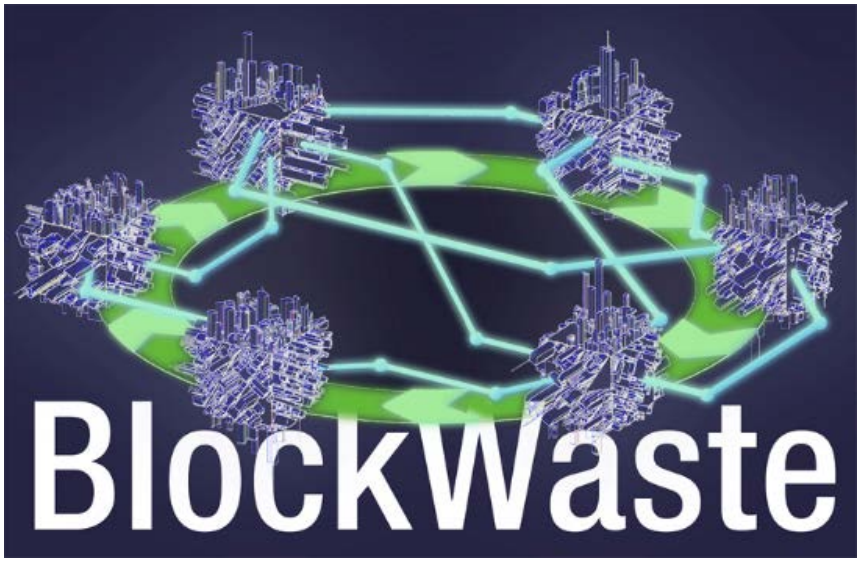
O4.A3 Pilot BlockWASTE Course implementation: environment test and technical improvements



ΙΔΡΥΜΑ ΚΡΑΤΙΚΩΝ ΥΠΟΤΡΟΦΙΩΝ IKY

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Author(s): Dimitris Damigos, National Technical University of Athens, damigos@metal.ntua.gr, Greece
Rainer Lenz & Leonie Holste, Bielefeld UAS, rlenz@fh-bielefeld.de & lholste@fh-bielefeld.de, Germany
Viktoria Voronova, Tallinn University of Technology, viktoria.voronova@taltech.ee, Estonia
Reviewed by: Athanassios Mavrikos, National Technical University of Athens, mavrikos@metal.ntua.gr, Greece

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List of abbreviations

Abbreviation	**Definition**
MSW	Municipal solid waste
MSWM	Municipal solid waste management
OER	Open Educational Resource
CE	Circular Economy
SMEs	Small and medium enterprises
IT	Information technology

Executive summary

The BlockWASTE Tool is an interactive role-playing game focusing on the management of municipal waste. Players can take on two different roles: The 'Mayor' and the 'households'. To test the effectiveness of the training materials, three pilot courses were conducted by three partner universities (NTUA, FH-Bielefeld, Tal-Tech). This document presents the outputs of O4/A3 “Pilot BlockWASTE Course implementation: Environment test and technical improvements”, which aims to test and verify the effectiveness of the training materials developed within the project, namely the BlockWASTE educational material (https://class.blockwasteproject.eu/), the Interactive BlockWASTE Tool (https://game.blockwasteproject.eu/), and the OER (https://blockwasteproject.eu/oer/). based on the evaluation results of the three pilot courses and to present recommendations for changes or improvements of the materials. Based on the results of the evaluation report, which included also recommendations for changes or improvements, the training materials developed within the project were revised and improved.

Based on the questionnaire results, it becomes clear that the BlockWASTE course and the Interactive BlockWASTE Tool appeal to the target group of students and are suitable for conveying theoretical knowledge as well as for deepening this knowledge through practical application. The design of the training material and its contents can facilitate the online and in-the-classroom learning, and the curriculum can be easily implemented in the European HEI organisations, as well as in companies in the waste management sector. This is supported by the fact that most of the participants mentioned that after their participation they became more familiar with the Blockchain technology, gained a more positive view on the use of the Blockchain in the waste management and, finally, were willing to learn more about the use of Blockchain technology in the waste management systems. In the same direction, the participants said that the Interactive BlockWASTE Tool offers a better understanding on waste management systems and team works and, consequently, and on the innovation and sustainability criteria of new methods in the context of the circular economy. Finally, the pilot schools showed that the teaching material is interesting and motivates the user to utilise it and ease of use in learning contexts and self-training. On the other hand, the participants indicated that certain aspects of the training material could be improved. These remarks were amended in the updated version of the BlockWASTE tool, which was tested at the third pilot school in Estonia.

1 Introduction

1.1 Brief project description

The BlockWASTE project aims to address the interoperability between waste management and blockchain technology and promote its proper treatment through educational training, so that the data collected will be shared within a safe environment, where there is no room for uncertainty and mistrust between all parties involved. For this purpose, the objectives of BlockWASTE project are as follows:

- To conduct research on solid waste generated in cities and how it is managed, so that it can be used to create an information base of good practices, in order to reintroduce waste into the value chain, promoting the idea of Intelligent Circular Cities.
- To identify the benefits of the Blockchain Technology within the municipal waste management (MSW) process.
- To create a study plan that allows the training of teachers and professionals of organizations and companies of the sector, in the overlap of the fields of Waste Management, Circular Economy (CE) and Blockchain Technology.
- To develop an interactive tool based on Blockchain Technology, which will make it possible to put into practice the management of data obtained from urban waste, thus visualizing the way in which the data is implemented in the Blockchain and enabling users to evaluate different forms of management

BlockWASTE aims to implement transnationally new educational contents with the goal of training its students in the partner countries and providing them with the necessary basic skills that allow them to act professionally as future workers in the sector, adding digital competences required by companies that are embracing the process of digital transformation. In this sense, the project is addressed to:

- Enterprises and SMEs, IT professionals, urbanisms and waste management professionals.
- Universities (professors, students and researchers).
- Public bodies

The project includes four Intellectual Outputs as follows:

- O1. Learning materials for interdisciplinary Blockchain-MSW
- O2. European common curriculum on MSW applying Blockchain technologies to Circular Economy strategies
- O3. E-Learning tool based-on Blockchain-MSW focused on Circular Economy
- O4. BlockWASTE Open Educational Resource (OER)

1.2 Objectives and methodological approach

This document presents the outputs of O4/A3 "Pilot BlockWASTE Course implementation: Environment test and technical improvements", which aims to test and verify the effectiveness of the training materials developed within the project, namely the BlockWASTE educational material (https://class.blockwasteproject.eu/), the Interactive BlockWASTE Tool (https://game.blockwasteproject.eu/), and the OER (https://blockwasteproject.eu/oer/).

The BlockWASTE educational material intends to provide innovative training materials for the development of basic skills, competencies, and theoretical knowledge for the implementation of blockchain in the circular economy. This theoretical knowledge aims to be applied and deepened in a practical way with the help of the Interactive BlockWASTE Tool. The BlockWASTE Tool is an interactive role-playing game focusing on the management of municipal waste. Players can take on two different roles: The 'Mayor' and the 'households'. The game is played in an iterative process of twelve steps (i.e., twelve months).

To test the effectiveness of the training materials, three pilot courses were conducted by three partner universities (NTUA, FH-Bielefeld, Tal-Tech). The aim of this report is to present the evaluation results of the conducted pilot courses and to present recommendations for changes or improvements of the materials. Based on the results of the evaluation report, the training materials developed within the project will be revised and improved.

The evaluation questionnaire was divided into four sections. In the first section, the personal data such as name, email, gender and age were requested. In the second section, general questions were asked regarding the participants' previous level of knowledge about the circular economy and the application of blockchain technology in waste management. In addition, participants were asked whether they had already participated in a similar format and whether they considered the use of blockchain technology in waste management to be useful. Section three asked whether participants are more familiar with Blockchain after the pilot course. The participants were also asked about their interest in learning more about the technology in waste management and participating in similar formats. Furthermore, they asked whether the view on the application of Blockchain in waste management is now more positive. In the final section, participants were asked to evaluate the experience gained in the pilot course. Participants were asked to indicate whether the BlockWASTE e-learning tool was helpful in developing a better understanding of waste management systems and blockchain technology.

The structure of the evaluation report is based on the chronological order in which the pilot courses were conducted, while the approach implemented in the pilot courses is outlined below. Subsequently, the results of the evaluations during the pilot courses are presented. Potential participants of the pilot course were contacted in advance by e-mail or phone and were briefly informed about the BlockWASTE project and the evaluation of the developed tools. It was important to acquire participants who correspond to the target group of the developed tools and who were able to deal critically with the functions and contents.

2 Results from the first pilot school in Greece

2.1 General information about the pilot school

The first pilot school was conducted in Greece, with the participation of 10 postgraduate students from the postgraduate programme “Environment and Development” and one teaching assistant from the Aristotle University of Thessaloniki. The pilot school was organised in the context of the postgraduate course “Environmental Economics: Applications to Development Issues in Mountainous Areas” and the participants were invited via email.

The pilot school was held on June 22, 2022, with physical presence at the NTUA's premises in Metsovo, where the postgraduate programme is implemented (Figure 1 and Figure 2).

Figure 1: View of the class during the presentation of the BlockWASTE tool

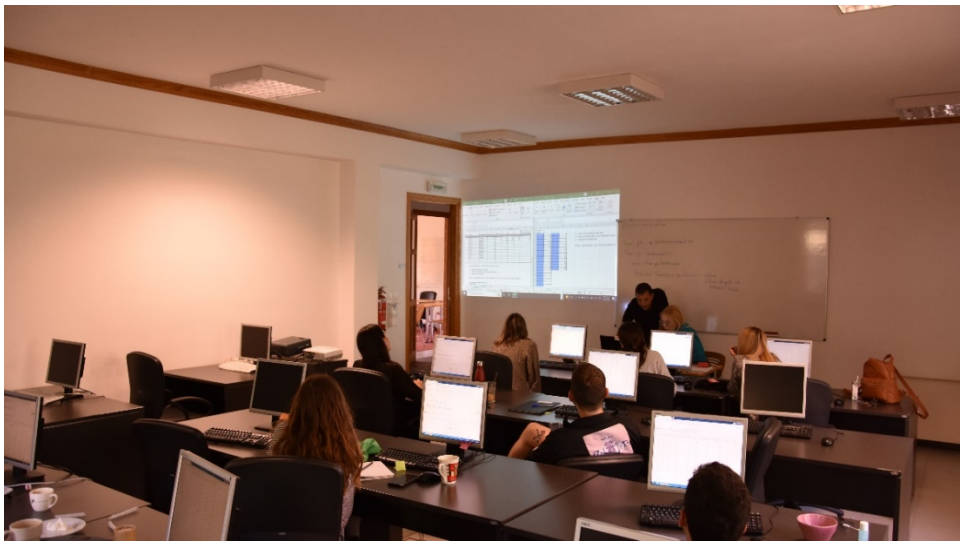


Figure 2: View of the class during the role playing with the BlockWASTE tool

The participants were provided with necessary information and had the opportunity to search the teaching materials of the course in advance. During the meeting, and similar to the

procedure followed in the first school, participants were introduced to the project in detail and asked to raise questions. Then, the BlockWASTE tool was presented. The presentation included the Blockchain module and the Waste Management module. The contents of the course were briefly discussed and the participants were asked to browse the website and ask questions further questions. Emphasis was given to the two different roles of the game, i.e. the 'mayor' and the 'households'.

Following the presentation, participants were assigned to the role of 'mayor' (one participant) and the 'households' (the rest of the participants). Then, they were provided with username and passwords and received time to log into the BlockWASTE tool. After everyone was successfully logged in, a first round was played. During this test round, the participants received further guidance and explanations about the input data. At this stage, participants were also introduced to the database for the E-Learning Tool (i.e. O3/A1). Participants were then left free to play the game for several rounds, without interference. At the end of the game, a discussion was held about the strategy followed at the two different levels of decision making, the effect of disclosing data on the decision making process, and the effect of disclosing data on the decision making process. Finally, participants were provided with a link to the online evaluation questionnaire. In the next section, the results of the evaluation questionnaire are presented.

2.2 Evaluation results

Based on the responses provided (see Annex I for details) after the end of the first pilot school, it turned out that although many students had heard about circular economy issues only two had heard about the Blockchain applications to waste management and only one had participated in a similar activity concerning the Blockchain technology in the past. In addition, all students but one agreed that there is a need to make use of the Blockchain in waste management.

After their participation in the pilot schools, all students but one mentioned that they would like to learn more about the role of Blockchain in waste management (Figure 3).

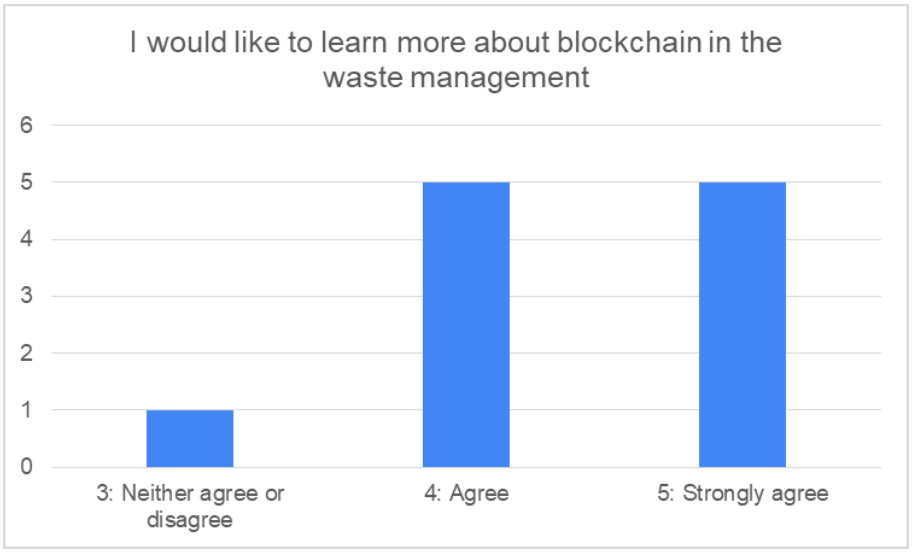


Figure 3: Views on learning more about the role of Blockchain in waste management

Moreover, the same number of students (i.e., 10 out of 11) said that they gained a more positive view on the use of Blockchain in waste management (Figure 4).

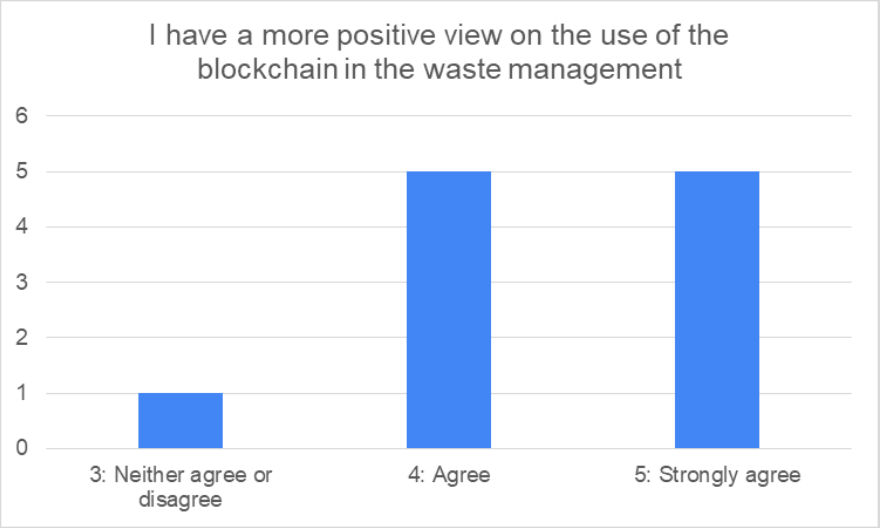


Figure 4: Positive views on the use of Blockchain in waste management

After participating in the pilot course, 8 out of 11 students indicated more familiarity with Blockchain and 9 out of 11 expressed their interest in participating in other Blockchain-oriented activities in the future.

Participants were also asked to indicate whether the BlockWASTE e-learning tool was helpful in developing a better understanding of waste management systems and blockchain technology. The results show that the waste management tool is useful for a deeper understanding of waste management and team works (Figure 5).

