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CRYPTOCURRENCY EDUCATION RESEARCH TRENDS: A BIBLIOMETRIC STUDY

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Abstract

This study examines the development and research patterns of cryptocurrency education using a bibliometric approach. The analysis covers 197 documents indexed in Scopus and published between 2013 and 2025. The study investigates publication trends, country-level contributions, keyword distributions, and the influence of prominent authors and highly cited publications. The findings indicate a substantial increase in research output beginning in 2019, with the United States, Malaysia, and India emerging as the leading contributing countries. Keyword co-occurrence analysis identifies five major thematic clusters, encompassing technological dimensions, educational perspectives, financial literacy, pedagogical innovation, and user behavior. The author collaboration network further reveals that research in this field remains relatively fragmented, with many scholars conducting studies independently. Nevertheless, several researchers, including Irannezhad and O'Brien, occupy relatively central positions within the international scholarly network. These findings highlight the need for greater interdisciplinary engagement, the incorporation of cryptocurrency-related topics into higher education curricula, and stronger international research collaboration. Overall, this study provides a conceptual and practical foundation for advancing digital financial education and supporting the development of financial policies that are adaptive, inclusive, and sustainable.

Keywords

Cryptocurrency Education,
Bibliometric Analysis,
Digital Literacy,
Blockchain, Academic
Collaboration.

INTRODUCTION

The rapid advancement of digital technology has brought about substantial changes in the global financial system, one of the most notable developments being the emergence of cryptocurrency as a decentralized form of digital asset. Cryptocurrency relies on blockchain technology to record transactions in a transparent, secure, and immutable manner without depending on a central authority, such as a bank or government (Kumar Singh et al., 2024). These characteristics have contributed to the growing interest in cryptocurrency as a medium of exchange, investment instrument, and representation of economic autonomy. Nevertheless, its potential is accompanied by considerable challenges, including substantial price volatility, security vulnerabilities, and regulatory uncertainty (Lan Trang, 2024; Wahyu et al., 2023).

The increasing popularity of cryptocurrency, particularly among younger populations and novice investors, has resulted in greater adoption that is not necessarily accompanied by a comparable level of understanding. Many users perceive cryptocurrency primarily as a speculative opportunity while having limited knowledge of its underlying mechanisms, associated risks, and technological foundations (P. Sharma & Vashishtha, 2024). This knowledge gap may increase individuals' exposure to financial losses, digital fraud, and potentially inappropriate financial decision-making (Choung et al., 2023). Consequently, cryptocurrency literacy has become an important prerequisite for developing a more inclusive and sustainable digital financial ecosystem.

Cryptocurrency literacy can be viewed as part of the broader concept of digital financial literacy, which refers to an individual's ability to manage financial activities through digital technologies in a responsible, informed, and secure manner (Bushra & Mir, 2024; Goel, 2024). Education has a fundamental role in developing such capabilities. Previous research suggests that formal educational attainment may influence individuals' attitudes toward cryptocurrency adoption, although the nature and strength of this relationship require further investigation (Horton et al., 2018; P. Sharma & Vashishtha, 2024). Accordingly, educational strategies that are contextualized, adaptive, and responsive to developments in financial technology are increasingly necessary.

Various educational approaches have been introduced to improve public understanding of cryptocurrency, ranging from gamification-based learning to the development of blockchain-supported educational platforms (Hadan et al., 2024; Stefansson & Lentin, 2017). Gamification, for instance, can provide an interactive and relatively risk-free learning environment in which participants explore cryptocurrency concepts through simulated experiences. Other initiatives, such as StudentCoin, combine educational activities with practical exposure to cryptocurrency, thereby strengthening the application-oriented nature of the learning process (Kumar Singh et al., 2024). In certain educational settings, cryptocurrency has also been explored as an incentive mechanism for encouraging students to improve their academic performance (Andre, 2022).

Despite these developments, incorporating cryptocurrency-related content into formal educational curricula remains subject to several constraints. These include cryptocurrency price volatility, regulatory uncertainty, and the limited preparedness and expertise of educators in addressing rapidly evolving digital financial technologies (Lan Trang, 2024; Nejari et al., 2024). Such challenges indicate the importance of adopting a balanced educational perspective that does not focus exclusively on the potential economic benefits of cryptocurrency but also addresses its financial risks, ethical considerations, and broader social implications (Siti et al., 2024; Wahyu et al., 2023).

