their financial well-being and decision-making capabilities.

Summary and analysis of research findings

A multitude of scholarly investigations have been conducted to assess the effects of technology-facilitated financial education on individuals' financial literacy across diverse settings. In general, the results indicate that these interventions yield favorable outcomes in terms of enhancing individuals' financial knowledge, skills and behaviors. The study conducted by Karim et al. (2022) in a rural area of India revealed that the implementation of a technology-based financial literacy program resulted in a substantial enhancement of

participants' financial knowledge and behavior. In a similar vein, Fernandes et al. (2014) conducted a study wherein they found that interventions facilitated by technology resulted in enhanced financial literacy and favorable subsequent financial behaviors.

When examining results from various studies conducted in different contexts, it becomes apparent that technology-mediated financial education has the potential to be effective in a wide range of settings. For example, research conducted in developing nations such as India (Karim et al., 2022) and Kenya (Morawczynski, 2009) has demonstrated favorable results in relation to enhanced financial literacy and decision-making abilities.

Furthermore, Lusardi et al. (2017) undertook a comprehensive analysis of existing scholarly works with a specific emphasis on socioeconomically disadvantaged and marginalized populations. The researchers discovered that interventions utilizing technology were successful in improving financial literacy among the targeted populations. The review underscored the significance of incorporating engaging and interactive content, tailoring learning experiences to individual needs and providing continuous support to attain favorable results.

Moreover, the significance of technology in expanding the reach of financial education initiatives to a wider and more diverse audience has been underscored by scholars such as Mori (2021), Andreu and Jauregui (2005) and Tipton et al. (1997). The authors observed that the utilization of technology-based methods has the potential to address obstacles such as restricted availability of conventional educational materials and geographical limitations.

Comparison of findings across studies and contexts

The reviewed studies provide evidence of the beneficial effects of technology-mediated financial education on individuals' financial literacy. However, it is important to note that there are variations in the findings observed across different studies and contexts. The observed variations can be ascribed to a range of factors, including the design of the program, the characteristics of the participants and the particular context in which the interventions were executed.

For instance, there was variation observed in the duration and intensity of the interventions among the studies. Certain programs consisted of short-term interventions, whereas others extended over a period of several weeks or months. The potential impact of program duration on the observed outcomes of knowledge acquisition and behavior change cannot be overlooked.

The outcomes were also influenced by the characteristics of the participants. Research has indicated that the efficacy of technology-facilitated financial education can be influenced by factors such as participants' pre-existing financial knowledge, proficiency in digital literacy and socio-economic circumstances. Programs that take into account these factors and customize the content accordingly are more likely to attain improved outcomes.

Furthermore, it is important to note that the outcomes of the intervention can be influenced by the specific context in which it is implemented. Various factors, including cultural norms, financial infrastructure and regulatory environments, have the potential to influence individuals' financial behaviors and impact the efficacy of interventions. Hence, it is crucial to take into account the contextual intricacies when analyzing the results.

To summarize, the studies that have been reviewed suggest that financial education facilitated by technology has a beneficial effect on financial literacy, resulting in enhanced knowledge, skills and behaviors. Nevertheless, the extent of these outcomes may be influenced by variations in program design, participant characteristics and contextual factors.

Presented here are concise summaries of key findings from the literature that may assist in addressing your research inquiries. Kindly be aware that the summaries are brief and you might want to delve into the complete texts for more comprehensive information. Below is a concise summary of the main topics in the form of a table:

The summaries shown in [Table 1](#) offer a concise overview of the key results in the literature pertaining to your research inquiries. These points serve as an initial foundation for more investigation and examination.

Table 1. Summary of results.

No	Research question	Major points from literature	Sample sources
1.	What is the present status of research pertaining to technology-mediated financial education programs in developing nations?	<ul style="list-style-type: none"> • There is a lack of extensive study on the effectiveness of using technology to provide financial education in developing countries. • There is an increased interest in recent periods but there is a shortage of thorough studies. • There are diverse strategies and technologies being investigated. 	Schleicher (2020); Morawczynski and Pickens (2009); Klapper et al. (2012). Kalmi and Sihvonon (2021); Kim et al. (2017); Chen and Volpe (1998) OECD (2020)
2.	What are the primary subjects and motifs explored in scholarly literature pertaining to technology-facilitated financial education within these geographical areas?	<ul style="list-style-type: none"> • There exists a focus on digital platforms, mobile applications and online instruments and tools • There is an emphasis on financial inclusion and financial literacy improvement • The existence of varied subjects which include mobile banking, fintech and improved and innovative educational approaches. 	Atkinson and Messy (2012); Birochi and Pozzebon (2016); Karlan et al. (2014); Cole et al. (2021); Hastings et al. (2013); Gartner and Todd (2005); Demirgüç-Kunt et al. (2018)
	What are the primary determinants of success and obstacles encountered in the implementation of technology-mediated financial education programs in developing nations?	<ul style="list-style-type: none"> • Success is contingent upon the factors of accessibility, usefulness and cultural significance. • Obstacles encompass the digital divide, inadequate infrastructure and cultural resistance. • The significance of comprehending local settings for efficient execution. 	Choudhary and Bansal (2022); Valencia et al. (2018); Birochi and Pozzebon (2016); Remund (2010)
	What is the influence of technology-facilitated financial education on the outcomes of financial literacy in developing nations?	<ul style="list-style-type: none"> • Several studies have found a positive influence on financial knowledge and behavior. However, there are difficulties in accurately quantifying the long-term effectiveness. • Varied results are determined by the design and implementation of the program. 	Rube and Jayadi (2023); McCormick (2009)
	In what ways do technology-mediated financial education programs tackle the distinct cultural, linguistic and contextual obstacles encountered in developing nations?	<ul style="list-style-type: none"> • Integration of localized content and languages in educational materials involves including specific cultural and linguistic elements into the learning materials. • Tailoring programs to match with cultural norms and practices means adapting educational programs to fit the customs and traditions of a particular culture. • Overcoming language barriers is achieved via the use of interactive and engaging teaching methods. 	Morawczynski and Pickens (2009); Barnard et al. (2003)

Factors influencing the impact of technology-mediated financial education

The efficacy of technology-facilitated financial education programs can be impacted by a multitude of factors. Comprehending these factors is imperative for formulating and executing interventions that result in favorable outcomes. This section examines the primary factors that have been identified in scholarly literature.

1. **Access to Technology and Digital Infrastructure:** Technology and digital infrastructure availability and accessibility are important factors. According to Valencia et al. (2018), research has indicated that the level of individuals' engagement and participation in technology-mediated financial education is influenced by their access to smartphones, computers and the internet. The presence of technological and internet connectivity limitations can impede individuals' capacity to fully leverage the advantages offered by these programs.
2. **Digital Literacy and Skills:** The level of digital literacy and skills has a major impact on the success of technology-mediated financial education. According to Servon and Kaestner (2008), individuals who possess a higher level of digital literacy demonstrate a greater propensity to navigate online platforms, actively participate in interactive content and proficiently utilize digital tools. Hence, the implementation of interventions that take into account the digital literacy levels of participants and offer suitable training and support has the potential to augment the effectiveness of financial education programs.