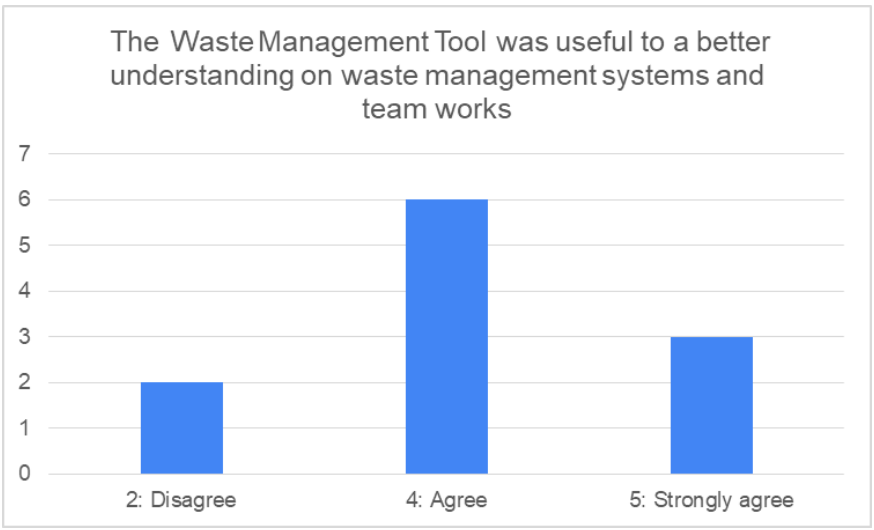


Figure 5: Usefulness of the BlockWASTE e-learning tool in understanding the operation of waste management system

The tool proved to be useful in contributing to a better understanding of Blockchain technology, according to 7 out of the 11 students (Figure 6).

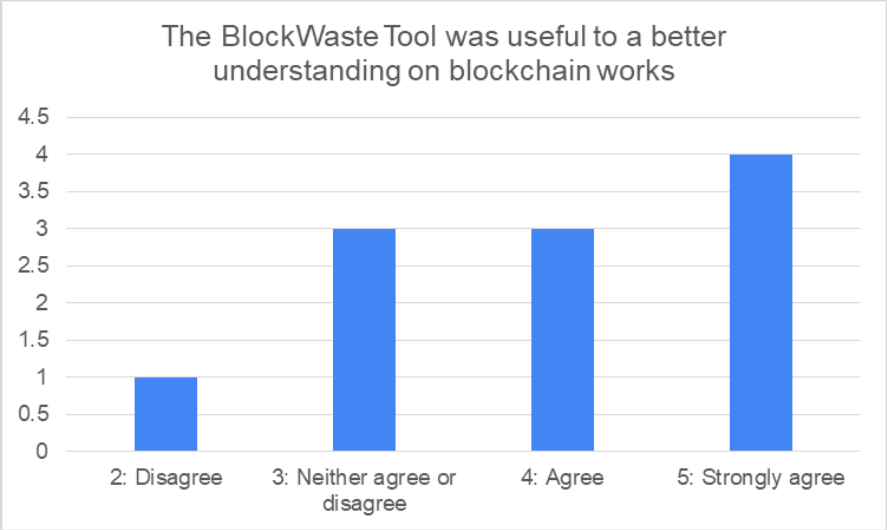


Figure 6: Usefulness of the BlockWASTE e-learning tool in understanding how Blockchain works

Nevertheless, all the students found, in general, the information and advice provided useful and characterised the teaching material satisfactory. Further most students said that the teaching material contains adequate information to improve knowledge about the interface of waste management and Blockchain, is interesting and motivating and fulfils its purposes and targets. Similarly, the majority of students were positive about the ease of use of the online sources.

The above remarks are also depicted on the comments left by some students. For instance, it was mentioned that "…the use of Blockchain is particularly useful for direct association of the user with waste management…" or that there is a "…very interesting approach to Blockchain theory, simple and understandable, especially on how the verification algorithm is solved and what happens when you change Blockchain elements…" and that the tool is "…very interesting. I think the cryptography method should be extended to other activities…". Of course, there were less positive views, e.g. one student mentioned that "… I would like to see a better correlation between the citizen's fees and the municipality, as it was not as well understood….".

Finally, as regards the pilot school, all the students said that the information was communicated in an understandable manner and that there was an opportunity to ask questions during the pilot course and that they were answered satisfactorily.

3 Results from the second pilot school in Germany

3.1 General information about the pilot school

The second school involved a total of 14 students which were recruited from various business administration courses at the University of Applied Sciences Bielefeld. The students where in the second to sixth semesters of their bachelor's degree.

Once the participants had agreed, they were invited to a Zoom meeting by e-mail. The group of students was invited to a joint meeting on July 7, 2022. In addition, the participants were provided in advance with necessary information as well as access data. Since the participants had the opportunity to view the teaching materials of the blockchain course in advance they were able to develop an opinion. Also, the participants could already log in and try out the BlockWASTE tool.

During the Zoom meeting, the participants were first introduced to the project in detail and existing questions could be clarified. Afterwards, some time was given to the participants to log into the BlockWASTE course on the project's website. The contents of the course were briefly discussed, and further questions were addressed. Afterwards, participants received time again to log into the BlockWASTE tool with an individual username and password. After everyone successfully logged in, the rules of the BlockWASTE tool were explained and a round was played. In the process, the participants took the role of 'households' and the game leader took the role of 'mayor'. Questions could be asked throughout the course of the game. Finally, participants were provided with a link to an online questionnaire. This online questionnaire was intended to evaluate the BlockWASTE course and tool. In the following, the results of the evaluation from the students' point of view are presented.

3.2 Evaluation results

Based on the survey results (detailed results are presented in Annex II), it turns out that very few students have already participated in a comparable format such as the BlockWASTE pilot course. However, the topic areas seem to be familiar to the students. For example, most students indicated they were already familiar with the circular economy and had heard about the potential use of blockchain technology in waste management. In addition, most students indicated neutrality towards the statement "I did not see the need to make use of the blockchain in waste management.".

Furthermore, students indicated more familiarity with blockchain and the technology in waste management after participating in the pilot course. In particular, students seem to have a more positive view of the use of Blockchain in waste management after participating in the pilot course (Figure 7). Also, most of them showed interest in participating in other blockchain-focused formats in the future.

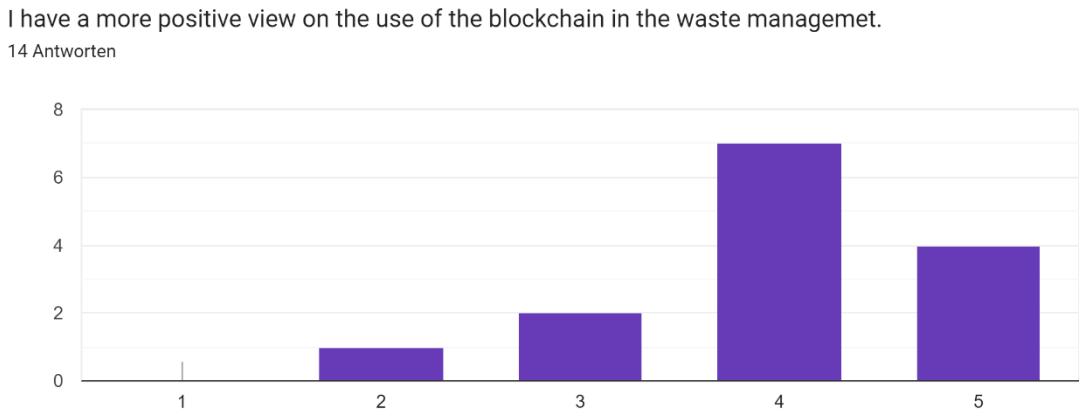


Figure 7: Views on the use of blockchain in waste management – German pilot school

Participants were also asked to indicate whether the BlockWASTE e-learning tool was helpful in developing a better understanding of waste management systems and blockchain technology. The results show that the waste management tool is useful for a deeper understanding of waste management and team works. However, at the same time, it turned out that the tool is limited in contributing to a better understanding of Blockchain technology (Figure 8).

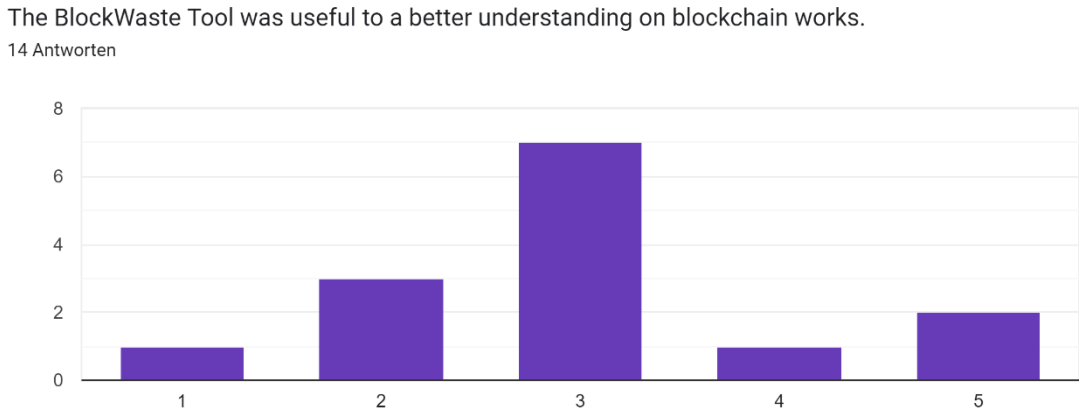


Figure 8: Views on the usefulness of BlockWASTE tool in blockchain operation – German pilot school

In addition, the students were asked whether the educational material provided is helpful, satisfactory and contains sufficient information of the intersection of waste management and blockchain. It was also asked whether the teaching material is interesting, motivating and fulfills the intended purpose. The majority of students perceived the teaching material of the BlockWASTE course as satisfactory. Also, most students indicated that the teaching materials contained adequate information to improve knowledge of the intersection of waste management and blockchain. However, it turned out that the teaching materials did not raise the desired interest. For example, most students indicated neutrality toward the statement "The teaching material is interesting so as to motivate the user to utilize it.". Despite the limited motivational impact of the teaching materials, students indicated that the teaching materials served their purpose and objectives.

In addition, questions were asked regarding ease of use, comprehensibility and the ability to ask questions and to get them answered. The majority of students were positive about the ease of use of the online sources as well as the comprehensibility of the information. In addition, most students indicated that there was an opportunity to ask questions during the pilot course and that they were answered satisfactorily.

Finally, the participants were given the opportunity to leave comments. In the comments, the project as well as the addressed topics blockchain and circular economy were described as exciting, current and application oriented. In the context of the circular economy, one of the students emphasized the importance of motivating individual households to behave better in terms of trash production through reward systems. Regarding the blockchain tool, it was noted that there is no transparency for the players regarding possible alternative actions to reduce the costs of waste generation and separation. It was suggested that a graphic should be provided to players to visualize existing costs associated with different types of waste. It was noted negatively that too little information related to blockchain was provided. In particular, concrete use cases for blockchain in waste management seem to be missing.

4 Results from the third pilot school in Estonia

4.1 General information about the pilot school

The third pilot school was conducted in Estonia in Tallinn University of Technology (TalTech) on August 30, 2022. In this school, 28 postgraduate students from the master programme "Environmental management and Engineering" of TalTech participated (Figure 9). The pilot schools was organised as introductory class for the courses "Life cycle assessment" and "Air pollution and prevention". Students received invitations in Moodle system using communication forum.

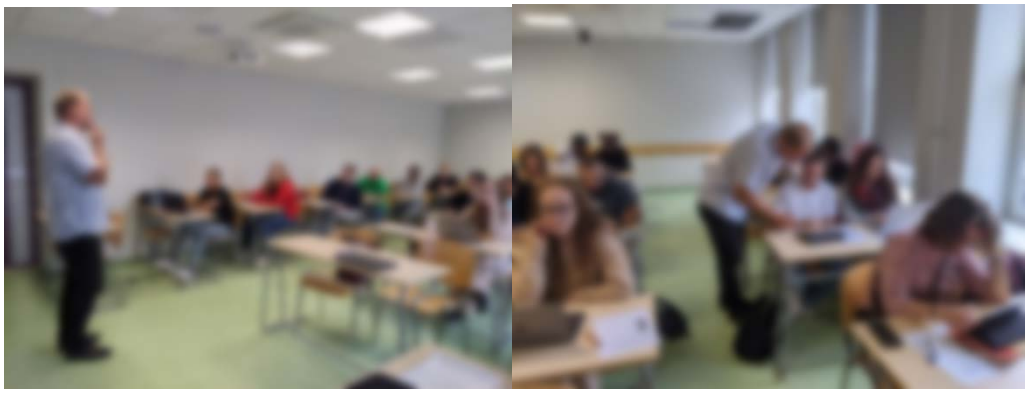


Figure 9: Pilot school in Tallinn, Estonia

In the beginning of the course, the Blockchain concept was introduced to students by Dr. Ermo Täks. At the end of the introduction, the students solved a simple Excel based example to find the "hash" under Dr. Täks' supervision. The second part of the course started with an introduction of the "Interactive BlockWASTE Tool" developed by lead partner NTUA, Greece (Figure 10). This introduction was given by Dr. Viktoria Voronova.

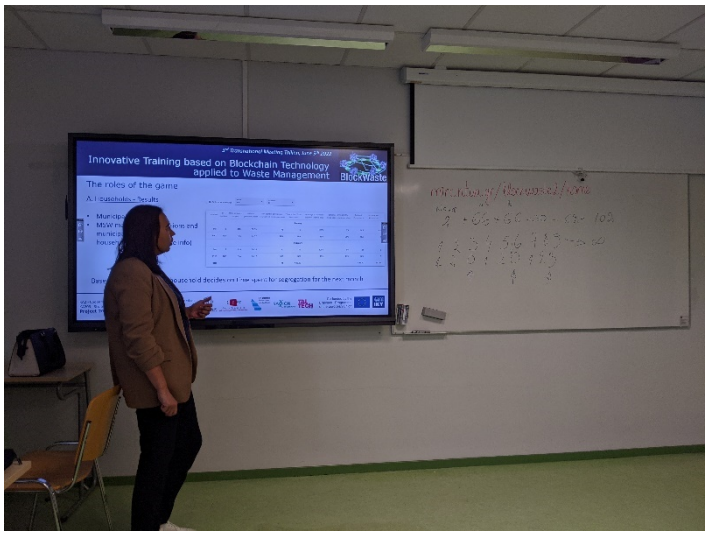


Figure 10: Introduction to the "Interactive BlockWASTE Tool"

In Tallinn's pilot school, students had opportunity to use the updated version of the BlockWASTE tool, which combines the MSW game with an integrated Blockchain problem. All students received the 'household' roles, while the role of the 'mayor' was assigned to the teacher of the pilot school. All participants logged in to the Blockwaste tool and were asked to fill in the table regarding waste negation, household characteristics, sorting abilities, etc. for the first month. After filling the table, all students solved the "hash" and then in order to submit their results to the 'mayor'. The role of the 'mayor' was explained to the students and after the submission of data by all students, the summary table was shown and discussed. After that, the 'mayor' sent back to each 'household' the amount of money that each household should pay (i.e. municipal fees) based on their waste generation, composition and sorting information. At the end of the game, discussion was followed.

At the end of the pilot course students were asked to fill in the evaluation form. Evaluation form was delivered online in Moodle through communication forum. Most of the students filled the evaluation form online. The results of the evaluation are presented in Ssection 4.2.

4.2 Evaluation results

The detailed evaluation results for the Estonian pilot school are presented in Annex III. The summary of the results is presented below.

Most students who participated in the third pilot school in Estonia have an environmental engineering background and, thus, the vast majority are familiar with circular economy principles. Most students have not heard or participated in activities connected with Blockchain in waste management before. Yet, about 65% of respondents see the need to use the Blockchain in waste management (Figure 11).

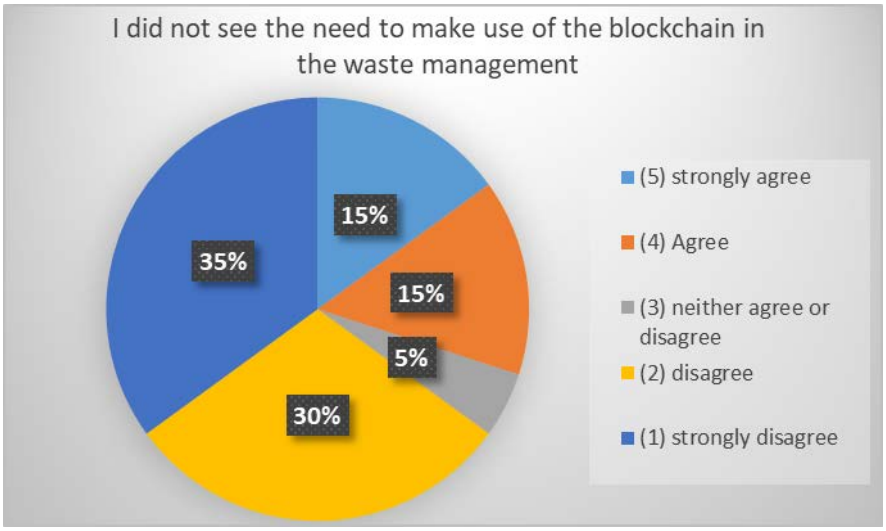


Figure 11: Responses to the question about need to make use of the blockchain in the waste management

After their participation in this pilot school, most students agreed that they became more familiar with the Blockchain and mentioned that they would like to learn more about the use

of Blockchain in waste management. About 72% of the respondents were interested in participating in other Blockchain oriented activities in the future (Figure 12).