At the same time, digital financial literacy has been associated with greater financial resilience and economic inclusion, particularly among underserved and marginalized communities. Research conducted in Peru, for example, indicates that digital literacy programs can strengthen public confidence in digital financial services (Ortiz et al., 2024). Similarly, research in Indonesia suggests that community-based educational approaches can help reduce literacy gaps in disadvantaged areas (Siti et al., 2024). These findings suggest that cryptocurrency education may provide an opportunity to extend financial knowledge and digital financial capabilities to vulnerable groups through more inclusive educational mechanisms.

Nevertheless, the academic literature specifically addressing cryptocurrency education remains relatively limited and fragmented. Existing studies have predominantly emphasized technological, macroeconomic, financial, or legal dimensions of cryptocurrency, whereas its educational dimension has received comparatively less systematic attention. This situation creates a research gap concerning the development, thematic structure, and academic evolution of cryptocurrency education. To address this gap, the present study employs a bibliometric approach to systematically map the research landscape, identify emerging and dominant themes, and examine scholarly contributions within the field of cryptocurrency education.

To provide a conceptual foundation for interpreting the research landscape, this study draws upon several relevant theoretical frameworks. First, the Technology Acceptance Model (TAM), proposed by Davis (1989), explains technology acceptance in terms of users' perceptions of usefulness and ease of use. Within an educational context, the adoption of cryptocurrency-related technologies may therefore be influenced by students' or users' perceptions of the educational value, usefulness, and accessibility of cryptocurrency-based platforms. Second, the Diffusion of Innovation theory developed by (Rogers, 2003) provides a framework for examining how educational processes may facilitate the dissemination and adoption of emerging technologies, including cryptocurrency, through stages involving knowledge, persuasion, decision, implementation, and confirmation. Third, the Digital Financial Literacy framework developed by the Organisation for Economic Co-operation and Development ((OECD), 2021) emphasizes the importance of understanding digital financial risks, making informed decisions based on relevant information, and protecting consumers within an increasingly digital financial environment. Collectively,

these frameworks provide a conceptual basis for interpreting the bibliometric findings while also supporting the formulation of more focused implications for policy and curriculum development.

Based on the foregoing discussion, this study addresses three principal research questions: (1) What publication trends and country-level contributions characterize research on cryptocurrency education during the 2017–2025 period? (2) Which thematic keywords dominate the literature, and how are they interconnected in forming major research clusters? and (3) Which authors and publications have exerted the greatest scholarly influence in the field of cryptocurrency education based on Scopus-indexed data? By addressing these questions, this study seeks to provide a comprehensive overview of the scholarly development of cryptocurrency education and to identify potential strategic directions for its future advancement.

LITERATURE REVIEW

Theoretical Frameworks Governing Digital Financial Adoption and Education

Understanding the adoption and pedagogical integration of cryptocurrency requires robust theoretical models that explain user behavior, technological diffusion, and digital competence. Three main theoretical frameworks underpin research in cryptocurrency education:

Technology Acceptance Model (TAM)

Developed by Davis (1989), TAM posits that individual adoption of new technologies is primarily driven by *perceived usefulness* and *perceived ease of use*. In the context of cryptocurrency education, TAM explains how learners and institutional stakeholders assess the utility and accessibility of blockchain-based learning platforms and digital financial tools before incorporating them into learning environments.

Diffusion of Innovations (DOI) Theory

Rogers' (2003) framework outlines how technological innovations spread through social systems across five distinct stages: knowledge, persuasion, decision, implementation, and confirmation. Applied to cryptocurrency literacy, DOI highlights how formal education accelerates the diffusion process by transitioning individuals from passive awareness to informed, critical decision-making regarding digital assets.

OECD Digital Financial Literacy Framework

Formulated by the OECD (2021), this framework extends traditional financial literacy into the digital realm by emphasizing risk perception, consumer protection, and responsible decision-making. It

provides a normative benchmark for evaluating how cryptocurrency educational interventions equip users to navigate volatile, decentralized digital markets safely.

Cryptocurrency Literacy, Market Adoption, and User Vulnerabilities

The rapid proliferation of decentralized digital currencies driven by underlying blockchain infrastructure has fundamentally altered contemporary financial ecosystems. While digital assets offer economic autonomy, transparency, and alternative investment pathways, they simultaneously introduce pronounced risks, including high market volatility, cyber fraud, and regulatory ambiguities.

Empirical literature demonstrates a growing disparity between high market participation and actual technical and risk-based comprehension among retail investors, particularly young adults. Many market participants engage with cryptocurrencies driven by speculative motives without a foundational grasp of distributed ledger technology, smart contracts, or asset valuation principles. This knowledge deficit heightens exposure to severe financial loss and cyber risks, reinforcing the critical necessity of structured digital financial education.