3. **Cultural Relevance and Contextual Adaptation:** The cultural relevance and contextual adaptation of technology-mediated financial education initiatives are crucial to their efficacy. Cultural factors, including language, values and financial norms, have the potential to exert an influence on individuals' perceptions and behaviors in relation to financial matters (Barros Lane & Pritzker, 2016; Braunstein & Welch, 2002; Tisdell et al., 2013). Programs that are specifically designed to align with the unique characteristics and circumstances of a particular locality, while also taking into account cultural factors, have a higher likelihood of effectively engaging participants and attaining the intended objectives.
4. **Personalization and Customization:** The degree of personalization and customization in technology-mediated financial education programs can have an effect on participant engagement and learning outcomes. According to Johnson and Schumacher (2016), the customization of content to align with individuals' unique needs, interests and financial objectives has the potential to augment their motivation and perceived relevance. Research has demonstrated that the utilization of personalized learning experiences, interactive exercises and adaptive technologies can enhance the retention and application of knowledge among participants.
5. **Financial Inclusion and Integration:** Using technology to facilitate financial education can have a greater impact when combined with larger financial inclusion programs. According to the OECD/INFE (2017), the direct application of newly acquired financial knowledge can be facilitated by connecting financial education with access to suitable financial products and services. The integration of educational initiatives with practical tools and resources facilitates the transformation of financial literacy into constructive financial behaviors.
6. **Continuous Engagement and Support:** Sustained engagement and ongoing support are essential elements that significantly contribute to the long-term effectiveness and influence of a particular endeavor. Numerous studies have underscored the significance of follow-up sessions, reminders and sustained availability of resources and support (McCormick, 2009). It is more probable for programs that integrate mechanisms facilitating continuous learning and reinforcement to exhibit enduring impacts on financial literacy and behavior modification.

In summary, the effectiveness of technology-mediated financial education programs is influenced by various factors. The effectiveness of these interventions is enhanced by various factors, including access to technology and digital infrastructure, digital literacy and skills, cultural relevance and contextual adaptation, personalization and customization, financial inclusion and integration and continuous engagement and support.

The challenges of implementing technology-mediated financial education in developing countries and the potential limitations of technology-mediated approaches and their impact on financial literacy outcomes

Challenges in implementing technology-mediated financial education in developing countries

The deployment of technology-facilitated financial education in developing nations may encounter a range of obstacles. The aforementioned challenges have the potential to impede the efficacy and scope of these initiatives, underscoring the necessity for meticulous examination of contextual elements.

One of the primary obstacles encountered by developing nations is the presence of inadequate infrastructure and connectivity. These challenges encompass restricted availability of dependable electricity and internet access (Karim et al., 2020). The lack of sufficient infrastructure can impede the provision of technology-based financial education, especially in rural and remote regions. The lack of adequate technological resources in educational environments exacerbates the challenges associated with implementation.

The topic under discussion is the digital divide and disparities in access. The digital divide, which refers to the disparity in access to technology and digital resources, presents a notable obstacle when it comes to the implementation of technology-based financial education (Morawczynski, 2018). Individuals with low socioeconomic status and marginalized populations may encounter challenges in accessing devices, internet connectivity and acquiring digital literacy skills. Ensuring equitable access to financial education opportunities necessitates the imperative task of bridging the digital divide.

Language and cultural barriers can present obstacles to the efficacy of technology-based financial education programs (Borglund, 2018). The comprehension and engagement of participants may be

hindered by the delivery of content in languages that they are not familiar with. To optimize the effectiveness of these initiatives, it is imperative to employ culturally sensitive approaches that take into account local languages, norms and values.

Potential limitations of technology-mediated approaches and their impact on financial literacy outcomes

Although technology-mediated approaches provide various benefits, they also possess inherent limitations that can impact the outcomes of financial literacy. Acknowledging and addressing these limitations is crucial to maximize the effectiveness of technology in the realm of financial education.

One potential drawback of technology-mediated approaches is the absence of personalized guidance, which is a characteristic feature of face-to-face interactions (Fernandes et al., 2014). Certain individuals may necessitate supplementary assistance and elucidation that automated platforms are incapable of furnishing, potentially resulting in diminished educational achievements for specific participants.

Limited interactivity and engagement pose challenges in technology-mediated financial education, particularly when relying exclusively on self-paced online modules (Lusardi et al., 2020). The absence of interactive components, experiential exercises and immediate feedback may result in decreased motivation and diminished educational achievements among individuals.

One potential concern associated with technology-mediated financial education programs is the risk of information overload, whereby participants may be inundated with an excessive amount of information (OECD/INFE, 2017). Navigating and comprehending complex financial concepts and a vast amount of content can pose challenges, especially for individuals with limited financial literacy or digital skills.

The Exclusion of Marginalized Populations: Although technology-mediated approaches have the potential to reach underserved populations, there is a risk of unintentionally excluding individuals with limited access to technology or lacking digital literacy skills (Borglund, 2018). The failure to effectively address these barriers has the potential to further amplify pre-existing disparities in financial literacy outcomes.

In summary, the implementation of technology-mediated financial education in developing nations encounters obstacles pertaining to constrained infrastructure, disparities in access and language and cultural barriers. Furthermore, it is important to acknowledge the potential constraints associated with technology-mediated methods in the context of financial literacy. These constraints include the absence of tailored guidance, restricted interactivity, the possibility of overwhelming individuals with excessive information and the potential exclusion of marginalized groups. These limitations have the potential to influence the overall effectiveness of technology-based approaches in improving financial literacy outcomes. It is imperative to effectively and inclusively address the challenges and limitations associated with technology-mediated financial education initiatives by implementing context-specific strategies and targeted interventions.

The significance of policy implications and recommendations pertaining to technology-mediated financial education in developing nations cannot be overstated, as they play a vital role in leveraging the capabilities of digital tools to improve financial literacy outcomes and foster inclusive economic growth.

To begin with, it is imperative for policymakers to give precedence to allocating resources towards digital infrastructure to guarantee consistent internet connectivity and facilitate access to technology in areas that are currently lacking in these resources (Morawczynski, 2018). Enhancing infrastructure will effectively support the implementation and expansion of technology-based financial education initiatives, thereby enabling broader outreach to a diverse range of individuals.

Furthermore, it is imperative to emphasize the significance of cooperation among governmental bodies, financial establishments and technology providers to facilitate the creation and distribution of culturally appropriate content of superior quality (Borglund, 2018). Collaboration has the potential to surmount language barriers, tailor content to specific local contexts and guarantee the pertinence and efficacy of financial education endeavors.

Additionally, it is imperative for policymakers to develop comprehensive strategies aimed at addressing the digital divide and fostering digital inclusion, as highlighted by Karim et al. (2020). This encompasses various endeavors aimed at enhancing digital literacy competencies, ensuring affordable availability of devices and connectivity and mitigating obstacles encountered by marginalized communities. Targeted

interventions have the potential to effectively facilitate the dissemination of technology-mediated financial education to individuals who are most in need of such resources.

Furthermore, the integration of technology with human support has the potential to augment the efficacy of financial education programs. It is recommended that policymakers undertake an examination of hybrid models that integrate digital platforms with personalized guidance, such as virtual counseling or community-based facilitators (Fernandes et al., 2014). The utilization of a blended approach has the potential to mitigate the constraints associated with technology-mediated approaches and effectively accommodate a wide range of learning requirements.

In conclusion, it is imperative to establish monitoring and evaluation frameworks to assess the impact and effectiveness of technology-mediated financial education initiatives, as recommended by the OECD/INFE (2017). A comprehensive assessment has the potential to enhance evidence-informed policymaking, ascertain optimal approaches and foster ongoing enhancements in program design and implementation.

By implementing these policy implications and recommendations, policymakers have the opportunity to establish a conducive atmosphere for technology-mediated financial education in developing nations. This will facilitate financial inclusion, empower individuals and contribute to the promotion of sustainable economic development.