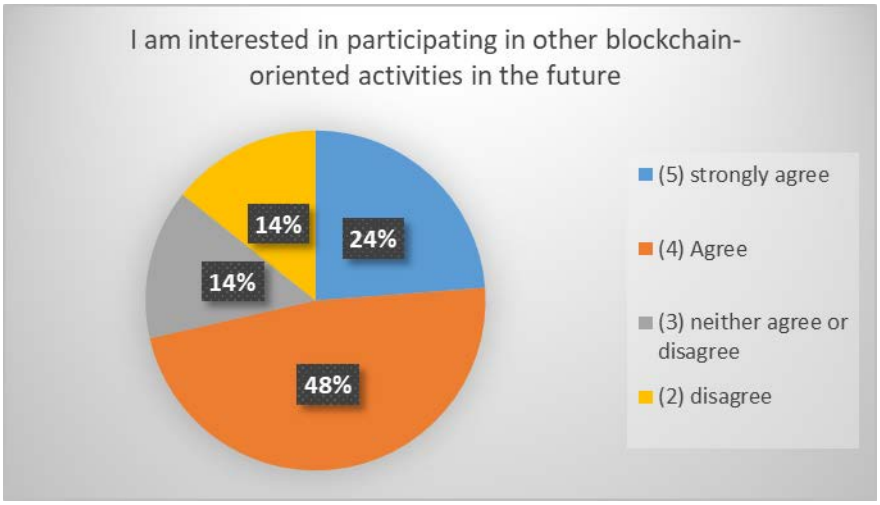


Figure 12: Interest in participation in other blockchain-oriented activities

Further, about 66% of students agreed that the BlockWASTE Tool was useful for better understand how Blockchain works ().

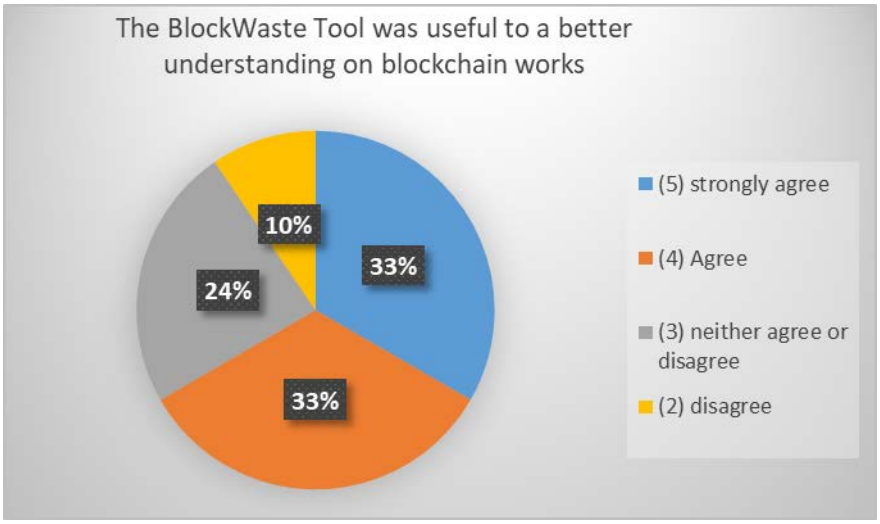


Figure 13: Understanding of Blockchain via the BlockWASTE Tool

Regarding the general information provided and the level of teaching materials, most students said that they were very satisfactory. Most also agreed that the teaching materials are interesting, fulfil their purpose and targets and contain adequate information to improve knowledge about the interface of waste management and Blockchain.

About 60% of the respondents agreed that it was easy to use the online sources of BlockWASTE, and only 10% though that for them it was complicated (Figure 14).

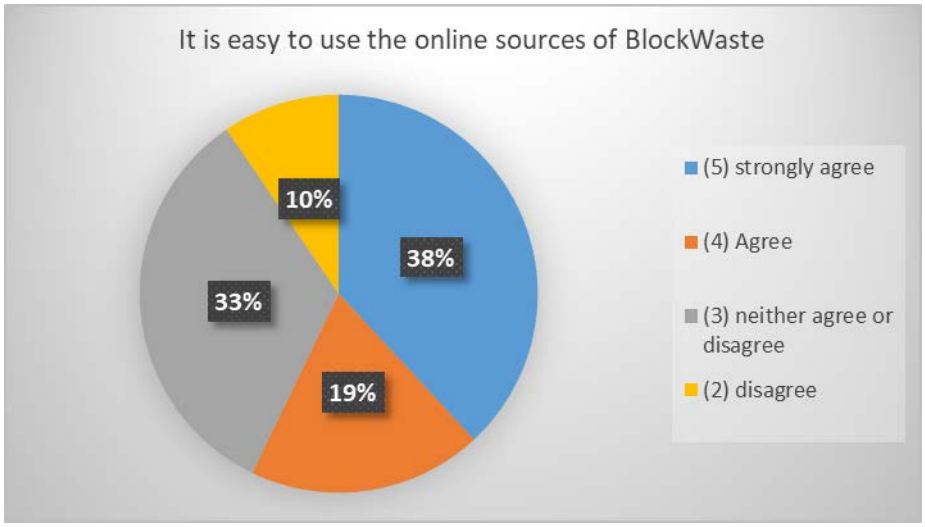


Figure 14: Easiness to use the online sources of BlockWASTE

Most respondents also agree that for them the information during the pilot school was communicated in an understandable manner and that they were provided with the opportunity to ask questions and get answers.

Additionally, positive comments regarding the pilot school were given, e.g., that “It was an interesting and interactive session which open my understanding of the blockchain ecosystem. I would love to participate in future events”, “It’s a very useful tool to manage waste“, and “The presentation was great, and I am very well interested in the implementation of blockchain features in waste management”.

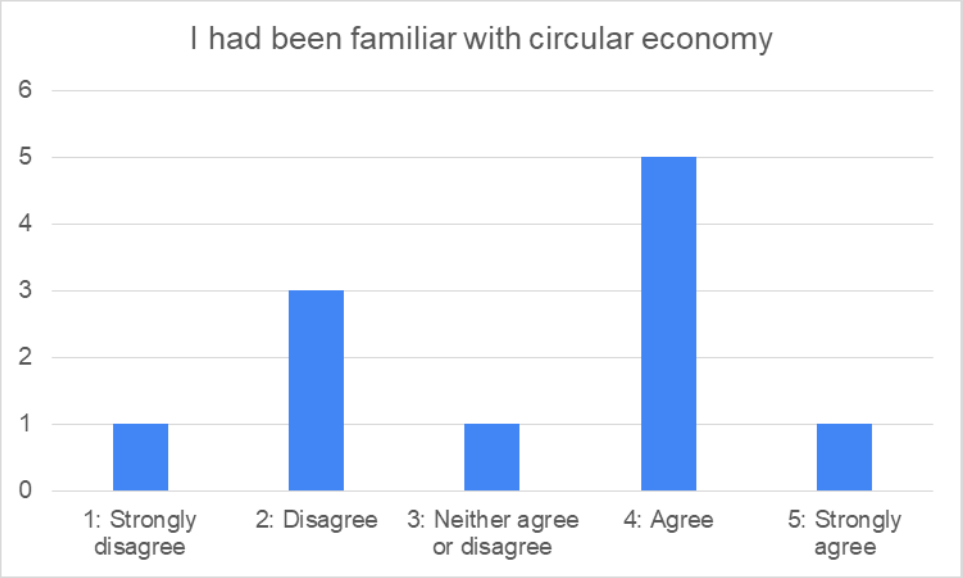
5 Conclusions

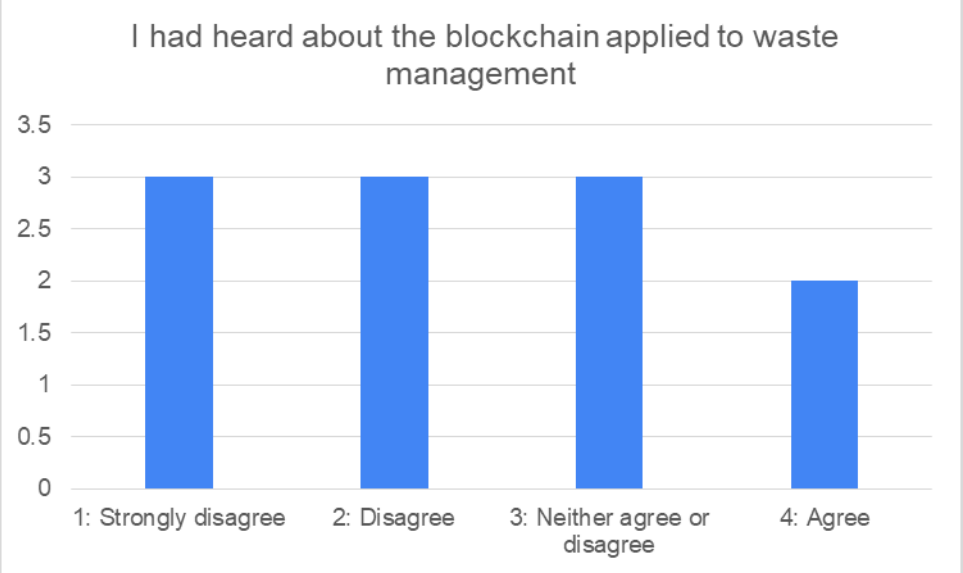
Based on the questionnaire results, it becomes clear that the topics of blockchain and circular economy addressed in the BlockWASTE course and the Interactive BlockWASTE Tool appeal to the target group of students. More specifically, the course and the tool seem to be suitable for conveying theoretical knowledge as well as for deepening this knowledge through practical application and the design of the contents can facilitate the online and in-the-classroom learning. In this direction, the curriculum for the BlockWASTE course can be easily implemented in the European HEI organisations, especially in the form of MOOC, as it was finally (and beyond the Application Form) developed. Moreover, the educational materials seem to be suitable not only for university programmes but also for companies in the waste management sector. This is supported by the fact that the vast majority of the participants in the three pilot schools mentioned that after their participation they became more familiar with the Blockchain technology, gained a more positive view on the use of the Blockchain in the waste management and, finally, were willing to learn more about the use of Blockchain technology in the waste management systems. In the same direction, the participants said that the Interactive BlockWASTE Tool offers a better understanding on waste management systems and team works and, consequently, and on the innovation and sustainability criteria of new methods in the context of the circular economy. Finally, the pilot schools showed that the teaching material is interesting and motivates the user to utilise it and ease of use in learning contexts and self-training.

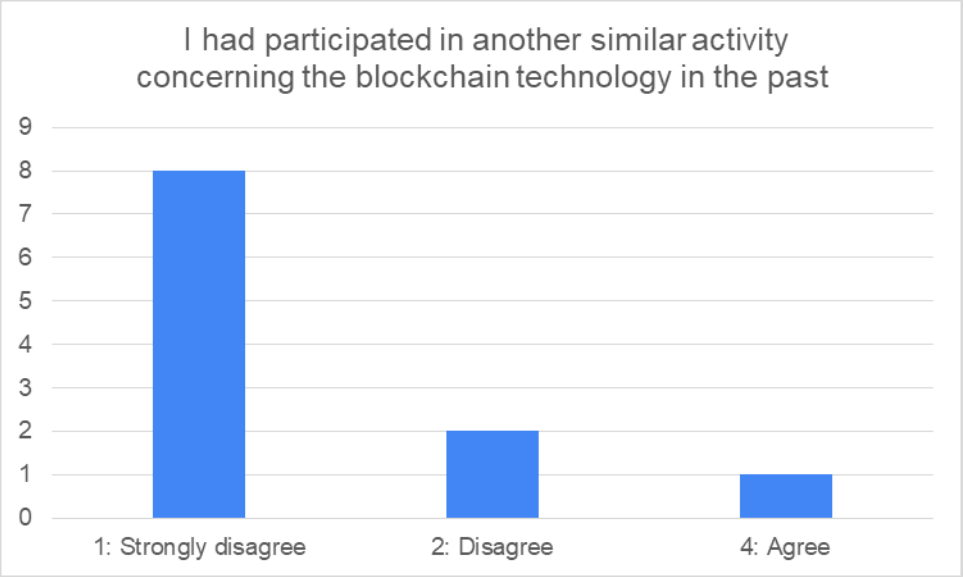
On the other hand, the participants indicated that certain aspects of the training material could be improved. For example, in the first two pilot schools it was mentioned that in the context of the BlockWASTE tool, it is necessary to provide more in-depth information on the integration of Blockchain technology in the waste management systems. In addition, they noticed some technical errors that need to be eliminated. Also, some participants said that the BlockWASTE tool could be extended with additional visualisations for the players. These remarks were amended in the updated version of the BlockWASTE tool, which was tested at the third pilot school in Estonia. Regarding the training material, which is provided with the course, a comment was that a more consistent structure in the provided videos would be useful. In this way, cross-references between the videos and recurring elements could be implemented, or own videos could be created, although this does not fall within and is not foreseen in the approved project plan.

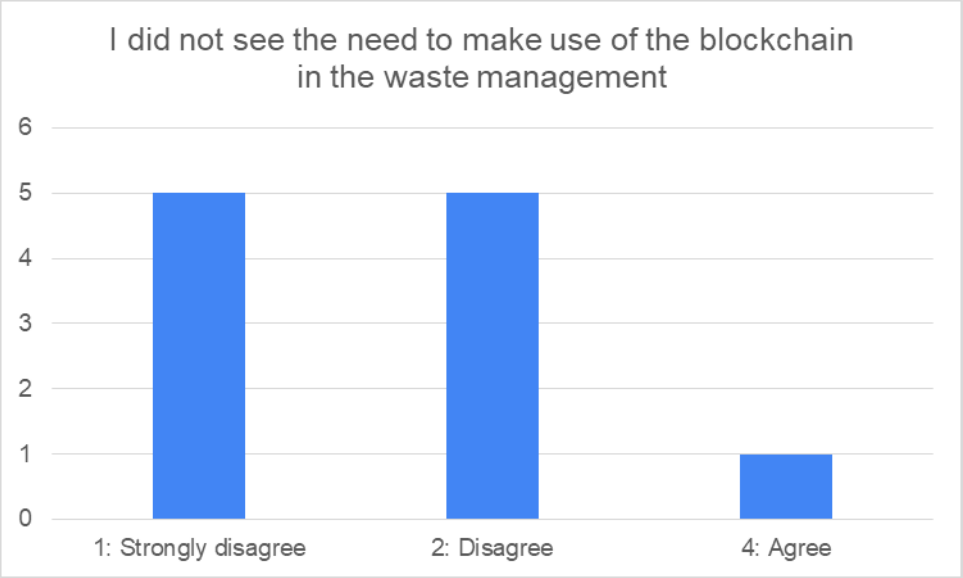
Annex I: Responses from the pilot school in Greece

A. Before my participation in this pilot school






I had participated in another similar activity concerning the blockchain technology in the past
9
8
7
6
5
4
3
2
1
0
1: Strongly disagree
2: Disagree
4: Agree


