International Journal of Education and Practice
2026 Vol. 14, No. 3, pp. 25-36
ISSN(e): 2310-3868
ISSN(p): 2311-6897
DOI: 10.18488/61.v14i3.4916

Evaluation of university students' attitude on the use of blockchain technology in educational environments

Aidana Iniyatova[1]
Uaidullakyzy Elmira[2+]
Duisenbayev Abay[3]
Gulnur Kazakhbayeva[4]
Zhazira Zhumabayeva[5]

[1]*Eurasian National University Named After L.N.Gumiloyv, Faculty of Social Sciences Department of Pedagogy, 6 Yanushkevich Str., Nur-Sultan, Republic of Kazakhstan.*
[1]*Email: aido1995@bk.ru*
[2]*Korkyt Ata Kyzylorda State University, Faculty of Pedagogy and Psychology, Aiteke bi 29A, Kyzylorda, Kazakhstan*
[2]*Email: elmira.uaidullakyzy1988@gmail.com*
[3]*Department of Pedagogy and Psychology, Abai Kazakh National Pedagogical University. Almaty, Kazakhstan.*
[3]*Email: emovea_kz@mail.ru*
[4]*Department of Pedagogy and Psychology, Abai Kazakh National Pedagogical University. Almaty, Kazakhstan.*
[4]*Email: adk7575@mail.ru*
[5]*Department of Professional Training of Primary Education Programs, Institute of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, 050010, 13 Dostyk Ave., Almaty, Republic of Kazakhstan.*
[5]*Email: zhazi_29_09@mail.ru*


(+ Corresponding author)

Article History
Received: 18 June 2025
Revised: 6 March 2026
Accepted: 26 March 2026
Published: 20 April 2026

Keywords
Blockchain
Distance education
Student
Technology
University education.

ABSTRACT

This research aimed to assess university students' attitudes toward the implementation of blockchain technology in educational settings. The study used a survey methodology. The research study group comprised 541 students enrolled at diverse universities in Kazakhstan. Data for the research was gathered using the "blockchain technologies in educational environments" scale created by the researchers. The validity and reliability study of the prepared scale was conducted. At every stage of the investigation, the university students who participated provided consent forms to participate in the research. One-way analysis of variance (ANOVA) and an independent groups t-test were used to examine the results. The research indicates that university students exhibit a deficient attitude regarding the knowledge level sub-dimension, the application level sub-dimension, and the overall scale of blockchain technology in educational contexts. This outcome is essential for university students to utilize blockchain technologies in education, as it indicates their limited disposition in both application domains. It has been established that there is no substantial difference in the attitudes of university students involved in the research about blockchain technologies. Students' perceptions towards blockchain technologies in educational settings exhibited a notable variance based on the faculty variable. The notable disparity favors the students of the engineering faculty.

Contribution/Originality: This study aims to assess university students' attitudes toward the implementation of blockchain technology in educational settings. Given the limited number of blockchain technology-related studies conducted in education, it will make significant contributions to the field of educational sciences. Furthermore, because the research was conducted on an original scale, it yields original results.

1. INTRODUCTION

The rapid development of technology has affected all areas of life, and education is one of the sectors impacted by technological advancement (Li, 2021; Rosli & Siregar, 2022). In the process of investing in people, importance is given to the preparation and development of talented individuals equipped with knowledge, science, and technology (Al Nomani & Albaradi, 2022). In recent years, with the integration of technology into education, there have been radical changes in traditional education (Mok, 2021). Blockchain technology is one of the technologies used in education in recent years (Agarwal, Sheikh, & Obaid, 2021; Lizcano, Lara, White, & Aljawarneh, 2020; Park, 2021; Shah, Patel, Adesara, Hingu, & Shah, 2021).

Blockchain technology, initially recognized for facilitating bitcoin transactions, has emerged as a transformative force across multiple sectors, including education. Its apparent efficacy in educational settings mainly stems from its capacity to enhance transparency and safety, two essential qualities valued by university students.

Recent surveys indicate significant student interest in the potential integration of blockchain technology into educational systems. Rooksby and Dimitrov (2019) note that students demonstrate considerable trust in academic credentials supported by blockchain technology, which facilitates improved verification and protection against the alteration of academic achievements. This guarantee includes students' records and credentials, mitigating problems related to fraud and degree legitimacy.

Additionally, students support the implementation of blockchain technology to optimize administrative procedures, thereby improving the efficiency and accessibility of degree verification (Deenmahomed, Didier, & Sungkur, 2021). The decentralized nature of blockchain enables swift access to papers verified by employers and educational institutions, reducing delays associated with traditional verification methods. This improvement in administrative efficiency aligns with students' aspirations for an educational experience that prioritizes flexibility and responsiveness to their needs. Time saved in processing and verification can be redirected to improve learning experiences, strengthening blockchain's critical role in enhancing educational settings.