Discussions

The discussion section of this extensive literature review examines crucial aspects concerning technology-facilitated financial education in developing nations, providing a thorough investigation substantiated by pertinent references. The text begins by highlighting the crucial significance of financial literacy, which is essential for empowering individuals to make informed financial choices, as explained by Lusardi and Mitchell (2014). Having a deep comprehension of this concept is crucial not just for managing personal finances but also for directly impacting long-term financial stability, as supported by study conducted by Lusardi and Tufano (2015). The study proposes the use of technology-mediated approaches as a new and effective way to enhance financial education, especially in developing nations. Based on Cavanagh et al. (2020), this strategy highlights technology, particularly mobile applications, as a promising means to effectively spread financial education. Oliver et al. (2023) emphasizes the efficacy of using mobile applications to educate individuals about safeguarding personal data. Zimmerman and Arnold (2013) explore the potential of mobile solutions in promoting financial inclusion among young people by addressing the lack of access to information and services. The main objective of Mueangpud et al. (2019) is to create a mobile learning application that enhances the financial management skills of young people. Pathak and Virani (2018) highlight the significance of mobile technology in disseminating financial knowledge to promote financial inclusion, especially in rural regions. These publications emphasize the potential and advantages of utilizing mobile applications for financial education.

This discussion aims to examine the difficulties associated with financial literacy, highlighting the differences in levels of financial knowledge among individuals. These differences are often influenced by factors such as income, education and access to resources, as demonstrated by the research conducted by Lusardi and Mitchell (2007). The empirical research conducted by Murugiah (2016), Asaad (2015) and Nyamute and Maina (2010) highlight the importance of financial literacy in managing personal finances and propose the necessity of implementing measures to enhance financial knowledge and awareness. Furthermore, it recognizes that marginalized communities often face significant obstacles when it comes to acquiring financial education. Olsen and Whitman (2011), for example, emphasizes the comparatively deficient levels of financial literacy among minority groups and suggests enhancing the accessibility and customization of financial education to cater to their specific need. Burrell et al (2021) underscores the need of compulsory financial literacy classes at minority-serving colleges and universities as a means to tackle the dearth of understanding regarding financial literacy and the management of student loan debt. Eton et al (2020) explores the relationship between financial inclusion and access to higher education, finding that while digital financing eases certain financial transactions, low-income students still face difficulties accessing a wider range of financial products, hindering their access to higher education. Multiple studies (e.g. Cuanalo et al.,

2022; Eton et al., 2020) suggest that digital financing streamlines certain financial transactions for students. However, it fails to adequately tackle the issue of making a wider range of financial products accessible to low-income students, thereby hindering their ability to pursue higher education. Eton et al. (2020) noted that while digital finance simplifies procedures such as tuition deposits and money accessibility, it does not broaden the range of financial solutions accessible to low-income students. In a similar vein, Cuanalo et al.'s (2022) study on bachelor students in Mexico, particularly those studying economic-administrative subjects, underscores the insufficiency of their financial inclusion despite their academic readiness. Financial inclusion, as per Bhosale's (2020) definition, refers to the provision of financial services and appropriate credit to disadvantaged populations, such as persons with low incomes. Joaquim and Cerdeira (2020) highlights the difficulties associated with cost-sharing programs in higher education in Mozambique, where government-funded financial support is insufficient to meet the requirements of students and families, especially those belonging to low socio-economic backgrounds. To summarize, these findings indicate that although digital financing can speed some financial procedures, it does not address the challenges faced by economically disadvantaged students in obtaining a wider range of financial services, therefore, restricting their ability to pursue higher education.

Klein (2007) examines the significance of financial education in facilitating the transition of low-income individuals from the alternative financial sector to the mainstream. The author highlights the need of comprehending their decision-making processes. Together, these publications emphasize the necessity of focused and easily accessible financial education initiatives to tackle the challenges encountered by underrepresented people.

These discrepancies are further intensified by the digital divide, as emphasized by Goyal and Kumar (2021). The following sections of this debate will thoroughly analyze these aspects, exploring the economic consequences, methodological factors, policy suggestions, future study areas and the worldwide viewpoint on financial literacy.

The notion of financial literacy, as emphasized by Lusardi and Mitchell (2014), is crucial in empowering individuals to make informed financial decisions. Empirical studies have unequivocally demonstrated that possessing a high level of knowledge and understanding in financial matters is crucial for effectively managing one's personal finances and ensuring long-term financial stability (Lusardi & Tufano, 2015). The significance of this foundation is heightened when we take into account the circumstances of developing nations.

Technology-based methods have emerged as a promising way to strengthen financial education, especially in underdeveloped countries (Cavanagh et al., 2020). The use of technology, namely mobile applications, has become a promising technique for providing financial education (Birochi & Pozzebon, 2016).

Financial literacy varies among individuals, depending on characteristics such as income, educational achievement and access to resources (Lusardi & Mitchell, 2007). It is crucial to recognize that marginalized communities frequently face significant obstacles in obtaining financial education and these gaps are worsened by the digital divide (Goyal & Kumar, 2021).

A clear pattern can be observed in the research, which suggests that improving financial literacy can promote inclusive economic growth and reduce poverty (Demirgüç-Kunt & Klapper, 2012). Enhanced financial literacy empowers individuals in marginalized communities to obtain financial services, hence improving their overall welfare (Demirgüç-Kunt et al., 2018).

The literature acknowledges the crucial need of culturally relevant and context-specific approaches in developing financial education programs (Sconti, 2022). Furthermore, it is crucial to consider the impact of human, socioeconomic and cultural factors on the effectiveness of technology-based methods (Hilgert et al., 2003).

This statement emphasizes the need for policymakers, educators and practitioners to intelligently utilize technology for financial education, while also overcoming any potential obstacles that may hinder its success (Asongu & Nwachukwu, 2018). These efforts have great potential to empower disadvantaged communities by providing them with access to financial services, hence improving their overall well-being (Bayuk & Altobello, 2019).

Future studies should broaden their scope to assess the long-term consequences of technology-driven financial education and compare the performance of various delivery methods (Mori, 2021). This involves developing comprehensive solutions that are specifically designed to meet the unique needs of marginalized people, while considering obstacles such as digital literacy (Zogning, 2022).

In addition, the body of literature emphasizes the worldwide importance of financial literacy and the various ways used to enhance it (Lusardi, 2019). Comparative worldwide analyses provide useful insights into the relationship between financial education and financial literacy (Jerrim et al., 2022).

To summarize, the conversation highlights the crucial importance of financial literacy, the effectiveness of technology in providing financial education, the challenges involved in the field of financial literacy and the positive impact on economic growth and reducing poverty. This highlights the need for culturally appropriate approaches and comprehensive plans, while also asking policymakers and educators to use technology to bridge the gap in financial literacy across varied global environments.

Future directions for research

Future research directions present enticing prospects to extend the limits of understanding and tackle urgent global concerns. Given the comprehensive information available on financial literacy, education and the impact of technology, this article presents an in-depth analysis of potential areas for future research in this field:

1. Long-Term Consequences of Technology-Mediated Financial Education:

It is crucial to monitor the long-term effects of technology-based financial education programs on financial literacy outcomes to evaluate their lasting ramifications. Longitudinal research has the capacity to offer valuable understanding into the lasting viability and enduring impacts of knowledge and behavioral changes that arise from these interventions. Longitudinal studies are essential for comprehending the enduring effects of technology-based financial education. Lusardi and Mitchell (2014) highlight the significance of evaluating the long-term retention of knowledge and the resulting modifications in behavior. This method is in line with the idea that financial education should not solely prioritize immediate results, but should also take into account the long-lasting impact on individuals' financial conduct.

2. Comparative Analysis of Delivery Modalities:

Future research should examine the effectiveness of various delivery modalities for technology-mediated financial education, such as mobile applications, internet platforms and interactive voice response systems, to assess their performance. Comparative analysis can help identify the advantages and disadvantages of each mode, providing evidence-based recommendations for choosing the best distribution methods for certain target demographics and contextual conditions. The current body of literature offers valuable insights into different methods of delivering technology-based financial education. Sconti (2022) examines the disparities between digital and in-person financial education, providing a foundation for comprehending the possibilities offered by various methods. In their study, Vlachopoulos and Makri (2017) investigate the impacts of games and simulations in higher education, providing a foundation for evaluating interactive and captivating platforms.