I did not see the need to make use of the blockchain in the waste management
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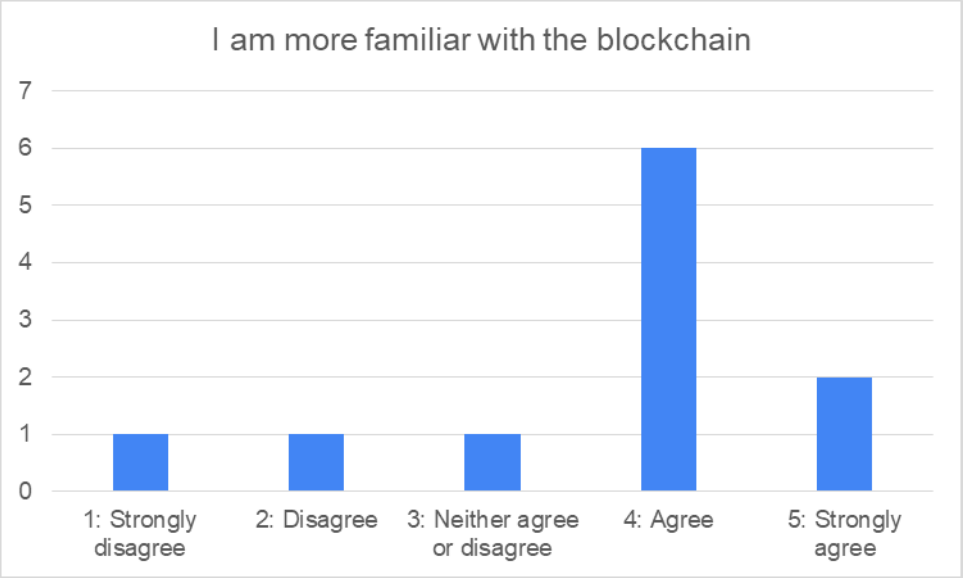
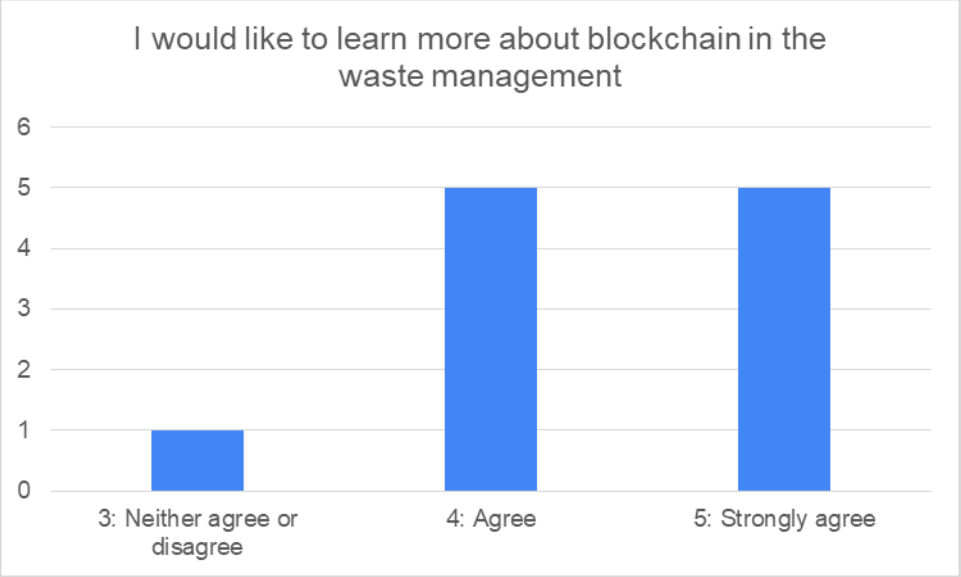
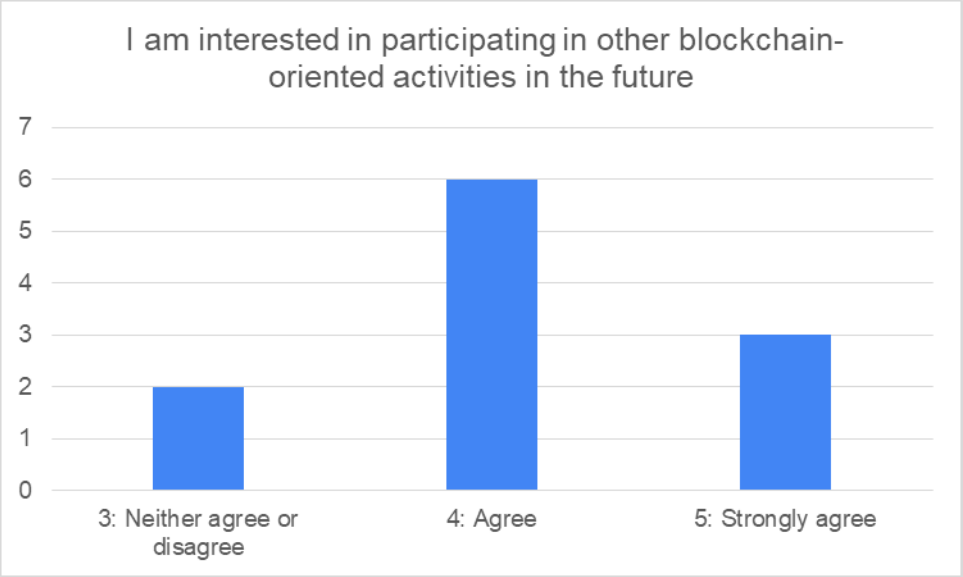
1: Strongly disagree
2: Disagree
4: Agree

B. After my participation in this pilot school






I am interested in participating in other blockchain-oriented activities in the future
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3: Neither agree or disagree
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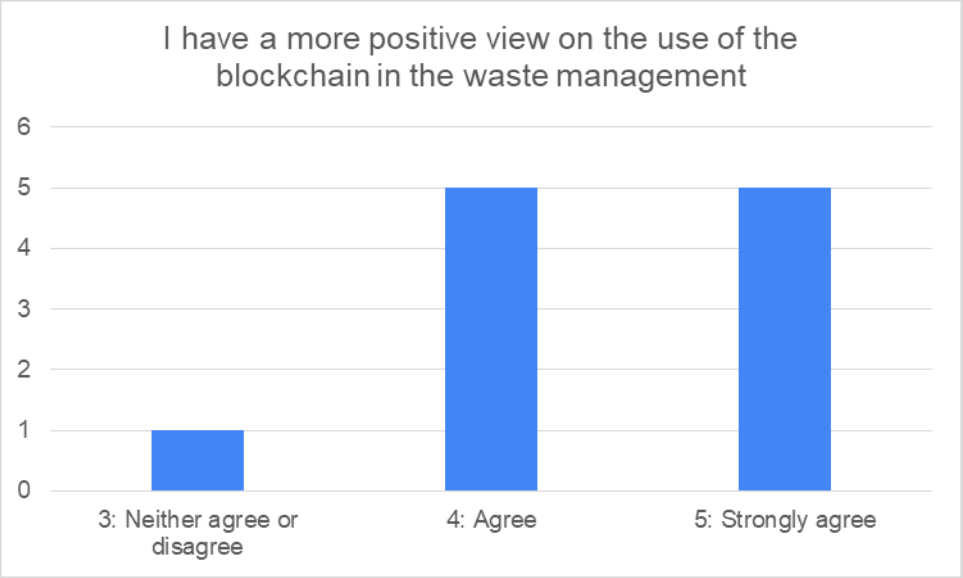
I have a more positive view on the use of the blockchain in the waste management
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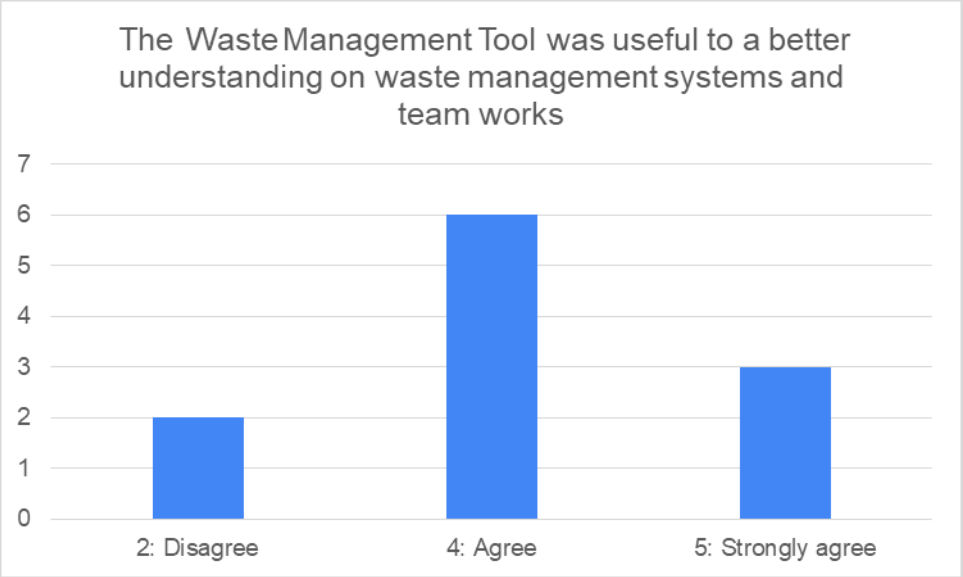
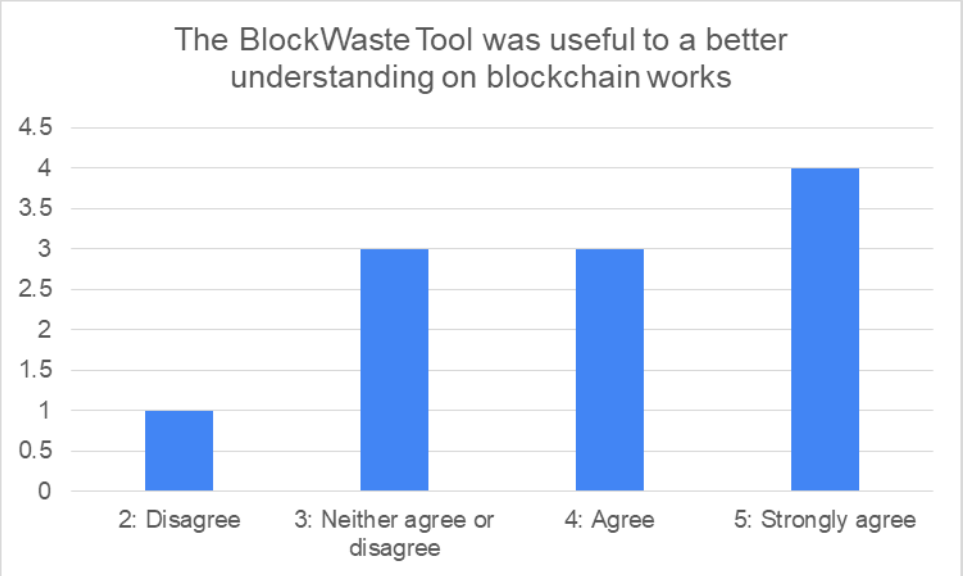
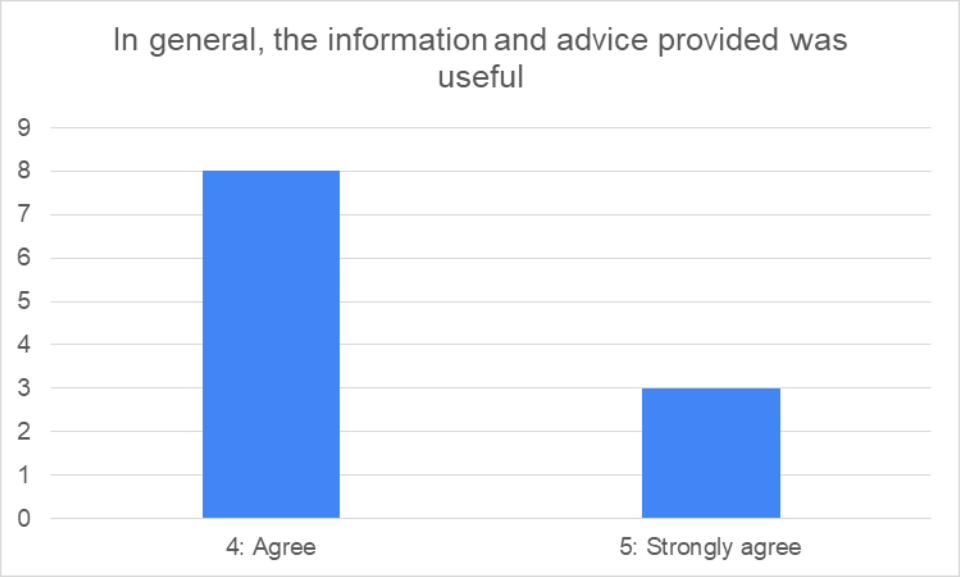
C. Evaluate your experience of this pilot school