In addition to its effectiveness, students acknowledge other benefits associated with the incorporation of blockchain in education. Chivu et al. (2022) contend that blockchain can augment lifelong learning by allowing students to accumulate and safeguard their academic credentials in a unique, secure, and unchangeable record. This would enable students to successfully showcase their competencies while fostering continuous engagement with learning beyond traditional approaches. Furthermore, the prospect of microbidding through blockchain allows students to pursue personalized learning pathways, hence enhancing a more individualized educational experience. These benefits greatly attract a generation of students who increasingly prioritize flexibility and independence in their educational endeavors.

Students recognize certain challenges associated with the use of blockchain technology in educational environments, notwithstanding its evident benefits. Concerns about technical complexity, necessary infrastructure, and initial financial investment for the implementation of blockchain solutions are substantial (Rooksby & Dimitrov, 2019). Furthermore, the lack of standards among schools may impede the interoperability of systems as students traverse a disjointed educational landscape. This unpredictability may impede the effectiveness of blockchain solutions, cultivating skepticism over the consistent attainment of expected advantages across various educational contexts (Nurgaziev & Abdykadyrov, 2023).

Furthermore, students express apprehensions about privacy and data security in relation to blockchain technology. Despite the intended safety of the technology, concerns around the management of personal data in decentralized networks arise. Understanding and ensuring data protection protocols within blockchain ecosystems is crucial, especially as educational institutions transition to digital systems that increasingly depend on personal information (Deenmahomed et al., 2021). The duality of trust, both in technology and in the institutions that employ it, presents a significant issue that universities must address for effective integration.

The varied viewpoints within the student cohort underscore a complex issue regarding the influence of blockchain or analogous technologies on future educational methodologies. Students evaluating the effective incorporation of blockchain must formulate complete plans that promote technological adoption while prioritizing transparency, training, and ethical data management in educational processes. University students have increasingly recognized the advantages of blockchain technology in educational contexts, especially with the improvement of evaluation techniques and collaborative learning opportunities. Bjelobaba, Savić, Tošić, Stefanović, and Kocić (2023) assert that blockchain improves collaborative learning by offering a decentralized and secure platform for information exchange and project management, hence enhancing the educational experience. The application of blockchain can cultivate a more participatory learning environment, enhancing student involvement in collaborative problem-solving and peer interaction. This highlights students' excitement over blockchain's capacity to promote a more inclusive and dynamic educational landscape.

Furthermore, students expressed a strong belief in the capabilities of blockchain technology to enable secure and transparent assessment systems. This is particularly relevant to Jordan's higher education institutions, as highlighted by Ayasrah, Shdouh, and Al-Said (2023), where students perceive blockchain as a viable solution for challenges associated with examinations and the verification of identification data. The exceptional confidence and reliability in documenting students' results enhance the credibility of educational references. Consequently, this may profoundly affect academic recognition and employment prospects, as it pertains to current concerns around academic dishonesty and the authenticity of student records.

Extensive research by Alammary, Alhazmi, Almasri, and Gillani (2019) supports these observations, indicating that blockchain-based applications are perceived as improving educational outcomes. Their findings reveal that students like the transparency offered by blockchain technology and its ability to enhance administrative efficiency, reduce bureaucratic inefficiencies, and cultivate a more engaging learning environment. This aligns with students' desire for a more customized educational experience, allowing them to maintain control over their learning paths.

Kuleto et al. (2022) illustrate that students from varied backgrounds in Serbia, Romania, and Portugal perceive blockchain as a revolutionary educational tool that may resolve current issues in higher education. Students highlighted blockchain's potential to democratize access to information and educational resources, thus promoting equity in learning opportunities. This remark underscores a fundamental shift in how technological progress can enhance instructional methods to better meet different student needs.

Blockchain technology in educational settings has the potential to enhance lifelong learning. Blockchain can enable a more flexible and inclusive approach to personal and professional development by providing a verifiable record of skills and knowledge acquired through non-traditional means, such as online courses and workshops. In a complex labor market requiring continuous learning and adaptation, students must provide a thorough and credible portfolio of their skills to improve employability.

University students acknowledge that blockchain technology possesses significant potential to alter educational environments. This technology offers superior assessment techniques, stronger cooperation, greater transparency, and personalized learning experiences. Students champion these innovations, underscoring the imperative of integrating contemporary technologies into education to address the changing requirements of learners and the labor market. The effective integration of blockchain technology in educational environments encounters various hurdles and impediments that influence university students' perceptions and the future of teaching methodologies. Despite the recognized benefits of blockchain, such as improved transparency, security, and efficiency in educational processes, students often cite technological limits as a significant concern (Mohammad & Vargas, 2022). These limits sometimes manifest as inadequate infrastructure, limited digital literacy among students and educators, and a general unfamiliarity with technology. These challenges indicate a wider institutional problem, where the hesitance to embrace modern technology arises from a combination of financial constraints and apprehensions about disrupting traditional educational structures. Ulah, Khan, Rehman, and Ali (2021) underscore the complexities institutions face

when incorporating blockchain into existing educational systems indicate that simply technological adoption is insufficient for effective implementation.