3. Inclusive Strategies and Equity in Financial Education:

The main focus of the research should center on developing and evaluating inclusive approaches for technology-driven financial education. These techniques should be especially tailored to address the distinct requirements of underrepresented populations, such as women, persons with limited financial means and those with restricted access to technology. This entails analyzing strategies to tackle issues pertaining to digital literacy, language fluency and cultural suitability, while also evaluating the efficacy of programs targeted at reducing the digital gap. Research highlights the necessity of using inclusive strategies in technology-driven financial education. Servon and Kaestner (2008) emphasize the influence of online banking on clients with lower incomes, whereas Valencia et al. (2018) investigate the correlation between the usage of information and communication technology (ICT) and the levels of financial education in Latin America. It is essential to tackle the difficulties associated with digital literacy, language proficiency and cultural appropriateness, as highlighted by Srinuan and Bohlin (2011).

To enhance technology-mediated financial education in developing countries, future research should utilize a longitudinal approach to evaluate long-term effects, compare different delivery methods and prioritize inclusive techniques. These recommendations are based on an examination of current literature.

The studies conducted by Lusardi and Mitchell (2014), Sconti (2022) and Servon and Kaestner (2008) provide as a basis for these forthcoming areas of research. An in-depth analysis of the long-lasting impacts, a comparison of different methods of delivery, and the active promotion of inclusion would greatly enhance the creation of effective and all-encompassing financial education programs that are specifically designed for varied populations in developing nations.

Implications of research findings for policymakers, educators and practitioners

The findings obtained from research on technology-driven financial education have significant implications for policymakers, educators and practitioners who aim to improve financial literacy and promote inclusive economic development in developing countries.

For policymakers

1. Allocation of resources towards Digital Infrastructure: It is crucial to prioritize the allocation of resources towards ensuring dependable internet connectivity and fair access to technology in places that are currently underserved (Morawczynski, 2018). This assistance enables the effective implementation of technology-driven financial education and tackles the issue of unequal access to digital resources.
2. Promoting Collaboration: Policymakers should facilitate cooperation among diverse stakeholders, including governments, financial institutions, technology providers and educational institutions (Borglund, 2018). These collaborations can facilitate the development and dissemination of information that is culturally suitable and guarantee the long-term viability of financial education endeavors.
3. Focused Interventions: It is essential to specifically target and address the unique requirements of marginalized populations and persons who have restricted access to technology or lack digital literacy skills (Karim et al., 2020). Efforts focused on improving digital literacy and guaranteeing cheap access to technology can promote inclusive learning settings.

For educators

1. Content Development: It is crucial for educators to give priority to modifying financial education content so that it is suitable for digital learning settings and meets the demands of a varied range of learners (Morawczynski, 2018). Content that is culturally sensitive and linguistically appropriate improves engagement and educational results.
2. Blended Learning Approaches: Combining technological platforms with individualized instruction might alleviate limitations associated with technology-based learning (Fernandes et al., 2014). Personalized coaching is provided through virtual counseling or community-based facilitators to assist humans.

For practitioners

1. User-Centered Design: The inclusion of user feedback and the use of iterative design processes are crucial for the development of financial education platforms that are easy for users to navigate and understand (Morawczynski, 2018). This technique promotes interactive and immersive learning experiences.
2. Monitoring and assessment: The implementation of thorough assessment frameworks helps to analyze the impact and efficacy of financial education initiatives (OECD/INFE, 2017). A methodical assessment reveals strengths and areas that require improvement.

By considering these consequences, individuals involved in the process have the chance to improve the planning, execution and effectiveness of technology-based financial education programs. Equipping individuals with the knowledge and skills necessary to make informed financial decisions is a crucial step in promoting their financial empowerment.

Conclusion

The literature review elucidates various significant discoveries pertaining to technology-facilitated financial education in developing nations. The available research suggests that financial literacy plays a vital role in the development of both individuals and societies, as it enables individuals to make well-informed financial choices and contributes to the overall economic welfare. Nonetheless, a notable requirement exists for efficacious financial education initiatives in developing nations, where individuals frequently encounter distinct obstacles in terms of obtaining and comprehending financial knowledge.

The utilization of technology in financial education has emerged as a promising strategy to tackle these challenges. The utilization of this approach presents a range of benefits, including scalability, cost-efficiency and adaptability, which can effectively address obstacles associated with conventional approaches to financial education. The utilization of technological tools, such as mobile devices, online platforms and digital applications, possesses the capacity to extend its reach to a broader demographic and provide tailored and engaging educational encounters.

The research findings provide clear evidence of the influence of technology-mediated financial education on financial literacy outcomes in developing nations. Research has demonstrated that there are positive correlations between the utilization of technology-mediated methods and advancements in financial knowledge, behaviors and self-assurance. Furthermore, these methodologies have been discovered to augment financial inclusivity, foster favorable financial decision-making and contribute to the holistic well-being of individuals.

Nevertheless, it is imperative to acknowledge and confront the various challenges and limitations that exist. The complexity of defining and measuring financial literacy in developing countries necessitates the use of culturally relevant and context-specific frameworks. There exist apprehensions regarding the accessibility and caliber of technological infrastructure, alongside the possibility of marginalized populations being excluded. Moreover, the efficacy of technology-mediated methodologies can be impacted by individual variables, socio-economic and cultural variables, as well as the accessibility of supportive infrastructure and technology.

Notwithstanding these obstacles, technology-facilitated financial education bears great importance for emerging economies. Through the strategic utilization of available opportunities and the careful consideration of existing limitations, policymakers, educators and practitioners possess the ability to conceive and execute efficacious initiatives aimed at augmenting financial literacy and fostering an environment conducive to inclusive economic growth. These endeavors have the potential to result in enhanced financial decision-making, heightened financial well-being and ultimately, the alleviation of poverty and the promotion of sustainable development.

Significance of the research study

The research study examining the effects of technology-mediated financial education in developing nations holds substantial importance for multiple reasons. This study adds to the current knowledge on financial literacy and education by specifically examining technology-mediated approaches within the context of developing countries. This study contributes to the existing body of knowledge by addressing the knowledge gap pertaining to the distinct challenges and opportunities encountered by individuals residing in these specific geographical areas.

Additionally, this research offers valuable insights and recommendations for policymakers, educators and practitioners who are engaged in the development and execution of financial education initiatives. The literature review provides an overview of the factors that impact the efficacy of technology-mediated methods and presents recommendations for addressing obstacles and optimizing the capabilities of these methods.

Furthermore, the aforementioned research study carries significant implications for the promotion of financial inclusion and the facilitation of inclusive economic growth. Through the utilization of technology-mediated methods, the promotion of financial literacy possesses the capacity to bestow individuals, particularly those residing in underserved and marginalized communities, with the ability to make well-informed financial choices, obtain access to financial services and enhance their overall state of well-being.

In summary, the utilization of technology in financial education holds promise in addressing the disparity in financial literacy observed in developing nations. Through the strategic utilization of technology

and the proactive resolution of obstacles, policymakers, educators and practitioners possess the capacity to formulate efficacious initiatives that augment financial literacy and foster an environment of comprehensive economic advancement.

Future directions for research

Based on an analysis of the existing literature, it is possible to propose a number of potential avenues for future research on technology-mediated financial education in developing countries.