Pedagogical Innovations and Experiential Learning Models

To address literacy gaps, recent scholarship has focused on innovative and interactive pedagogical methodologies tailored to complex digital finance concepts:

Gamification and Simulated Learning

Incorporating game mechanics and simulated trading environments offers risk-free settings where learners can observe market dynamics, execute transactions, and analyze risk outcomes without capital exposure.

Incentive-Based Learning Systems

Emerging platforms utilize native utility tokens or educational reward mechanisms to enhance learner motivation, self-efficacy, and engagement through direct practical application.

Interdisciplinary Curriculum Integration

Scholars advocate for holistic instructional designs that bridge computer science, economics, law, and ethics, ensuring that students comprehend both the technical mechanics and broader socio-economic implications of digital assets.

Institutional Barriers and Curricular Adaptation

Despite the clear demand for digital financial education, incorporating cryptocurrency topics into formal university curricula faces several structural constraints:

Instructor Readiness and Expertise

Rapid technological evolution outpaces traditional faculty development, leaving educators with limited training to teach advanced blockchain and fintech concepts effectively.

Regulatory and Market Volatility Risks

Educational institutions often hesitate to endorse digital asset studies due to uncertain legal classifications and extreme price fluctuations associated with cryptocurrencies.

Balanced Content Delivery

Academic literature emphasizes that educational programs must avoid overemphasizing speculative gains and instead prioritize comprehensive risk management, security protocols, and financial resilience.

Financial Inclusion, Regional Disparities, and Research Gaps

Digital financial literacy acts as a catalyst for economic inclusion and resilience, particularly among underserved populations in emerging economies. Community-based and contextualized educational initiatives in developing regions have demonstrated positive impacts on financial confidence and adoption of digital financial services.

However, bibliometric patterns indicate that academic research on cryptocurrency education remains heavily concentrated in developed or technologically advanced nations, such as the United States, Malaysia, and India. Furthermore, scholarly output is characterized by fragmented collaboration networks, with many researchers operating independently. Expanding cross-border academic collaborations and integrating local contextual perspectives from developing economies remain essential steps toward establishing inclusive and globally relevant digital financial education policies.

METHODS

This study adopts a quantitative bibliometric approach to systematically examine and map the research landscape and publication trends in the field of cryptocurrency education. The research procedure

and analytical process were organized into five systematic stages, adapted from the framework proposed by (Tranfield et al., 2003) and subsequently applied by (Nuryana et al., 2024)

Keyword Identification

The literature search was conducted using the following combination of keywords: “cryptocurrency” AND “education”. The search terms were applied to the **TITLE-ABS-KEY** fields in the Scopus database to identify publications whose titles, abstracts, or keywords were directly related to the research topic.

Initial Scopus Search

The initial literature search was conducted through the Scopus database on June 30, 2025, covering publications issued during the 2013–2025 period. The initial search retrieved 290 documents. The results were subsequently screened according to the predetermined inclusion criteria, with the analysis restricted to English-language journal articles. Following this screening process, 91 articles were retained for further bibliometric analysis.

