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MANUAL FOR TEACHERS FOR USING THE AR EDUCATIONAL SOFTWARE IN STEM ORIENTED SCHOOL SUBJECTS



AUGMENTED REALITY EDUCATION MODULE - DEVELOPMENT AND IMPLEMENTATION
OF INNOVATIVE ICT - BASED EDUCATIONAL TOOL IN STEM ORIENTATED SCHOOL SUBJECTS

AR EDU



techko.net



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CSEG



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AR-EDU Cloud based application

Introduction

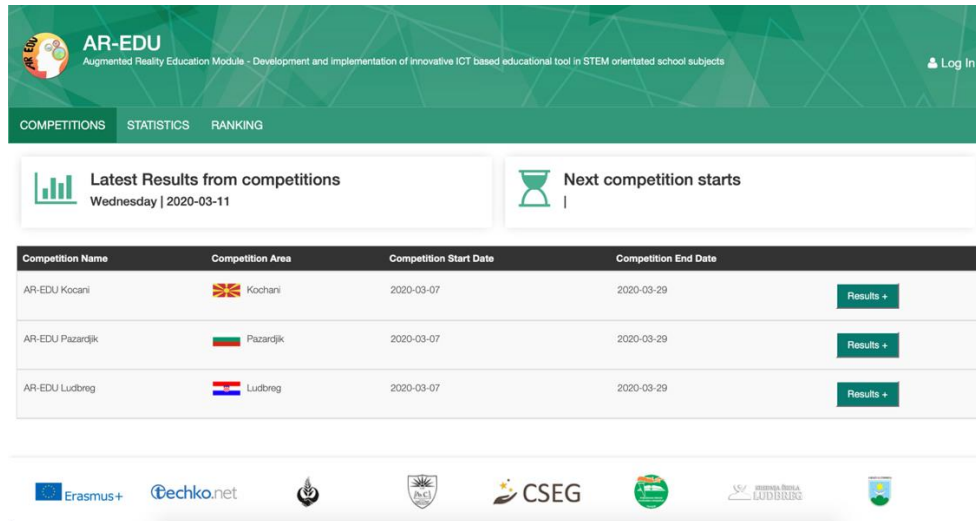
hive.mk and AR-EDU application

hive.mk is a cloud based system application developed for the purpose of the AR-EDU project. The hive.mk system consists of the administrative backend, web platform for monitoring of the results and statistics, Q&A database (400 STEM related questions and 1600 possible answers) and Database, for keeping the needed data.

The home page of hive.mk (picture 1) actually is a publicly open web platform on which the results from competitions are shown.

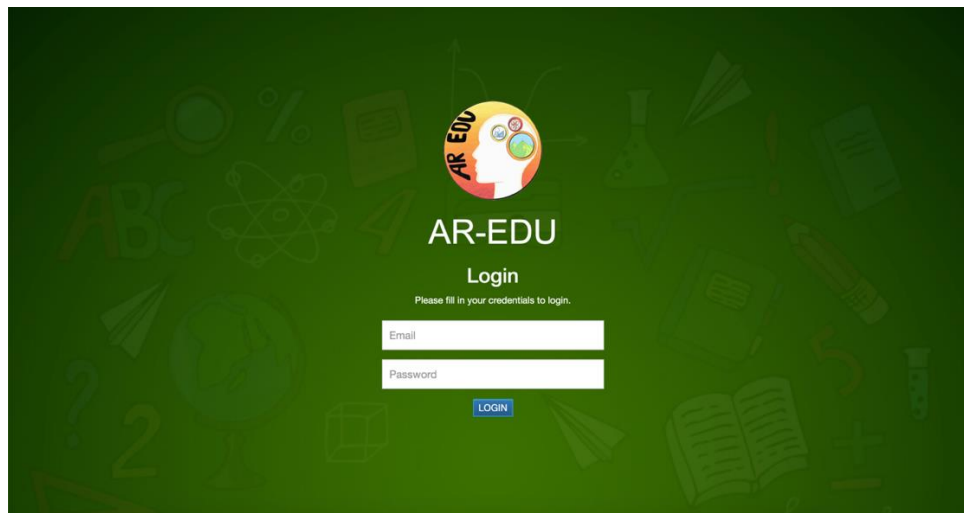
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On this public web platform statistics are available for any visitor on the system. They are organized by competition results per competition and participants, Statistics by subject and Ranking by team.



