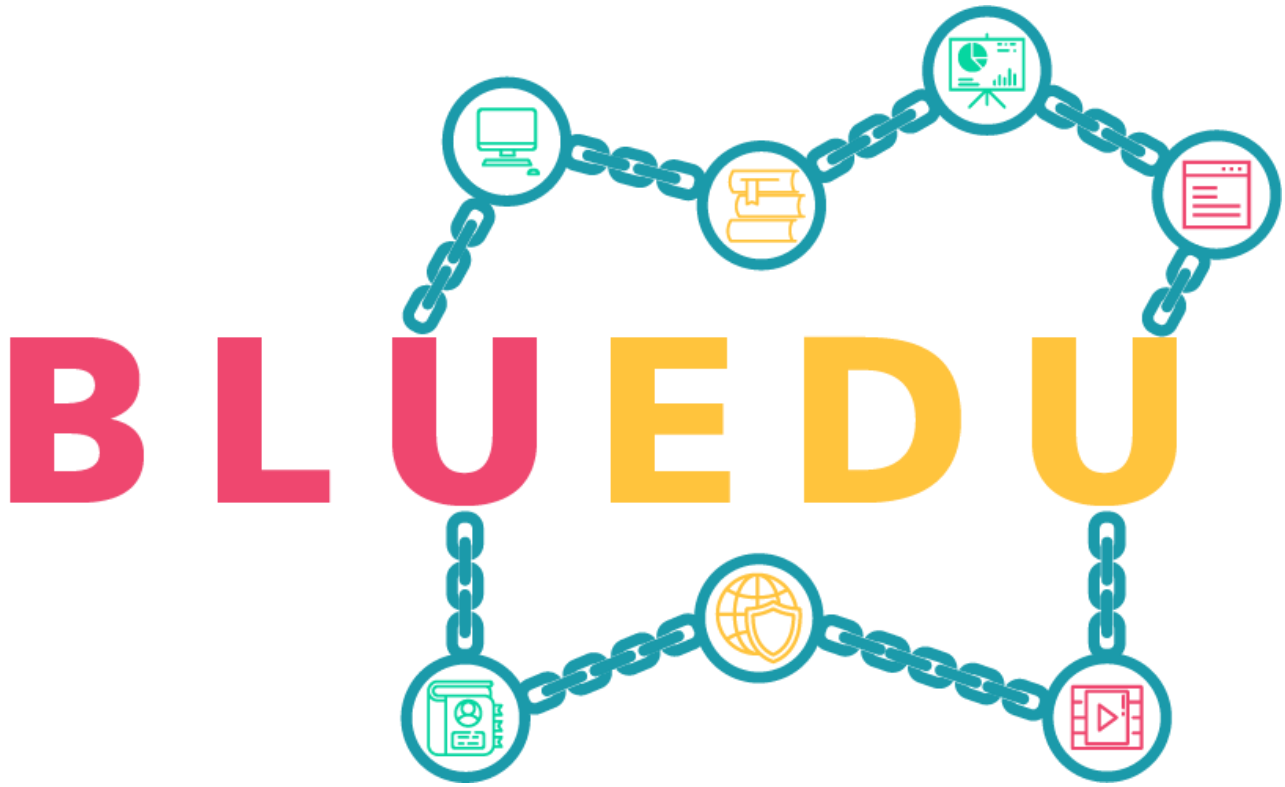

A1: Determination of teaching objectives and development of the training outline

Co-funded by
the European Union



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the European Union


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Authors	BLUEDU Consortium

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2.0	Draft version		22/03/2023
3.0	Final version		31/03/2023

Table of Contents

1. Introduction

Blockchain technology (BT) is developing rapidly in the field of information technologies (IT). Blockchain technology is an important sector that needs knowledgeable employees. The target group of BLUEDU is VET trainers in the areas of blockchain technologies.

A detailed desk study by the BLUEDU consortium reviewed the literature, best practices and the current VET curricula. Teaching objectives were determined in line with the information obtained in the desk study and according to the results of the survey conducted with VET educators. In the desk study, 5 cases and examples from real-life examples, 23 Literature (Research paper, book or book chapter), 8 Current VET Curricula were analysed. 101 VET educators were surveyed to understand their needs and determine the teaching objectives accordingly.

2. Desk Study Results

2.1 Research Papers

Our desk research analysed the main findings from the recent literature, the researchers focused on Blockchain education and the importance of Blockchain in education and other sectors.

Bhaskar et al (2020), in the paper "Blockchain in education management: present and future applications" states in the research that blockchain technology is applied in limited areas in the education sector, that the potential in the field of education cannot be utilized in the desired rate and that progress in this field is slow. The study states that the obstacles to the application of Blockchain technology in the field of education must be overcome.

Holotescu (2018), in the paper "Understanding Blockchain Opportunities and Challenges" stated in her research that given the ever-increasing need for blockchain-related jobs in various fields indicates that there is a need for courses on blockchain technology.

Silvestru et al (2022) in "Smart Academic and Professional Education" stated that their research covers the image of tertiary education, mostly at the university level. At this level of education, novel educational programs are supported especially by distance education. Researchers present how technologies such as Blockchain and XR can be enhanced through learning methods e.g., MOOCs and gamification. Universities have been able to increase interaction and motivation outside class hours by offering students options to pay with cryptocurrencies (for example, for articles or

educational programs) and through gamification. Thus, it makes it easier for them to learn with the application of blockchain and XR technologies.

Chivu et al (2022) in their paper "The Role of Blockchain Technologies in the Sustainable Development of Students' Learning Process" conducted two specialized studies (in Romania), examined blockchain technology as a motivational factor to improve learning and analysed the benefits of rewards that will increase learner motivation to learn by implementing a system that can bring students credit points that can be converted into cryptocurrencies or online badges. Similarly, Kuleto et al (2022) in their paper "The Potential of Blockchain Technology in Higher Education as Perceived by students in Serbia, Romania, and Portugal" analysed students' opinions, and concluded that blockchain technology had a positive effect on their learning performance. Bucea-Manea-Țoniș (2021) in their paper "Blockchain Technology Enhances Sustainable Higher Education" aimed to enhance the current state of blockchain applications researched current literature, analysed blockchain platforms, used case studies, and implemented a survey. The researchers reached 3 universities in Serbia, Romania, and Portugal to gather data from 150 students. Researchers found that teamwork, motivation, and student involvement were important factors to enhance learning, as were blockchain-based tools. They concluded motivation, collaboration, and engagement were enhanced via MOOCs, AR, VR, gamification, and online classes associated with learning performance.

JRC Science for policy report "Blockchain Education" (Grech, & Camilleri, 2017) focuses on the education sector and points out the fundamental principles of blockchain technologies. The report presents how this technology may both disrupt institutional norms and empower learners. Based on the current state-of-the-art technologies, they propose eight scenarios for the application of blockchain in an education context.

Choi et al (2022) in their paper "Development of Blockchain Learning Game-Themed Education Program Targeting Elementary Students Based on ASSURE Model" presented the findings of the education program they developed by applying the training design process in six steps following the ASSURE model. In the first phase of their study on South Korean primary school students, they questioned the students' digital literacy problems and the jobs they wanted to have in the future. In the second stage, they defined the purpose of blockchain education as "improving primary school students' awareness and attention to blockchain technology." In the third stage, they adopted gamification applied lessons as a teaching method, and developed educational environments as course materials that could be used both online and offline. In the fourth stage, the developed learning

materials were evaluated. In the fifth stage, award-winning learning games were designed. In the last stage, the learning program was designed to teach the principles of consensus mechanisms, private blockchain, and public blockchain, respectively. The feedback from the education experts was analyzed statistically for the modification of the program. The learning program design approach, which included gamification elements, was found to be effective, however, it is recommended to expand the scope to include teaching elements at different levels.

Zhou et al (2020) in their paper “Development Status, Trends and Challenges in the Field of Blockchain and Education" analysed "blockchain + education" literature in China, and the trends of blockchain technology. They delved into research on blockchain technology in the field of resource sharing and knowledge management to grasp the current situation in the field of education. It discusses the difficulties encountered in the implementation of blockchain technology and ways to integrate blockchain and education.