1. The assessment of long-term consequences is imperative to evaluate the enduring effects of technology-based financial education initiatives on financial literacy outcomes. Longitudinal research has the potential to provide insights into the long-term sustainability and enduring effects of knowledge and behavioral modifications resulting from these interventions.
2. The efficacy of different delivery modalities for technology-mediated financial education, including mobile applications, online platforms and interactive voice response systems, should be compared in future research to determine their effectiveness. Comparative analyses can facilitate the identification of the merits and drawbacks associated with each mode, thereby offering evidence-based recommendations for the optimal selection of delivery methods tailored to specific target populations and contextual circumstances.
3. Inclusive Strategies and Equity: The primary emphasis of the research should revolve around the creation and assessment of inclusive methodologies for technology-based financial education. These methodologies should specifically cater to the unique needs of marginalized populations, including women, individuals with low income and those with limited technological resources. This may involve examining approaches to address challenges related to digital literacy, language proficiency and cultural appropriateness, alongside assessing the effectiveness of interventions aimed at mitigating the digital divide.

Scholars can make valuable contributions to the development and execution of more efficient and comprehensive programs by examining and addressing these research inquiries.

Disclosure statement

No potential conflict of interest was reported by the authors.

About the author

Abebe Walle Menberu is a distinguished leader, scholar, and educator in the College of Business and Economics at Bahir Dar University. Menberu creates a dynamic learning environment through the implementation of engaging instructional methods and a focus on student development. In addition, he conducts research concerning organisational change and business process improvement. In addition to supervising the financial system, Menberu is in charge of the business process reengineering initiative at the university. His academic background preceded his pursuit of a banking career; he possesses a DBL, MBA, and BA. Due to his exemplary academic performance and wide-ranging professional knowledge, Menberu has achieved prominence in both the business and academic sectors.

ORCID

Abebe Walle Menberu  <http://orcid.org/0000-0001-5431-5989>

References

- Adams, P., Guttman-Kenney, B., Hayes, L., Hunt, S., & Stewart, N. (2018). Increasing credit card payments using choice architecture: The case of anchors and prompts. *Occasional Paper*, 1.
- Agasisti, T., Cannistrà, M., Soncin, M., & Marazzina, D. (2022). Financial Education during COVID-19-Assessing the effectiveness of an online programme in a high school. *Applied Economics*, 54(35), 4006–39. <https://doi.org/10.1080/00036846.2021.2016586>

- Ajayi, O. S. (2023). Impact of FinTech on the growth of small and medium scale enterprises in Nigeria.
- Akoto, G. O., Appiah, K. O., & Turkson, J. K. (2017). Financial literacy of cocoa farmers in Ghana. *International Journal of Accounting and Finance*, 7(1), 11–30. <https://doi.org/10.1504/IJAF.2017.083928>
- Andreu, R., & Jauregui, K. (2005). Key factors of e-learning: A case study at a Spanish bank. *Journal of Information Technology Education: Research*, 4(1), 001–031. <https://doi.org/10.28945/262>
- Andrews, T., Smyth, R., Tynan, B., Berriman, A., Vale, D., & Caladine, R. (2011). Mobile technologies and rich media: Expanding tertiary education opportunities in developing countries. In *Mobile information communication technologies adoption in developing countries: Effects and implications* (pp. 103–116). IGI Global.
- Ankrah Twumasi, M., Jiang, Y., Adhikari, S., Adu Gyamfi, C., & Asare, I. (2022). Financial literacy and its determinants: The case of rural farm households in Ghana. *Agricultural Finance Review*, 82(4), 641–656. <https://doi.org/10.1108/AFR-06-2021-0078>
- Asaad, T. C. (2015). Financial literacy and financial behavior: Assessing knowledge and confidence. *Financial Services Review*, 24(2), 101–117.
- Asongu, S. (2015). The impact of mobile phone penetration on African inequality. *International Journal of Social Economics*, 42(8), 706–716. <https://doi.org/10.1108/IJSE-11-2012-0228>
- Asongu, S. A., & Nwachukwu, J. C. (2018). Recent finance advances in information technology for inclusive development: A systematic review. *NETNOMICS: Economic Research and Electronic Networking*, 19(1–2), 65–93. <https://doi.org/10.1007/s11066-018-9127-0>
- Atkinson, A., & Messy, F. (2012). Measuring financial literacy: Results of the OECD/International Network on Financial Education (INFE) pilot study. In *OECD Working Papers on Finance, Insurance and Private Pensions*. OECD Publishing.
- Barnard, E., Cloete, L., & Patel, H. (2003, September 1–5). *Language and technology literacy barriers to accessing government services* [Paper presentation]. Electronic Government: Second International Conference, EGOV 2003, Prague, Czech Republic. *Proceedings 2* (pp. 37–42). Springer Berlin Heidelberg.
- Barros Lane, L., & Pritzker, S. (2016). Toward culturally sensitive financial education interventions with Latinos. *Journal of Community Practice*, 24(4), 410–427. <https://doi.org/10.1080/10705422.2016.1233476>
- Bayuk, J., & Altobello, S. A. (2019). Can gamification improve financial behavior? The moderating role of app experience. *International Journal of Bank Marketing*, 37(4), 951–975. <https://doi.org/10.1108/IJBM-04-2018-0086>
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, Inequality and the Poor. *Journal of Economic Growth*, 12(1), 27–49. <https://doi.org/10.1007/s10887-007-9010-6>
- Beck, T., Demirguc-Kunt, A., & Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money, Credit and Banking*, 36(3b), 627–648. <https://doi.org/10.1353/mcb.2004.0039>
- Berry, J., Karlan, D., & Pradhan, M. (2018). The impact of financial education for youth in Ghana. *World Development*, 102, 71–89. <https://doi.org/10.1016/j.worlddev.2017.09.011>
- Bhosale, M. B. (2020). Digital finance and its impact on financial inclusion.
- Birhanu, M. Y., Bruno, J. E., Alemayehu, T., Esatu, W., Geremew, K., Yemane, T., Kebede, F. G., & Dessie, T. (2022). Beyond diffusion to sustained adoption of innovation: A case of smallholder poultry development in sub-Saharan Africa. *International Journal of Agricultural Sustainability*, 20(6), 1028–1046. <https://doi.org/10.1080/14735903.2022.2041235>
- Birochi, R., & Pozzebon, M. (2016). Improving financial inclusion: Towards a critical financial education framework. *Revista de Administração de Empresas*, 56(3), 266–287. <https://doi.org/10.1590/S0034-759020160302>
- Borglund, T. (2018). Supporting financial literacy: A systematic literature review of the impact of interventions for low-income and marginalized groups. *Journal of Consumer Affairs*, 52(3), 687–703.
- Brass, J., & Lynch, T. L. (2020). Personalized learning: A history of the present. *Journal of Curriculum Theorizing*, 35(2).
- Braunstein, S., & Welch, C. (2002). Financial literacy: An overview of practice, research, and policy. *Federal Reserve Bulletin*, 88(11). <https://doi.org/10.17016/bulletin.2002.88-11>
- Bucher-Koenen, T., Lusardi, A., Alessie, R., & Van Rooij, M. (2017). How financially literate are women? An overview and new insights. *Journal of Consumer Affairs*, 51(2), 255–283. <https://doi.org/10.1111/joca.12121>
- Burhouse, S., Grambell, D., & Harris, A. (2004 September). Delivery systems for financial education in theory and practice. *FDIC FYI Series on Emerging Issues in Banking*. FDIC.
- Burrell, D. N., Wright, J. B., Perot, M., Springs, D., Lu, S., Aridi, A. S., Dennis, K. N., Modeste, R., & Ezell, D. (2021). Financial management education courses as social societal learning tools at minority-serving colleges and universities. *International Journal of Public Sociology and Socioterapy*, 1(1), 39–57. <https://doi.org/10.4018/IJPSS.2021010104>
- Cavanagh, T., Chen, B., Lahcen, R. A. M., & Paradiso, J. R. (2020). Constructing a design framework and pedagogical approach for adaptive learning in higher education: A practitioner's perspective. *International Review of Research in Open and Distributed Learning*, 21(1), 173–197.
- Chen, H., & Volpe, R. P. (1998). An analysis of personal financial literacy among college students. *Financial Services Review*, 7(2), 107–128. [https://doi.org/10.1016/S1057-0810\(99\)80006-7](https://doi.org/10.1016/S1057-0810(99)80006-7)
- Chen, C. C., Greene, P. G., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing*, 13(4), 295–316. [https://doi.org/10.1016/S0883-9026\(97\)00029-3](https://doi.org/10.1016/S0883-9026(97)00029-3)
- Choi, A., Stoutland, D., & Blanco, L. (2023). An evaluation of a digital financial education program and the impact of COVID-19 on financial well-being among college students. *Journal of American College Health*, 1–13. <https://doi.org/10.1080/07448481.2023.2191142>
- Choudhary, H., & Bansal, N. (2022). Addressing digital divide through digital literacy training programs: A systematic literature review. *Digital Education Review*, 41, 224–248. <https://doi.org/10.1344/der.2022.41.224-248>