In general, the information and advice provided was useful
9
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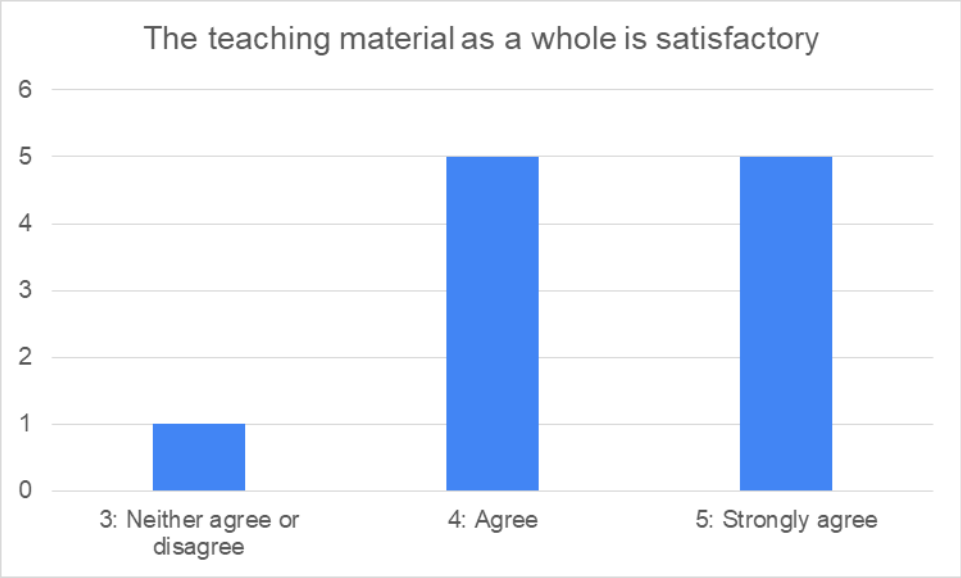
The teaching material as a whole is satisfactory
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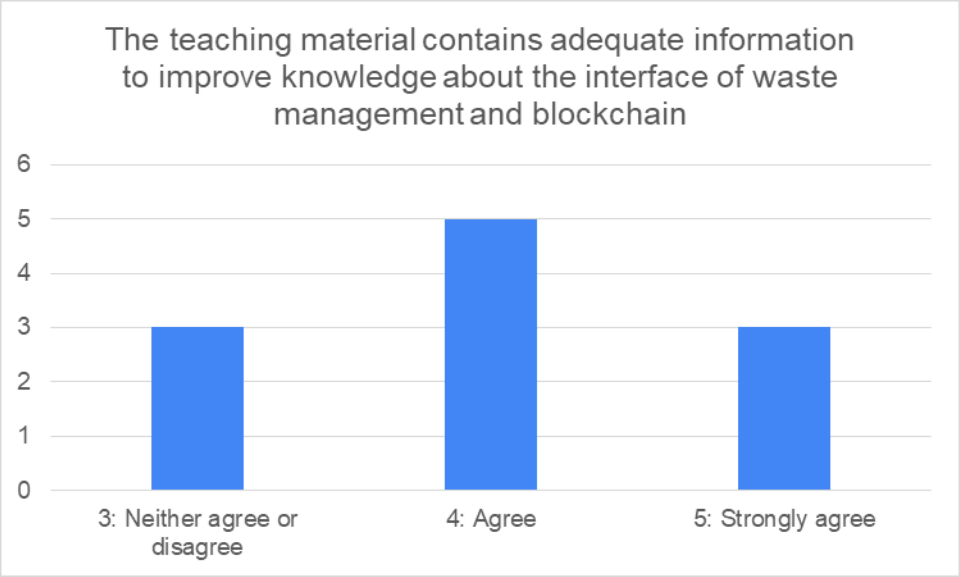
The teaching material contains adequate information to improve knowledge about the interface of waste management and blockchain
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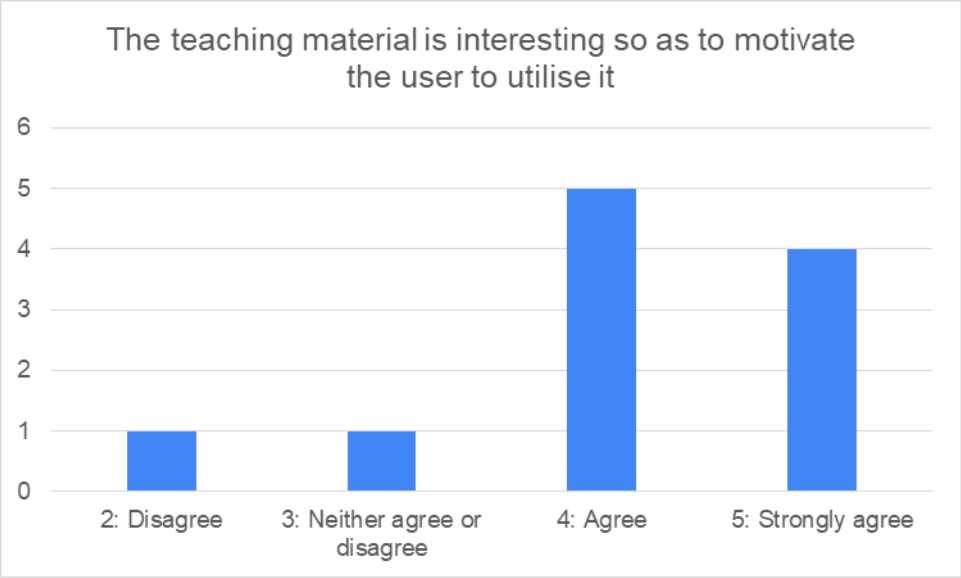
The teaching material is interesting so as to motivate the user to utilise it
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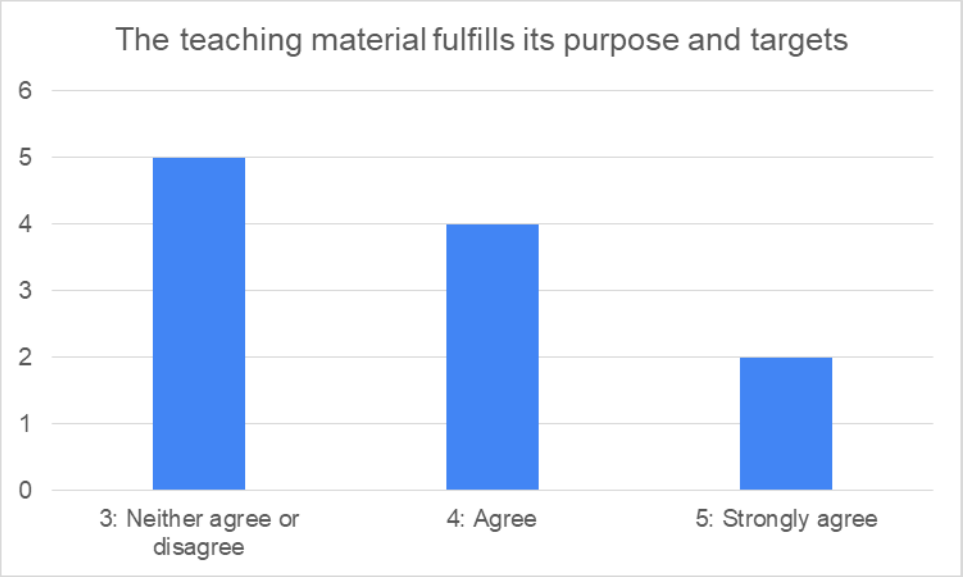
The teaching material fulfills its purpose and targets
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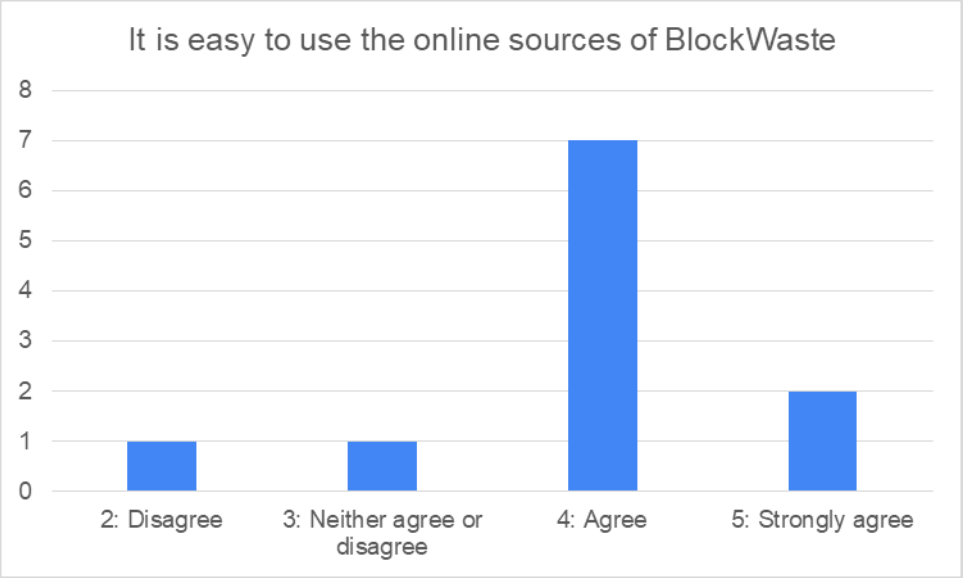
It is easy to use the online sources of BlockWaste
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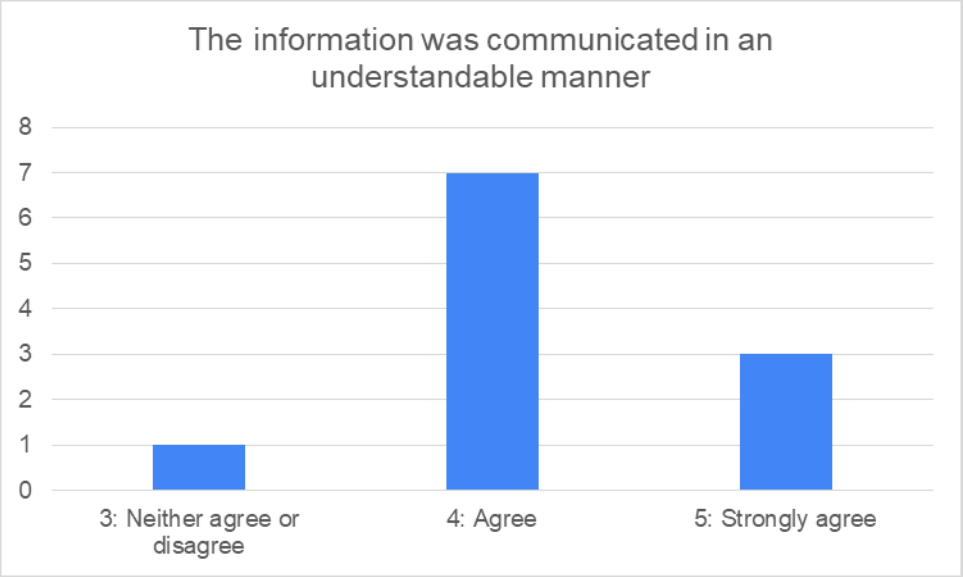
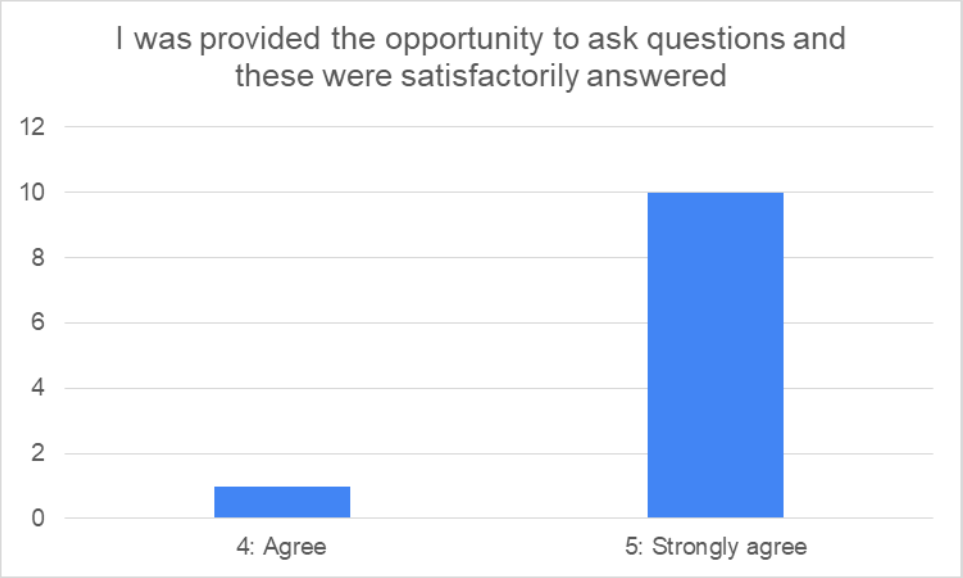




D. Additional comments

D.1 The use of blockchain is particularly useful for direct association of the user with waste management. I would like to see a better correlation between the citizen's fees and the municipality, as it was not as well understood.

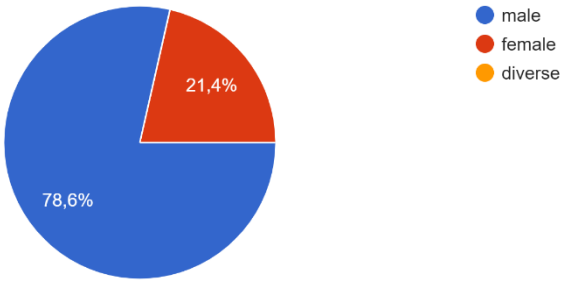
D2. Very interesting approach to blockchain theory, simple and understandable, especially on how the verification algorithm is solved and what happens when you change blockchain elements

D3. I found it very interesting. I think the cryptography method should be extended to other activities

Annex II: Responses from the pilot school in Germany

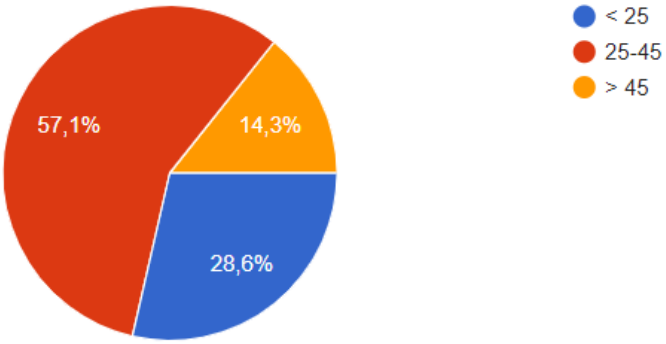
Gender

14 Antworten



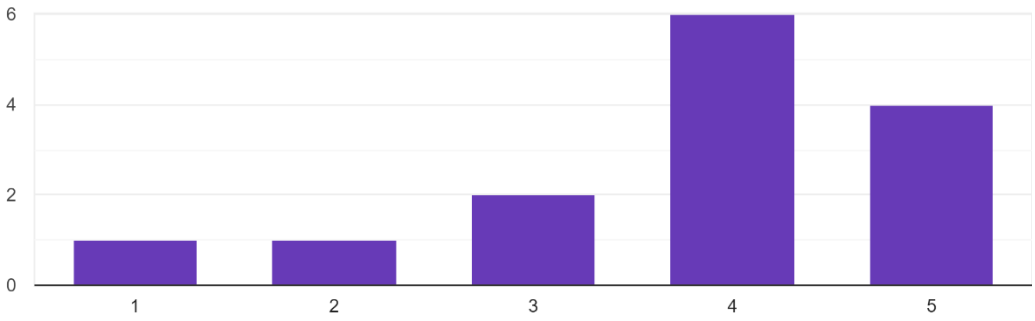
Age

14 Antworten



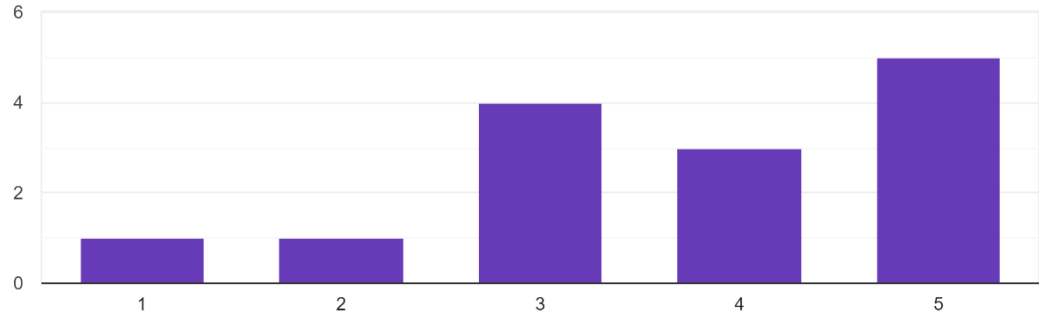
I had been familiar with circular economy.

14 Antworten



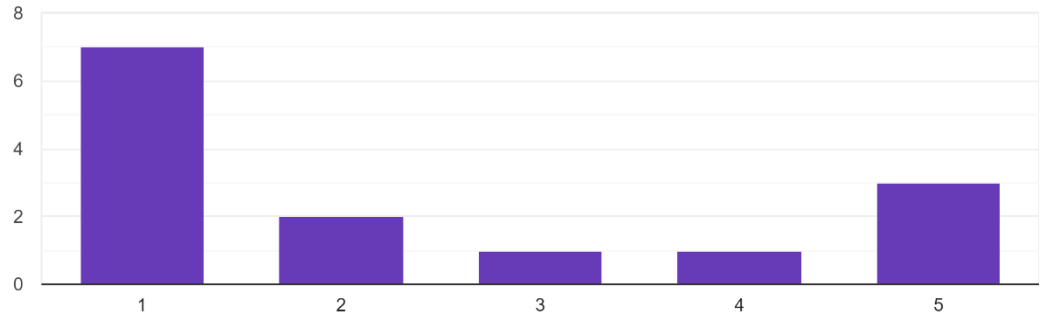
I had heard about the blockchain applied to waste management.

14 Antworten



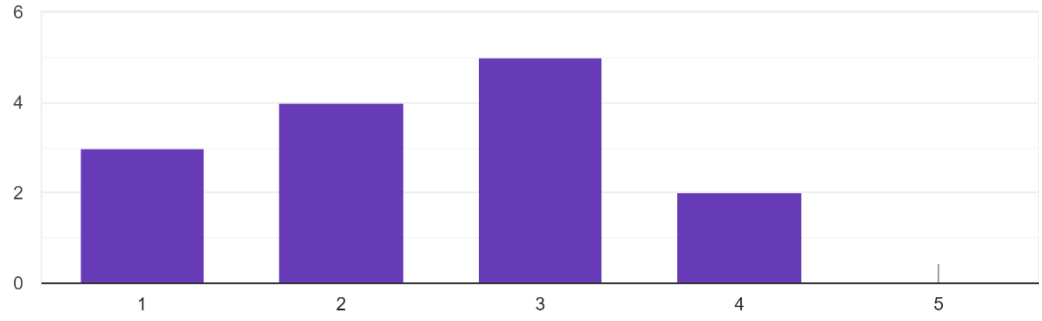
I had participated in another similar activity concerning the blockchain technology in the past.

14 Antworten



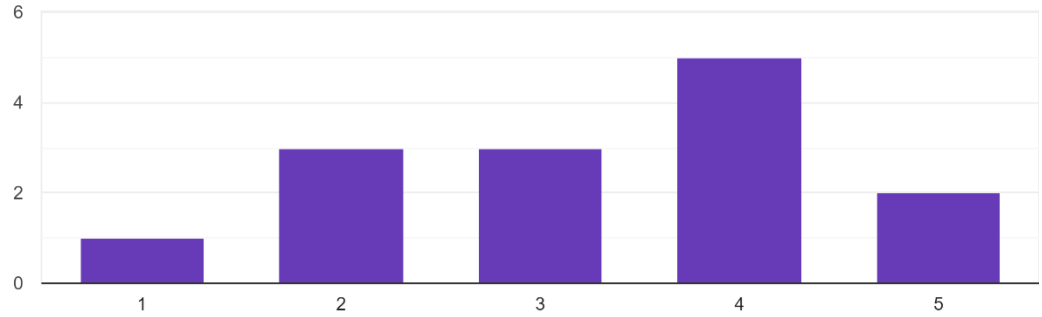
I did not see the need to make use of the blockchain in the waste management.

14 Antworten



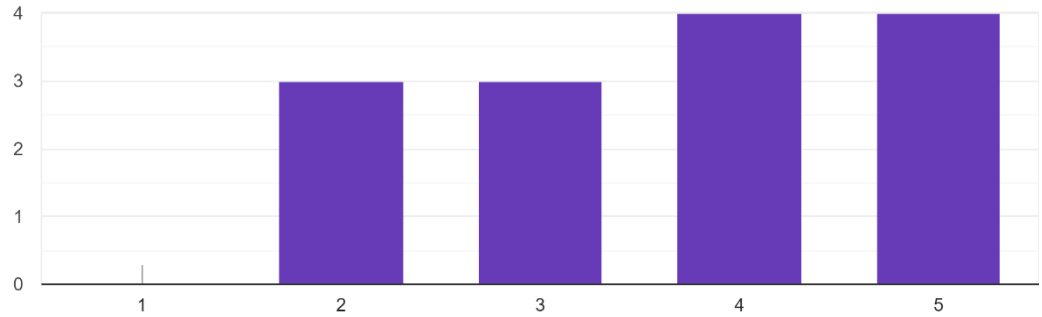
I am more familiar with the blockchain.