Sharma and Batth (2020) in their paper “Blockchain Technology for Higher Education System: A Mirror Review” aimed to understand blockchain technology and its application in education. It discusses the use of blockchain and a few of the many models designed to support education. They discussed the gaps and challenges for the successful support of blockchain in education.

Brown (2022), in their paper “The Emerald Handbook of Higher Education in a Post-Covid World: New Approaches and Technologies for Teaching and Learning” stated that blockchain adoption can be one such step towards a smart campus.

Dash et al’s (2022) and Tiwari and Pal’s (2022) papers are bibliographic analyses of Blockchain applications.

Düdder et al (2020) in their paper “Interdisciplinary Blockchain Education: Utilizing Blockchain Technology From Various Perspectives” stated that the preparation and provision of interdisciplinary courses that offer comprehensive competencies and knowledge about blockchain technology makes a significant contribution to understanding the scope of blockchain technology and seeing its impact on different business environments.

Stern and Reinstein (2021) in their paper “A blockchain course for accounting and other business students” stated that students with little knowledge of information technologies may have difficulty in understanding blockchain topics.

The desk study of our research validates the importance of blockchain education in different specializations and sectors and represents the research gap, especially in the VET education area.

2.2 Cases and Examples

In this part of the desk research, the cases and examples are mainly derived from the EU-funded projects as presented in Table 1.

Table 1. The cases and examples for blockchain education

Name of the case/example	Country	Short description of the case study (Max 150 words)	Additional comments
Blockchain Network Online Education for Interdisciplinary European Competence Transfer	EU (Coordinator: Lithuania)	This project aimed to create innovations that would encourage the creation of a professional workforce and help to reap the benefits of this innovation, with academic institutions making sufficient efforts to develop and transfer their knowledge about blockchain technology. (Click for further information)	This project was funded by the Erasmus+ program with the number 2018-1-LT01-KA203-047044.
Blockchain for Entrepreneurs - a non-traditional Industry 4.0 curriculum for Higher Education	EU (Coordinator: Romania)	This project created a networked collaboration platform in curriculum development for universities and companies to develop blended learning courses tailored for the Industry 4.0 world. (Click for further information)	This project was funded by the Erasmus+ program with the number 2018-1-RO01-KA203-049510.
Blockchain in Education	NA	This report introduces the fundamental principles of the Blockchain focusing on its potential for the education sector. (Click for further information)	Joint Research Center of the European Commission.
TRUE - Transparency of Learning Outcomes through Blockchain Technology	EU (Coordinator: Portugal)	This project aims to prepare a training program for integrating blockchain technology into higher education institutions in Europe. (Click for further information)	This project was funded by the Erasmus+ program with the number 2020-1-PT01-KA203-078421.
Digitalization of tax administrations in the EU	EU (Coordinator: Spain)	The main objective of the project is a specific Digital Government for Citizens Charter related to tax collection, including what Citizens reasonably expect from these services, from new technologies and the Tax Administrations using or offering them. (Click for further information)	This project was funded by the Erasmus+ program with the number 612029-EPP-1-2019-1-ES-EPPJMO-PROJECT

The projects mainly focus on blockchain education, for different sectors, none of them is specifically designed for VET educators.

2.3 Current VET Curriculum

This part of the desk study aims to reach the current curriculum of Blockchain in various European educational institutions. Table 2 lists some of the example curricula from Europe.

Table 2. Examples of blockchain education curricula

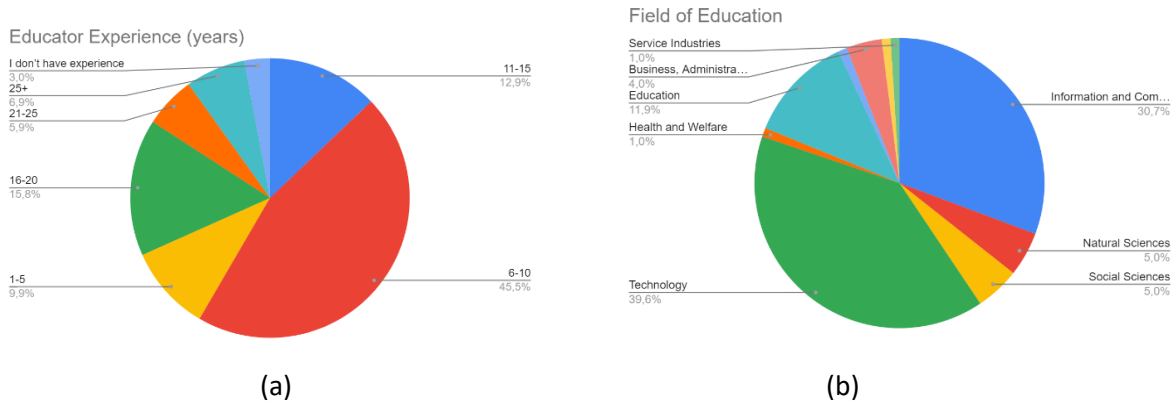
Name of the institution	Country	Short Description	Delivery method
Dundalk Institute of Technology	Ireland	The course continues for two semesters and covers two different modules. Its first term module is 'Blockchain Essentials'. This module introduces Blockchain Fundamentals. (Link to Curricula)	Online learning / Distance learning
TUM Institute for LifeLong Learning Technical University of Munich	Germany	The course consists of two modules and continues online for 11-14 weeks. Case studies are included in the modules. After successful completion of the first module, the second module enables them to gain experience with a real case study. (Link to Curricula)	Online learning / Distance learning
University of Oxford, Department for Continuing Education	United Kingdom	Starting from complete basics, and through a mixture of taught lectures, hands-on tutorials and group activities (Link to Curricula)	Face to face
The University of Nicosia (UNIC), MSc Program	South Cyprus	The program provides an introduction to research within the field and aims to strengthen the candidate's effective application of computer science methods. (Link to Curricula)	Online learning / Distance learning
The University of Malta	Malta	The program allows the learners to describe the multi-disciplinary area and how the various areas complement and integrate, helps to analyze academic material to their chosen specialization (Link to Curricula)	Face to face
Universitary expert on Blockchain	Spain	This Online Course in Blockchain of the European University is designed to train participants to lead projects based on Blockchain technologies (Link to Curricula)	Online learning / Distance learning
Develop Smart Contracts with UNIR's online Blockchain Course in collaboration with UCM and Alastria	Spain	The Blockchain Development Course: technologies and applications online of UNIR, in collaboration with UCM (Complutense University of Madrid) and Alastria, is the first interuniversity degree 100% online that will introduce to the Blockchain ecosystem. (Link to Curricula)	Online learning

3. Survey Results

A total of 101 VET educators from Spain and Türkiye were reached, and the survey questions are presented in the ANNEX. All survey questions were prepared by the research team in English, translated into Spanish and Turkish and distributed by emails to VET schools and VET teachers in the network of the consortium members.

3.1 Demographic Information

The demographic analysis shows that the participants are approximately equally distributed from Spain (50.5%) and Türkiye (49.5). Most of the participants were male (74.3%). The age distribution of the participants is 67.3% between 36-45, 15.8% between 46-55, 14.9% between 26-35 and %2 between 56-65, respectively. Most of the VET educators are post-graduates (61.4%), 12.9% of them are undergraduates and 25.7% of them have doctoral degrees. Figure 1. shows the experience of the educators and their field of education. Among the participants 45.5% of them have experience as an educator between 6-10 years, 15.8% of them between 16-20 years, 5.9% of them between 11-15 years, 9.9% between 1-5 years, 5.9% between 21-25 years, 6.9% of more than 25 years and 3% of the participants did not have an educator experience yet. The field of education of the participants reveals a wide distribution mostly IT (30.7%) and technology (39.6%). The rest of the participants have a background in natural sciences, health and welfare, education, business and administration, service industries and social sciences. All participants state that they have internet access and smart device access at their location. The daily internet, computer and smart device usage time of the participants are given in Figure 2. Most of them did not take a course about blockchain before (9.1%), similarly, most of them do not use blockchain in their classes or schools (9.6%).



