



Chargers of
Electric Vehicles
in Learning

Description of teacher assessment and evaluation methodology

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1 - Introduction

The objective of C-Evil project is to develop new learning and training materials on EV chargers in order to fill the gap in electricity education due to the sufficient and efficient multiplying activities. The growing number of electric vehicles needs more and more EV chargers which require adequate electricity professionals who can install, operate and maintain the equipment properly. Expert partners will provide a special knowledge that can be taught to electricians or future professionals (VET students). Together with the VET partners, they will elaborate materials that can be used anywhere in the EU.

The materials will cover the main areas connected to EV chargers such as charger types, electrical connections, licencing and permitting, installation, electricity standards, management, maintenance and error maintenance. We will put special focus on not only the hardware part of the EV chargers, but also on its software features, i.e. smart management applications. We would like to also highlight in the materials that, even though, there are general information that is valid everywhere, there are also rules and specifications that are different in every country. Country-specified information will be available which will make the materials more thorough.

In order to help understanding the terminology in the different languages, and to facilitate the employment in the EU, a glossary will be set up with the most important terminology in the project partners' languages.

Four intellectual outputs of the C-Evil project will be built upon each other. O1 will provide a solid base for the further activities of the project by defining the learning objectives (O1-T1), methodology and approach (O1-T2), and also developing the EV charger curriculum (O1-T3).

Based on the O1, the partnership will elaborate the content of the training materials (O2-T1). In further tasks of the O2, methodology of trainers' assessment (O2-T2) will be described, and trainers' feedback on the training materials will be collected (O2-T3).

O3 will include the elaboration of the learning materials (O3-T1) which will be the adaptation of the training materials in a student- and user-friendly way. Students will evaluate the learning materials (O3-T4) which requires a description of evaluation methodology (O3-T2). This IO will involve the development of the online learning space (O3-T3) where learning materials will be available for e-learning purposes.

For enhancing the spread and the adaptation of the project results, in O4, project partners will prepare guidelines and handbooks for the most important stakeholders: VET institutions (O4-T1), VET trainers (O4-T2), e-learners (O4-T3) and policy makers (O4-T4).

The partners are committed to disseminate the project results during and even after the project closure, through their daily activity. The outputs will be available on the project's platform, thus, it can be used for future projects and for further educational purposes.

Duration: 24 months

CAM is a micro-sized enterprise in Hungary, acting as lead partner of C-Evil. CAM as an expert organisation has great experiences in the field of electric mobility and in international co-operation covering professional and financial management.

The Turkish EGE University offers courses, inter alia, in the field of electrical-electronics engineering, their experts have expertise and experience related to electric mobility, especially chargers.

The Hungarian VET school, Kecskeméti Szakképzési Centrum Kandó Kálmán Szakgimnáziuma és Szakközépiskolája offers, among others, trainings for electricians. They have professional project experience in an electric car battery project.

The Romanian Colegiul Stefan Odobleja offers a wide range of qualifications in the field of, among others, mechanics and electronics, focusing on providing practical trainings to students. Automotive industry has a priority in their trainings.

Servicios Extremeños Enseña is a Spanish training center providing high-quality educational service. The institution also has experience in training material development and widespread partners to reach out to, including Spanish VET schools.

Learning Hub Friesland is a Dutch NGO enabling, driving and maximizing innovation in education in Friesland. They have experiences in training programme and training material development, organizing workshop and seminars and they have a broad network in the field of education, social sector, industry and governmental.

The Italian-Slovak Chamber of Commerce is an NGO with wide range of partner network. In C-Evil, they will ensure the representation of the labour market, and they can contribute significantly to the dissemination purposes.

Avaca Technologies is a Greek IT expert who has the required expertise for developing the project platform and also has many experiences in international projects on education.

2 – Purpose of the document

Based on the learning approach and objectives defined in O1, partners develop the most suitable methods to apply for assessment and evaluation in order to define whether the participants of the “train the trainer” workshop have acquired the skills related to EV chargers.

The aim of the assessment is to see if the learning objectives can be achieved entirely with the materials. We will put emphasize on getting the teachers’ opinions with open-ended questions about their impressions, thoughts and recommendations. They will be asked to suggest any kind of modifications and recommendations related to the learning methodology, the materials or the content itself.

Language of the evaluation materials is English in accordance with the materials developed in O2-T2. Besides examining the methodological side of the materials, expert partners will also create a short test with about 10 questions related to EV chargers in order to check the teachers’ knowledge participating in the workshop. The test will be done twice in the workshop: before and after the presentations of the training.

The Hungarian VET partner has coordinated the task. Although initially, we planned to include all PPs (except AVACA) to provide input/feedback, we decided to keep this document in an inner circle in order to not to intrude in the results of the evaluation.

3 – Methodology behind evaluation

3.1. Testing of the acquired knowledge

The purpose of the evaluation was to check the quality and the level of complexity of the C-Evil training material before the partnership develop it to a module-based learning material. Although in order to see personal developments, we asked for the name of the participants of the tests, we didn’t use any personal data in the evaluation. Considering the length and depth of the training content and “train the trainer” workshop timeframes, the optimal evaluation methodology for the short-term joint staff training is the before-and-after testing.

The objectives of the BEFORE TESTS:

- Help coordinators see the participants' existing knowledge and experience in the topic;
- Establish a reference for the after tests.

Main requirements for the BEFORE TESTS:

- ✳ Use the developed training material as main source;
- ✳ Include general and also specific questions;
- ✳ Not make the questions available publicly before the joint staff training;
- ✳ Include different type of questions.

The objectives of the AFTER TESTS:

- Help see how the participants' knowledge have changed quantified;
- Make conclusions about the effectiveness and the difficultness of the content.

Main requirements for the AFTER TESTS:

- ✳ Use the exact same questions as in the after tests;
- ✳ Include general and also specific questions;
- ✳ Not make available publicly.

Annex I contains the developed questionnaire.

3.2. Collection of feedback

Besides testing directly the content, another purpose of the evaluation was to collect feedbacks from the participants. These comments are very valuable as they are coming from working VET teachers, trainers and educators who are supposed to work with this content. We asked them to contribute to the training material so we can consider practical, real-life experience from the classroom in the project results. The best way to collect feedbacks, especially when we have an opportunity to discuss ideas real-time and not in email exchanges, is round-table sessions.

The objectives of the round-table discussions:

- Collect any content-related comments that expert partners should reconsider;
- Make conclusions about the effectiveness and the difficultness of the content.

Main requirements for the round-table discussions:

- ✳ Uses general questions as much as possible;
- ✳ Allows every participant to express their opinions;
- ✳ Make enough time for discussing every issue;
- ✳ The session host should help the flow of the discussions with further questions if necessary.

4 – Technology background

Eventually, three platforms were used in total for the testing of the acquired knowledge and the collection of feedbacks. CAM used Google form at joint staff training level, EGE used Quizizz platform for their own presentations, and LHF used Miro for round-table discussions.