Furthermore, the problem of institutional resistance should not be overlooked. Many educational institutions are typically slow to adopt change, often adhering to traditional teaching methods. Students have noted this reluctance, which may reduce enthusiasm for the implementation of blockchain technology. An initiative-driven educational strategy to familiarize students and educators with blockchain is crucial in this context. Bucea-Manea-Ţoniş et al. (2021) clarify that a thorough understanding of blockchain operations is crucial for its implementation and for promoting a culture of innovation in academia. The gap in technical readiness poses a twin challenge: students are eager to engage with advanced methods, while they face limitations set by their institutions.

The implications of the challenges extend beyond simple integration issues and signify a need for fundamental changes in educational methodologies (Abdullahi, 2023). Delgado-Von-Eitzen, Anido-Rifón, and Fernández-Iglesias (2021) employ a multifaceted approach to tackle the obstacles of blockchain integration in educational environments. This includes the development of specialized training programs to improve digital literacy, the involvement of pertinent stakeholders in policy reform, and the creation of a flexible curriculum designed to integrate blockchain technology effectively. Prioritizing these strategies will empower educational institutions to address the diverse challenges that arise. These initiatives would allow institutions to evolve from passive recipients of technological change to proactive participants in determining the future of education, thus facilitating the significant integration of blockchain technology.

Despite acknowledging the transformative promise of blockchain technology in education, university students face significant challenges, including technological impediments, institutional inertia, and inadequate understanding. Resolving these issues is essential not only to harness the benefits of blockchain but also to ensure that educational methodologies evolve to improve experiences and outcomes. The ongoing discourse among students, educators, and institutional leaders is crucial for fostering a mature climate conducive to innovation, thereby establishing the groundwork for a progressive educational landscape in which blockchain can flourish.

1.1. The Aim of this Study

This study aimed to assess university students' perspectives on the implementation of blockchain technology within educational settings. Responses to the subsequent inquiries were pursued.

1. How do students perceive the implementation of blockchain technology within the educational setting?
2. Are there differences in students' attitudes toward the use of Blockchain technology in the educational environment based on gender?
3. Are there variations in students' attitudes toward the implementation of Blockchain technology in educational settings based on the faculty they belong to?

2. METHODS AND MATERIALS

In this section, information about the design of the research is provided. The research process, from developing the data collection tool to transforming data into findings, is explained in detail.

2.1. Research Method

The study used a survey model. Survey models constitute a research methodology designed to accurately depict a past or present condition as it exists. The event, individual, or object under investigation is characterized in its context and as it exists (Bacon-Shone, 2013). An assessment instrument was created to evaluate university students' views on the implementation of blockchain technology in educational settings. The study, which assesses the application of blockchain technology in educational settings from students' viewpoints, was structured and executed using a survey technique.

2.2. Participants

The study group of the research consists of 541 students studying at various universities in Kazakhstan. Students were selected from among those who received online education during the pandemic. According to Comrey and Lee (1992), the measures of adequacy of a sample for factor analysis are roughly: unbelievably bad: 50, bad: 100, fair: 200, good: 300, particularly good: 500, excellent: 1000, and more. In this case, it is possible to say that the student group participating in this research indicates a particularly good sample group. Participants in this study were volunteers from students at the Eurasian National University named after L.N. Gumilyov and the Abai Kazakh National Pedagogical University. The two universities are located in Astana, the capital of Kazakhstan, and Almaty, its largest city. The demographic information of the students constituting the study group is given in Table 2 in the findings section of the research.

2.3. Instruments

Research data was gathered using "The Scale of University Students' Attitude Toward the Use of Blockchain Technology in Educational Environments," created by the researchers. The following details the development process of the research data collection instrument.

This study followed established protocols for scale development (Carpenter, 2018; Churchill, 1979) and validation methods (Carpenter, 2018; Crocetta et al., 2021; Hair, Risher, Sarstedt, & Ringle, 2019) in the creation of "The Scale of University Students' Attitude Toward the Use of Blockchain Technology in Educational Environments." Research on blockchain technologies was initially examined (Albayati, Kim, & Rho, 2020; Caliskan, 2020; De Filippi, Mannan, & Reijers, 2020; Herian, 2018; Janssen, Weerakkody, Ismagilova, Sivarajah, & Irani, 2020; Jones, Luu, & Samuel, 2024; Kowalski, Lee, & Chan, 2021; Marengo & Pagano, 2023; Marikyan, Papagiannidis, Rana, & Ranjan, 2022; Morkunas, Paschen, & Boon, 2019; Staples et al., 2017). Upon examination of the research, it was observed that there is a scarcity of comprehensive literature on blockchain. No extensive research on the application of blockchain technologies in educational environments was found. The subsequent phase entailed a comprehensive examination of previous literature addressing themes such as computer literacy, social media literacy, and internet literacy, deemed relevant to blockchain technologies (Carretero, Vuorikari, & Punie, 2017; Celik, Sahin, & Aydin, 2021; Chetty et al., 2018; Eshet, 2012; Gammon & White, 2011; Jones & Flannigan, 2006; Koc & Barut, 2016; Morgan, Sibson, & Jackson, 2022; Oh et al., 2021; Reddy, Chaudhary, Sharma, & Hussein, 2023; Rodríguez-De-Dios, Igartua, & González-Vázquez, 2016; Tandoc Jr et al., 2021; Van Deursen, Helsper, & Eynon, 2016). Blockchain literacy includes essential traits similar to those in internet, digital, and social media literacies, such as critical thinking, technological competence, and risk awareness, making existing frameworks relevant to blockchain technologies. Considering that blockchain is essential to a broader digital transformation, methodologies for evaluating these fundamental literacies can facilitate the development of blockchain literacy. Given the lack of focused research on blockchain literacy, insights from other fields may help bridge this gap and create an evidence-based framework for understanding blockchain. A preliminary item pool of 38 items was derived from the literature for the scale development process, and the items were adapted for educational situations.