(a) (b)

Figure 1. (a) Experience of educators in years (b) Field of education of educators

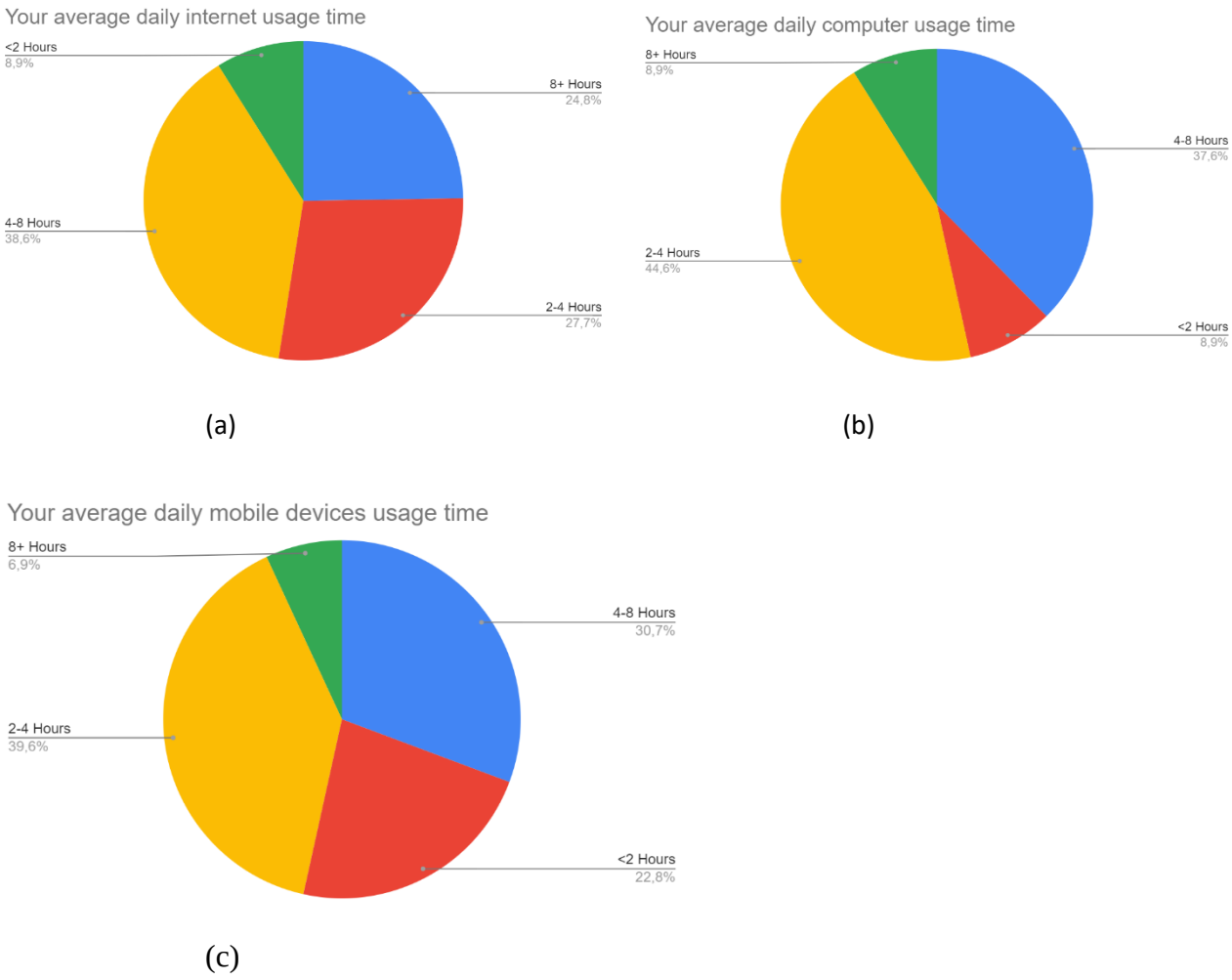


Figure 2 Average daily (a) internet, (b) computer, (c) mobile device usage time of the participants

3.2 Blockchain Self-efficacy Questions

The participants were questioned about self-efficacy of blockchain technologies. It is interesting to reveal that most of the participants were "undecided" about their self-efficacy of blockchain technologies ranging between 44.6% to 26.7%. Among the participants, only 19.8% of them (strongly agree + agree) can describe blockchain technology in general terms, only 28.7% of them (strongly agree + agree) know how blockchain technology works, 28.8% of them (strongly agree + agree) are aware of usage areas of the blockchain technologies, 23.8% of them (strongly agree + agree) can explain blockchain technologies technically and 31.7% of them can benefit from blockchain technologies according to their needs. See Figure 3 for the rest of the results.