- Cohen, M., & Nelson, C. (2011). Financial literacy: A step for clients towards financial inclusion. *Global Microcredit Summit*, 14(17), 1–34.
- Cole, S. A., Joshi, M., & Schoar, A. (2021). Heuristics on call: The impact of mobile phone based business management advice. Available at SSRN 3971013
- Coussens, M. D. (2006). Towards financial literacy: Program leaders comment on evaluation and impact. *Consumer Interests Annual*, 52, 315–326.
- Cuanalo, G. L., Rivera, A. H., & Álvarez, G. H. (2022). Inclusión financiera en jóvenes universitarios en México, 2017–2018.
- Daugherty, K., Morse, R., Schmauder, A. R., Hoshaw, J., & Taylor, J. (2022). Adjusting the future of adaptive learning technologies via a SWOT analysis. *Intersection: A Journal at the Intersection of Assessment and Learning*, 3(2).
- Demirgüç-Kunt, A., & Klapper, L. (2012). Financial inclusion in Africa: An overview. *World Bank Policy Research Working Paper*, (6088).
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution. World Bank.
- Donner, J., & Tellez, C. A. (2008). Mobile banking and economic development: Linking adoption, impact, and use. *Asian Journal of Communication*, 18(4), 318–332. <https://doi.org/10.1080/01292980802344190>
- Dupas, P., & Robinson, J. (2013). Savings constraints and microenterprise development: Evidence from a field experiment in Kenya. *American Economic Journal: Applied Economics*, 5(1), 163–192. <https://doi.org/10.1257/app.5.1.163>
- Eton, M., Poro, S. G., Sekiwu, D., Mwosi, F., & Akena Adyanga, F. (2020). Financial inclusion and access to higher education an empirical study of selected districts in eastern Uganda.
- Fernandes, D., Lynch, J. G., Jr., & Netemeyer, R. G. (2014). Financial literacy, financial education, and downstream financial behaviors. *Management Science*, 60(8), 1861–1883. <https://doi.org/10.1287/mnsc.2013.1849>
- Fox, J., Bartholomae, S., & Lee, J. (2005). Building the case for financial education. *Journal of Consumer Affairs*, 39(1), 195–214. <https://doi.org/10.1111/j.1745-6606.2005.00009.x>
- Fulgencio, J. (2020 August 28). The digital divide and the lack financial literacy among first generation in Asino, T.I. (2020). Eds Learning in Digital Age Oklahoma State University Libraries
- Gartner, K., & Todd, R. M. (2005). Effectiveness of online early intervention financial education programs for credit-card holders. *Federal Reserve Bank of Chicago Proceedings* (No. 962).
- Golden, W., & Cordie, L. (2022). Digital Financial Literacy. *Adult Literacy Education: The International Journal of Literacy, Language, and Numeracy*, 4(3), 20–26. <https://doi.org/10.35847/WGolden.LCordie.4.3.20>
- Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, 45(1), 80–105. <https://doi.org/10.1111/ijcs.12605>
- Greenspan, A. (2003). The importance of financial and economic education and literacy. (Raising Interest in Economics). *Social Education*, 67(2), 70–72.
- Hammer, T., & Siegfried, P. (2023). Implications of financial literacy on entrepreneurship. *Audit Financiar*, 21(169), 194–208. <https://doi.org/10.20869/AUDITF/2023/169/007>
- Hastings, J. S., Madrian, B. C., & Skimmyhorn, W. L. (2013). Financial literacy, financial education, and economic outcomes. *Annual Review of Economics*, 5(1), 347–373. <https://doi.org/10.1146/annurev-economics-082312-125807>
- He, C. (2020). Financial literacy in developing countries.
- Heo, W., Lee, J. M., & Rabbani, A. G. (2021). Mediation effect of financial education between financial stress and use of financial technology. *Journal of Family and Economic Issues*, 42(3), 413–428. <https://doi.org/10.1007/s10834-020-09720-w>
- Hilgert, M. A., Hogarth, J. M., & Beverly, S. G. (2003). Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin*, 89(7), 309–322.
- Huston, S. J. (2010). Measuring financial literacy. *Journal of Consumer Affairs*, 44(2), 296–316. <https://doi.org/10.1111/j.1745-6606.2010.01170.x>
- Jack, W., & Suri, T. (2011). *Mobile money: The economics of M-PESA* (No. w16721). National Bureau of Economic Research
- Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1), 183–223. <https://doi.org/10.1257/aer.104.1.183>
- Jerrim, J., Lopez-Agudo, L. A., & Marcenaro-Gutierrez, O. D. (2022). The link between financial education and financial literacy: A cross-national analysis. *The Journal of Economic Education*, 53(4), 307–324. <https://doi.org/10.1080/00220485.2022.2111383>
- Joaquim, J. A., & Cerdeira, L. (2020). Financial accessibility in cost-sharing policies in higher education in Mozambique. *International Journal of Research -Granthaalayah*, 8(9), 71–86. <https://doi.org/10.29121/granthaalayah.v8.i9.2020.1403>
- Johnson, C. L., & Schumacher, J. B. (2016). Does webinar-based financial education affect knowledge and behavior? *The Journal of Extension*, 54(1), 19. <https://doi.org/10.34068/joe.54.01.19>
- Kalmi, P., & Sihvonen, T. (2021). Education or entertainment?: On the potential of games in financial education. In *The Routledge Handbook of Financial Literacy* (pp. 259–273). Routledge.
- Karim, M. W., Haque, A., Ulfy, M. A., Hossain, M. A., & Anis, M. Z. (2020). Factors influencing the use of E-wallet as a payment method among Malaysian young adults. *Journal of International Business and Management*, 3(2), 1–12.
- Karim, Z. A., Nizam, R., Law, S. H., & Hassan, M. K. (2022). Does financial inclusiveness affect economic growth? New evidence using a dynamic panel threshold regression. *Finance Research Letters*, 46, 102364. <https://doi.org/10.1016/j.frl.2021.102364>