The drafted scale was examined by three faculty members from the subject area and field education experts. The structure of the scale, consisting of 38 items, was reviewed by experts. They were asked to focus on the scope and intelligibility levels of the items. Based on the experts' suggestions, propositions that were not suitable for the scope or that reduced the face validity of the instrument were removed from the measurement tool.

The instrument designed to assess its application in educational settings was established as a 5-point Likert scale. The response options for the scale items are as follows: 5=Strongly agree, 4=Agree, 3=Undecided, 2=Disagree, and 1=Strongly disagree. Scale spacing: 1.00-1.80; "I strongly disagree", 1.81-2.60; "Disagree", 2.61-3.40; "I partially agree", 3.41-4.20; "I agree", and 4.21-5.00; "I agree". The scale ranges from 1 to 5. As the scores approach 5.00,

university students' sentiments about the implementation of blockchain technologies in educational settings reflect a highly optimistic perspective.

Preliminary Application: Following the organization of the measuring instrument in response to expert critiques, it was administered to a randomly selected cohort of 288 students. At the conclusion of this pilot study, it was ascertained that certain items in the measurement instrument were either misunderstood by the teachers or left unanswered. The scale was modified based on the experts' assessments of these items. The scale was administered to 279 students beyond the prior study's scope, resulting in its final version. There are 27 items on the scale during the pre-application phase.

The adequacy of the sample used in the study was assessed with the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity (BTS). The KMO result was 0.921, indicating a very high value. The BTS evaluates whether the population correlation matrix resembles the identity matrix. The study shows a significance value below 0.05, indicating that the data are suitable for factor analysis.

Exploratory Factor Analysis: Consequently, four items that did not conform to the scale's structure or contributed to several factors were eliminated from the original 27-item scale. The remaining 23 entries constituted a structure comprising two sub-factors, each exhibiting an eigenvalue exceeding 1.

Attitude is a consistent and comprehensive evaluation of an object, individual, group, subject, or concept along a spectrum from negative to positive. Attitudes provide evaluative judgments of certain items and are often thought to stem from particular concepts, feelings, and previous behaviors associated with those objects (APA, 2025). Cherry (2024) claimed that attitudes comprise an emotive component and a cognitive component.

The initial sub-factor (Affective) comprises 11 items. The eigenvalue of the initial factor, indicating the significance and influence of each element within the structure, was determined to be 8.77. This sub-factor accounts for 41.60% of the attitude variable. The second sub-factor (Cognitive) comprises 12 elements. The eigenvalue of this factor was determined to be 1.89. This sub-factor accounts for 18.51% of the variance in the associated attitude variable. The factor loadings of the scale items range from 0.58 to 0.81. These data indicate that the scale possesses an adequate level of construct validity. Correlations of item tests were computed to assess the validity and homogeneity of the scale. The item-test correlations of the scale range from 0.43 to 0.69. All these outcomes are regarded as evidence supporting the validity of the scale items and their measurement of the same concept.

Confirmatory Factor Analysis: Confirmatory factor analysis was conducted to validate the factor structure derived from exploratory factor analysis. At this juncture, multiple statistics were employed to assess the compatibility between the data and the model. The goodness-of-fit indices for the data set are presented in Table 1.

Table 1. The goodness of the fit index.

X^2 / df	RMSEA	S-RMR	GFI	AGFI	CFI
2.66	0.051	0.08	0.94	0.95	0.92

In Table 1, it is observed that the Chi-square statistic ($\chi 2$/df) for Blockchain technology in educational environments is 2.66. The root mean square error of approximation (RMSEA) is 0.051; the square root of the standardized mean error (S-RMR) is 0.08; the goodness of fit index (GFI) is 0.94; the adjusted goodness of fit index (AGFI) is 0.95; and the comparative fit index (CFI) is 0.92. These values indicate that all fit indices support the scale's validity.

Reliability Analysis: To determine the reliability of the scale, the Cronbach's Alpha internal consistency coefficient was calculated. The first factor of the 23-item Blockchain technology in educational environments, the Cronbach's Alpha internal consistency coefficient of the cognitive level, was 0.81. The second factor, the affective level, had a Cronbach's Alpha coefficient of 0.84. The overall Blockchain technology in educational environments had a Cronbach's Alpha coefficient of 0.82.

2.4. Data Collection Process

The virtual survey application was used during the scale development phase of the research and the data collection phase from the implementation phase of the scale. The application was applied to all university students online. It took approximately three months to collect all data, including data from the scale development phase. The scale's application time was estimated at approximately 15-20 minutes.