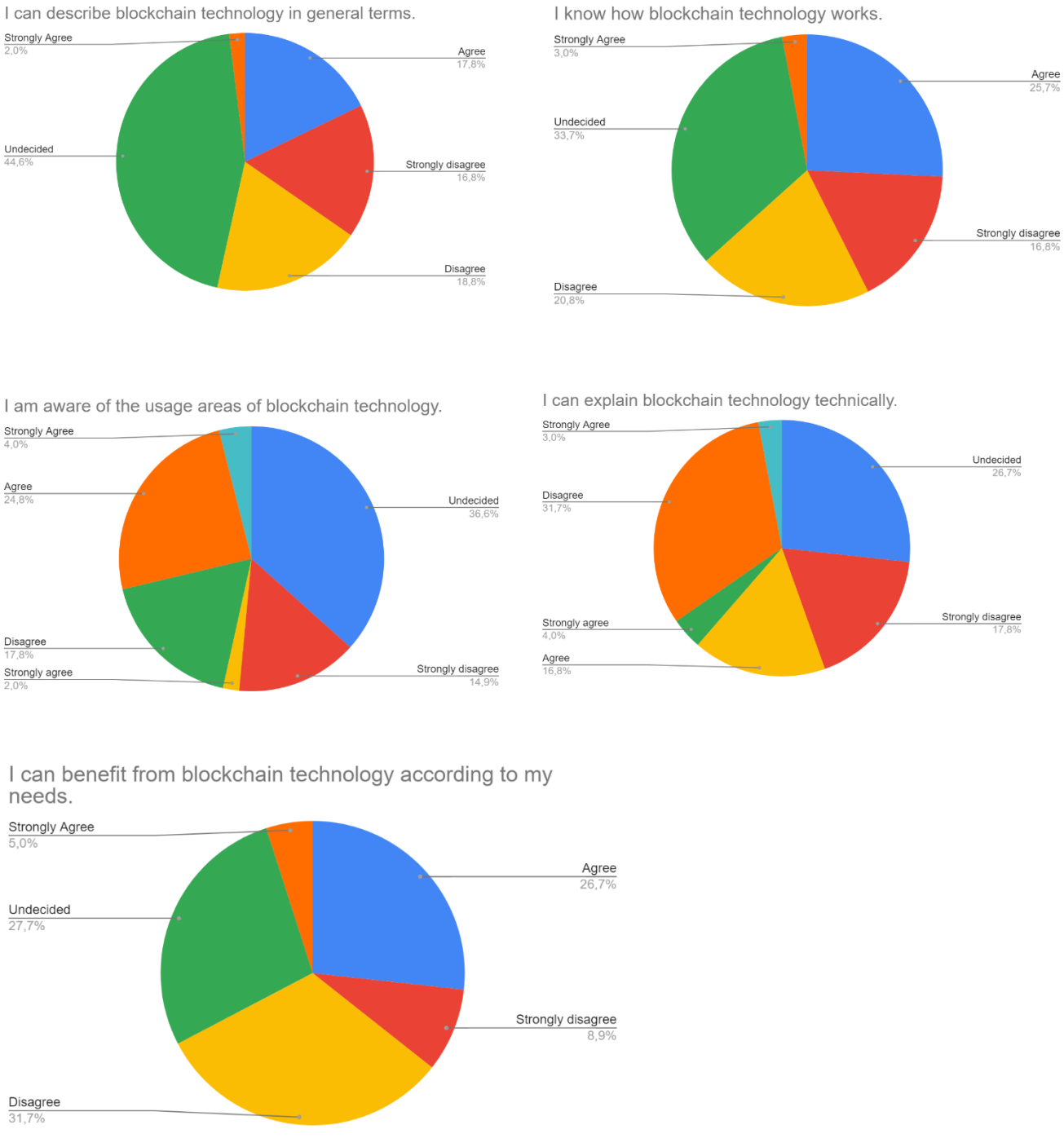


Figure 3. Responses to self-efficacy questions

3.3 Knowledge Level Questions

Most of the participants rated their knowledge about blockchain as very poor (35.6%) and poor (20.8%), knowledge about ICT as very poor (18.8%), poor (2%), average (34.7%), good (25.7%), very good (18.8%), knowledge about cryptography very poor (13.9%), poor (19.8%), average (19.8%), good (26.7%), very good (10.9%), and no idea (8.9%), knowledge about data storage, very poor (14.9%), poor (19.8%), average (32.7%), good (23.8%) and very good (8.9%). It can be seen that the VET educators have main knowledge about ICT, but their knowledge level is low in terms of blockchain technologies and related knowledge. Figure 4. Shows the responses to knowledge level questions.

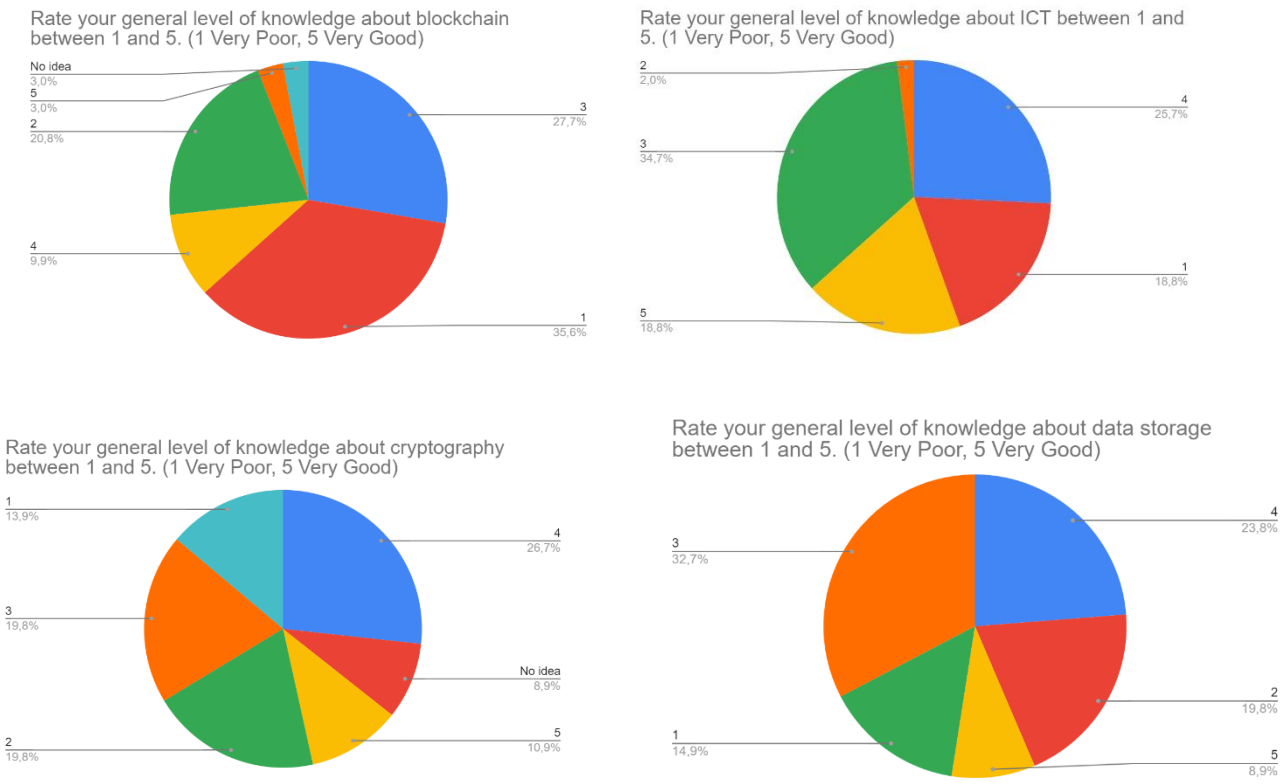


Figure 4: Responses to knowledge level questions

3.4 Blockchain Teaching Questions

When the VET teachers were questioned about their teaching preferences in terms of blockchain education, the most preferred methods and approaches (more than 10% preference) can be listed as below:

Evaluation methods:

- Process evaluation (29.3%)
- Formative evaluation (23.6%)
- Summative evaluation (11.5%)
- Outcome evaluation (11.5%)

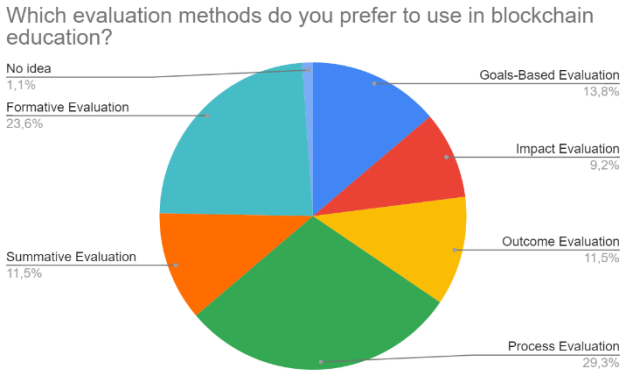
Teaching methods:

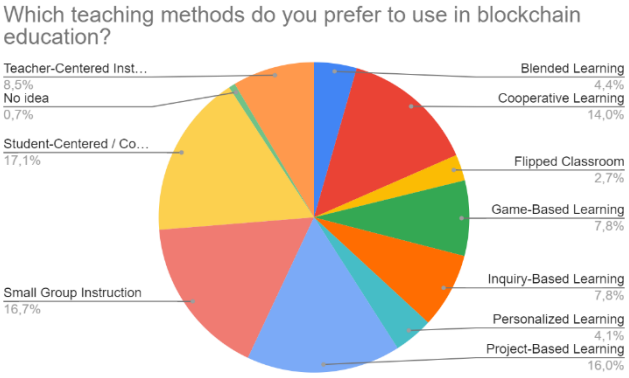
- Student-centered / Constructivist Approach (17.1%)
- Small group instruction (16.7%)
- Project-based learning (16%)
- Cooperative learning (14%)

Learning approaches:

- Active learning (21.9%)
- Collaborative learning (18%)
- Interdisciplinary learning (16.7%)
- Experiential learning (15.7%)
- Learner-centered learning (11.1%)

Responses to teaching questions are given in Figure 5.