Picture 1

A Login button is initially displayed on a top right side of the system which redirects visitor to a login page (picture 2), from where by entering a valid username and password any member already registered can access the administrative dashboard.



Picture 2

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Dashboard

Once you are logged in on the left side you will notice a menu from which you can access different parts of the admin system (picture 3):

- Dashboard – The home page of the admin panel.
- Questions – for entering/translating the questions/answers
- Teams – for managing the teams.
- Team Members – for managing the team members.
- Locations – for managing the competition locations.
- Competitions – for managing the Competitions.
- User Profiles – for managing all user profiles.
- My Profile – for managing your own profile.
- Downloads – access to useful downloadable information

** some of the menus depend on the user level and may not be present on your account*

The first one Dashboard is automatically opened. In the top right corner there is a user profile photo and by clicking on it, it will show the user menu (picture 3 – arrow 1). The first line in this menu is showing the e-mail by which the user is logged in. By clicking on the Logout button (picture 3 – arrow 1) user can log out from the system.

WELCOME
Martin Serafimov
TO AR-EDU!

You are now logged in to our AR-EDU service.
If you want to edit or modify your account information,
please follow this link.

Questions in the system:	399
Translations of the questions:	
Macedonian:	384
Bulgarian:	377
Croatian:	399

User Profiles:	25
Super Admin:	3
Admin:	9
Professors:	13

Team Info	
Teams:	2
Team Members:	5

Locations No:	5
in Macedonia:	5
in Croatia:	0
in Bulgaria:	0

Competitions No:	3
in Macedonia:	3
in Croatia:	0
in Bulgaria:	0

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Picture 3

The dashboard (picture 3) displays a welcome message with the information of the logged in user and a few tables with statistics like how many questions, translations, user profiles, teams, locations and competitions are in the system database.

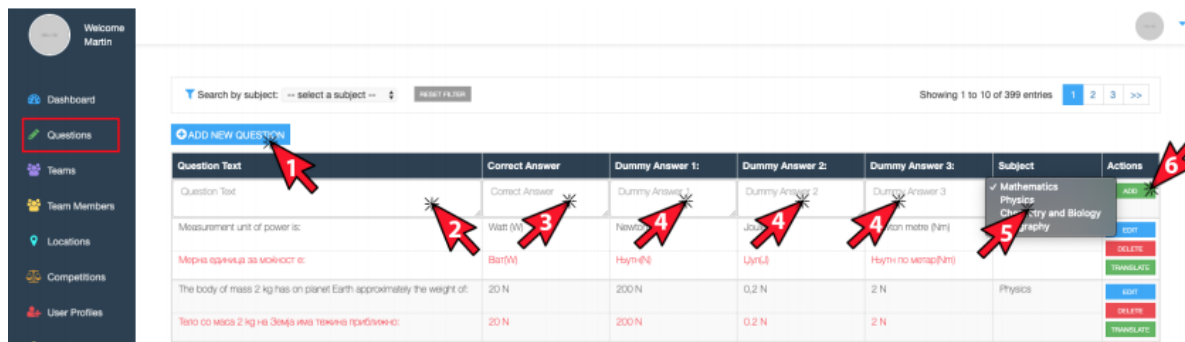
- Questions table shows how many questions are in the system and how many of them have been translated into the appropriate languages.
- User Profiles table shows how many users are registered in the system and they are sorted by access type (super admin, admin and professor).
- Team information table shows how many teams and members are in the system.
- Locations table shows how many competition locations in to the system organized by country.
- Competition table shows how many competitions are in the system organized by country.

Questions

Questions tab (picture 4) is the place where you can work with the questions/answers and the translation of them.

Adding a new question

1. Click on the "ADD NEW QUESTION" button (1) which will add a new column at the top of the questions table.
2. Type the question in English language into the first column (2)
3. Fill the correct Answer in the second column (3)
4. Then you need to fill the next 3 columns (4) with three incorrect answers.
5. In the 6th column there is a "Subject box" dropdown (5), select the subject in which the question belongs.
6. To save the question into the system click the "ADD" button (6).