4.1. Quizizz

Quizizz is an online assessment tool that allows teachers and students to create, edit and use each other's quizzes. It is a tool that provides the possibility to create an online classroom. In

addition to creating classes, it can be used as an exam or used for homework at a specific deadline, instantly providing students with a unique access code. As a result of the teacher's adjustments, after the exam is completed, students can see their answers. Additionally, the data obtained is presented in a spreadsheet. In this way, teachers can clearly understand the performance of students. Teachers can use this instant feedback to change future learning activities and sacrifice the focus of the material by paying more attention to the ideas students struggle with. At the C-evil training, the Quizizz tool was for before-test and after-test.

4.1.1. Using Quizizz

The Quizizz tool can be accessed at www.quizizz.com. When the application is accessed, there are some buttons for logging into the tool, accessing the quizzes and sign up (See Figure 1.). By clicking the sign up button, you can go to the registration screen.

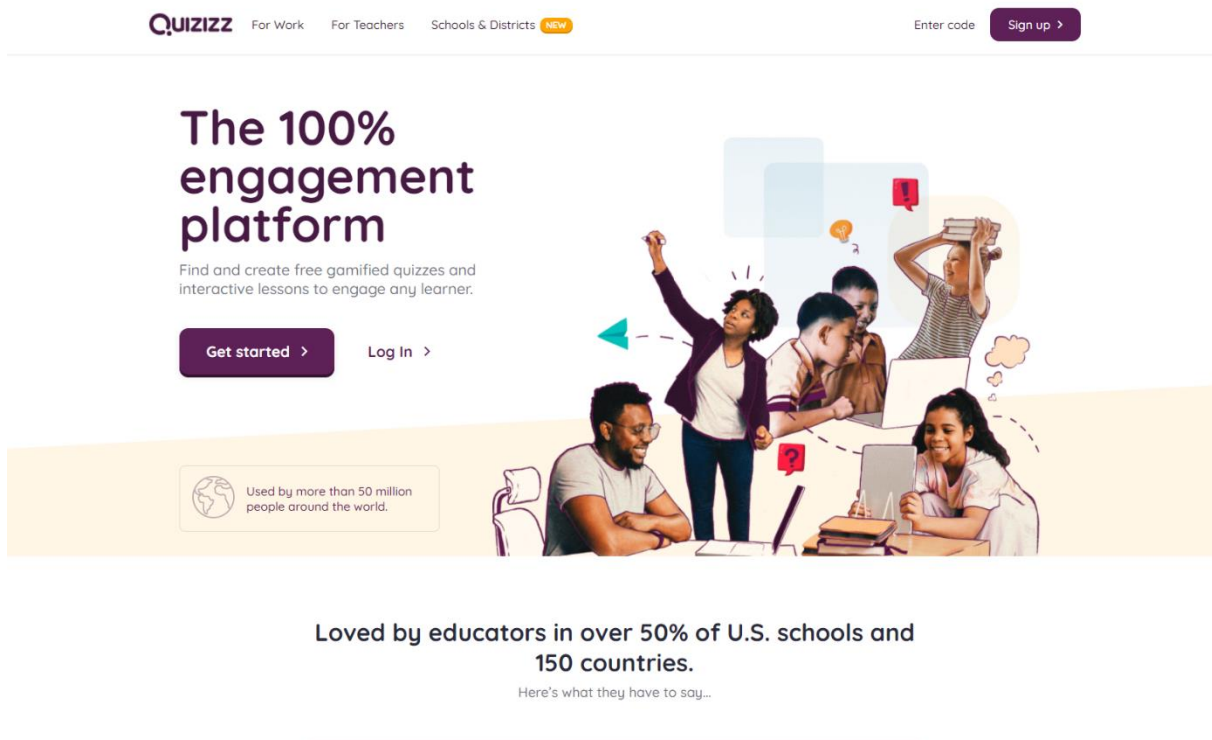


Figure 1. Quizizz tool homepage

When you click on the register button, three options appear. These are continue with Google account, continue with Microsoft account and continue using email address (See Figure 2.).

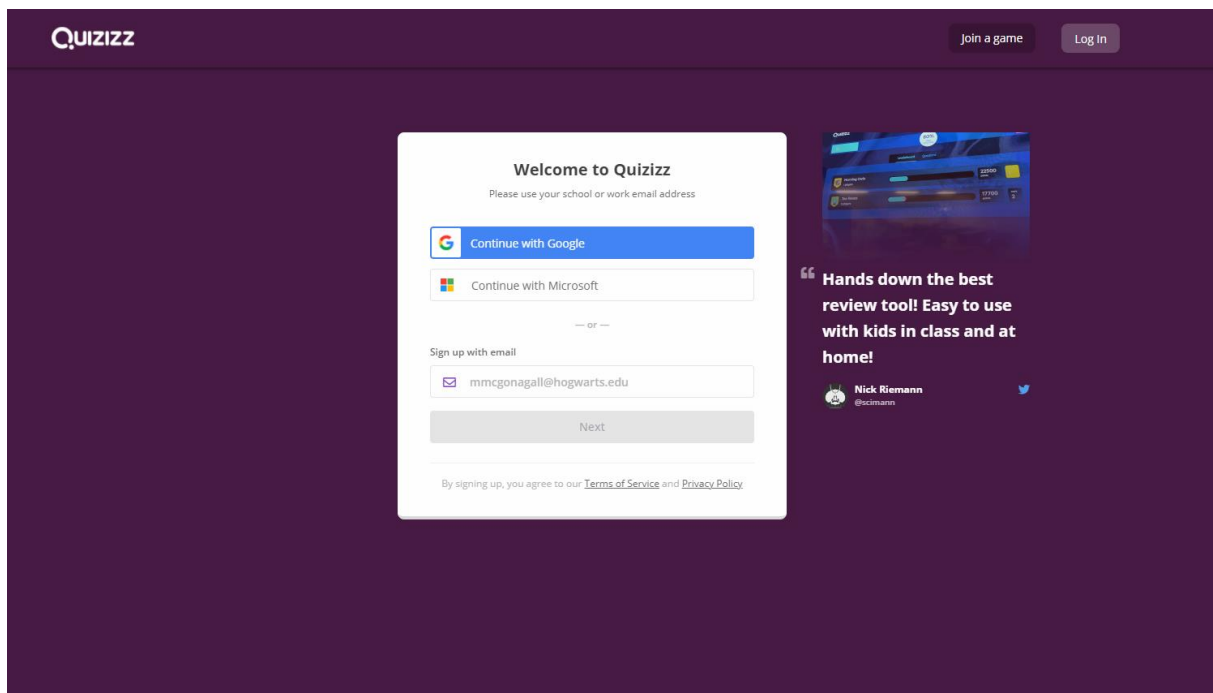


Figure 2. Registration Step 1

When continuing by selecting any option, users are shown three more options. These are 'at a school', 'at a business' and 'personal use' (See Figure 3.). For the education option, 'at a school' can be selected.