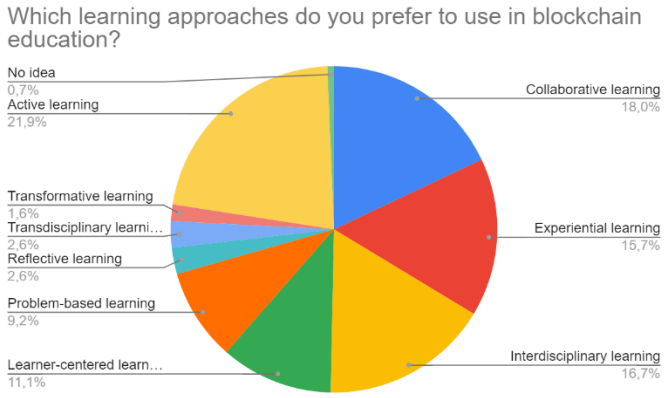


Figure 5. Responses to teaching questions

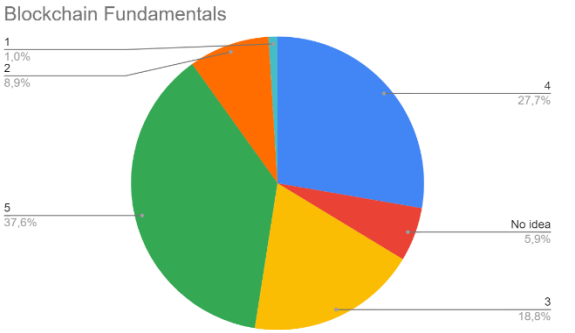
3.5 Blockchain Topics

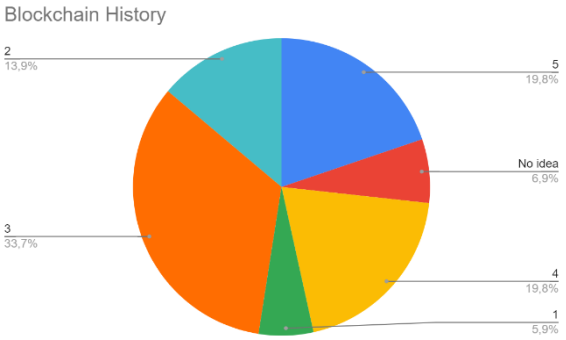
The researchers tried to understand and evaluate the importance of the topics that can be included in blockchain education. The topics were questioned in the importance of knowledge gained. The topics were rated according to their importance between 1 and 5. (1 Unimportant, 5 Very Important). Table 3. Lists the importance of the topics as the summation of the participants' responses that were scored as 5-very important and 4-important. The topics were ranked according to their level of importance. Figure 6 represents all responses to blockchain topics.

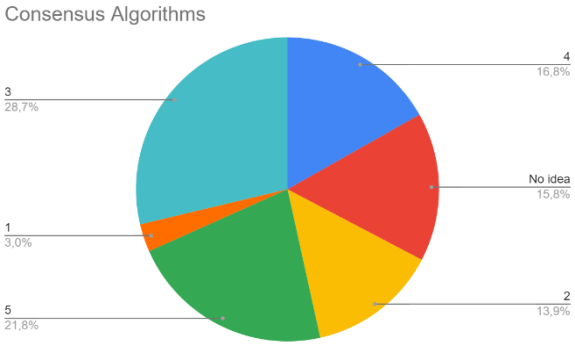
Table 3. Importance of topics according to participants

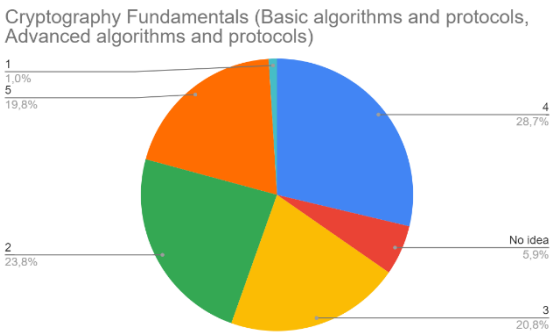
Topic	Score: as the summation of 5 and 4 in %	Rank
Blockchain fundamentals	65.3	1
Blockchain history	39.6	21
Consensus algorithms	38.6	22
Cryptography fundamentals	48.5	13
Blockchain platforms & networks	53.4	8
Layer 2 architectures	44.6	16
Blockchain programming	55.4	6
Decentralized application development	45.6	15
Blockchain transactions, mining & wallets	51.5	10
Smart contracts	55.4	7
Blockchain security	56.5	4

Blockchain privacy	55.5	5
Dapp-smart contract audit	41.6	18
Blockchain governance	48.5	14
Blockchain regulations	49.5	11
Blockchain integration technologies	59.4	2
Issues and trends in blockchain technologies	59.4	3
Non-fungible tokens	40.6	20
Tokenomics	38.6	23
Wallet safety and security	49.5	12
Blockchain application domains and real world samples	52.5	9
Tools: explorer, wallet, faucet and bot	42.5	17
Web3	41.6	19
DAOs & DApps	38.6	24
Initial X offering	28.8	27
Blockchain scalability	36.3	26
Blockchain labs	37.6	25

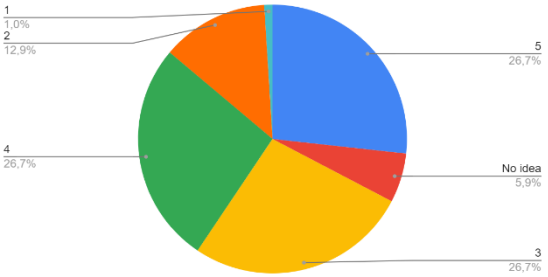




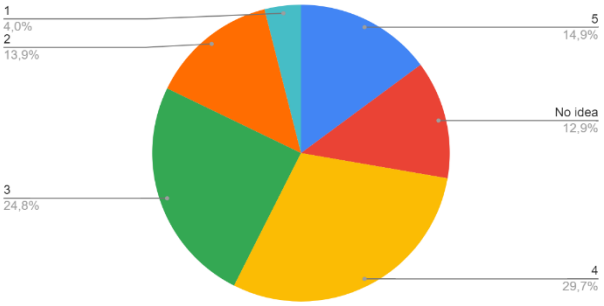




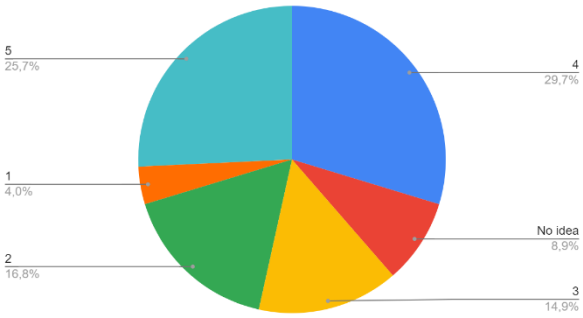
Blockchain Platforms/Networks (Platforms Types and Samples, Ethereum Mechanics, Bitcoin Mechanics)



Layer2 Architectures (State channels, Side chain, Bridges, Oracles)