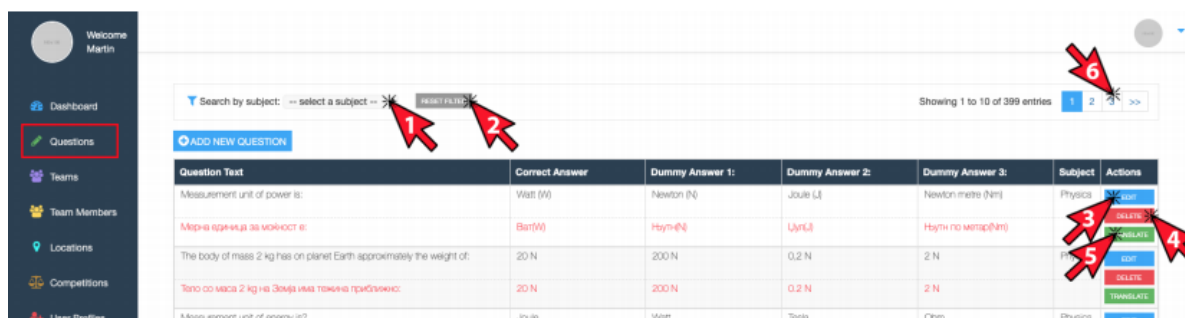


picture 4

Already entered questions are shown in a table with the translation under each one of them if there is one.

Navigating and Filtering the questions

In order to browse more question there is a pagination in the right top corner (picture 5 – arrow 6)



picture 5

There is also a filter in order to make easier to find the questions by subject. Clicking on the dropdown "Search by Subject" (picture 5 – arrow 1) you can choose the wanted subject and filter them by it. In order to show all questions again just click on "RESET FILTER" (picture 5 – arrow 2).

Editing the questions

On this page admins and professors can edit previously entered questions by clicking the "EDIT" button (picture 5 – arrow 3) which will give the ability to type into the table row where the question is (picture 5/1):

The screenshot shows a user interface for managing questions. On the left is a dark sidebar with navigation options: Dashboard, Questions, Teams, Team Members, Locations, Competitions, User Profiles, My Profile, Downloads, and Collapse Menu. The main area has a search bar and a table of questions. The table has columns for Question Text, Correct Answer, Dummy Answer 1, Dummy Answer 2, and Dummy Answer 3. Each row has 'EDIT' and 'DELETE' buttons. The first row is highlighted, showing a question about the measurement unit of power.

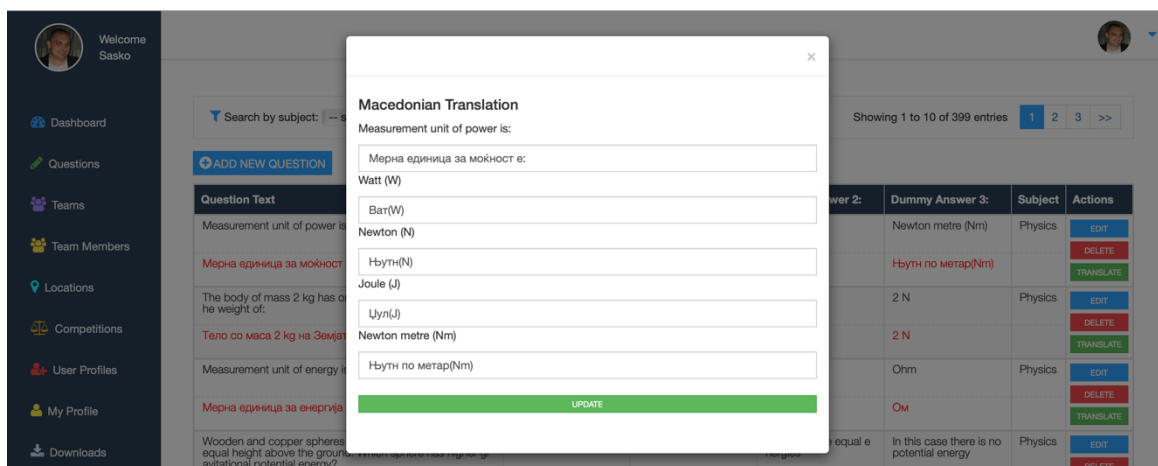
Question Text	Correct Answer	Dummy Answer 1	Dummy Answer 2	Dummy Answer 3	
Measurement unit of power is:	Watt (W)	Newton (N)	Joule (J)	Newton metre (Nm)	UPDATE CANCEL
The body of mass 2 kg has on planet Earth approximately the weight of:	20 N	200 N	0,2 N	2 N	EDIT DELETE
Measurement unit of energy is?	Joule	Watt	Tesla	Ohm	EDIT DELETE
Wooden and copper spheres of equal circumference are at equal height above the ground. Which sphere has higher gravitational potential energy?	Copper sphere	Wooden sphere	Spheres have equal energies	In this case there is no potential energy	EDIT DELETE
An object is raised 4 meters above the floor. If raised to a height of 8 m above the floor, the gravitational potential energy of the object increases:	2 times	4 times	8 times	3 times	EDIT DELETE
Which type of energy is not renewable:	Fossil fuel energy	Solar energy	Water energy	Biomass energy	EDIT DELETE
A boy, weighing 35 kg, is rollerskating. His father, weighing 80 kg, is running alongside him at same speed. Who has a higher kinetic energy?	The father	The boy	They have equal kinetic energies	The father and the boy have potential energy	EDIT DELETE