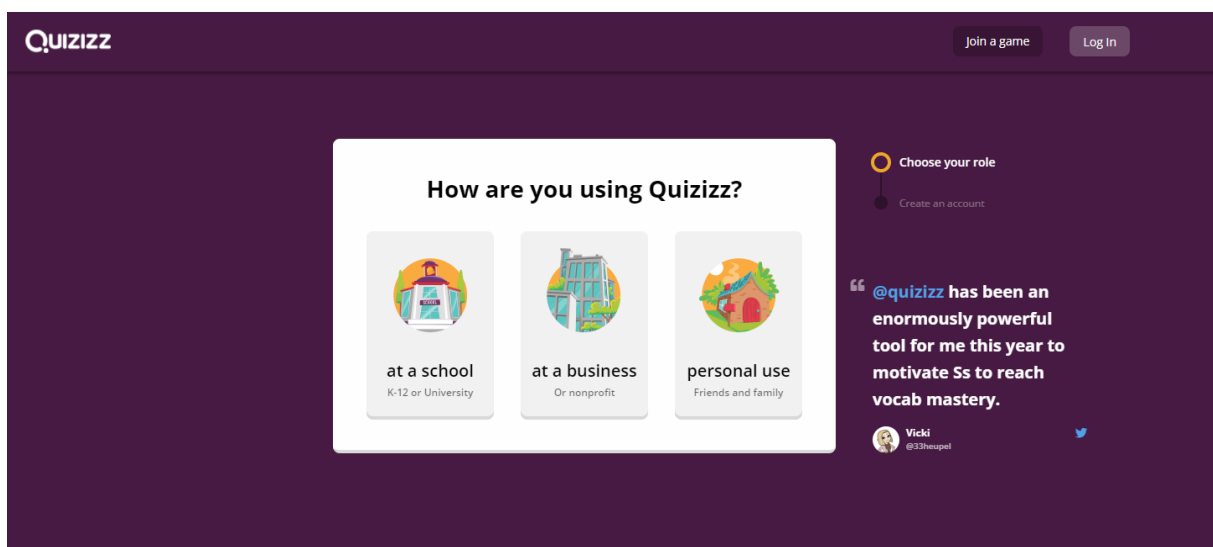


Figure 3. Registration Step 2

When continuing by choosing the 'at a school' option, three options are shown. These are 'Teacher', 'Student' and 'Parent' (See Figure 4.).

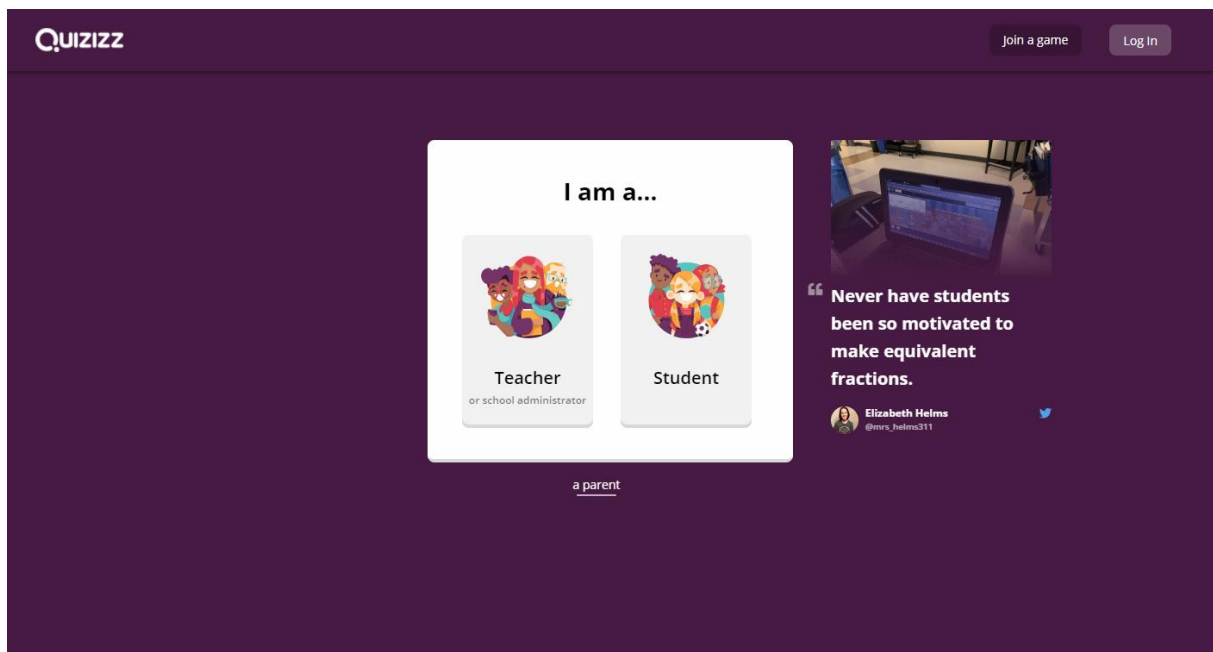


Figure 4. Registration Step 3

When any option is selected and continued, the form asking for various information appears on the screen (See Figure 5.). The required title, name, surname and password information must be filled in the form.

 The image shows the Quizizz registration interface at step 4. At the top, the Quizizz logo is on the left, and 'Join a game' and 'Log in' buttons are on the right. The main content area has a white card titled 'Your account details'. The form includes fields for:

- Title: A dropdown menu with a downward arrow.
- First name: A text input field containing 'Minerva'.
- Last name: A text input field containing 'McGonagall'.
- Password: A text input field with masked characters (*****). To the right of the field are an eye icon and an information icon.

 Below the password field, it says 'Password strength: Weak'. At the bottom of the card is a 'Continue' button. To the right of the card, there is a testimonial from Sara Golden (@MrsGolden25) with a photo of a person and the quote: 'Shout out to @quizizz for being so easy to use during remote learning... My students work at their own pace...'

Figure 5. Registration Step 4

When the registration is completed, the tool's dashboard will appear (See Figure 6.). There are many sections in this page. In the left part, there are quiz creation button, lesson creation button, quiz library, reports on previous applications, classes and settings. In the middle section, there is an input for search topic and quiz.