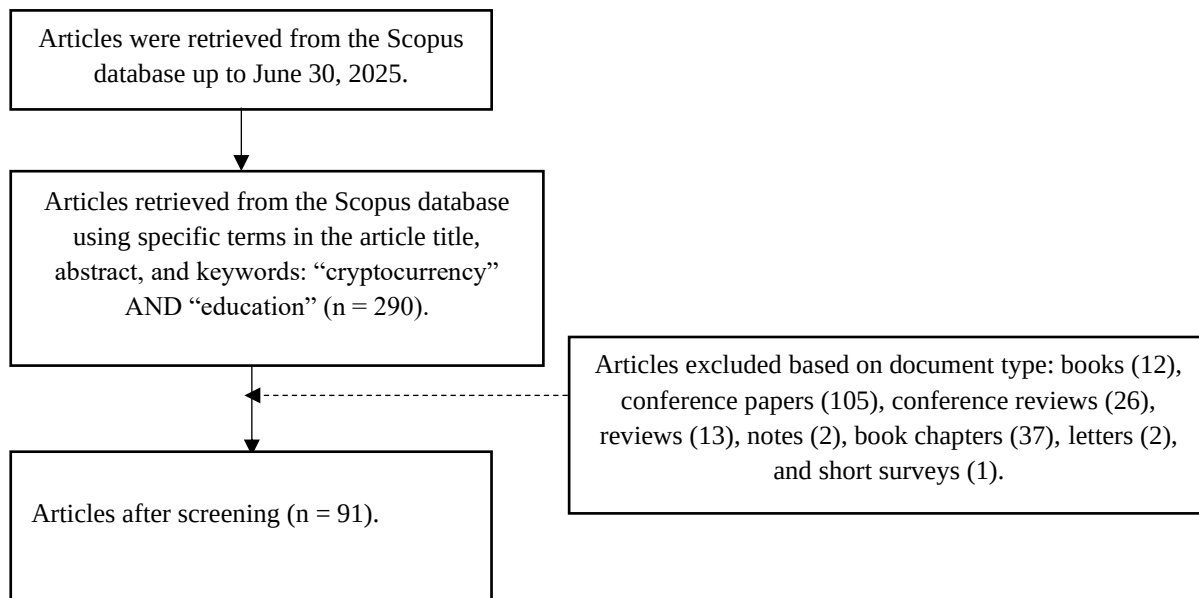


Figure 1. Literature Screening Process

Data Refinement

Irrelevant records and duplicate entries were removed during the data-cleaning process. The resulting metadata were then exported and stored in CSV format for subsequent statistical analysis and bibliometric visualization.

Preliminary Descriptive Statistics

The refined dataset was initially examined using descriptive statistical analysis to obtain basic information regarding the distribution of publications across years, authors' institutional affiliations, and countries of origin.

Data Analysis and Visualization

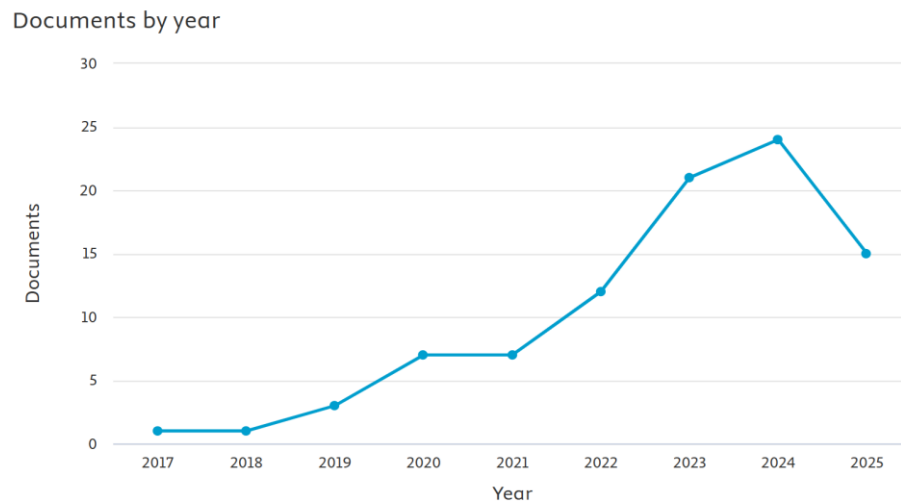
Bibliometric analysis and visualization were conducted using VOS viewer to examine several dimensions of the literature, including: (1) Co-authorship analysis; (2) Keyword co-occurrence mapping; (3) Overlay and density visualization; and (4) Citation analysis. These analyses were performed to address the research questions concerning publication trends, dominant research keywords, thematic relationships, and the most influential contributors to the cryptocurrency education literature.

RESULTS AND DISCUSSION

This study addresses three main research questions: (1) how have publication trends and country-level contributions to cryptocurrency education research developed during the 2013–2025 period? (2) Which thematic keywords are most prominent, and how are they interconnected in forming distinct research clusters? and (3) Which authors and publications have made the most significant scholarly contributions to this research area? The findings and their interpretation are presented systematically according to these three areas of investigation.

Publication Trends and Country Contributions

The analysis reveals a marked increase in scholarly publications concerning cryptocurrency education over the most recent five-year period. Since 2019, the number of publications has demonstrated an accelerated upward trajectory, reaching its highest levels between 2021 and 2024, as illustrated in Figure 2. This growth coincides with the increasing global adoption of cryptocurrencies, continued advances in blockchain technology, and growing responses from educational institutions to the challenges associated with digital financial literacy (Goel, 2024; V. Sharma et al., 2024).



Source: Scopus Database

Figure 2. Number of Publications on Cryptocurrency Education

From a geographical perspective, the **United States** accounts for the largest share of publications, followed by **Malaysia** and **India**. The substantial research output from these countries reflects their active involvement in the development of cryptocurrency education research, potentially supported by established technological infrastructure and educational policies that are responsive to developments in digital finance.