picture 5/1

once finished with the edits of the question at the end of the same row there are two new buttons, the "UPDATE" button needs to be clicked in order to save the edits or the "CANCEL" button to cancel the edits (picture 5/1).

Translation of the Questions

Already entered question can be translated from this screen by clicking the "TRANSLATE" button (picture 5 – arrow 4) which will show a popup screen (picture 5/2) and the admin/professor can enter the translation just for the language that he is registered for, the fields are self explanatory.



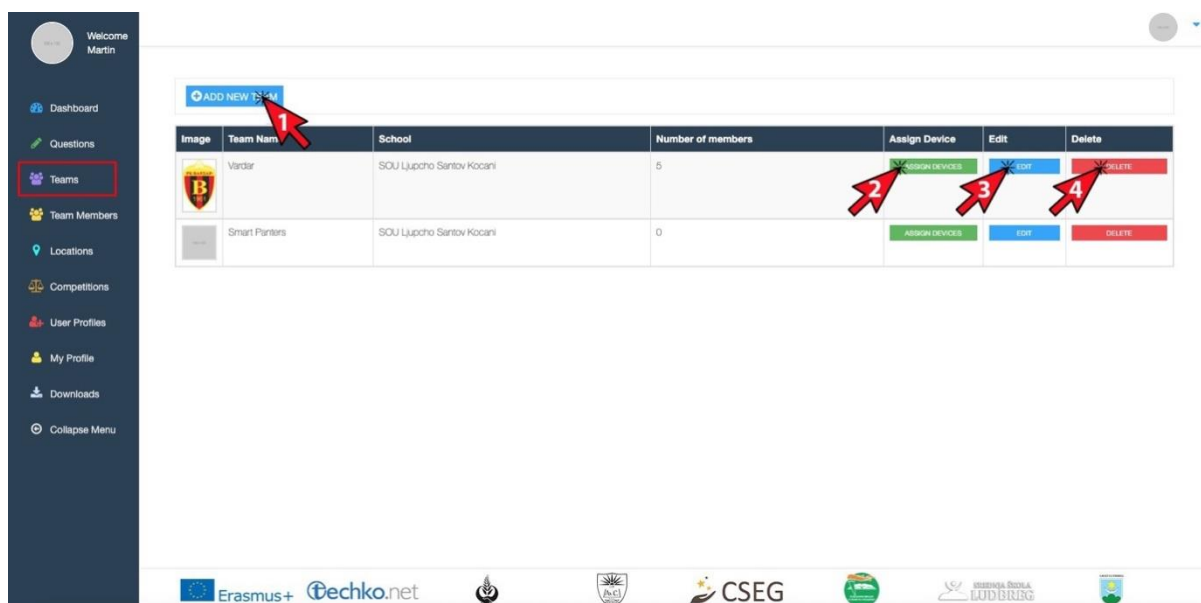
picture 5/2

Deleting a Question

To delete a question, the "DELETE" button (picture 5 – arrow 5) needs to be clicked, deleting a question deletes his translations as well. Please be careful with delete option there is no way to restore deleted question.

Teams

Teams tab (picture 6) is the place where you can work with the teams, with the ability to add, edit or delete a team. This is also the place where the device which will be used for the field AR exploration is assigned to the team.

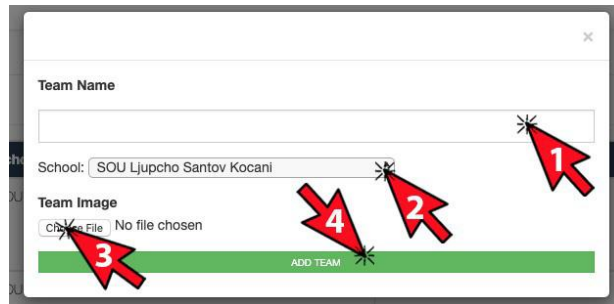


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picture 6

Create a new team

Click on the "ADD NEW TEAM" button (picture 6 – arrow 1) and a new popup will show (picture 6/1)



picture 6/1

on the new screen all information is required and needs to be filled.