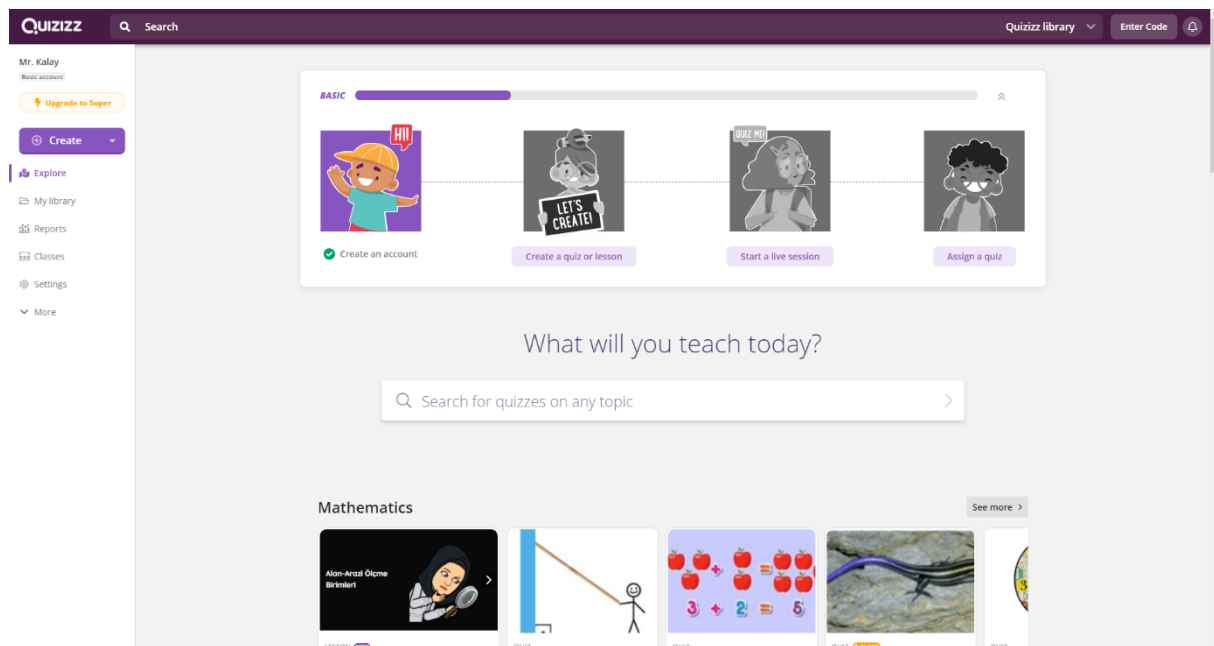


Figure 6. Quizizz User Dashboard

When the Create button is pressed, two options appear. These are 'Quiz' and 'Lesson' (See Figure 7.).

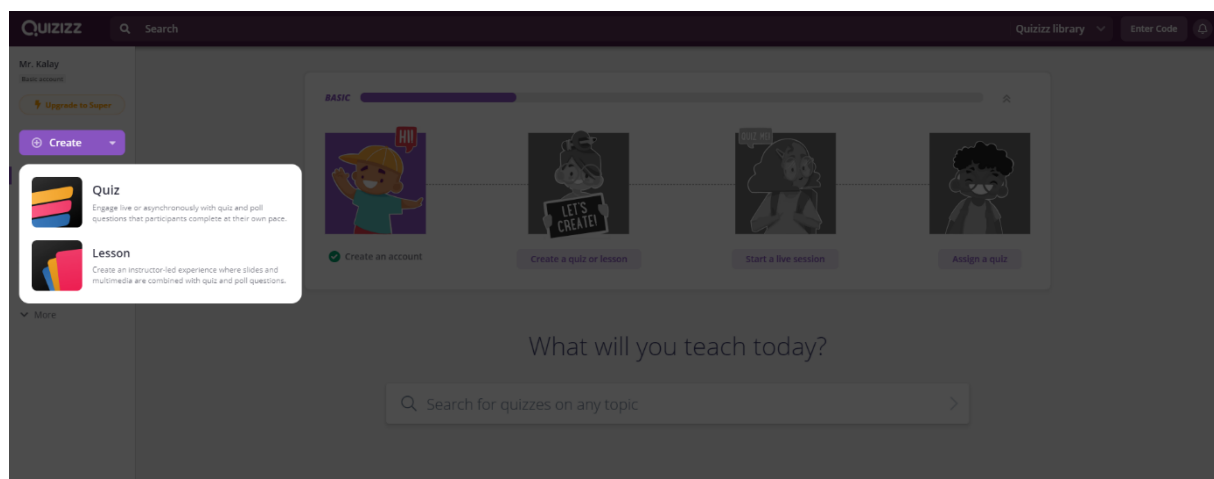


Figure 7. Quiz Creation Step 1

When the Quiz option is selected, a form asking for the name of the quiz and relevant subjects will appear (See Figure 8.). After choosing the name of the quiz and relevant subjects, you can click the 'Next' button for next step.

Figure 8. Quiz Creation Step 2

After selecting the quiz name and relevant subjects, a screen appears where the quiz content can be prepared (See Figure 9.). In this step, the quiz can be edited. In addition to this situation, this step also provides copying or generating new questions from the questions in the tool. If a new question will be created, five question options on the screen can be used. These are multiple choice, checkbox, fill-in-the-blank, pool, and open-ended.

Figure 9. Quiz Creation Step 3

When any option is selected, the question creation and preview section is displayed (See Figure 10.). In the question creation part, you can benefit from functions, images, sounds and videos. It can benefit from functions and images in the answer creation part. The tick to the left of the correct answers can be selected. At the bottom left of the question creation area, there is a

section where the duration of the question and related tags can be added. When all processes are completed, the question can be saved by clicking the save button.

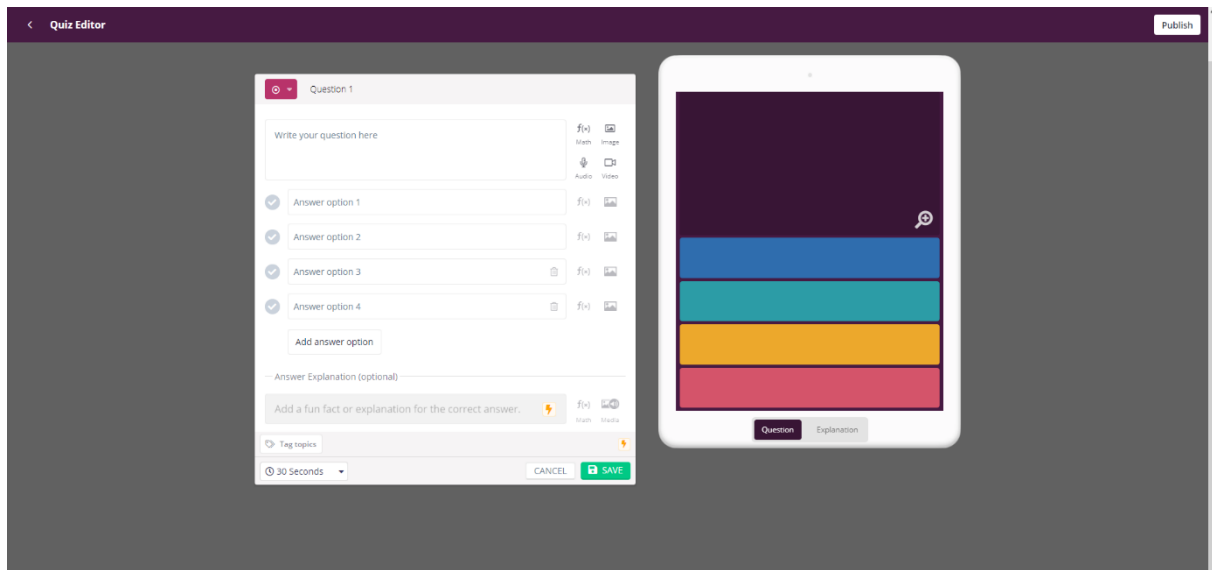


Figure 10. Question Creation

When the process of adding questions to the quiz is completed, the preparation of the quiz can be completed by clicking the publish button. Some information is required to complete the quiz. These are information about the quiz title image, quiz language, grade, and privacy (See Figure 11.).