14 Antworten



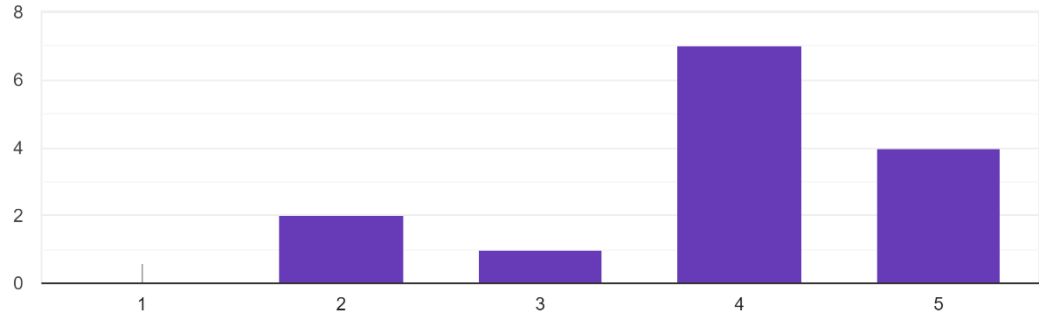
I would like to learn more about blockchain in the waste management.

14 Antworten



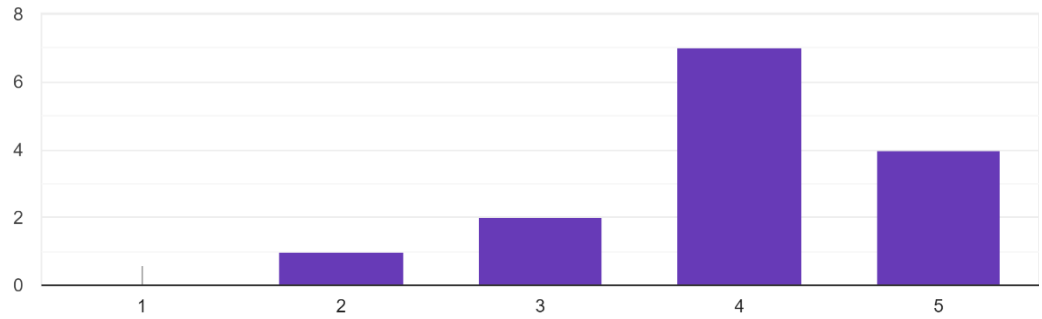
I am interested in participating in other blockchain-oriented activities in the future.

14 Antworten



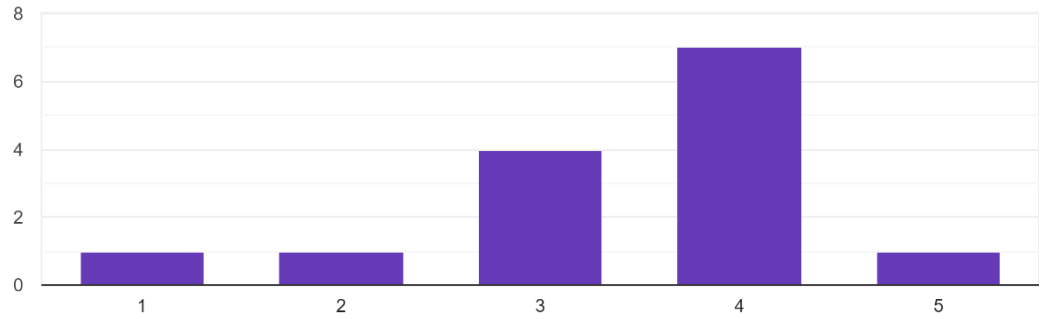
I have a more positive view on the use of the blockchain in the waste managemet.

14 Antworten



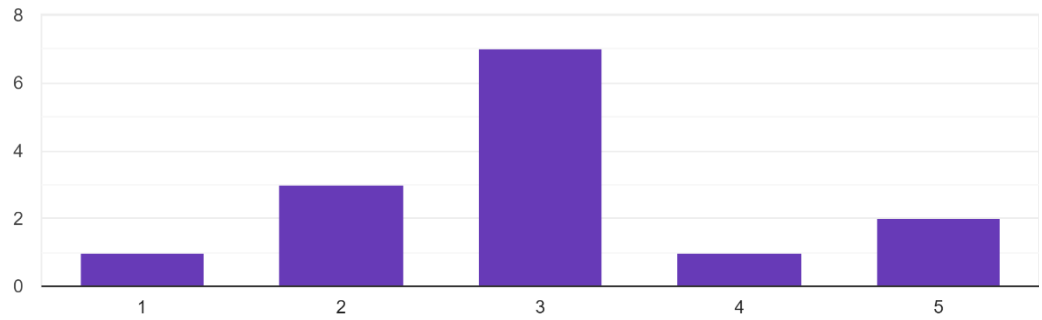
The Waste Management Tool was useful to a better understanding on waste management systems and team works.

14 Antworten



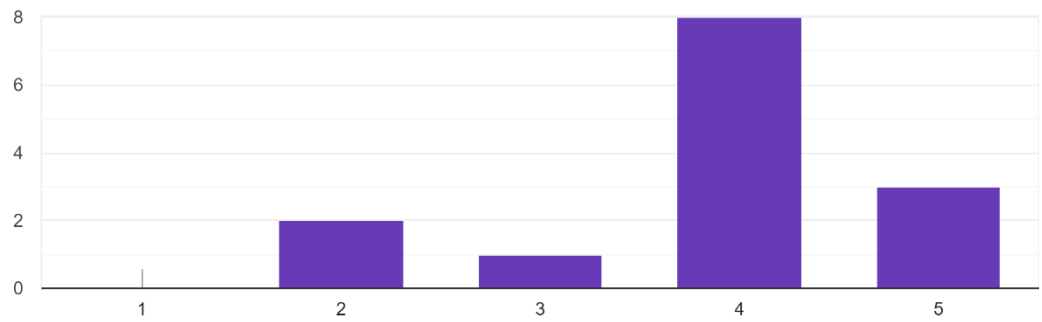
The BlockWaste Tool was useful to a better understanding on blockchain works.

14 Antworten



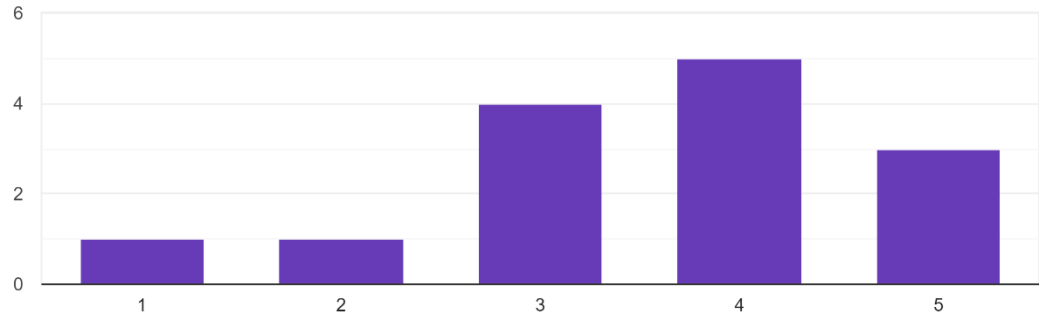
In general, the information and advice provided was useful.

14 Antworten



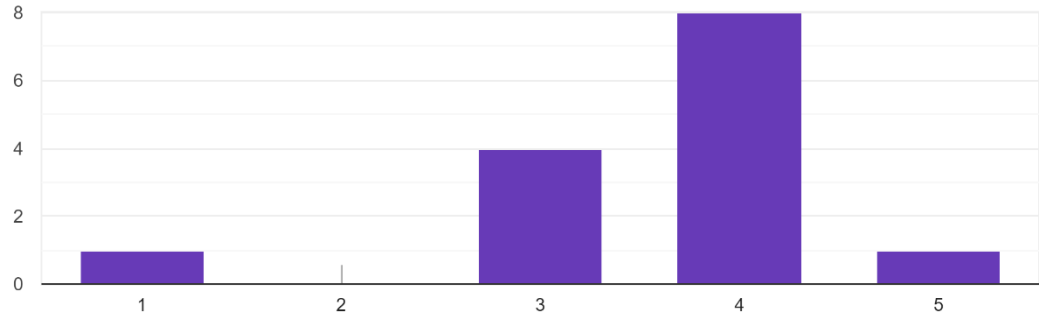
The teaching material as a whole is satisfactory.

14 Antworten



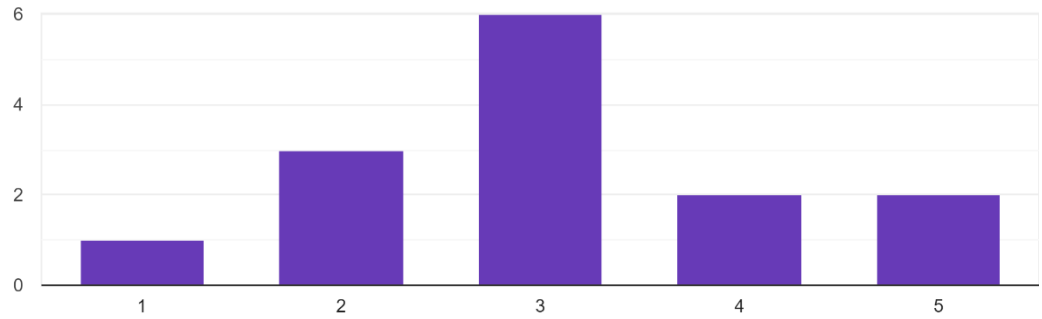
The teaching material contains adequate information to improve knowledge about the interface of waste management and blockchain.

14 Antworten



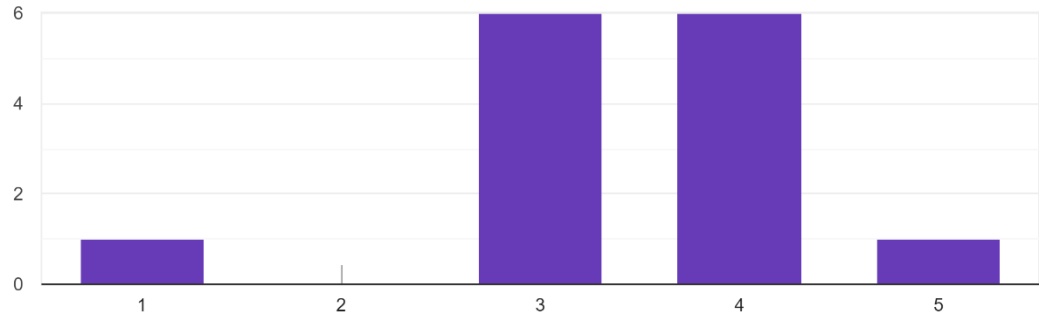
The teaching material is interesting so as to motivate the user to utilise it.

14 Antworten



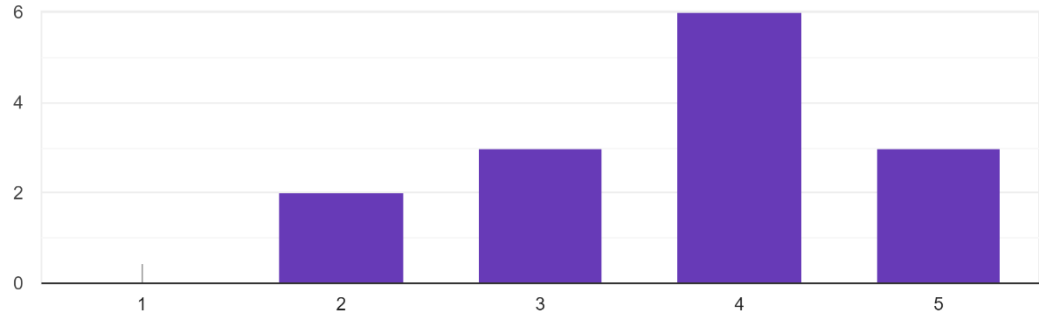
The teaching material fulfills its purpose and targets.

14 Antworten



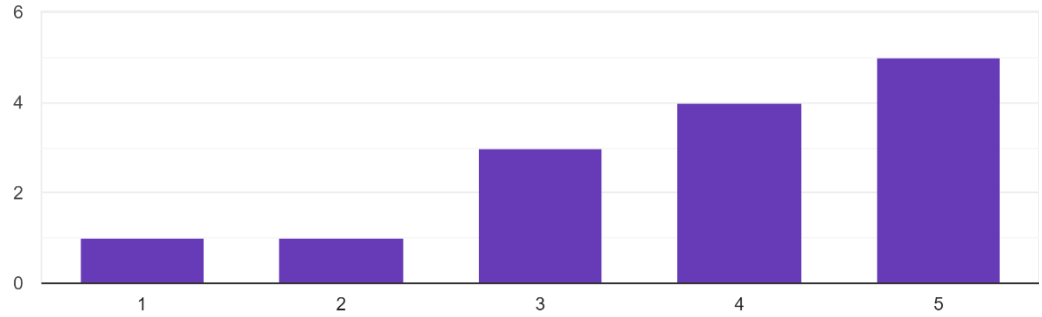
It is easy to use the online sources of BlockWaste.

14 Antworten



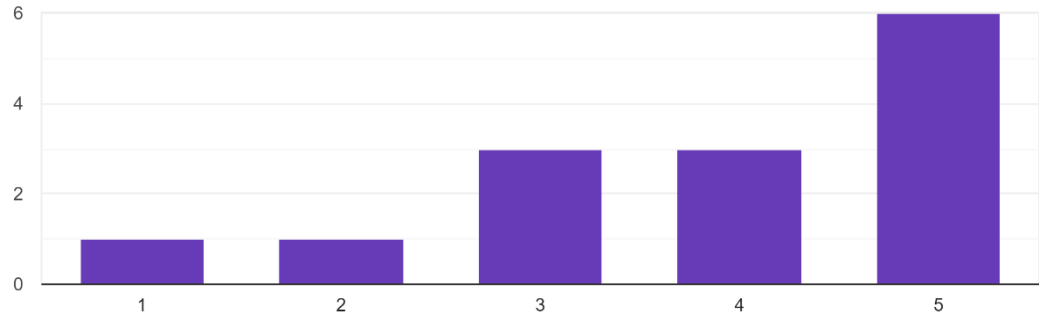
The information was communicated in an understandable manner.

14 Antworten



I was provided the opportunity to ask questions and these were satisfactorily answered.

14 Antworten



Comments:

6 Antworten

Mal schauen, ob alles klappt!

Avoid negatives in in statements. Terminology sometimes confusing.

I'm very happy with the BlockWaster Project. The project itself is very exciting and application-related. I hope to engage in further Blockchain projects.

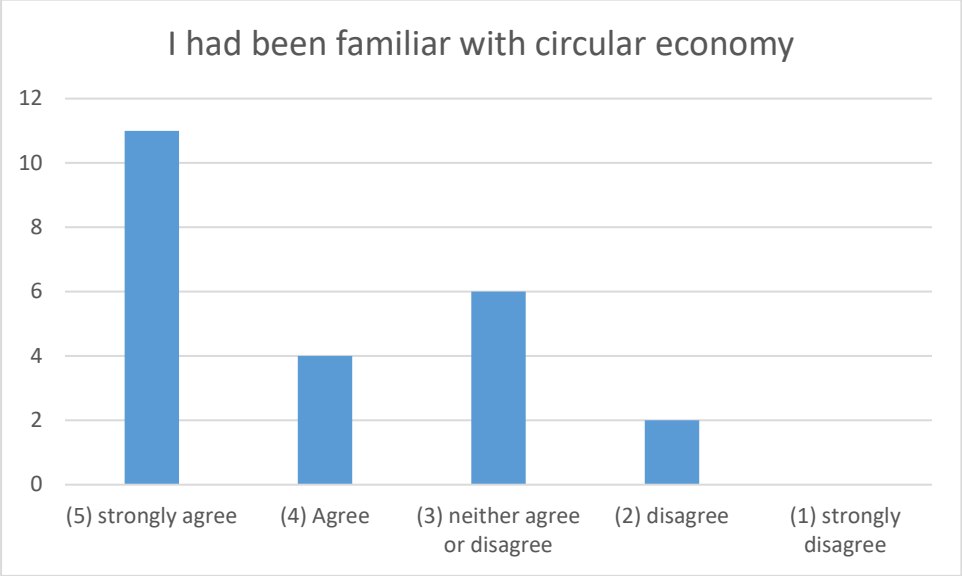
It would be interesting to take a community approach over an individual approach. Waste management, in my opinion, is part of the efforts to combat global warming. Since companies are very successful in blaming individuals behavior instead of accepting their own responsibility, an approach towards collective efforts by groups of people would be interesting. Instead of focusing on individual households, quarters could be of interest. Motivating multiple households all together would yield better results plus individuals could gain higher incentives when efforts are doubled, tripled, etc.