1. The team name (picture 6/1 – arrow 1) needs to be unique name by which the team will be known.
2. The School dropdown (picture 6/1 – arrow 2) determines from where the team is and in which competitions they will be.
3. Attach a photo that will be unique to each team in the Team Picturefield (picture 6/1 – arrow 3)
4. Click ADD TEAM (picture 6/1 – arrow 4) to save the team.

Edit a team

Click on the "EDIT" button (picture 6 – arrow 3) and a new popup will show (picture 6/1) the fields are already prefilled after the changes are done the "UPDATE" button needs to be clicked.

Delete a team

Click on the "DELETE" button (picture 6 – arrow 4) and the team will be deleted. Please be careful with delete option there is no way to restore deleted team, you will need to recreate it.

Assign a device

Pressing the "ASSIGN DEVICE" button (picture 6 – arrow 2) will show new popup containing a QR code (picture 6/2),



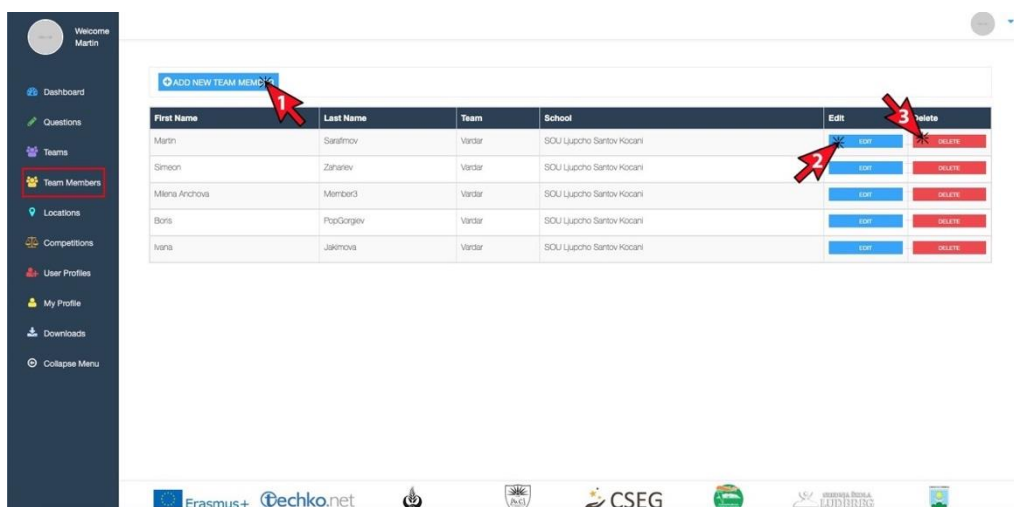
picture 6/2

once you see the popup you need to point the camera from the phone that will be used from the team on the competition, with the AR-EDU running on it. More about this in the AR-EDU application section below.

Team Members

Team Members tab (picture 7) is the place where you can work with the team members, with the ability to add, edit or delete a team member.

Already entered team members are shown in a table with the corresponding columns like First Name, Last Name, Team, School and a column with edit button and delete button to interact with the existing team members.

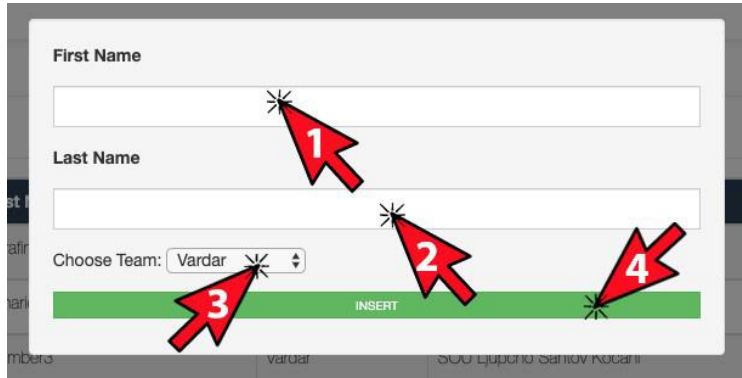


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picture 7

Add a Team Member

In order to create a new team member, press the "ADD NEW TEAM MEMBER" button (picture 7 - arrow 1) and a new popup will show (picture 7/1)



picture 7/1

all fields are required, so please fill them with the corresponding data:

1. First Name
2. Last Name
3. Choose the team they belong to
4. and click the "Insert" button to save the team member.

Edit a Team Member

To edit an already existing team member simple press the "EDIT" button (picture 7 – arrow 2) and an edit popup will show (picture 7/1), all fields are required, so please fill them with the corresponding data and click the "Update" button.