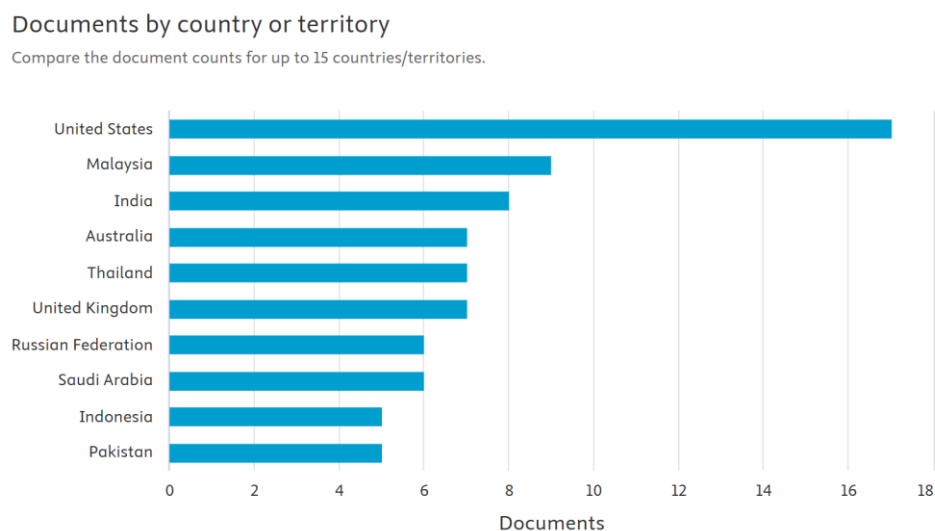


Figure 3. Number of Articles by Country or Territory

Research activity in cryptocurrency education remains largely concentrated in countries with relatively progressive digital policies and well-developed technological ecosystems. This geographical concentration indicates the need for a more balanced global distribution of research efforts. It also creates opportunities for developing countries, including Indonesia, to strengthen their contribution to this emerging field by enhancing educational curricula, developing the capacity of lecturers and researchers, and fostering cross-border research collaborations. Such efforts could help address local educational needs while simultaneously increasing the international visibility and competitiveness of research from developing economies.

Dominant Keywords and Thematic Clusters

The keyword co-occurrence analysis conducted using VOS viewer identified five major thematic clusters within the cryptocurrency education literature. The first cluster encompasses terms such as *cryptocurrency*, *blockchain*, and *fintech*, representing the technological and infrastructural dimensions of the field. The second cluster centers on educational and pedagogical concepts, particularly *education*, *learning*, and *knowledge*. The third cluster focuses on financial literacy and inclusion, highlighting issues related to individuals' awareness and understanding of digital financial assets. The fourth cluster reflects technology-enhanced learning approaches, including *gamification*, *engagement*, and *e-learning*. The fifth cluster addresses psychological and behavioral dimensions, represented by keywords such as *risk*, *behavior*, and *perception*.

Table 1. Major Keyword Clusters in Cryptocurrency Education Research

Cluster	Main Keywords	Thematic Focus
1	<i>cryptocurrency, blockchain, fintech</i>	Technology and Infrastructure
2	<i>education, learning, knowledge</i>	Education and Learning
3	<i>financial literacy, inclusion, awareness</i>	Financial Literacy and Inclusion
4	<i>gamification, engagement, e-learning</i>	Technology-Enhanced Learning Innovation
5	<i>risk, behavior, perception</i>	User Psychology and Behavior



Figure 4. VOS viewer Keyword Analysis

The observed pattern indicates that the cryptocurrency education literature is characterized by considerable interdisciplinarity and continues to evolve in response to developments in digital technology and finance. In particular, topics such as *gamification* and *e-learning* have gained increasing attention in recent years, reflecting the growing demand for engaging, interactive, and context-sensitive learning approaches ((Hadan et al., 2024; Stefansson & Lentin, 2017)).

These developments suggest that educational institutions may need to adapt their instructional strategies by incorporating innovative learning approaches, including blockchain-based educational platforms, digital incentive mechanisms, and project-based learning activities that are connected to real-world developments in the digital economy. Figures 5 and 6 further extend the keyword analysis by presenting the overlay visualization and density visualization, respectively.