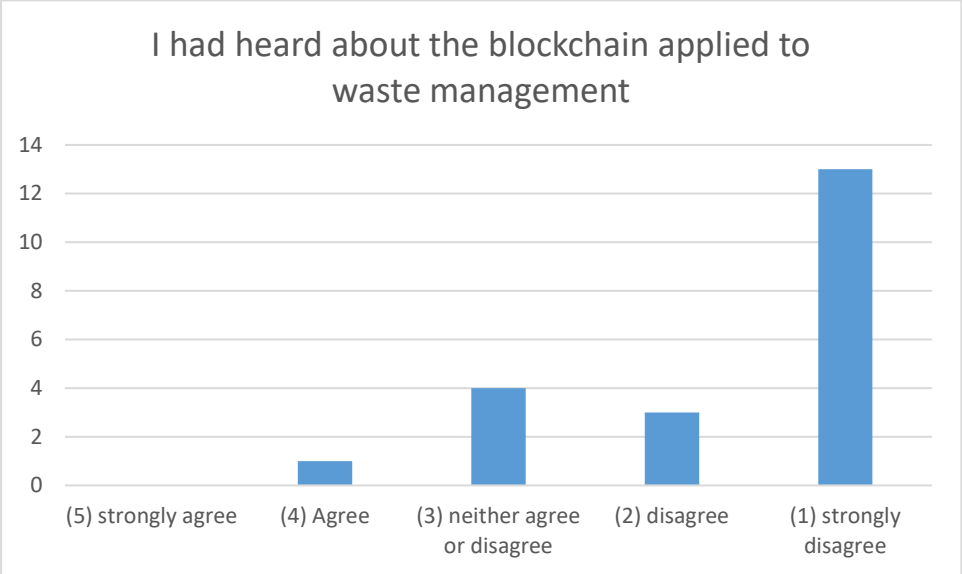
How can I reduce my cost of waste? By sorting better? separating better? producing less waste? There was no graphic on which type of trash is the most costly; Consumers could particular pay attention to creating e.g. plastic waste if this was highlighted as the most costly waste-type. There was just a total sum of cost for waste

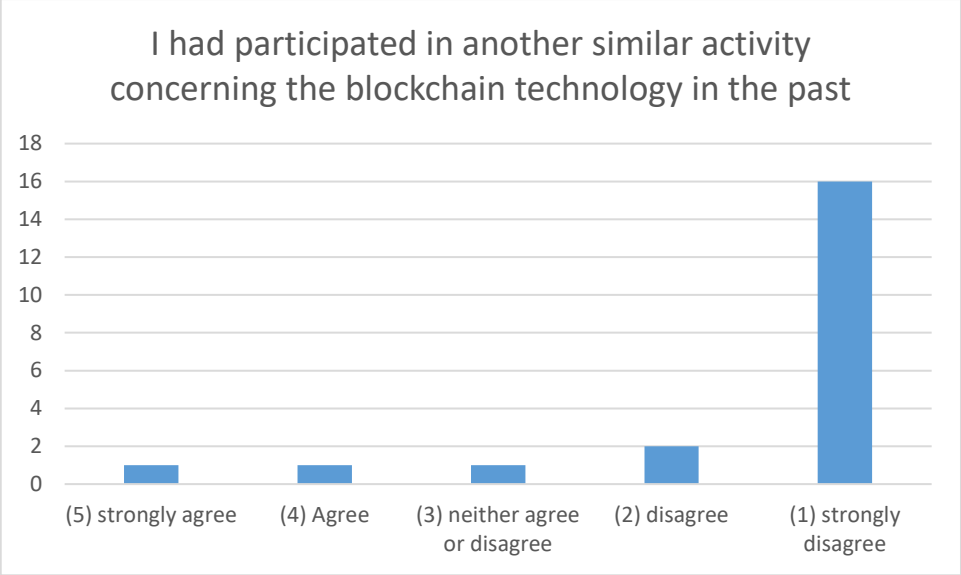
Whenever I rated 3 it was because I feel explanation on block chains was missing. I don't know anything on block chains and after the pilot school I still know very little. It was talked a lot about waste management, which is why I would give a 5 solely for that, but there was no slide explaining general knowledge about block chains. There was only one quick comment about it being sharing data in a chain, like the waste data in a municipal entity. I would have loved to learn a bit more about block chains and how exactly they are applied for waste management.
I really like the topics covered in the BlockWASTE Course, I like that society will become more informed about these topics, there is a great need for it.
In the blockwaste game, maybe it could be further specified whether the number of household members include pets, or add another entry for number of pets even, so that the weight of their excrements can be considered.

Annex III: Responses from the pilot school in Estonia

A. Before my participation in this pilot school






I had participated in another similar activity concerning the blockchain technology in the past
18
16
14
12
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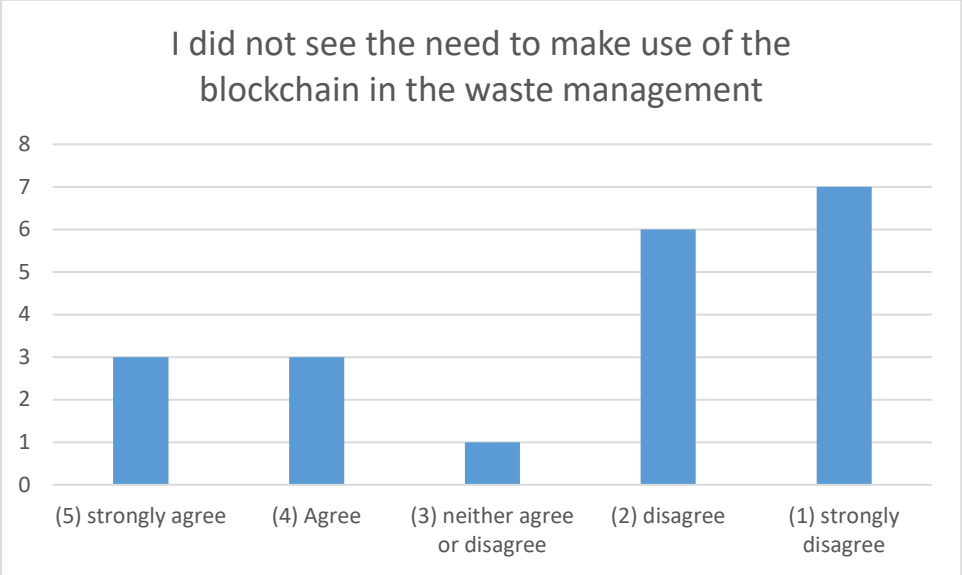
(5) strongly agree
(4) Agree
(3) neither agree or disagree
(2) disagree
(1) strongly disagree


I did not see the need to make use of the blockchain in the waste management
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7
6
5
4
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(4) Agree
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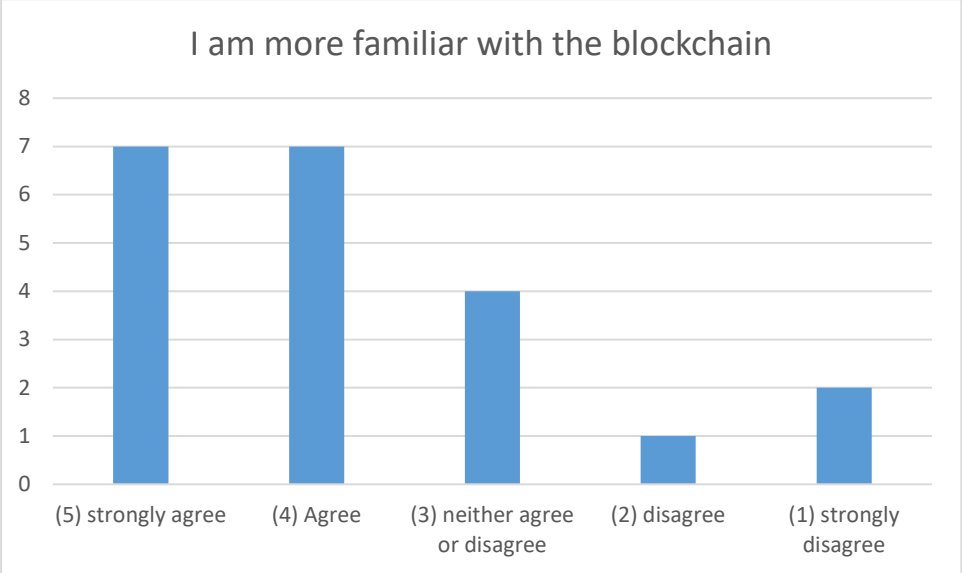
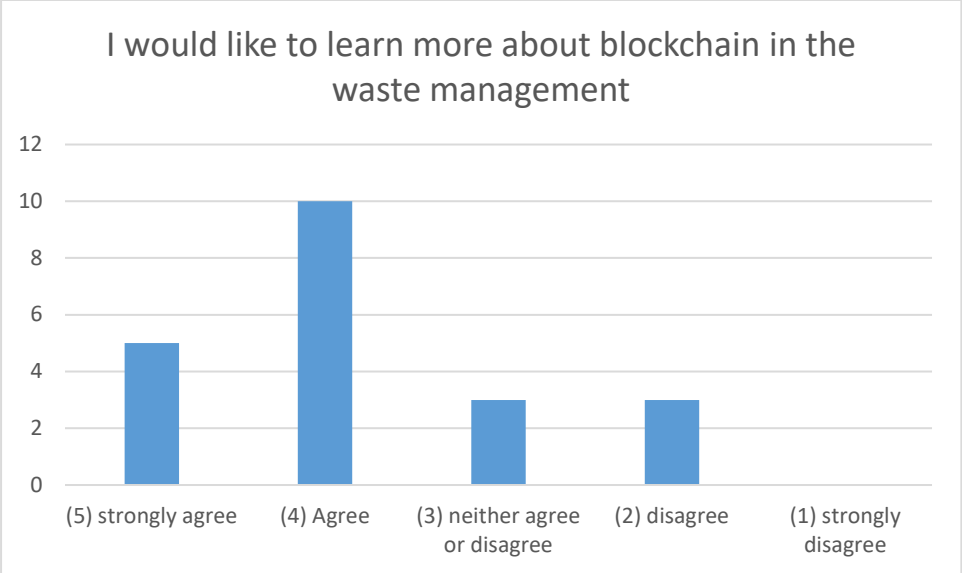
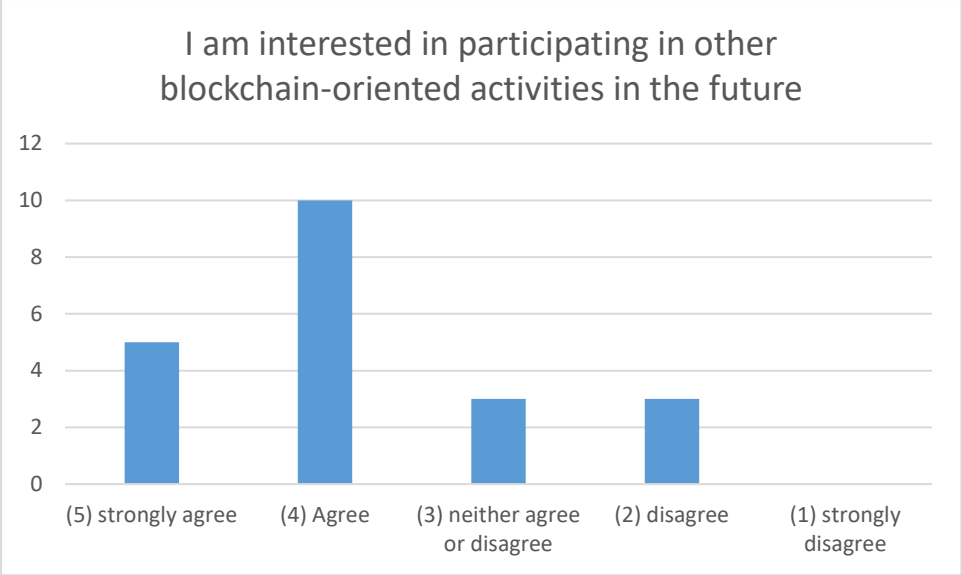
B. After my participation in this pilot school






I am interested in participating in other blockchain-oriented activities in the future
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6
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(5) strongly agree
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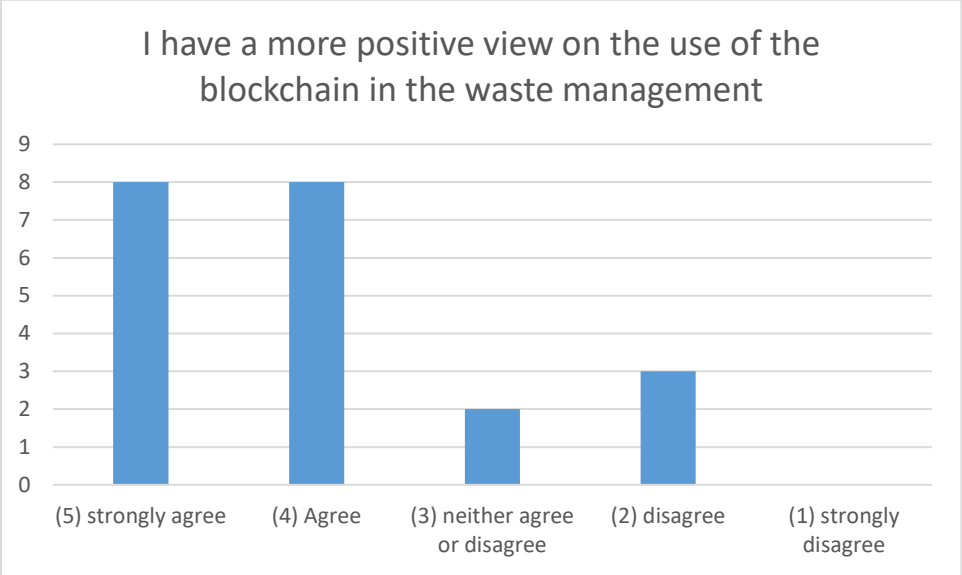
I have a more positive view on the use of the blockchain in the waste management
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(5) strongly agree
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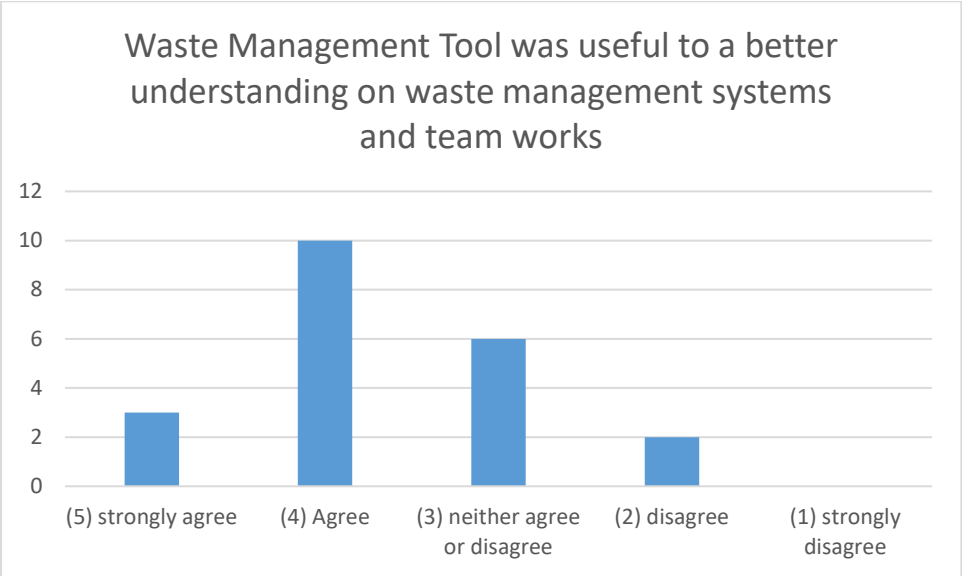
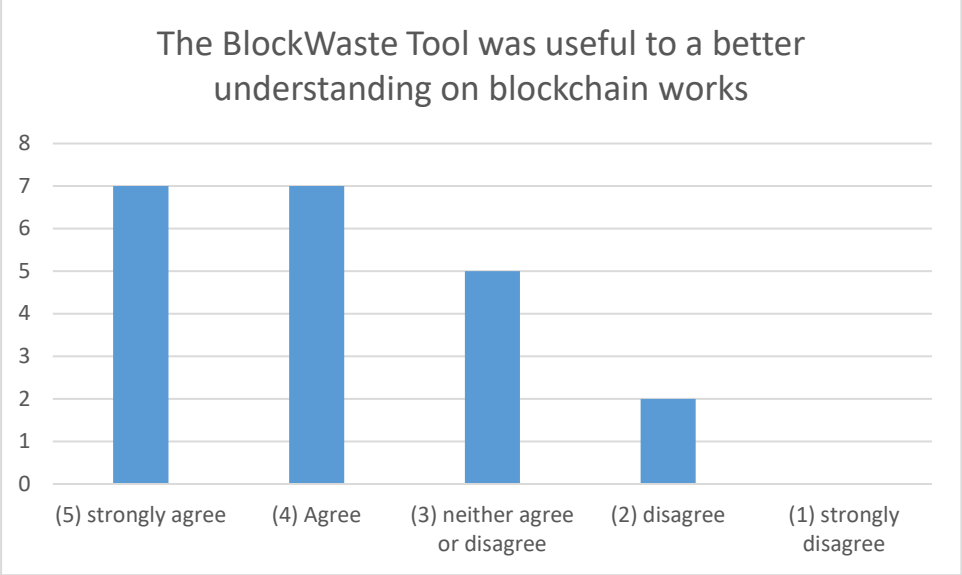
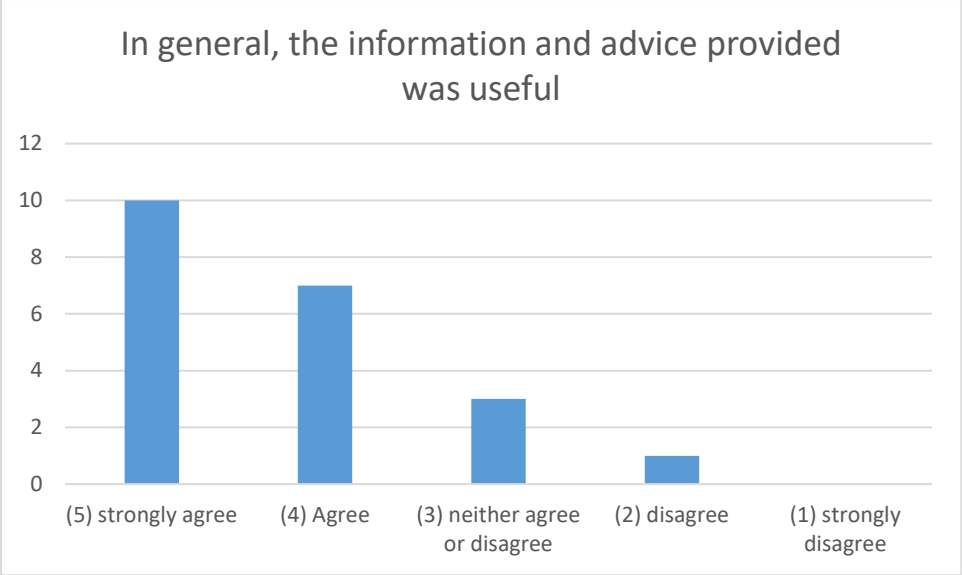
C. Evaluate your experience of this pilot school