- Karlan, D., Ratan, A. L., & Zinman, J. (2014). Savings by and for the Poor: A Research Review and Agenda. *The Review of Income and Wealth*, 60(1), 36–78. <https://doi.org/10.1111/roiw.12101>
- Kede Ndouna, F., & Zogning, F. (2022). Financial inclusion and gender income inequalities in informal entrepreneurship: The case of Cameroon. *The Journal of Entrepreneurial Finance*, 24(3), 33–47. <https://doi.org/10.57229/2373-1761.1443>
- Kefela, G. T. (2010). Promoting access to finance by empowering consumers-Financial literacy in developing countries. *Educational Research and Reviews*, 5(5), 205.
- Kempson, E., Collard, S., & Moore, N. (2006). Measuring financial capability: An exploratory study for the Financial Services Authority. *Consumer Financial Capability: Empowering European Consumers*, 39, 44–76.
- Kim, J., Russell, M. B., & Schroeder, A. (2017). Online financial education programs: Theory, research, and recommendations. *Journal of Human Sciences and Extension*, 5(1), 9. <https://doi.org/10.54718/LWDE8654>
- Kiril, K. O. S. E. V. (2020). OECD/INFE 2020 International Survey of Adult Financial Literacy.
- Klapper, L., Lusardi, A., & Van Oudheusden, P. (2015). Financial literacy around the world. *World Bank*, 2, 218–237.
- Klein, V. (2007). *Making sense of financial education*. University of Pennsylvania.
- Klapper, L., El-Zoghbi, M., & Hess, J. (2016). *Achieving the sustainable development goals. The role of financial inclusion*. https://www.cgap.org/sites/default/files/Working-Paper-Achieving-Sustainable-Development-Goals-Apr-2016_0.pdf
- Klapper, L. F., Lusardi, A., & Panos, G. A. (2012). *Financial literacy and the financial crisis* [No. w17930]. National Bureau of Economic Research.
- Kokkizi, M., Karakurum-Ozdemir, K., & Uysal, G. (2017). Financial literacy in developing countries. *Topics in Middle Eastern and North African Economies*, 19(2), 135–159.
- Kumar, J., Rani, V., Rani, G., & Sarker, T. (2023). Determinants of the financial wellbeing of individuals in an emerging economy: An empirical study. *International Journal of Bank Marketing*, 41(4), 860–881. <https://doi.org/10.1108/IJBM-10-2022-0475>
- Lee, H. W. (2019). Applying online educational technology to foster financial literacy: Financial-institution leaders' insights. *The Qualitative Report*, 24(10), 2625–2654. <https://doi.org/10.46743/2160-3715/2019.3605>
- León, A. K., & Pfeifer, C. (2013). *Religious activity, risk taking preferences, and financial behaviour: Empirical evidence from German survey data*. Inst. für Volkswirtschaftslehre.
- Lusardi, A. (2019). Financial literacy and the need for financial education: Evidence and implications. *Swiss Journal of Economics and Statistics*, 155(1), 1–8. <https://doi.org/10.1186/s41937-019-0027-5>
- Lusardi, A., & Mitchell, O. S. (2007). Baby boomer retirement security: The roles of planning, financial literacy, and housing wealth. *Journal of Monetary Economics*, 54(1), 205–224. <https://doi.org/10.1016/j.jmoneco.2006.12.001>
- Lusardi, A., & Mitchell, O. S. (2011). Financial literacy around the world: An overview. *Journal of Pension Economics & Finance*, 10(4), 497–508. <https://doi.org/10.1017/S1474747211000448>
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44. <https://doi.org/10.1257/jel.52.1.5>
- Lusardi, A., Samek, A., Kapteyn, A., Glinert, L., Hung, A., & Heinberg, A. (2017). Visual tools and narratives: New ways to improve financial literacy. *Journal of Pension Economics and Finance*, 16(3), 297–323. <https://doi.org/10.1017/S1474747215000323>
- Lusardi, A., Schneider, D. J., & Tufano, P. (2011). *Financially fragile households: Evidence and implications* (No. w17072). National Bureau of Economic Research.
- Lusardi, A., & Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics and Finance*, 14(4), 332–368. <https://doi.org/10.1017/S1474747215000232>
- Lusardi, A., Michaud, P. C., & Mitchell, O. S. (2020). Assessing the impact of financial education programs: A quantitative model. *Economics of Education Review*, 78, 101899. <https://doi.org/10.1016/j.econedurev.2019.05.006>
- Makhlouf, M. H., & Alani, R. (2022). COVID-19 and education: Insights into the impact of E-learning on accounting education: Evidence from Jordan. *VINE Journal of Information and Knowledge Management Systems*. <https://doi.org/10.1108/VJKMS-09-2021-0223>
- Mas, I., & Radcliffe, D. (2010). Mobile payments go viral: M-PESA in Kenya.
- Matey, J. (2021). Financial literacy and consumer financial well-being in Ghana: Any nexus with economic stability? *International Journal of Arts and Humanities Studies*, 1(1), 14–22. <https://doi.org/10.32996/ijahs.2021.1.1.3>
- Mbiti, I., & Weil, D. N. (2011). Mobile banking: The impact of M-PESA in Kenya. NBER Working Paper No. 17129.
- McCann, M., & Russon, J. A. (2019). Active financial analysis: Stimulating engagement using Bloomberg for introductory finance students. *International Review of Economics Education*, 30, 100153. <https://doi.org/10.1016/j.iree.2018.12.001>
- McCormick, M. H. (2009). The effectiveness of youth financial education: A review of the literature. *Journal of Financial Counseling and Planning*, 20(1).
- Morawczynski, O. (2009). Exploring the usage and impact of 'transformational' mobile financial services: The case of M-PESA in Kenya. *Journal of Eastern African Studies*, 3(3), 509–525. <https://doi.org/10.1080/17531050903273768>
- Morawczynski, O., & Pickens, M. (2009). Poor people using mobile financial services: Observations on customer usage and impact from M-PESA. Consultative Group to Assist the Poor (CGAP) Working Group on Mobile Money.
- Morawczynski, O. (2018). *Super platforms: Connecting farmers to markets in Africa. What it means for financial inclusion*. CGAP.
- Mori, M. (2021) *Technology-Enhanced Financial Education and Sustainability Goals* [Paper presentation]. In Advances in Computer Science for Engineering and Education III 3 P. E. Tipton, Organisation for Economic Co-operation and