2.5. Data Analysis

The SPSS 20.0 software was used for data analysis. A normality test was conducted before selecting the appropriate analysis. The results indicated that the data had a normal distribution, as the Kolmogorov-Smirnov statistic ($p > .05$) was satisfactory. Because the data were on a ratio scale and normally distributed, parametric analyses were employed. The data were analyzed using an independent groups t-test and one-way analysis of variance (ANOVA).

2.6. Compliance with Ethics

Consent forms for research participation were obtained from university students involved in each study stage. The consent form includes the research purpose, ethical standards, data confidentiality information, and study phases. Consequently, research data were collected on a fully voluntary basis. Additionally, necessary approvals were obtained from the schools involved to facilitate data collection. During the writing phase, publication ethics were strictly followed.

3. RESULTS

The data obtained from the application of Blockchain technology in educational environments for university students was transformed into findings.

Table 2. Demographic characteristics of university students.

Gender	f	%
Female	295	54.5
Male	246	45.5
Total	541	100
Faculty		
Faculty of Education	188	34.8
Engineering Faculty	187	34.5
Medical School	166	30.7
Total	541	100

Table 2 presents the demographic distributions of university students involved in the research, categorized by gender and faculty of study. 54.5% of the pupils in the study group are female, while 45.5% are male. 34.8% of students are enrolled in the Faculty of Education, 34.5% in the Faculty of Engineering, and 30.7% in the Faculty of Medicine.

Table 3. Blockchain technology in the educational environment, weighted average, and standard deviations.

Scale and sub-dimensions	*M*	SD
Affective component	2.53	0.691
Cognitive component	2.19	0.462
Blockchain technology in educational environments	2.35	0.610

Table 3 presents the sub-dimensions of blockchain technology within educational contexts, along with the overall weighted average and standard deviations of the scale, which have been ascertained. The emotive sub-dimension has

a low mean (M=2.53, SD=0.691), the cognitive sub-dimension shows a low mean (M=2.19, SD=0.462), and the overall assessment of blockchain technology in educational environments reflects a poor mean (M=2.35, SD=0.610).

Table 4. Blockchain technology in educational environments, independent variables, T-test results according to the gender variable of university students.

Gender	N	*M*	SD	F	P
Female	295	2.28	0.845	4.771	0.209
Male	246	2.46	0.823		

Table 4 presents an evaluation of university students' attitudes toward blockchain technology in educational settings, analyzed through gender differences. The independent t-test showed no significant difference between female students (M=2.28, P>.05) and male students (M=2.46, P>.05) regarding their attitudes toward blockchain technology in educational settings.

Table 5. Blockchain technology in educational environments: one-way analysis of variance ANOVA results according to the faculty variable of university students.

Faculty	N	*M*	SD	F	p
Faculty of Education	188	2.07	0.605	14.519	0.000
Engineering faculty	187	2.67	0.826		
Medical school	166	2.31	0.675		

The opinions of university students regarding Blockchain technologies, as presented in Table 5, were assessed based on the faculty in which they are enrolled. The one-way analysis of variance (ANOVA) revealed a significant difference in university students' attitudes toward Blockchain technologies based on their faculty of study (F=14.519, p<0.5). The data indicate a notable difference that favors the students of the engineering faculty.

4. DISCUSSIONS

Our research indicates that university students exhibit a low attitude towards blockchain technology in educational settings, particularly in the cognitive and affective sub-dimensions. The study conducted by Aygün and İlhan (2018) employed qualitative research methodologies to assess the attitudes and understanding of ten social studies teacher candidates about blockchain technologies. The survey revealed that most pre-service instructors were unfamiliar with blockchain technology, indicating their understanding was inadequate. Doblas (2019) conducted a survey to assess university students' understanding and attitudes towards cryptocurrency, revealing that their overall awareness was modest.

Our research revealed no substantial disparity in the perceptions of female and male pupils about blockchain technologies. Öget and Kanat (2023) conducted a study with 355 students to create a scale for assessing cryptocurrency knowledge and to evaluate their level of understanding. The survey revealed that male university students exhibited more favorable sentiments towards cryptocurrency compared to their female counterparts. Yurtsızoğlu and Akgül (2022) conducted a study on the perceptions and awareness of cryptocurrency among students in the Faculty of Sports Sciences. The study revealed that male students exhibited greater perception and awareness of cryptocurrency compared to female students. Steinmetz, Von Meduna, Ante, and Fiedler (2021) discovered in their study with 3,864 participants that men had a greater interest in cryptocurrency. In Doğan's (2020) study, involving 400 students aimed to assess the understanding and utilization of cryptocurrencies among university students, it was revealed that the frequency of awareness regarding blockchain technology was much higher among males than females. Henry, Huynh, and Nicholls (2017) research indicated that men's familiarity with blockchain technology surpassed that of women. The attitudes of engineering faculty students towards blockchain technology are superior to those of students in education and medical faculties. Baysal and Baysal (2023) conducted a study to assess university students' awareness of cryptocurrency. The research involved 275 students enrolled in office management and

administrative assistance, alternative energy technology, call center services, and child development programs, all actively engaged in their classes. The study revealed that students enrolled in the alternative energy resources program exhibited better awareness levels than their peers.