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10
8
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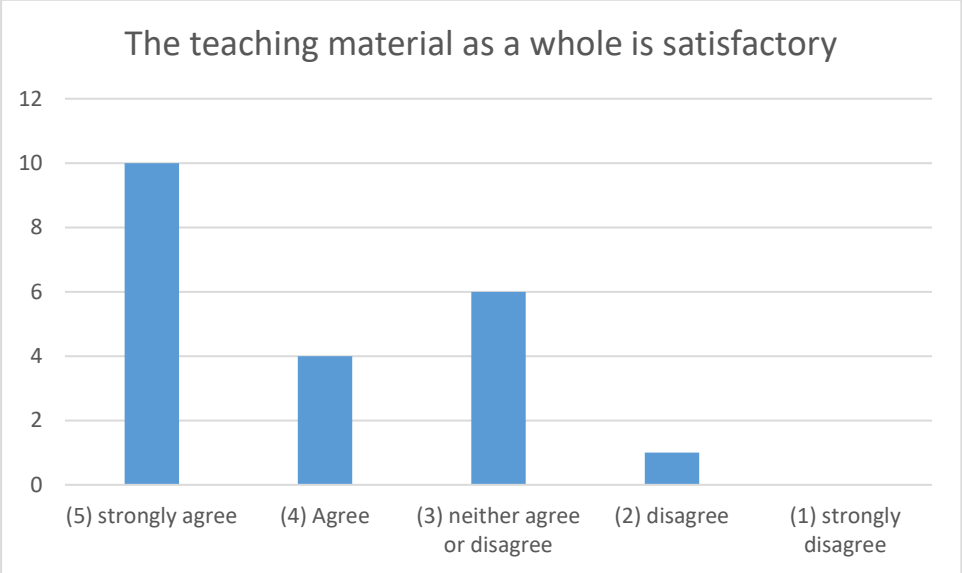
The teaching material as a whole is satisfactory
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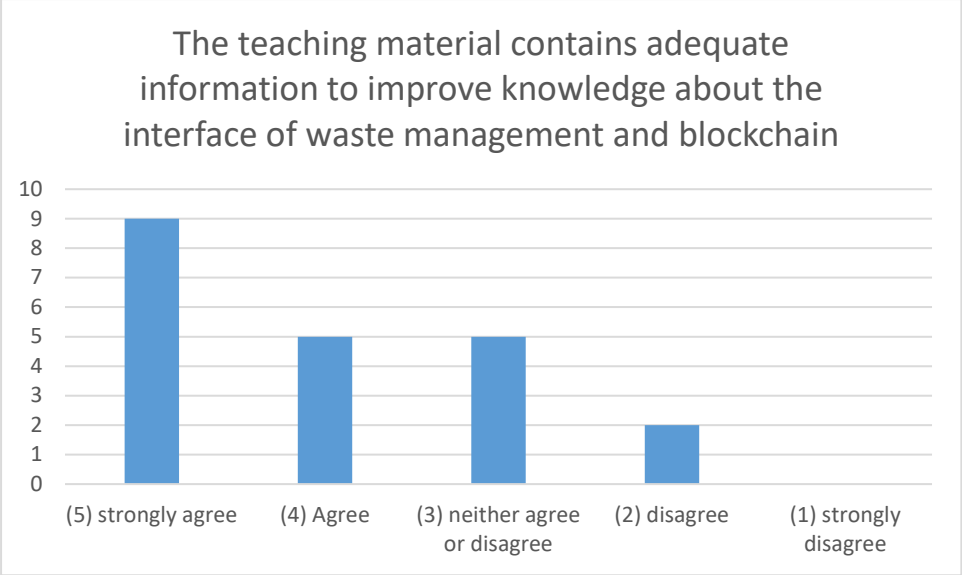
(2) disagree
(1) strongly disagree


The teaching material contains adequate information to improve knowledge about the interface of waste management and blockchain
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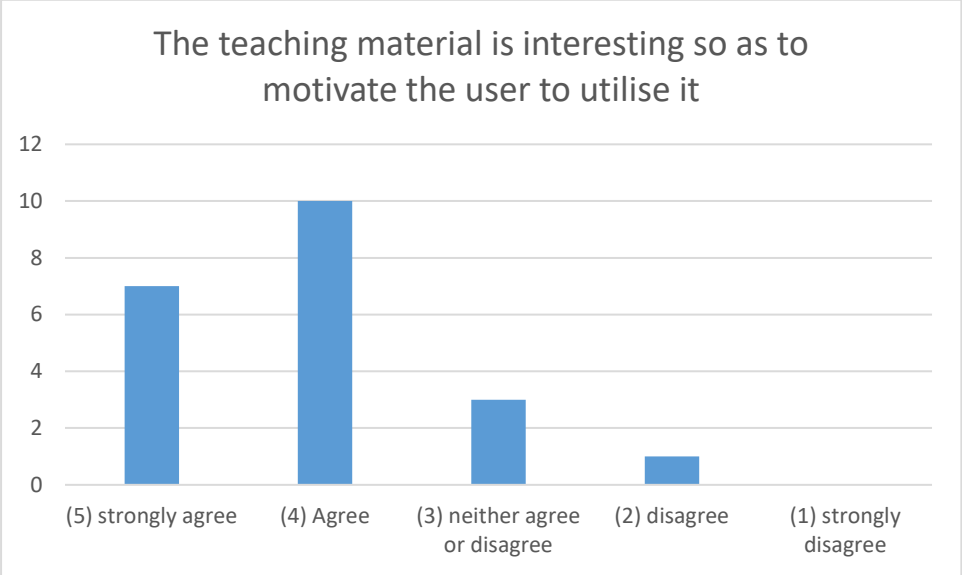
(5) strongly agree
(4) Agree
(3) neither agree or disagree
(2) disagree
(1) strongly disagree


The teaching material is interesting so as to motivate the user to utilise it
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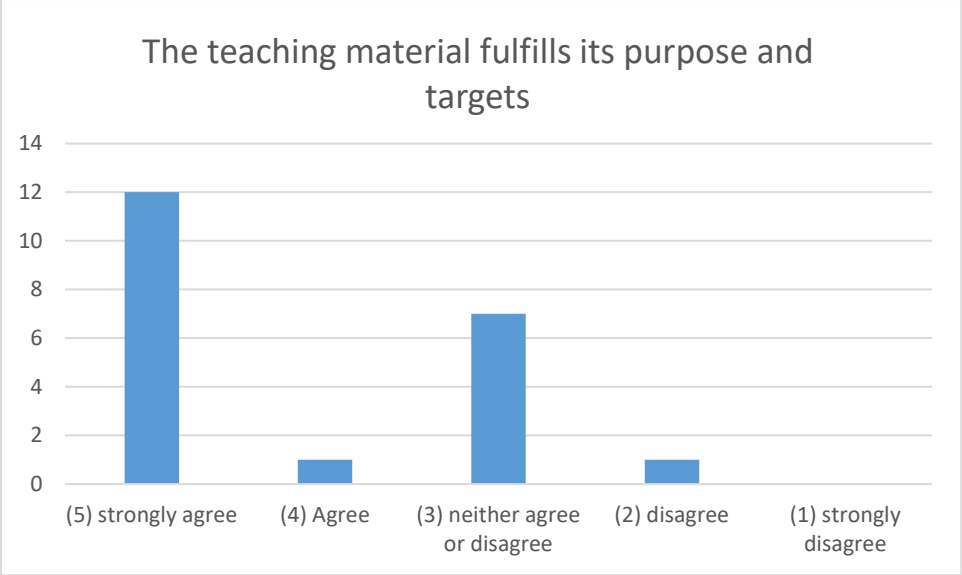
(5) strongly agree
(4) Agree
(3) neither agree or disagree
(2) disagree
(1) strongly disagree


The teaching material fulfills its purpose and targets
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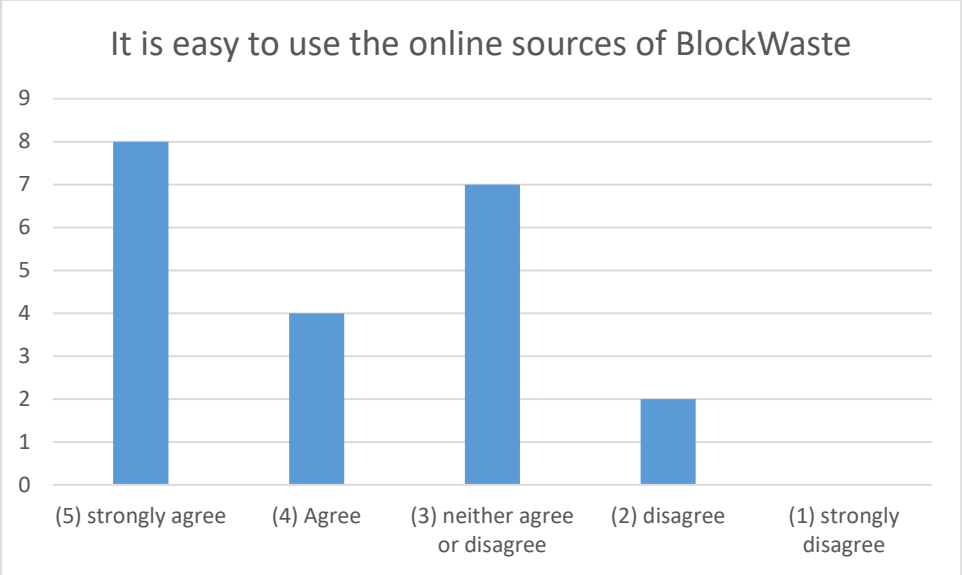
(5) strongly agree
(4) Agree
(3) neither agree or disagree
(2) disagree
(1) strongly disagree


It is easy to use the online sources of BlockWaste
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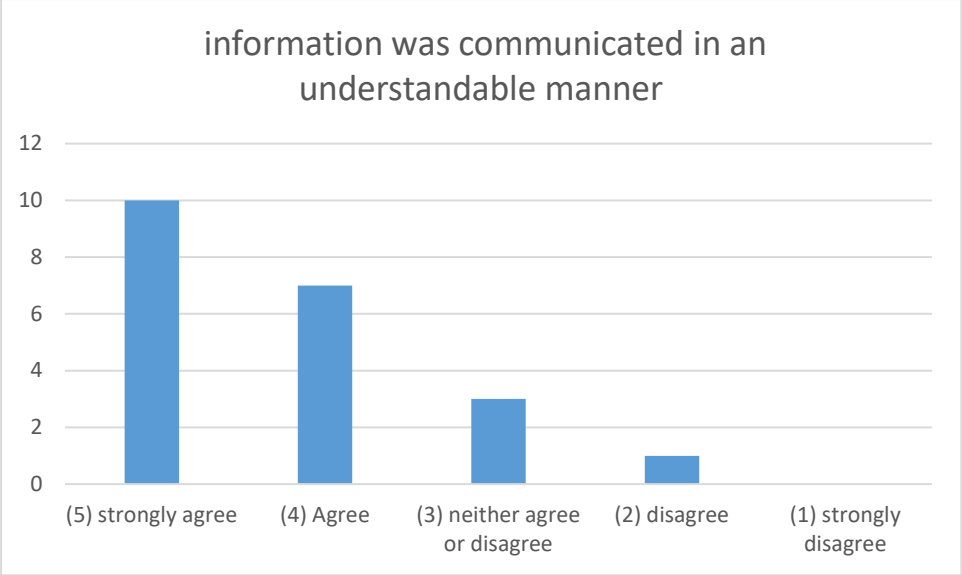
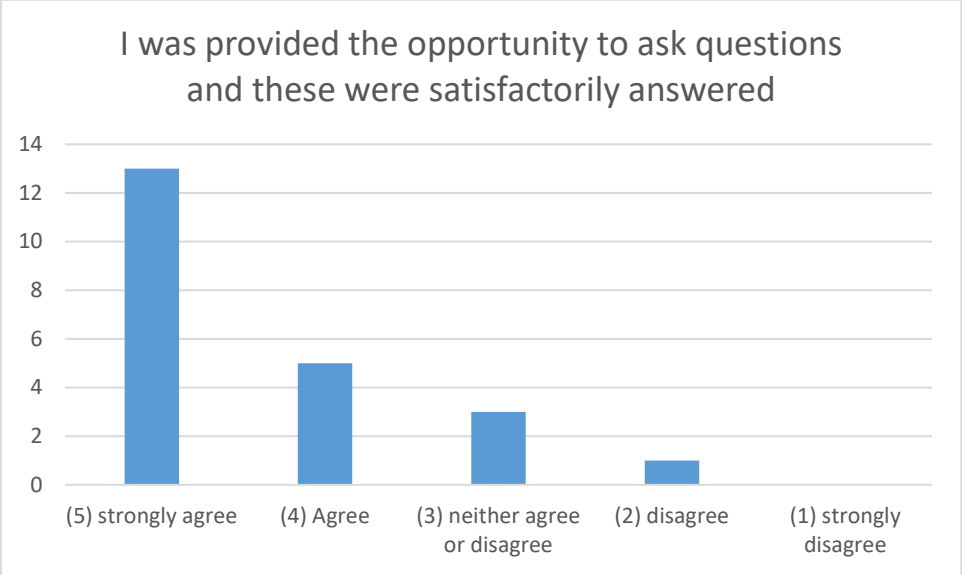
(4) Agree
(3) neither agree or disagree
(2) disagree
(1) strongly disagree





D. Additional comments

1. It was an interesting and interactive session which open my understanding of the blockchain ecosystem. I would love to participate in future events.

2. It's a very useful tool to manage waste

3. The presentation was great, and I am very well interested in the implementation of blockchain features in waste management.