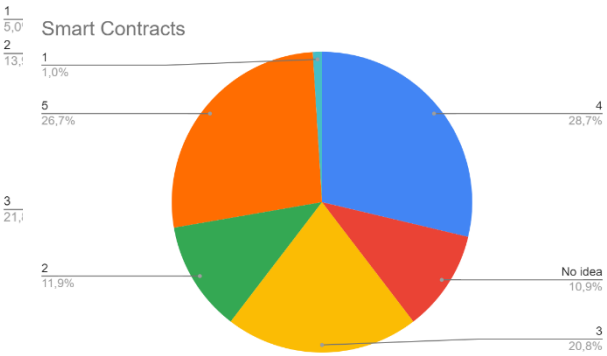


Blockchain Programming

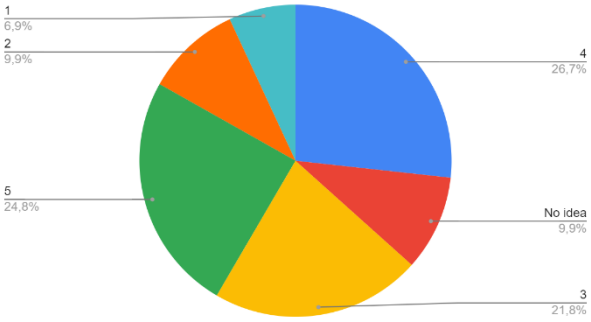


Decentralized Application Development

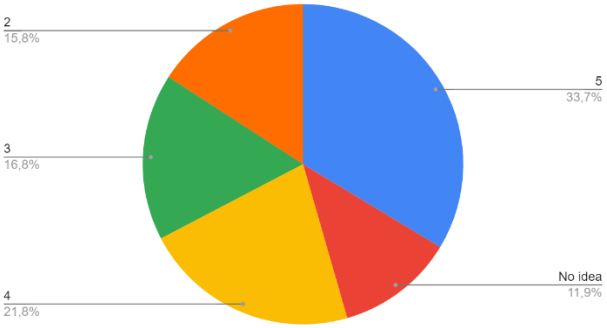
Smart Contracts



Blockchain Transactions, Mining, and Wallets

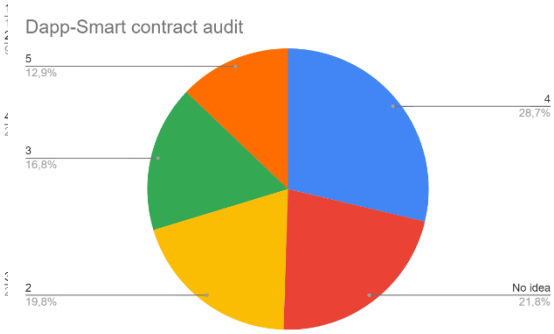


Blockchain Privacy

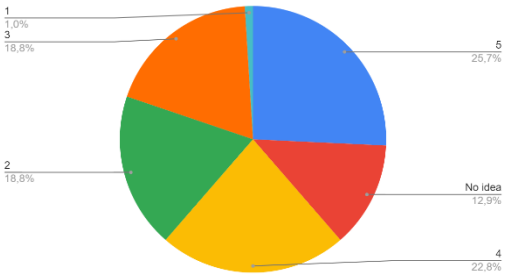


Blockchain Security

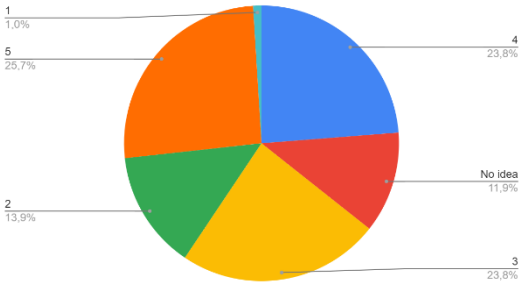
Dapp-Smart contract audit



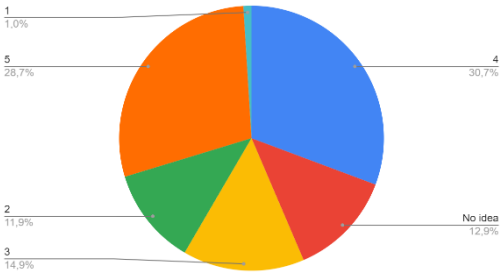
Blockchain Governance



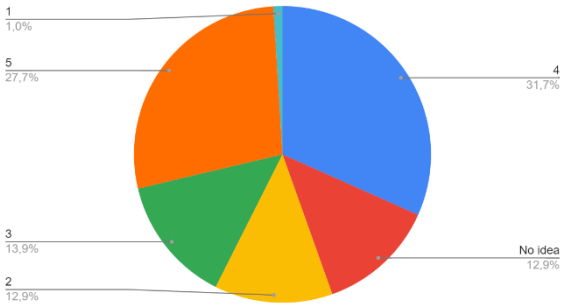
Blockchain Regulations



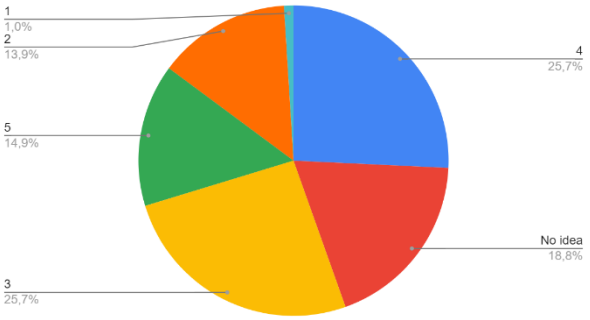
Blockchain Integration Technologies



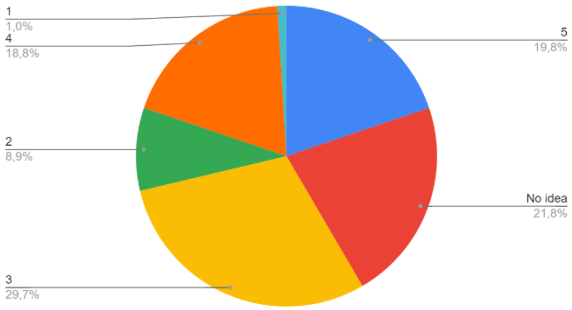
Issues and Trends in Blockchain Technologies



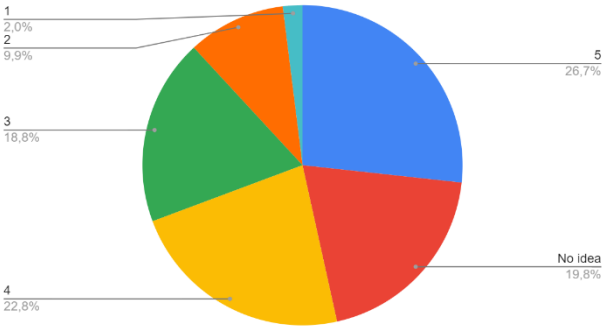
Non-Fungible Tokens



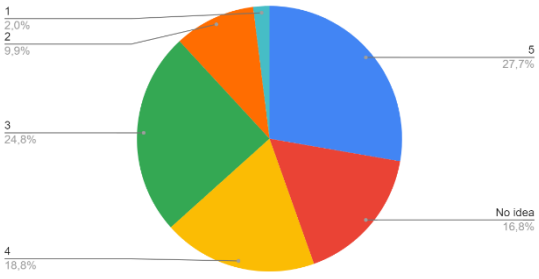
Tokenomics (Finance and Economics)



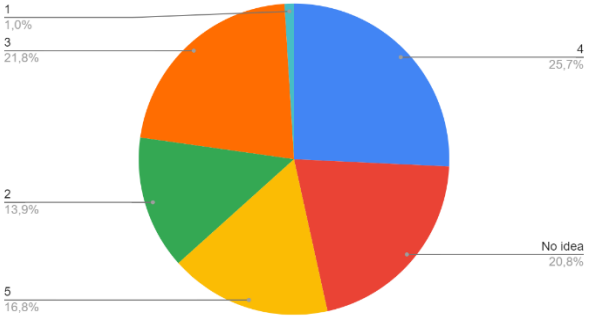
Wallet Safety and Security, Custody, Backup, Recovery



Blockchain Application Domains and Real world samples (Blockchain Feasibility Analysis, Introduction to Cryptocurren…