Delete a Team Member

Click on the "DELETE" button (picture 7 – arrow 3) and the team member will be deleted. Please be careful with delete option there is no way to restore deleted team member, you will need to recreate it.

Locations

Locations tab (picture 8) is the place where you work with the competition question locations on which students can find the hidden question, with the ability to add or delete a location.

There is a map that shows the area where you are registered in. On the map are shown already added locations which also are shown in the table below the map.

Location Name:	Latitude:	Longitude:	City	Remove
parking	41.9126129	22.4032749	Kochani	Remove
phugi	41.9129539	22.4036552	Kochani	Remove
moneni	41.9130551	22.4032980	Kochani	Remove
postnack	41.9121971	22.4072704	Kochani	Remove
bazicki	41.9127350	22.4077959	Kochani	Remove

picture 8

Adding a new Location

The map is used to add a new location:

1. Move the blue "Select new Location" marker (picture 8 – arrow with*) to the location you want to be the new location for the question quest. Use + and – signs on the map in order to find the best location, keep in mind zoom as much as possible in order to put the pin more precisely. You will notice that as you move the pin the fields "Latitude" and "Longitude" above the map are automatically populated.

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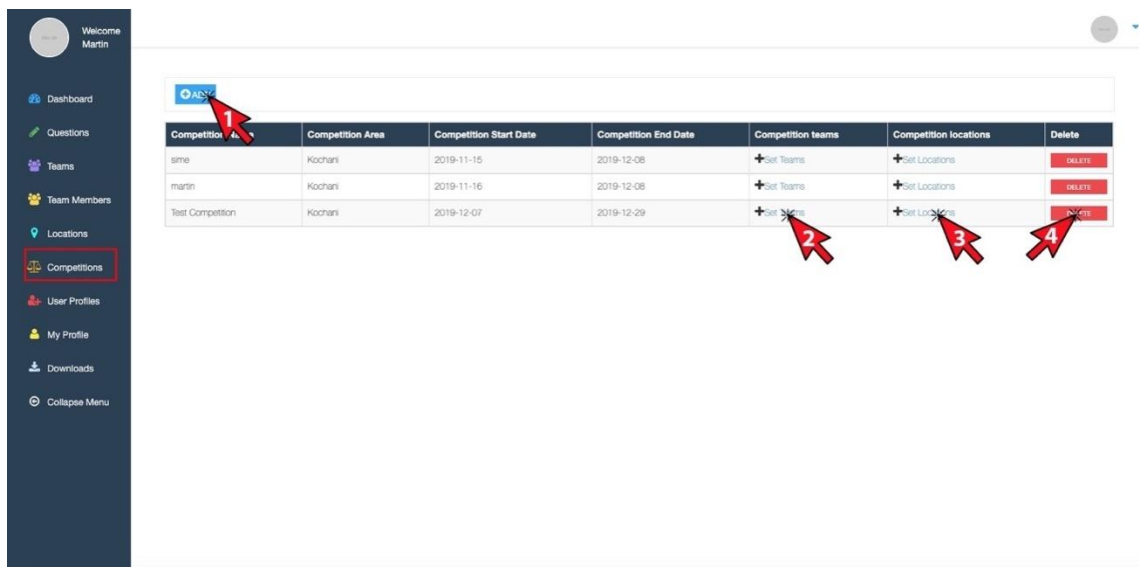
2. Once you are satisfied with the location of the blue pin, you need to choose from the "City" field (picture 8 – arrow 1) the city where the location belongs to.
3. Then in the "Location Name" field (picture 8 – arrow 2) type the desired name of that location by which you can later identify the location.
4. In order to save the location, click the "ADD LOCATION" button (picture 8 - arrow 3) and the location will be then shown in the table below and on the map with a red pin.