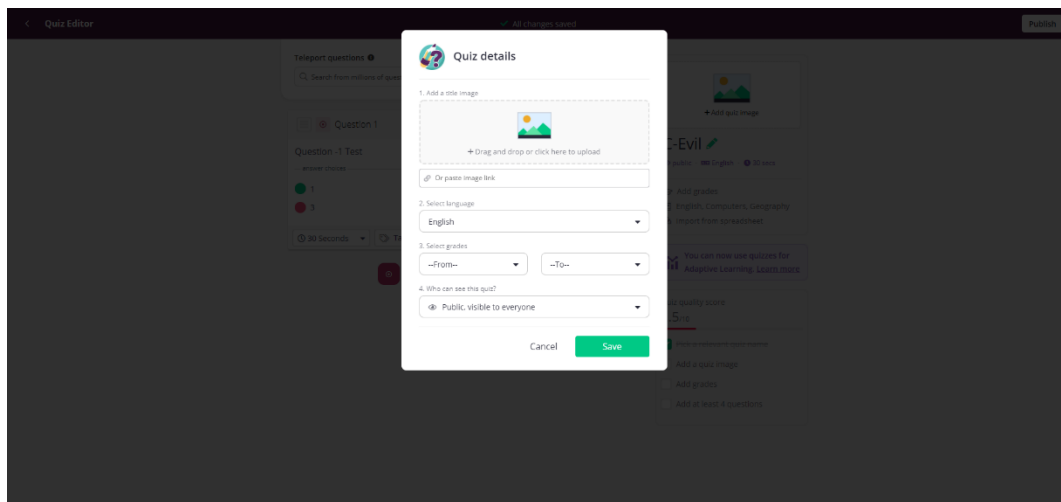


Figure 11. Publishing The Quiz

When the quiz preparation is completed, the quiz dashboard screen appears (See Figure 12.). From this section, you can start the quiz live and assign it as homework.

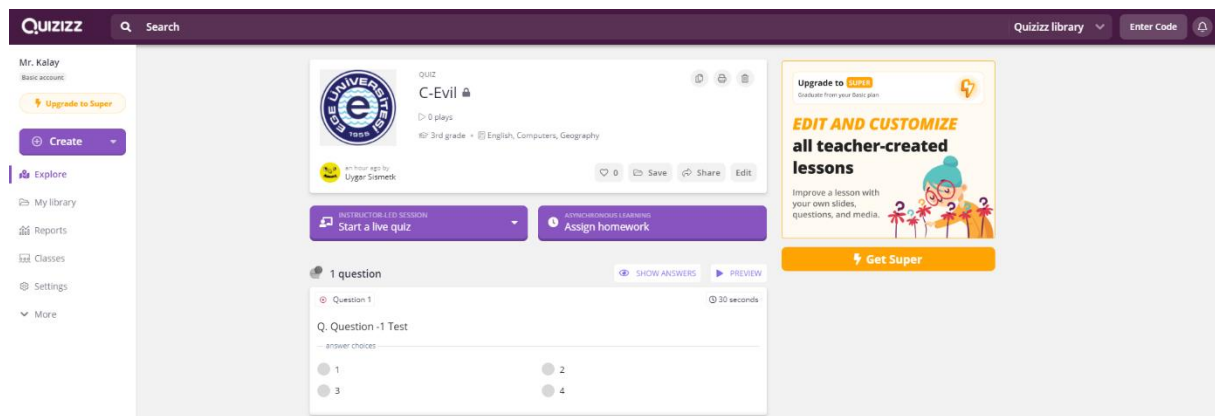


Figure 12. Quiz Dashboard

Two options are offered when the quiz live start button is pressed. These are Classic and Instructor-paced (See Figure 13.).

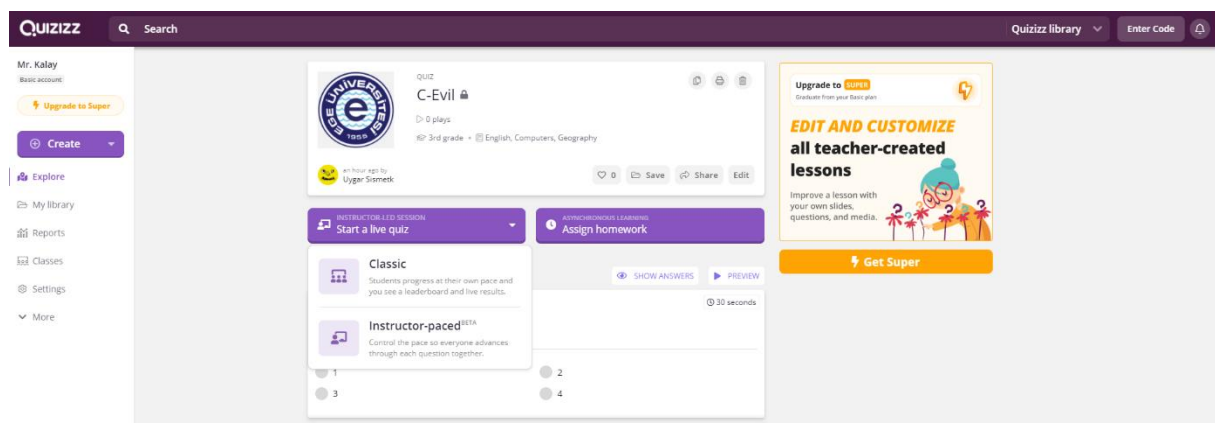


Figure 13. Starting a Live Quiz Step 1

When the Classic option is selected, options for the quiz application are presented (See Figure 14.). Progress can be made by selecting the appropriate options from these options and pressing the continue button.

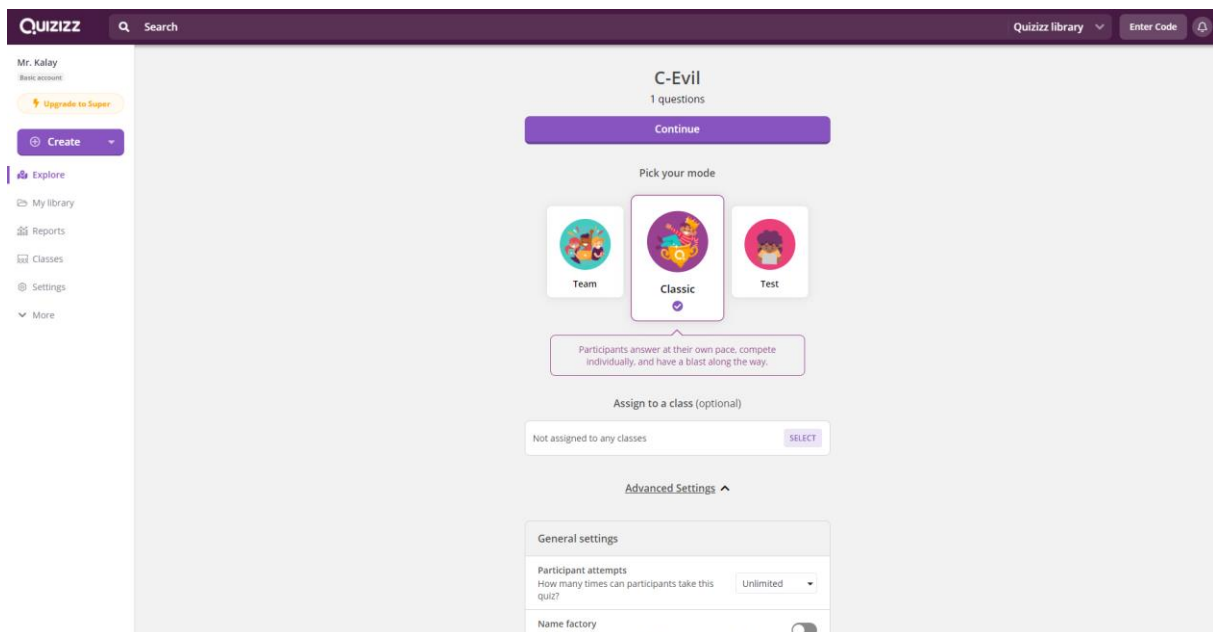


Figure 14. Starting a Live Quiz Step 2

When the continue button is pressed, the live quiz screen appears, with instructions for users to participate (See Figure 15.). After logging in to the address on the screen, users can connect by typing the join code. In addition, users can participate by sharing from the sharing options on the screen.