Tools: Explorer, Wallet, Faucet, and Bot



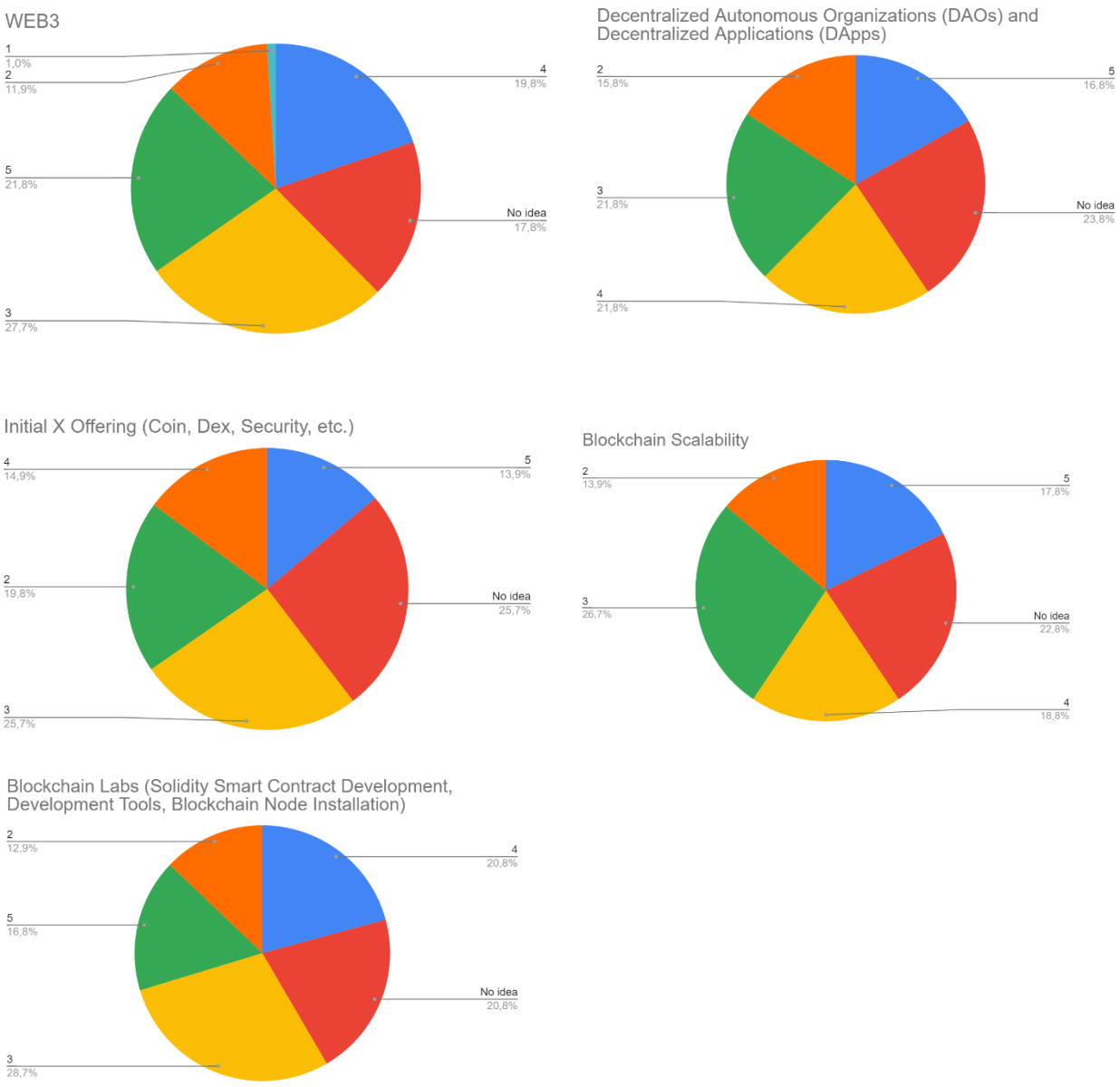
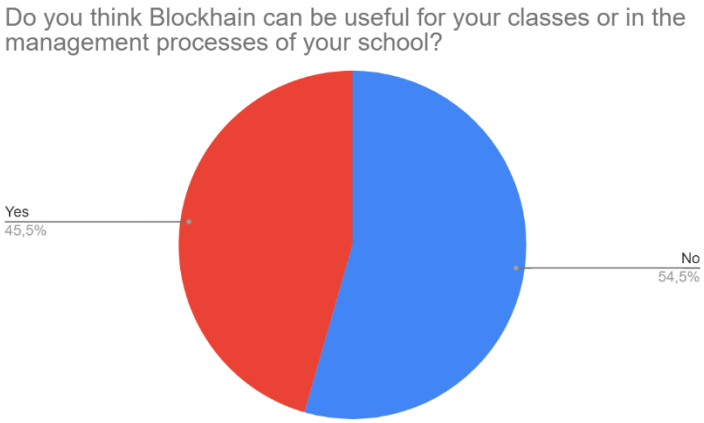


Figure 6. Responses to blockchain topics

3.6 Blockchain in Classroom Questions

Finally, it was questioned if the participants found the blockchain useful for their classes or management processes in schools. Among the participants, 45.5% found it useful and the rest did not. Considering the lack of knowledge in Blockchain technologies these results were meaningful for the analysis.



The survey results show the lack of awareness and knowledge of VET teachers in both countries. They are interested in learning more about Blockchain technology and related topics, and use different teaching approaches and methods in their classrooms. They need to understand and address the suitable learning approach and methodology to teach blockchain technologies in their courses/schools.

4. Teaching Objectives

The findings of the desk study and surveys guided us in determining the teaching objectives of Blockchain education in VET. The teaching objectives consist of three parts; (i) teaching approaches, (ii) teaching tools and (iii) blockchain technology.

4.1 Blockchain Technology

1. Learners will be able to know blockchain fundamentals.
2. Learners will be able to know blockchain history.
3. Learners will be able to know blockchain advantages and limitations.
4. Learners will be able to know consensus algorithms.
5. Learners will be able to know cryptography fundamentals (basic algorithms and protocols, advanced algorithms and protocols).
6. Learners will be able to know blockchain platforms/networks (platforms types and samples, Ethereum mechanics, bitcoin mechanics).
7. Learners will be able to know layer2 architectures (state channels, side chain, bridges, oracles).
8. Learners will be able to know blockchain programming.

9. Learners will be able to know decentralized application development.
10. Learners will be able to know blockchain transactions, mining, and wallets.
11. Learners will be able to know smart contracts.
12. Learners will be able to know blockchain security.
13. Learners will be able to know blockchain privacy.
14. Learners will be able to know dapp-smart contract audit.
15. Learners will be able to know blockchain governance.
16. Learners will be able to know blockchain regulations.
17. Learners will be able to know blockchain integration technologies.
18. Learners will be able to know issues and trends in blockchain technologies.
19. Learners will be able to know non-fungible tokens.
20. Learners will be able to know tokenomics (finance and economics).
21. Learners will be able to know wallet safety and security, custody, backup, recovery.
22. Learners will be able to know blockchain application domains and real-world samples (blockchain feasibility analysis, introduction to cryptocurrency, cryptocurrencies, currencies, tokens, and stablecoins, decentralized finance (defi), ico, sto, central crypto exchanges, central bank digital currencies, supply chains, metaverse, blockchain gaming (gamefi), decentralized identity management, self-sovereign identities, health).
23. Learners will be able to know tools: explorer, wallet, faucet, and bot.
24. Learners will be able to know web3.
25. Learners will be able to know decentralized autonomous organizations (daos) and decentralized applications (dapps).
26. Learners will be able to know initial x offering (coin, dex, security, etc.).
27. Learners will be able to know blockchain scalability.
28. Learners will be able to know blockchain labs (solidity smart contract development, development tools, blockchain node installation).

4.2 Teaching Approaches for Blockchain Education

1. Learners will be able to know active learning approach.
2. Learners will be able to know learner-centered learning approach.
3. Learners will be able to know collaborative learning approach.
4. Learners will be able to know experiential learning approach.

5. Learners will be able to know problem-based learning approach.
6. Learners will be able to know interdisciplinary learning approach.
7. Learners will be able to know how to use active learning approach in blockchain education.
8. Learners will be able to know how to use learner-centered learning approach in blockchain education.
9. Learners will be able to know how to use collaborative learning approach in blockchain education.
10. Learners will be able to know how to use experiential learning approach in blockchain education.
11. Learners will be able to know how to use problem-based learning approach in blockchain education.
12. Learners will be able to know how to use interdisciplinary learning approach in blockchain education.

4.3 Teaching and Evaluation Methods and Tools for Blockchain Education

1. Learners will be able to know how to use small group instruction tools in blockchain education
2. Learners will be able to know how to use student-centered / constructivist approach tools in blockchain education.
3. Learners will be able to know how to use project-based learning tools in blockchain education.
4. Learners will be able to know how to use cooperative learning tools in blockchain education.
5. Learners will be able to know how to use game-based learning tools in blockchain education.
6. Learners will be able to know how to use formative evaluation tools in blockchain education.
7. Learners will be able to know how to use process evaluation tools in blockchain education.
8. Learners will be able to know how to use outcome evaluation tools in blockchain education.
9. Learners will be able to know how to use impact evaluation tools in blockchain education.
10. Learners will be able to know how to use summative evaluation tools in blockchain education.
11. Learners will be able to know how to use goals-based evaluation tools in blockchain education.

5. Blockchain Technologies for VET Education Teaching Content

This teaching content is a draft training outline prepared for the purpose of creating an interactive self-learning book for VET educators, who are the target audience of the BLUEDU project. The topics that will be included in this context are presented.