Deleting a Location

If you want to delete a location find in the table below the map and click the "DELETE" button (picture 8 – arrow 4). Please be careful with delete option there is no way to restore deleted location, you will need to recreate it.

Competitions

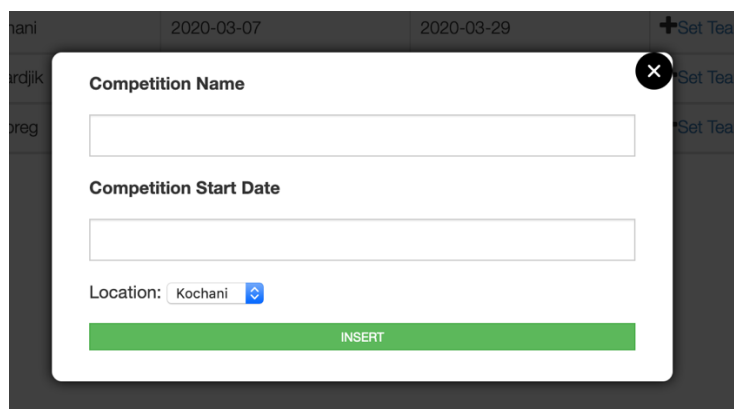
Competitions tab (picture 9) is the place where you work with the competitions, with the ability to add/delete a competition and also to assign teams and locations to a specific competition. Already entered competitions are shown in a table with the corresponding columns like Competition Name, Competition Area, Competition Start Date, Competition End Date, Competition Teams button, Competition Locations buttons and a column with delete button to interact with the existing competitions.



picture 9

Creating a new Competition

In order to create a new competition, press the "ADD" button (picture 9 - arrow 1) and a new popup will show (picture 9/1)



picture 9/1

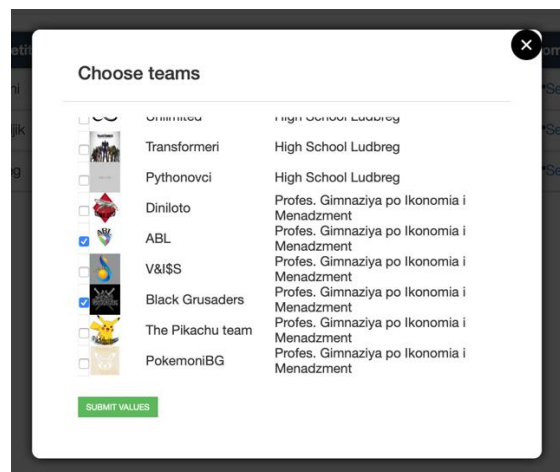
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all fields are required, so please fill them with the corresponding data:

1. Competition Name – choose a unique name by which the competition will be identified
2. Competition Start Date – choose the date from the dropdown when the competition will start and the system will calculate the end date and times by itself making the competitions available on weekends dedicating a weekend for every subject.
3. Choose the location where the competition will be held.
4. and click the “Insert” button to save the competition.

Assign teams to the competition

In order for teams to participate in a Competition they need to be assigned to one. To assign a team to a competition you need to press the “Set Teams” button (picture 9 - arrow 2) in the competition row which you want to interact, once you click the “Set Teams” button (picture 9 - arrow 2) a new popup will show (picture 9/2):



picture 9/2

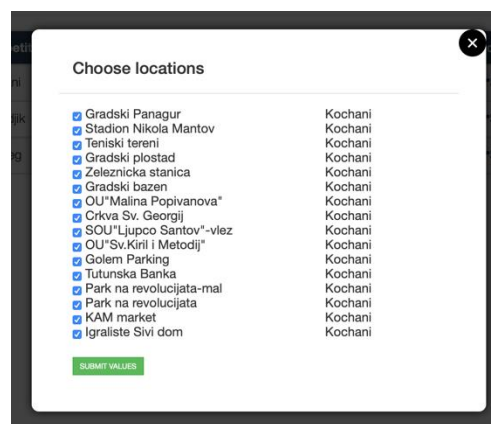
In the popup (picture 9/2) you will see list of all available teams with their logo, name and school they come from. There is a checkmark in front of the team logo and if it's checked the team will be part of this competition, if it's unchecked it will

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not be part of the competition. Once you finish checking the desired teams just press "SUBMIT VALLUES" button (picture 9/2)