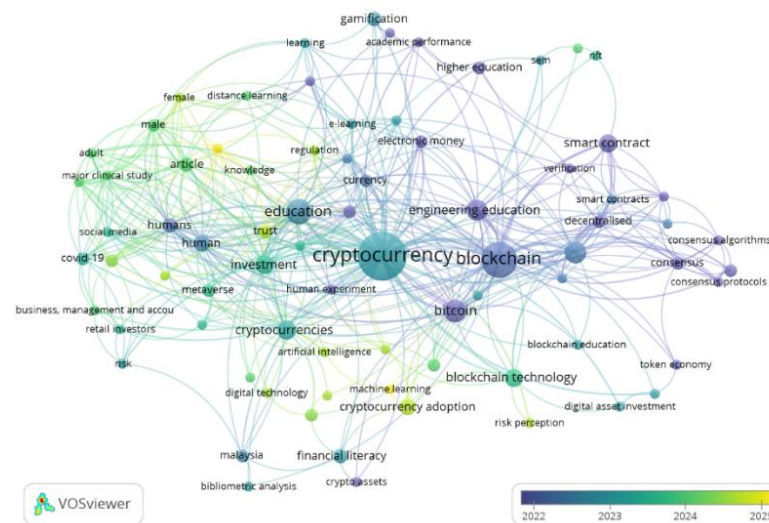


Figure 5. Overlay Visualization

Figure 5 illustrates the temporal development of keywords within the cryptocurrency education literature. The **blue nodes** represent relatively established themes, including *cryptocurrency*, *bitcoin*, and *education*, which were more prominent during the earlier stages of research development. In contrast, the **yellow nodes**, including *cryptocurrency adoption*, *gamification*, and *financial literacy*, indicate topics that have attracted greater scholarly attention in more recent years.

This temporal pattern suggests a gradual shift in the research agenda, moving beyond predominantly technical discussions toward more practical, educational, and adoption-oriented issues. The emerging themes indicate increasing scholarly interest in how cryptocurrency can be understood, adopted, and incorporated into broader financial education and digital literacy contexts.

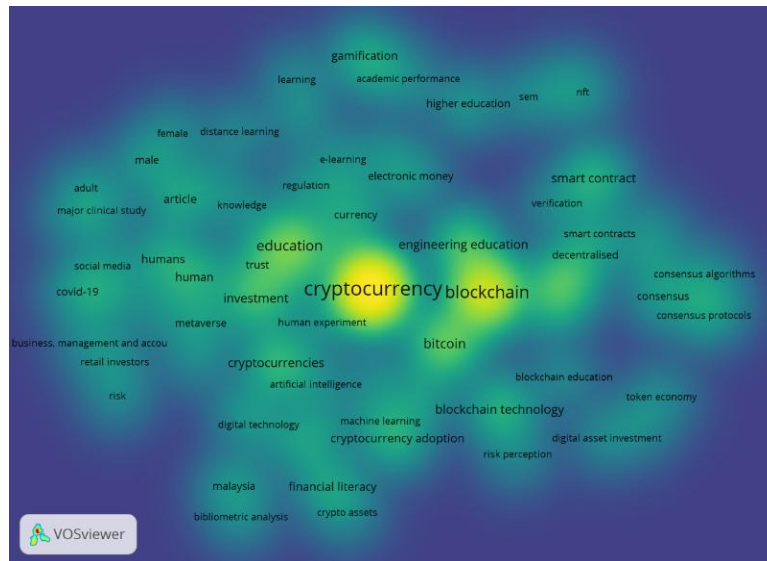


Figure 6. Density Visualization

Figure 6 presents the density distribution of the most frequently occurring terms within the cryptocurrency education literature. The **bright yellow areas** represent highly concentrated research topics, particularly *cryptocurrency*, *blockchain*, and *education*, which function as central nodes within the research landscape. As the distance from these central areas increases, the visualization gradually changes from green to blue, indicating terms with relatively lower frequencies of occurrence.

The density map reinforces the finding that education and financial literacy constitute central dimensions of cryptocurrency-related research. These themes are supported by technological components, particularly blockchain, as well as digital and technology-enhanced teaching approaches that serve as prominent conceptual frameworks within the literature.