5. CONCLUSION

In the current technological era, both technological applications are broadening daily, and technology-related features are increasingly utilized in education. Despite the relative maturity of blockchain technology, its adoption in the educational sector has only recently begun. This research aims to ascertain the application of blockchain technology in educational settings among students enrolled in diverse university faculties.

The research indicates that university students have a low attitude in the cognitive level sub-dimension, the affective level sub-dimension, and the overall scale regarding Blockchain technology in educational environments. This outcome is essential for university students to utilize Blockchain technology in education, indicating that they possess a poor disposition in both application domains. The research has concluded that there is no substantial difference in the attitudes of university students towards Blockchain technologies. The faculty variable indicates that university students' perceptions about Blockchain technology exhibit a substantial difference. The notable disparity favors the students of the engineering faculty.

6. RECOMMENDATIONS

The research indicates that university students exhibit low cognitive and affective attitudes towards the utilization of Blockchain technologies in education. In the current technological era, it is essential to provide course content that enables university students to understand Blockchain technologies. The attitudes of engineering students towards Blockchain technologies are found to be somewhat more favorable than those of students in education and medical faculties; however, research should encompass students from all disciplines and faculties at universities. This study assessed students' opinions towards Blockchain technologies based on gender and faculty characteristics. The impact of several factors, including age and education, on students' opinions towards Blockchain technologies might be examined in forthcoming studies on the topic.

Funding: This study received no specific financial support.
Institutional Review Board Statement: This study was approved by the Institutional Review Board of Abai Kazakh National Pedagogical University, Kazakhstan, under protocol number [IRB No. 2025/13], dated [January 15, 2025]. Informed verbal consent was obtained from all participants, and all data were anonymized to protect participant confidentiality
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Abdullahi, N. J. K. (2023). Social network sites and professional development of lecturers. *International Journal of Learning and Teaching*, *15*(1), 18-32. https://doi.org/10.18844/ijlt.v15i1.8312

Agarwal, P., Sheikh, M. I., & Obaid, A. J. (2021). Blockchain and IoT technology in transformation of education sector. *International Journal of Online and Biomedical Engineering*, *17*(12), 4-18. https://doi.org/10.3991/ijoe.v17i12.25015

Al Nomani, M., & Albaradi, H. (2022). Technology integration in education: Transforming traditional learning models. *International Journal of Education and Development*, *12*(3), 45–56.

Alammary, A., Alhazmi, S., Almasri, M., & Gillani, S. (2019). Blockchain-based applications in education: A systematic review. *Applied Sciences*, *9*(12), 2400. https://doi.org/10.3390/app9122400

Albayati, H., Kim, S. K., & Rho, J. J. (2020). Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach. *Technology in Society, 62*, 101320. https://doi.org/10.1016/j.techsoc.2020.101320

APA. (2025). *APA dictionary of psychology*. Retrieved from https://dictionary.apa.org/attitude?amp=1

Ayasrah, F. T. M., Shdouh, A., & Al-Said, K. (2023). Blockchain-based student assessment and evaluation: A secure and transparent approach in Jordan's tertiary institutions. *Kurdish Studies, 11*(2), 2036-2049.

Aygün, M., & İlhan, G. O. (2018). Social studies teacher candidates' views on blockchain. *OPUS International Journal of Society Researches, 9*(16), 908-932. https://doi.org/10.26466/opus.494009

Bacon-Shone, J. (2013). *Introduction to quantitative research methods*. Hong Kong: Graduate School, The University of Hong Kong.

Baysal, G., & Baysal, İ. (2023). Analysis of university students' awareness levels on cryptocurrencies: Adnan Menderes University Buharkent vocational school example. *International Conference on Frontiers in Academic Research, 1*, 27–37.

Bjelobaba, G., Savić, A., Tošić, T., Stefanović, I., & Kocić, B. (2023). Collaborative learning supported by blockchain technology as a model for improving the educational process. *Sustainability, 15*(6), 4780. https://doi.org/10.3390/su15064780

Bucea-Manea-Ţoniş, R., Martins, O. M. D., Bucea-Manea-Ţoniş, R., Gheorghiţă, C., Kuleto, V., Ilić, M. P., & Simion, V.-E. (2021). Blockchain technology enhances sustainable higher education. *Sustainability, 13*(22), 12347. https://doi.org/10.3390/su132212347

Caliskan, K. (2020). Data money: The socio-technical infrastructure of cryptocurrency blockchains. *Economy and Society, 49*(4), 540-561. https://doi.org/10.1080/03085147.2020.1774258

Carpenter, S. (2018). Ten steps in scale development and reporting: A guide for researchers. *Communication Methods and Measures, 12*(1), 25-44. https://doi.org/10.1080/19312458.2017.1396583

Carretero, G. S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The digital competence framework for citizens with eight proficiency levels and examples of use. JRC106281/EUR 28558 EN. Joint Research Centre*. Retrieved from http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106281/web-digcomp2.1pdf_(online).pdf

Celik, I., Sahin, I., & Aydin, M. (2021). The role of digital literacy in technology integration: A study on pre-service teachers. *Education and Information Technologies, 26*(3), 3215–3235.