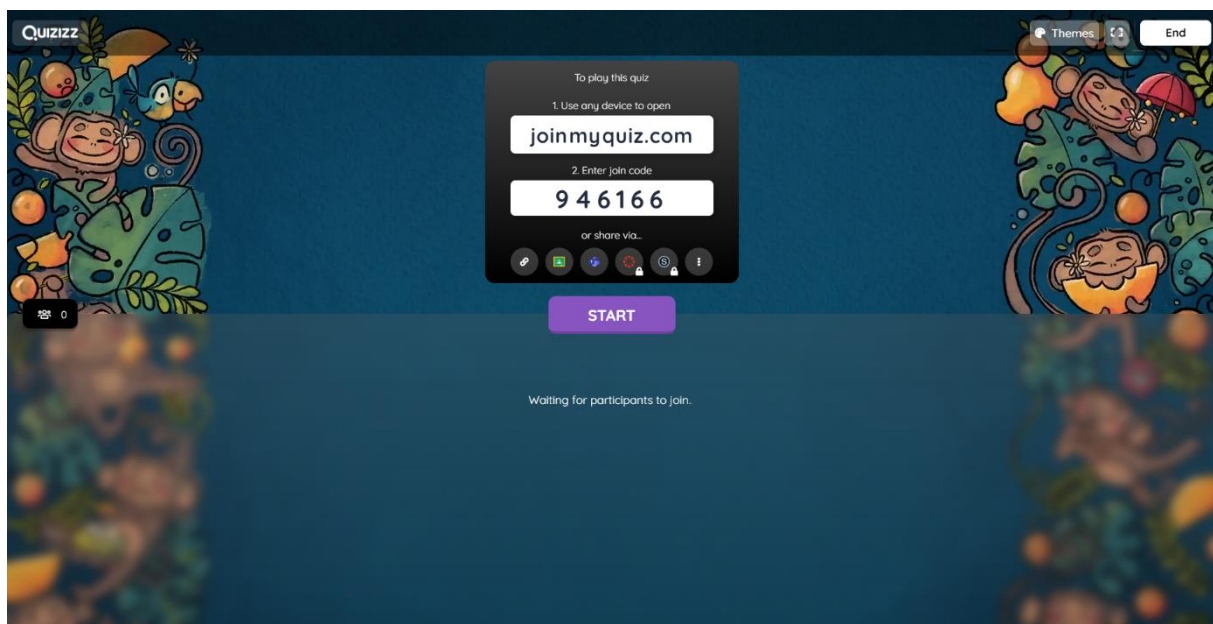


Figure 15. Live Quiz Screen

When users log in, their nicknames are instantly displayed on the screen (See Figure 16.). When all users are connected, the quiz application can be started by pressing the start button.

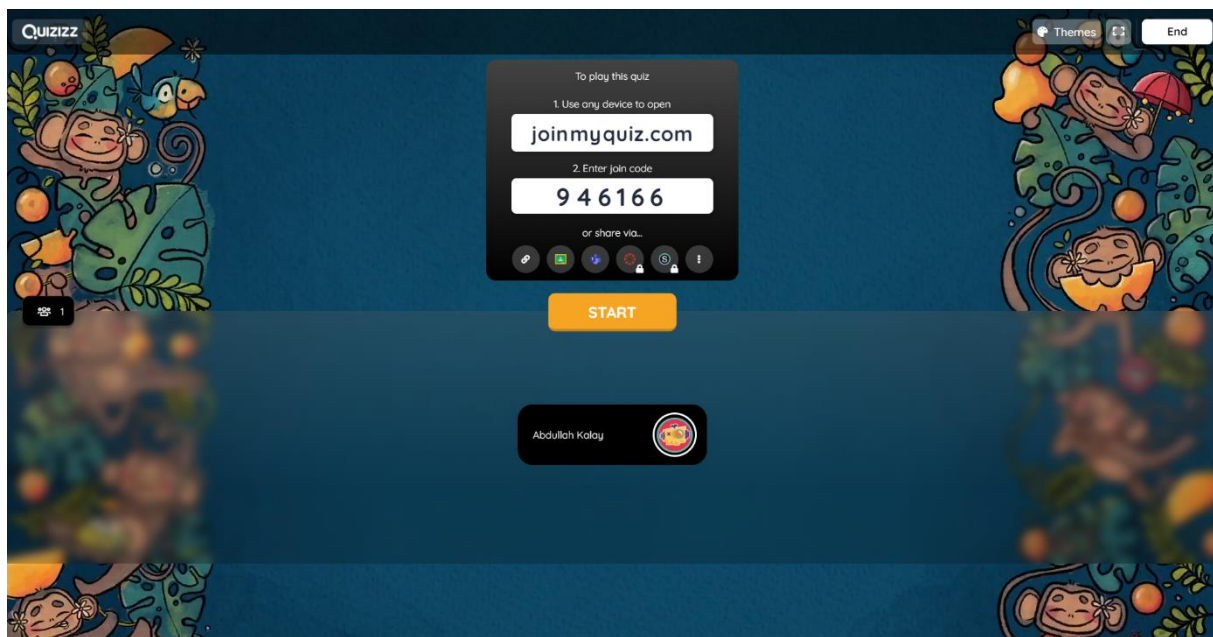


Figure 16. Live Quiz Screen 2

When the quiz starts, the progress of the users can be seen instantly. Information such as correct response rate and response status on the basis of questions can be tracked (Figure 17.).