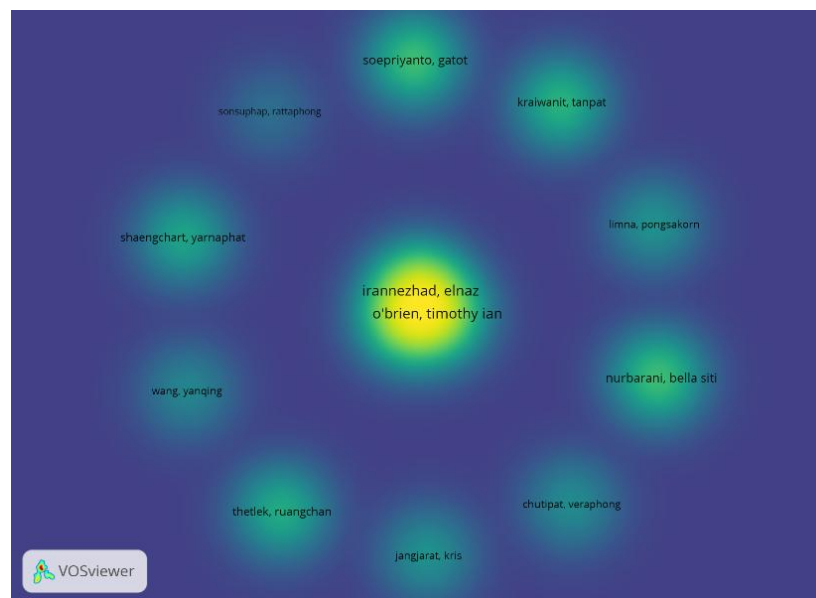
Most Influential Contributors and Publications

Author contributions were assessed using three bibliometric indicators: publication output, citation counts, and collaboration network strength, measured through Total Link Strength (TLS). Several researchers demonstrate notable contributions either through their academic impact, as reflected by citation counts, or through their strategic positions within the collaborative research network.

Based on citation counts, Alharbi, Abdullah has received the highest number of citations, with 70 citations, followed by Bee, Thai Siew and Wasiuzzaman, Shaista, each with 49 citations. In terms of collaborative connectivity, Irannezhad, Elnaz; O'Brien, Timothy Ian; and Xi, Dingli record the highest Total Link Strength (TLS) of 11. This indicates a relatively strong level of involvement in collaborative research networks within the cryptocurrency education literature.

Table 2. Authors with the Highest Citation Counts and Collaboration Strength

No	Author	Document	Citation	Total Link Strength
1	Alharbi, Abdullah	1	70	3
2	Bee, Thai Siew	1	49	3
3	Wasiuzzaman, Shaista	1	49	3
4	Irannezhad, Elnaz	1	40	11
5	O'Brien, Timothy Ian	1	40	11
6	Xi, Dingli	1	40	11
7	Sukumaran, Shangeetha	1	49	3
8	Ahmad, Mazida	1	8	3
9	Kalid, Khairul Shafee	1	14	3
10	Nurbayani, Bella Siti	1	19	3

**Figure 7. Author Collaboration Network Visualization (Density View)**

The author density map (Figure 7) identifies Irannezhad, O'Brien, and Xi as prominent nodes within the collaboration network, highlighting their relatively central roles in research collaboration. Although a considerable number of authors appear only once in the dataset, their contributions remain relevant to the development and direction of scholarly discussions in the field.

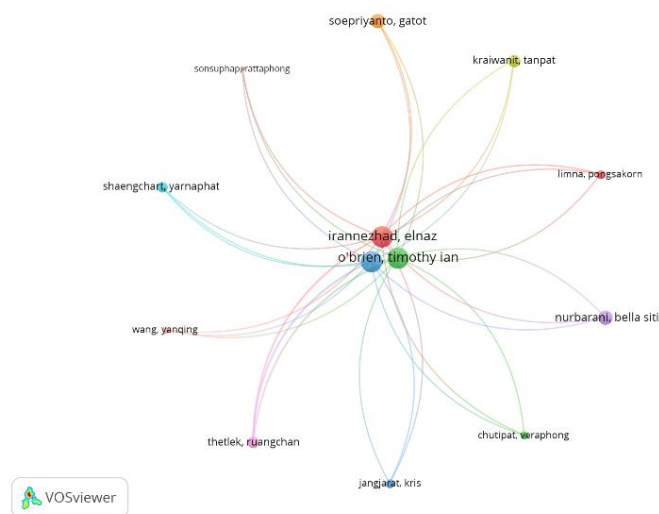


Figure 8. Author Collaboration Map Based on Total Link Strength

The visualization indicates that the author network remains relatively dispersed, with extensive and sustained collaboration yet to be fully established. Nevertheless, the participation of several researchers from Southeast Asia suggests potential for further regional development in this research area. Researchers from developing countries may strengthen their contribution to cryptocurrency education research by expanding international partnerships and becoming more actively involved in cross-country research networks.