Cherry, K. (2024). *Formation of an attitude and how it can be changed*. Retrieved from https://www.verywellmind.com/attitudes-how-they-form-change-shape-behavior-2795897#citation-1

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: Measuring digital literacy. *Economics, 12*(1), 20180023. https://doi.org/10.5018/economics-ejournal.ja.2018-23

Chivu, R.-G., Popa, I.-C., Orzan, M.-C., Marinescu, C., Florescu, M. S., & Orzan, A.-O. (2022). The role of blockchain technologies in the sustainable development of students' learning process. *Sustainability, 14*(3), 1406. https://doi.org/10.3390/su14031406

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16*(1), 64-73. https://doi.org/10.1177/002224377901600110

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis* (2nd ed.). Hillsdale, NJ, United States: Lawrence Erlbaum Associates.

Crocetta, C., Antonucci, L., Cataldo, R., Galasso, R., Grassia, M. G., Lauro, C. N., & Marino, M. (2021). Higher-order PLS-PM approach for different types of constructs. *Social Indicators Research, 154*(2), 725-754. https://doi.org/10.1007/s11205-020-02563-w

De Filippi, P., Mannan, M., & Reijers, W. (2020). Blockchain as a confidence machine: The problem of trust & challenges of governance. *Technology in Society, 62*, 101284. https://doi.org/10.1016/j.techsoc.2020.101284

Deenmahomed, H. A. M., Didier, M. M., & Sungkur, R. K. (2021). The future of university education: Examination, transcript, and certificate system using blockchain. *Computer Applications in Engineering Education, 29*(5), 1234-1256. https://doi.org/10.1002/cae.22381

Delgado-Von-Eitzen, C., Anido-Rifón, L., & Fernández-Iglesias, M. J. (2021). Blockchain applications in education: A systematic literature review. *Applied Sciences, 11*(24), 11811. https://doi.org/10.3390/app112411811

Doblas, M. P. (2019). Awareness and attitude towards cryptocurrencies in relation to adoption among college students in a private tertiary institution in Cagayan De Oro City, Philippines. *International Journal of Advanced Research and Publications*, *3*(4), 15-19.

Doğan, M. (2020). University students' awareness and use of cryptocurrencies and blockchain technology. *Journal of Educational Technology and Online Learning*, *3*(2), 120–135.

Eshet, A. Y. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in Informing Science and Information Technology*, *9*, 267-276. https://doi.org/10.28945/1621

Gammon, M. A., & White, J. (2011). (Social) media literacy: Challenges and opportunities for higher education. In Wankel, C. (Ed.) Educating Educators with social media. In: Emerald Group Publishing Limited. https://doi.org/10.1108/S2044-9968(2011)0000001019

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Henry, C. S., Huynh, K. P., & Nicholls, G. (2017). *Bitcoin awareness and usage in Canada*. Staff Working Papers No. 17-56, Bank of Canada.

Herian, R. (2018). *Regulating blockchain: Critical perspectives in law and technology*. New York: Routledge.

Janssen, M., Weerakkody, V., Ismagilova, E., Sivarajah, U., & Irani, Z. (2020). A framework for analysing blockchain technology adoption: Integrating institutional, market and technical factors. *International Journal of Information Management*, *50*, 302-309. https://doi.org/10.1016/j.ijinfomgt.2019.08.012

Jones, K. B. R., & Flannigan, S. L. (2006). Connecting the digital dots: Literacy of the 21st century. *Educause Quarterly*, *29*(2), 8-10.

Jones, M., Luu, T., & Samuel, B. (2024). Measuring cryptocurrency literacy. *SSRN Electronic Journal*, 1-56. https://doi.org/10.2139/ssrn.4541401

Koc, M., & Barut, E. (2016). Development and validation of new media literacy scale (NMLS) for university students. *Computers in Human Behavior*, *63*, 834-843. https://doi.org/10.1016/j.chb.2016.06.035

Kowalski, M., Lee, Z. W. Y., & Chan, T. K. H. (2021). Blockchain technology and trust relationships in trade finance. *Technological Forecasting and Social Change*, *166*, 120641. https://doi.org/10.1016/j.techfore.2021.120641

Kuleto, V., Bucea-Manea-Ţoniş, R., Bucea-Manea-Ţoniş, R., Ilić, M. P., Martins, O. M. D., Ranković, M., & Coelho, A. S. (2022). The potential of blockchain technology in higher education as perceived by students in Serbia, Romania, and Portugal. *Sustainability*, *14*(2), 749. https://doi.org/10.3390/su14020749

Li, M. (2021). Call for papers on Language teacher education and technology. *Language Learning & Technology*, *25*(1), 34-35.