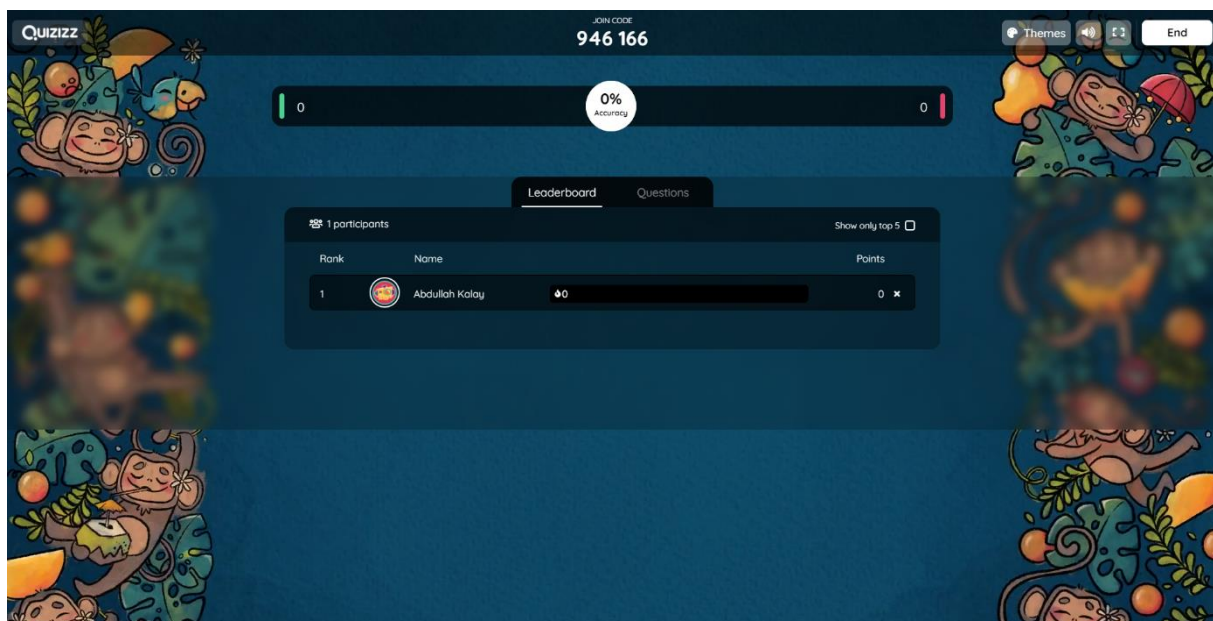


Figure 17. Live Quiz Leaderboard

During the quiz, the questions come to the users in full screen (See Figure 18.). Users can answer the question from the buttons on the screen.

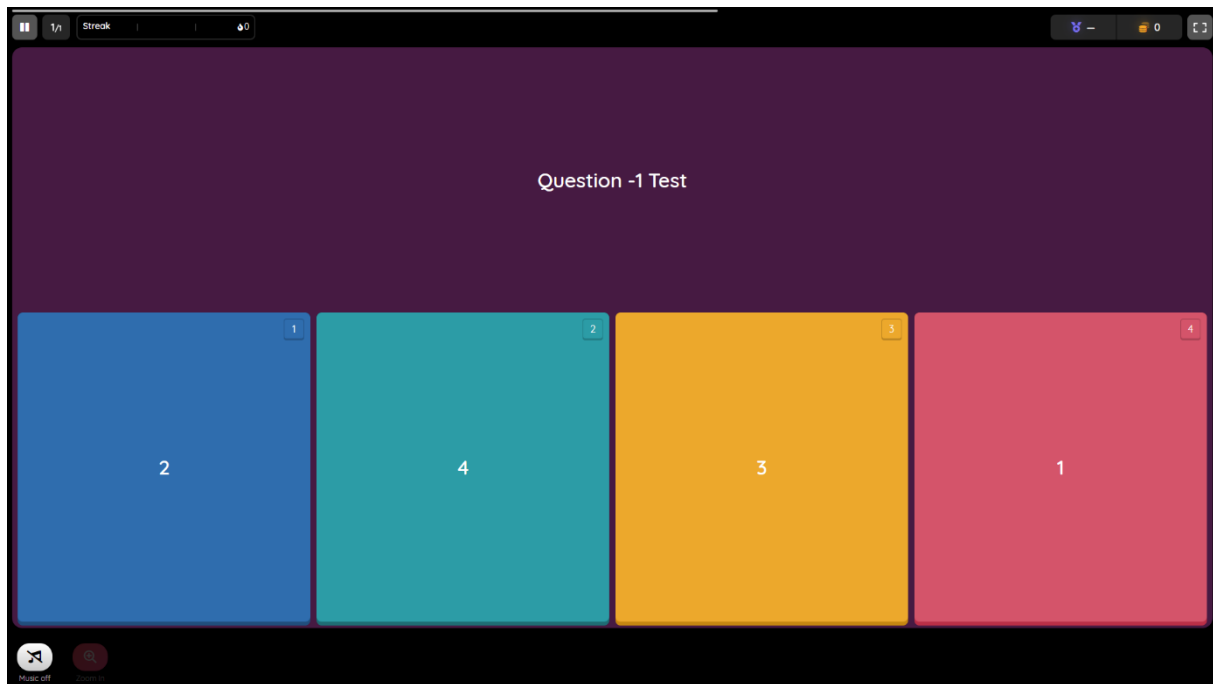


Figure 18. Quiz Screen

During the quiz, the progress of the users can be seen on the live quiz dashboard (See Figure 19.).

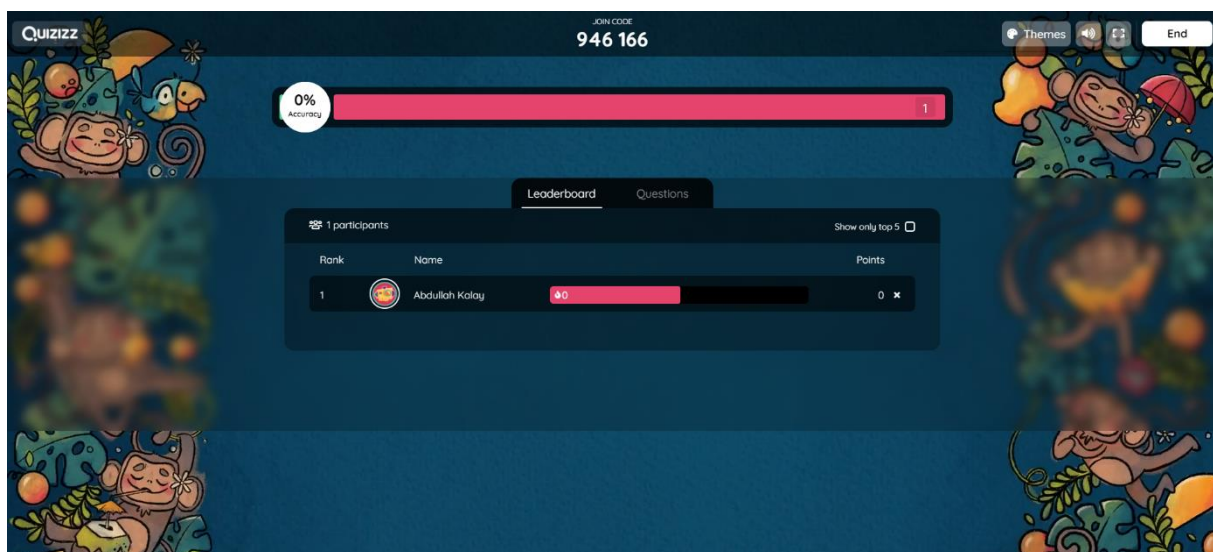


Figure 19. Live Quiz Dashboard

When the quiz is desired to be completed, the quiz can be completed by pressing the end button (See Figure 20.).