5.1 Blockchain Technology

1. Introduction
    1.1. Blockchain Fundamentals
        1.1.1.Tools: Explorer, Wallet, Faucet, and Bot
    1.2. Blockchain Advantages and Limitations
2. Consensus Algorithms
3. Cryptography Fundamentals (Basic algorithms and protocols, Advanced algorithms and protocols)
4. Blockchain Platforms/Networks (Platforms Types and Samples, Ethereum Mechanics, Bitcoin Mechanics)
    4.1. Layer2 Architectures (State channels, Side chain, Bridges, Oracles)
    4.2. Decentralized Application Development
5. Blockchain Programming
    5.1. Blockchain Integration Technologies
6. Blockchain Transactions, Mining, and Wallets
    6.1. Blockchain Governance
7. Smart Contracts
8. Blockchain Security
    8.1. Dapp-Smart contract audit
    8.2. Wallet Safety and Security, Custody, Backup, Recovery
9. Blockchain Privacy
10. Issues and Trends in Blockchain Technologies
    10.1. Blockchain Regulations
    10.2. Non-Fungible Tokens
    10.3. Tokenomics (Finance and Economics)
    10.4. Blockchain Application Domains and Real world samples (Blockchain Feasibility Analysis, Introduction to Cryptocurrency, Cryptocurrencies, Currencies, Tokens, and Stablecoins, Decentralized Finance (DeFi), ICO, STO, Central Crypto Exchanges, Central Bank Digital Currencies, Supply chains, Metaverse, Blockchain Gaming (GameFi), Decentralized Identity Management, Self-Sovereign Identities, Health)
    10.5. WEB3
    10.6. Decentralized Autonomous Organizations (DAOs) and Decentralized Applications (DApps)
    10.7. Initial X Offering (Coin, Dex, Security, etc.)

10.8. Blockchain Scalability

10.9. Blockchain Labs (Solidity Smart Contract Development, Development Tools, Blockchain Node Installation)

5.2 Teaching Approaches for Blockchain Education

1. Introduction
2. Active learning approach.
3. Learner-centered learning approach.
4. Collaborative learning approach.
5. Experiential learning approach.
6. Problem-based learning approach.
7. Interdisciplinary learning approach.

5.3 Teaching and Evaluation Methods and Tools for Blockchain Education

1. Introduction
2. Teacher-Centered Instruction
3. Small Group Instruction
4. Student-Centered / Constructivist Approach
5. Project-Based Learning
6. Inquiry-Based Learning
7. Flipped Classroom
8. Cooperative Learning
9. Game-Based Learning
10. Blended Learning
11. Personalized Learning
12. Formative Evaluation
13. Process Evaluation
14. Outcome Evaluation
15. Impact Evaluation
16. Summative Evaluation

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7. Annex

BLUEDU Survey Questions

Country:

- Turkey
- Spain
- Other: …….

Education:

- Undergraduate
- Postgraduate
- Doctorate
- Other:.....

Gender:

- Male
- Female
- Rather Not Say

Age:

- <=25
- 26-35
- 36-45
- 46-55
- 56-65
- >65

Educator Experience (Years):

- I don’t have experience
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 25+

Field of education:

- Agriculture and Forestry
- Business, Administration and Law
- Education
- Health and Welfare
- Humanities and Arts
- Information and Communication Technologies (ICTs)
- Natural Sciences
- Service Industries
- Social Sciences

- Technology
- Other:

Do you have taken a course about blockchain before?

- Yes
- No

Do you use blockchain in your classes or in your school processes?

- Yes
- No

Answer the following questions about blockchain technology.

I can describe blockchain technology in general terms.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I know how blockchain technology works.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I am aware of the usage areas of blockchain technology.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I can explain blockchain technology technically.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I can benefit from blockchain technology according to my needs.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

Rate your general level of knowledge about blockchain between 1 and 5. (1 Very Poor, 5 Very Good)

- 1
- 2
- 3
- 4
- 5
- I don’t have any idea

Rate your general level of knowledge about ICT between 1 and 5. (1 Very Poor, 5 Very Good)

- 1
- 2
- 3
- 4
- 5
- I don’t have any idea

Rate your general level of knowledge about cryptography between 1 and 5. (1 Very Poor, 5 Very Good)

- 1
- 2
- 3
- 4
- 5
- I don’t have any idea

Rate your general level of knowledge about data storage between 1 and 5. (1 Very Poor, 5 Very Good)

- 1
- 2
- 3
- 4
- 5
- I don’t have any idea

Technology reach and use questions

I have internet access at my location.

- Yes
- No

Devices you can access

- Computer
- Smart phone
- Smart television
- Tablet
- Other:

Your average daily internet usage time:

- I don’t use
- <2 Hours
- 2-4 Hours
- 4-8 Hours
- 8+ Hours

Your average daily computer usage time:

- I don’t use
- <2 Hours
- 2-4 Hours
- 4-8 Hours
- 8+ Hours

Your average daily mobile devices usage time:

- I don’t use
- <2 Hours
- 2-4 Hours
- 4-8 Hours
- 8+ Hours

Which learning approaches do you prefer to use in blockchain education?

- Active learning
- Learner-centered learning
- Reflective learning
- Collaborative learning
- Experiential learning
- Problem-based learning
- Interdisciplinary learning
- Transdisciplinary learning
- Transformative learning
- Other:

Which teaching methods do you prefer to use in blockchain education?

- Teacher-Centered Instruction
- Small Group Instruction
- Student-Centered / Constructivist Approach
- Project-Based Learning
- Inquiry-Based Learning
- Flipped Classroom
- Cooperative Learning
- Game-Based Learning
- Blended Learning
- Personalized Learning
- Other:

Which evaluation methods do you prefer to use in blockchain education?

- Formative Evaluation
- Process Evaluation
- Outcome Evaluation

- Impact Evaluation
- Summative Evaluation
- Goals-Based Evaluation
- Other:

What goals do you prefer to include in blockchain education? (Not compulsory)

What are your views on blockchain? (Not compulsory)

Rate the topics planned to be in the blockchain education e-book between 1 and 5. (1 Unimportant, 5 Very Important, no idea)

Topic	**1**	**2**	**3**	**4**	**5**	**No idea**
Blockchain Fundamentals						
Blockchain History						
Consensus Algorithms						
Cryptography Fundamentals (Basic algorithms and protocols, Advanced algorithms and protocols)						
Blockchain Platforms/Networks (Platforms Types and Samples, Ethereum Mechanics, Bitcoin Mechanics)						
Layer2 Architectures (State channels, Side chain, Bridges, Oracles)						
Blockchain Programming						
Decentralized Application Development						
Blockchain Transactions, Mining, and Wallets						
Smart Contracts						
Blockchain Security						
Blockchain Privacy						
Dapp-Smart contract audit						
Blockchain Governance						
Blockchain Regulations						
Blockchain Integration Technologies						
Issues and Trends in Blockchain Technologies						
Non-Fungible Tokens						
Tokenomics (Finance and Economics)						
Wallet Safety and Security, Custody, Backup, Recovery						

Blockchain Application Domains and Real world samples (Blockchain Feasibility Analysis, Introduction to Cryptocurrency, Cryptocurrencies, Currencies, Tokens, and Stablecoins, Decentralized Finance (DeFi), ICO, STO, Central Crypto Exchanges, Central Bank Digital Currencies, Supply chains, Metaverse, Blockchain Gaming (GameFi), Decentralized Identity Management, Self-Sovereign Identities, Health)						
Tools: Explorer, Wallet, Faucet, and Bot						
WEB3						
Decentralized Autonomous Organizations (DAOs) and Decentralized Applications (DApps)						
Initial X Offering (Coin, Dex, Security, etc.)						
Blockchain Scalability						

Blockchain Labs (Solidity Smart Contract Development, Development Tools, Blockchain Node Installation)						

Do you think Blockhain can be useful for your classes or in the management processes of your school?

If yes, How do you think Blockhain can be useful for your classes or in the management processes of your school? Example: Certificates of studies, authentication of exams, training history…. (Not compulsory)