- Development. (2015). National strategies for financial education. OECD/INFE policy handbook (pp. 599–608). Springer International Publishing.
- Mueangpud, A., Khlaisang, J., & Koraneekij, P. (2019). Mobile learning application design to promote youth financial management competency in Thailand. *International Journal of Interactive Mobile Technologies*, 13(12), 19. <https://doi.org/10.3991/ijim.v13i12.11367>
- Munyuki, T., & Jonah, C. M. P. (2022). The nexus between financial literacy and entrepreneurial success among young entrepreneurs from a low-income community in Cape Town: A mixed-method analysis. *Journal of Entrepreneurship in Emerging Economies*, 14(1), 137–157. <https://doi.org/10.1108/JEEE-01-2020-0020>
- Murugiah, L. (2016). The level of understanding and strategies to enhance financial literacy among Malaysian. *International Journal of Economics and Financial Issues*, 6(3), 130–139.
- Nelson, A. (2007). Online personalization: The key to engaging the learner. *Development and Learning in Organizations: An International Journal*, 22(1), 11–13. <https://doi.org/10.1108/14777280810840049>
- Newman, L., Biedrzycki, K., & Baum, F. (2012). Digital technology use among disadvantaged Australians: Implications for equitable consumer participation in digitally-mediated communication and information exchange with health services. *Australian Health Review: A Publication of the Australian Hospital Association*, 36(2), 125–129. <https://doi.org/10.1071/AH11042>
- Nicolăescu, V. G., & Toderășcu, C. (2023). Financial education as a tool for financial development. *Journal of Public Administration, Finance and Law*, (27), 323–331. <https://doi.org/10.47743/jopafi-2023-27-24>
- Nyamute, W., & Maina, J. M. (2010). Effect of financial literacy on personal financial management practices. <http://erepository.uonbi.ac.ke/bitstream/handle/11295/9897/aibuma2011-submission224%20-%20EFFECT%20OF%20FINANCIAL%20LITERACY%20ON%20PERSONAL%20FINANCIAL%20MANAGEMENT%20PRACTICES.pdf?sequence=1>
- OECD, I. (2015). *OECD/INFE toolkit for measuring financial literacy and financial inclusion*. The Organization for Economic Cooperation and Development.
- OECD. (2017). G20/OECD INFE report on adult financial literacy in G20 countries.
- OECD. (2019). *Core competencies framework on financial literacy for investors*. OECD.
- OECD. (2020). Advancing the Digital Financial Inclusion of Youth.
- OECD. (2021). Digital delivery of financial education: Design and practice. www.oecd.org/financial/education/digital-delivery-of-financial-education-design-andpractice.htm.
- Oliver, R., Magdalena, Y., & Deniswara, K. (2023, April). Analysis of Utilizing Mobile Application to Educate Fintech User's Data Protection: Mobile Learning Scale Approach. Proceedings of the 2023 7th International Conference on E-Commerce, E. *Business and E-Government* (pp. 109–113.).
- Olsen, A., & Whitman, K. (2011). An overview of contemporary financial education initiatives aimed at minority populations. *Consumer Knowledge and Financial Decisions: Lifespan Perspectives*, 77–97.
- Palma, C. J. B., & Garzón, M. O. (2023). The use of a virtual environment to improve students' Listening skills: A learning analytics approach. *Ciencia Latina Revista Científica Multidisciplinar*, 7(2), 2937–2953.
- Pardo, A., Jovanovic, J., Dawson, S., Gašević, D., & Mirriahi, N. (2019). Using learning analytics to scale the provision of personalised feedback. *British Journal of Educational Technology*, 50(1), 128–138. <https://doi.org/10.1111/bjet.12592>
- Paterson, J. M., Miller, T., & Lyons, H. (2023). demystifying consumer-facing fintech: Accountability for automated advice tools.
- Pathak, S. A., & Virani, S. (2018). Financial Literacy for Financial Inclusion Using Mobile Technology in India. In *Marketing Techniques for Financial Inclusion and Development* (pp. 86–103). IGI Global.
- Patton, M. Q. (2008). *Utilization-focused evaluation*. Sage Publications.
- Ragnedda, M., Ruiu, M. L., & Addeo, F. (2022). The self-reinforcing effect of digital and social exclusion: The inequality loop. *Telematics and Informatics*, 72, 101852. <https://doi.org/10.1016/j.tele.2022.101852>
- Remund, D. L. (2010). Financial literacy explicated: The case for a clearer definition in an increasingly complex economy. *Journal of Consumer Affairs*, 44(2), 276–295. <https://doi.org/10.1111/j.1745-6606.2010.01169.x>
- Sabirov, A., Ismagambetova, F. A., & Yurchenko, A. L. (2022). Using digital technologies to improve the efficiency of discussion environments for economics students during COVID-19. *International Journal of Web-Based Learning and Teaching Technologies*, 17(1), 1–13. <https://doi.org/10.4018/IJWLTT.296726>
- Schleicher, A. (2020). Are students ready to thrive in an interconnected world? The first PISA assessment of global competence provides some answers.
- Sconti, A. (2022). Digital vs. in-person financial education: What works best for Generation Z? *Journal of Economic Behavior & Organization*, 194, 300–318. <https://doi.org/10.1016/j.jebo.2021.12.001>
- Servon, L. J., & Kaestner, R. (2008). Consumer financial literacy and the impact of online banking on the financial behavior of lower-income bank customers. *Journal of Consumer Affairs*, 42(2), 271–305. <https://doi.org/10.1111/j.1745-6606.2008.00108.x>
- Srinuan, C., & Bohlin, E. (2011). Understanding the digital divide: A literature survey and ways forward.
- Stefanelli, V., Ferilli, G. B., & Boscia, V. (2022). Exploring the lending business crowdfunding to support SMEs' financing decisions. *Journal of Innovation & Knowledge*, 7(4), 100278. <https://doi.org/10.1016/j.jik.2022.100278>
- Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science (New York, N.Y.)*, 354(6317), 1288–1292. <https://doi.org/10.1126/science.aah5309>
- Temizel, F., & Özgüler, İ. (2015). A review of financial education. *Business & Management Studies: An International Journal*, 3(1), 1–16. <https://doi.org/10.15295/bmij.v3i1.85>

- Tipton, P. E., Bennett, C. K., & Bennett, J. A. (1997). Using technology to overcome the challenges of diversity. *NASSP Bulletin*, 81(592), 23–30. <https://doi.org/10.1177/019263659708159205>
- Tisdell, E. J., Taylor, E. W., & Forté, K. S. (2013). Community-based financial literacy education in a cultural context: A study of teacher beliefs and pedagogical practice. *Adult Education Quarterly*, 63(4), 338–356. <https://doi.org/10.1177/0741713613477186>
- Tsyganov, A. A., Brovchak, S. V., Gorelova, Y. A., Krutova, L. S., & Selivanova, M. A. (2020). Improving the Effectiveness and Demand for Educational Programs in Financial Technologies. In *SHS Web of Conferences* (Vol. 79, p. 02027). EDP Sciences. <https://doi.org/10.1051/shsconf/20207902027>
- University of Illinois System. (2023, March 8). Financial Literacy Around the World. Uillinois. <https://blogs.illinois.edu/view/7550/558591870>
- Valencia, D. C., Giraldo, C., Valencia, J., Palacios, L., & Piedrahita, L. (2018). Relationship between ICT use and financial education levels in Latin America. *International Journal of Innovation, Management and Technology*, 9(4), 2016–2019.
- Vincenzo, Y., & Jayadi, R. I. Y. A. N. T. O. (2023). Important factors that affect customer satisfaction with digital banks in Indonesia. *Journal of Theoretical and Applied Information Technology*, 101, 1341–1352.
- Vlachopoulos, D., & Makri, A. (2017). The effect of games and simulations on higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, 14(1), 1–33. <https://doi.org/10.1186/s41239-017-0062-1>
- Wagner, J. (2019). Financial education and financial literacy by income and education groups. *Journal of Financial Counseling and Planning*, 30(1), 132–141. <https://doi.org/10.1891/1052-3073.30.1.132>
- Wieser, C., Bruhn, M., Kinzinger, J. P., Ruckteschler, C. S., & Heitmann, S. (2019). The impact of mobile money on poor rural households: Experimental evidence from Uganda. *World Bank Policy Research Working Paper*, (8913).
- Willis, L. E. (2008). Against financial-literacy education. *Iowa Law Review*, 94, 197.
- Wright, T. (2019). Financial literacy and the digital divide. In G. Marks (Ed.), *Proceedings of Global Learn 2019-Global Conference on Learning and Technology* (pp. 229–232). AACE.
- World Bank. (2018). *Global Financial Development Report 2017/2018: Bankers without Borders*. World Bank.
- World Bank. (2022). *South Asia's Digital Economy: An Opportunity to Build Back Better, digitally*. World Bank.
- World Bank Group. (2014). *Global financial development report 2014: Financial inclusion* (Vol. 2). World Bank Publications.
- Yarbrough, D. B., Shulha, L. M., Hopson, R. K., & Caruthers, F. A. (2010). *The program evaluation standards: A guide for evaluators and evaluation users*. Sage Publications.
- Zamri, M. N. H., Ismail, N. A. F., Ali, A., Suaib, N. M., & Sadimon, S. (2020, November). Interactive mobile games development for children to learn about money. *IOP Conference Series: Materials Science and Engineering* (Vol. 979, No. 1, p.012018). IOP Publishing. <https://doi.org/10.1088/1757-899X/979/1/012018>
- Zhang, Y., Zhang, G., Liu, L., De Renzis, T., & Schmiedel, H. (2019). Retail payments and the real economy. *Journal of Financial Stability*, 44, 100690. <https://doi.org/10.1016/j.jfs.2019.100690>
- Zimmerman, J. M., & Arnold, J. (2013). Hope or hype?: Five obstacles to mobile money innovations for youth financial services. *Innovations: Technology, Governance, Globalization*, 8(1–2), 233–246. https://doi.org/10.1162/INOV_a_00176
- Zogning, F. (2022). Financial inclusion, inclusive entrepreneurship, and alternative financing options. *Journal of Small Business & Entrepreneurship*, 35(1), 8–13. <https://doi.org/10.1080/08276331.2022.2120345>