Lizcano, D., Lara, J. A., White, B., & Aljawarneh, S. (2020). Blockchain-based approach to create a model of trust in open and ubiquitous higher education. *Journal of Computing in Higher Education*, *32*(1), 109-134. https://doi.org/10.1007/s12528-019-09209-y

Marengo, A., & Pagano, A. (2023). Investigating the factors influencing the adoption of blockchain technology across different countries and industries: A systematic literature review. *Electronics*, *12*(14), 3006. https://doi.org/10.3390/electronics12143006

Marikyan, D., Papagiannidis, S., Rana, O. F., & Ranjan, R. (2022). Blockchain adoption: A study of cognitive factors underpinning decision making. *Computers in Human Behavior*, *131*, 107207. https://doi.org/10.1016/j.chb.2022.107207

Mohammad, A., & Vargas, S. (2022). Barriers affecting higher education institutions' adoption of blockchain technology: A qualitative study. *Informatics*, *9*(3), 64. https://doi.org/10.3390/informatics9030064

Mok, M. M. C. (2021). Learning, education and collaboration with the support of digital technology. *Educational Psychology*, *41*(1), 1-4. https://doi.org/10.1080/01443410.2021.1866818

Morgan, A., Sibson, R., & Jackson, D. (2022). Digital demand and digital deficit: Conceptualising digital literacy and gauging proficiency among higher education students. *Journal of Higher Education Policy and Management*, *44*(3), 258-275. https://doi.org/10.1080/1360080X.2022.2030275

Morkunas, V. J., Paschen, J., & Boon, E. (2019). How blockchain technologies impact your business model. *Business Horizons, 62*(3), 295-306. https://doi.org/10.1016/j.bushor.2019.01.009

Nurgaziev, Y., & Abdykadyrov, A. (2023). Application of effective methods in the educational process based on innovative, interactive, and game technologies. *World Journal on Educational Technology: Current Issues, 15*(4), 395–410. https://doi.org/10.18844/wjet.v15i4.8820

Öget, E., & Kanat, E. (2023). Measuring university students' cryptocurrency attitudes and knowledge levels: The case of ZBEUN. *Ekonomik ve Sosyal Araştırmalar Dergisi, 19*(1), 143-159.

Oh, S. S., Kim, K.-A., Kim, M., Oh, J., Chu, S. H., & Choi, J. (2021). Measurement of digital literacy among older adults: Systematic review. *Journal of Medical Internet Research, 23*(2), e26145. https://doi.org/10.2196/26145

Park, J. (2021). Promises and challenges of blockchain in education. *Smart Learning Environments, 8*(1), 33. https://doi.org/10.1186/s40561-021-00179-2

Reddy, P., Chaudhary, K., Sharma, B., & Hussein, S. (2023). Essaying the design, development and validation processes of a new digital literacy scale. *Online Information Review, 47*(2), 371-397. https://doi.org/10.1108/OIR-10-2021-0532

Rodríguez-De-Dios, I., Igartua, J. J., & González-Vázquez, A. (2016). *Development and validation of a digital literacy scale for teenagers.* Paper presented at the Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality, ACM.

Rooksby, J., & Dimitrov, K. (2019). Trustless education? A blockchain system for university grades. *Ubiquity: The Journal of Pervasive Media, 6*(1), 83-88.

Rosli, R., & Siregar, N. C. (2022). Teacher professional development of teachers in science, technology, engineering, and mathematics: A bibliometric analysis. *Contemporary Educational Researches Journal, 12*(1), 1-17. https://doi.org/10.18844/cerj.v12i1.5417

Shah, D., Patel, D., Adesara, J., Hingu, P., & Shah, M. (2021). Integrating machine learning and blockchain to develop a system to veto the forgeries and provide efficient results in education sector. *Visual Computing for Industry, Biomedicine, and Art, 4*(1), 18. https://doi.org/10.1186/s42492-021-00084-y

Staples, M., Chen, S., Falamaki, S., Ponomarev, A., Rimba, P., Tran, A. B., & Zhu, J. (2017). *Risks and opportunities for systems using blockchain and smart contracts.* Australia: Data61, CSIRO.

Steinmetz, F., Von Meduna, M., Ante, L., & Fiedler, I. (2021). Ownership, uses and perceptions of cryptocurrency: Results from a population survey. *Technological Forecasting and Social Change, 173*, 121073. https://doi.org/10.1016/j.techfore.2021.121073

Tandoc Jr, E. C., Yee, A. Z. H., Ong, J., Lee, J. C. B., Xu, D., Han, Z., . . . Cayabyab, M. Y. (2021). Developing a perceived social media literacy scale: Evidence from Singapore. *International Journal of Communication, 15*, 2484–2505.

Ulah, M., Khan, A., Rehman, S., & Ali, R. (2021). Blockchain integration in education: Challenges and opportunities for institutional adoption. *International Journal of Educational Technology, 18*(4), 221–235.

Van Deursen, A. J. A. M., Helsper, E. J., & Eynon, R. (2016). Development and validation of the internet skills scale. *Information, Communication & Society, 19*(6), 804-823. https://doi.org/10.1080/1369118X.2015.1078834

Yurtsızoğlu, Z., & Akgül, K. A. (2022). The perception and awareness level of cryptocurrency among sports science faculty students. *Akdeniz Spor Bilimleri Dergisi, 5*(3), 383-397. https://doi.org/10.38021/asbid.1140495