Research Implications

This study contributes to a broader understanding of the direction, structure, and characteristics of research on cryptocurrency education. Through a bibliometric approach, the study not only identifies patterns of publication and scholarly collaboration but also provides a basis for examining how key research themes may inform educational policies, instructional strategies, and the development of adaptive learning models.

First, the findings concerning publication trends and country contributions indicate that countries with relatively progressive digital policies, including the United States, Malaysia, and India, have become important contributors to cryptocurrency education research. This pattern suggests an association between digital infrastructure readiness, higher education policies, and scholarly productivity in this emerging field (Goel, 2024; P. Sharma & Vashishtha, 2024). From the perspective of Diffusion of Innovation Theory (Rogers, 2003), these countries can be viewed as having progressed further in the stages of adopting and implementing educational innovations related to cryptocurrency, whereas some developing countries,

including Indonesia, may still be strengthening the knowledge and persuasion stages. This finding highlights the relevance of national policies that support the incorporation of cryptocurrency-related content into educational curricula and the development of contextualized digital financial literacy programs (Ortiz et al., 2024; Siti et al., 2024).

Second, the thematic keyword analysis demonstrates that cryptocurrency education is inherently interdisciplinary, encompassing technological, pedagogical, financial literacy, gamification, and user-psychology dimensions. The prominence of terms such as *blockchain*, *education*, *gamification*, and *financial literacy* indicates that the development of cryptocurrency learning materials may benefit from perspectives drawn from multiple academic disciplines (Hadan et al., 2024; Stefansson & Lentin, 2017). Within the framework of the Technology Acceptance Model (TAM) (Davis, 1989), learners' perceptions of the usefulness and ease of use of technology-based educational media may influence their attitudes and engagement with cryptocurrency-related learning materials. Accordingly, instructional design can incorporate experiential and real-world learning approaches, including simulations, digital investment projects, and blockchain-supported learning platforms (Andre, 2022; Kumar Singh et al., 2024).

Third, regarding the identification of influential authors and publications, the findings show that the work of Alharbi, Abdullah (2022) received the highest number of citations, with a focus on the relationships among risk, user attitudes, and cryptocurrency adoption in an educational context. Meanwhile, the work involving Bee, Thai Siew and Wasiuzzaman, Shaista is notable for examining gamification-based approaches to strengthening cryptocurrency literacy among university students (Bee et al., 2022). These publications highlight the relevance of innovative educational methods while also providing insights that may contribute to the development of instructional policies in higher education. In this context, citation counts can be interpreted as an indicator of academic influence, whereas Total Link Strength, as demonstrated by Irannezhad, O'Brien, and Xi (2023), reflects the connectivity of researchers within the scholarly network and their involvement in collaborative research activities.

Fourth, the author collaboration analysis indicates that a substantial proportion of research remains relatively sporadic and fragmented, with only a limited number of central nodes maintaining stronger collaborative connections. This pattern highlights the importance of strengthening international research networks, particularly by increasing the participation of researchers from developing countries so that local perspectives can become more visible within the global academic discussion (Siti et al., 2024). From the perspective of the Digital Financial Literacy Framework developed by the Organisation for Economic Co-operation and Development (OECD), (2021), combining global and local perspectives is important for developing more inclusive educational interventions that account for differences in culture, language, and digital infrastructure across regions.

CONCLUSION

This study maps the development and characteristics of cryptocurrency education research during the 2013–2025 period using a bibliometric approach. The findings demonstrate a substantial increase in publications on this topic since 2019, with the United States, Malaysia, and India representing the countries with prominent contributions. The five thematic clusters identified through keyword analysis demonstrate the interdisciplinary nature of cryptocurrency education, encompassing technology, education, financial literacy, pedagogical innovation, and user psychology. These findings suggest that cryptocurrency education requires a multidimensional approach that incorporates perspectives and strategies from different academic fields.

The author collaboration analysis further reveals that, although several researchers, including Irannezhad, O'Brien, and Xi, occupy relatively central positions within the scholarly network, many contributions remain individual or confined to relatively limited collaborative groups. Greater collaboration across institutions and countries, particularly involving researchers from developing economies, could broaden the academic and practical relevance of cryptocurrency education research. The findings also highlight the importance of incorporating cryptocurrency literacy into educational curricula while encouraging interdisciplinary research and stronger international academic connectivity. Such efforts can contribute to the continued development of cryptocurrency education in ways that are responsive to technological change and the evolving requirements of the digital financial environment.

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