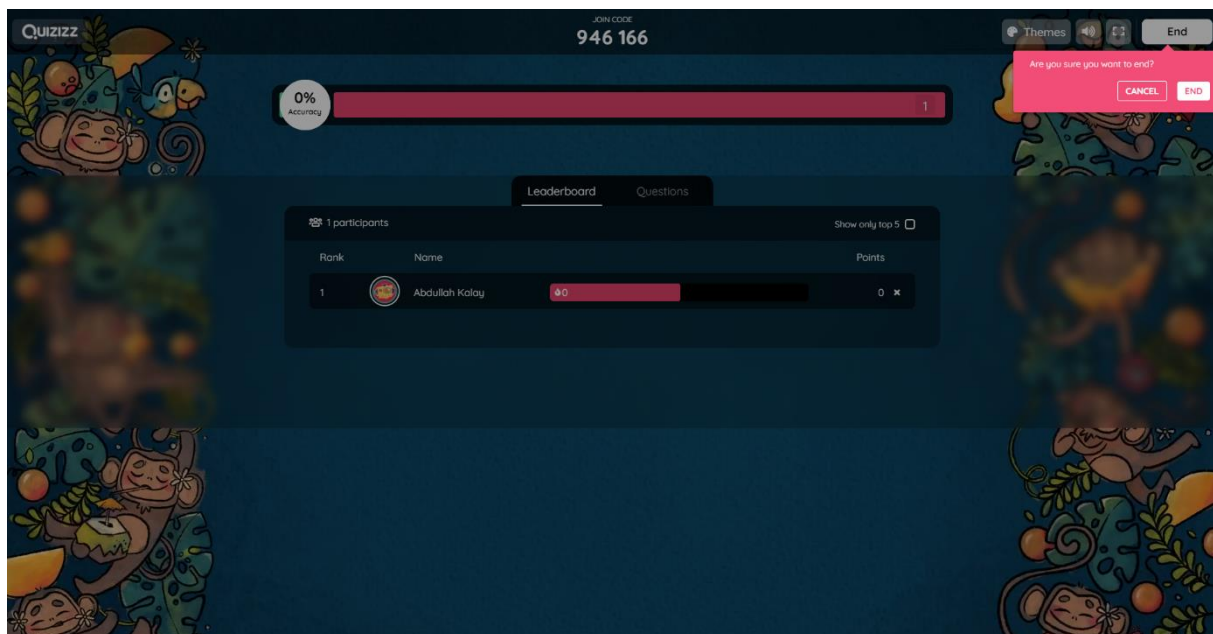


Figure 20. Ending The Quiz

When the quiz is completed, the end screen of the quiz appears. In this screen, downloading the quiz report, the status of the participants, and question-based answer situations are presented (See Figure 21.).

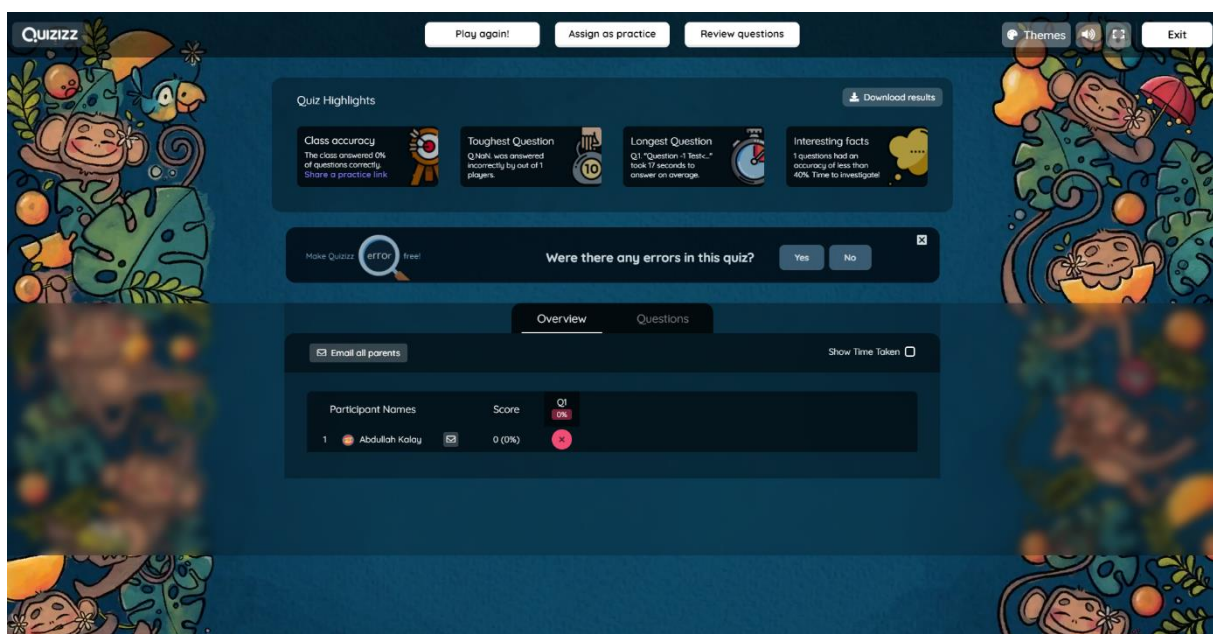


Figure 21. Quiz Result Screen

4.2. Miro

Miro is the online collaborative whiteboarding platform that enables distributed teams to work effectively together, from brainstorming with digital sticky notes to planning and managing agile workflows. Miro is a cloud-based collaboration tool. The solution features a digital whiteboard that can be used for research, ideation, building customer journeys and user story maps, wireframing and a range of other collaborative activities. Today Miro is running as a

freemium model: there is a free and paid version of the product. Educational institutes get a discount and can use a paid version for free.

At the Cevil training the Miro tool was for the round table discussions and facilitated the interaction between participants and generation of feedback.

For more information, please check out our video:

<https://c-evil.eu/post/how-to-engage-vet-students-in-online-courses-about-ev-charging-with-miro-4>

It shows a short tutorial on how to use this digital tool in online lessons and brainstorming sessions between students.

Annex I – Before and after questionnaire

1. What electric vehicle brands do you know? (List at least 3 of them!)
2. What are the three basic types of Electric Vehicles? (acronym + full name)
3. What does the following battery related acronym (abbreviation) stand for: C (Ah)?
4. What does the following battery related acronym (abbreviation) stand for: SOC?
5. Please select the correct statements. (more than one correct answer can be chosen)
 - ☐ Domestic sockets are not designed to energize the high power devices.
 - ☐ Domestic sockets can handle high power and provide maximum safety.
 - ☐ Household socket does not permit controlling or scheduling the charging power.
 - ☐ CHAdeMO plug was developed for AC charging.
6. What does the following battery related acronym (abbreviation) stand for: BMS?
7. A portable EVSE equipment is part of the charging cable in case of Mode 2 charging. What is it and what functions does it have?
8. The maximum current value that a conductor can safely carry (ampacity) depends on many factors. Write at least 4 of them! (e.g. cross-section area)
9. The maximum current value that a conductor can safely carry (ampacity) depends on many factors. Write at least 4 of them! (e.g. cross-section area)
10. What do the letters in „TN-S“ stand for in electricity?
11. Which of the following statements are correct for a lithium battery? (more than one correct answer can be chosen)
 - ☐ cheap cost to produce
 - ☐ high specific energy
 - ☐ long lifetime

- ☐ low efficiency
- ☐ short cycle life

12. TRUE OR FALSE? AC charging is faster than DC charging.

- ☐ True
- ☐ False

13. Open Charge Point Protocol (OCPP) is a protocol for managing the communication between EV charging stations and a central management system. Write 2 advantages of OCPP. *