Assign question locations to the competition

When we have a competition ready we need to assign question locations to that competition. To assign a question location to a competition you need to press the "Set Locations" button (picture 9 - arrow 3) in the competition row which you want to interact, once you click the "Set Locations" button (picture 9 - arrow 3) a new popup will show (picture 9/3):



picture 9/3

In the popup (picture 9/3) you will see list of all available Question Locations with their name and area they come from. There is a checkmark in front of the Question Location and if its checked that question location will be part of this competition, if its unchecked it will not be part of the competition. Once you finish checking the desired Question Locations just press "SUBMIT VALLUES" button (picture 9/3)

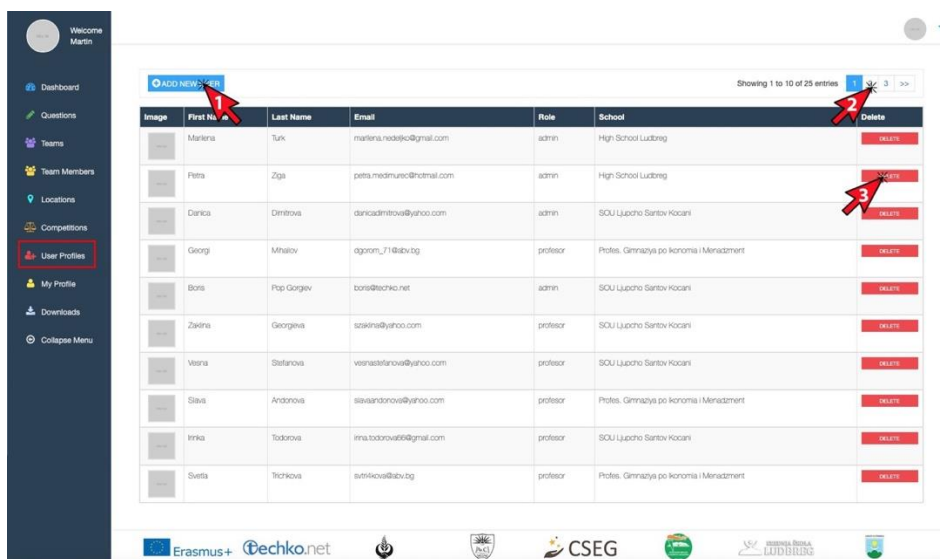
Deleting a Competition

If you want to delete a competition click the "DELETE" button (picture 9 – arrow 4) in the corresponding competition row. Please be careful with delete option there is no way to restore deleted competition, you will need to recreate it. Also you need to keep in mind if a competition has started its not possible to delete it.

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User Profiles

User Profiles tab (picture 10) is the place where you work with the user profiles, with the ability to add/delete a user. This tab is only visible to users with admin privilege. Already entered User Profiles are shown in a table with the corresponding columns like Picture, First Name, Last Name, Email, Rolle, Scholl and a column with delete button to interact with the existing user profile.



picture 10

Navigating the User Profiles

In order to see more user profiles there is a pagination in the right/top corner (picture 10 – arrow 2)

Add a User Profile

In order to create a new user profile, press the "ADD NEW USER" button (picture 10 - arrow 1) and a new popup will show (picture 10/1):

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The screenshot shows a form titled "Enter Name" with a close button (X) in the top right corner. The form contains the following fields and elements:

- 1. "Enter Name" text box with a red arrow pointing to the asterisk on the right.
- 2. "Enter Surname" text box with a red arrow pointing to the asterisk on the right.
- 3. "Enter Mail" text box with a red arrow pointing to the asterisk on the right.
- 4. "Enter Password" text box with a red arrow pointing to the asterisk on the right.
- 5. "Role:" dropdown menu showing "admin" with a red arrow pointing to the dropdown arrow.
- 6. "School:" dropdown menu showing "Ljupcho Santov Kocani" with a red arrow pointing to the dropdown arrow.
- 7. A green "INSERT" button with a red arrow pointing to it.

picture 10/1

all fields are required (picture 10/1), so please fill them with the corresponding data:

1. First Name - (picture 10/1 – arrow 1),
2. Last Name - (picture 10/1 – arrow 2),
3. User email* - (picture 10/1 – arrow 3),
4. User password** - (picture 10/1 – arrow 4),
5. Choose the privilege role they belong to - (picture 10/1 – arrow 5),
6. Choose the school they belong to - (picture 10/1 – arrow 6),
7. and click the "INSERT" button to save the user profile. - (picture 10/1 – arrow 7),

*the email and password are the identification by which the user will be recognized into the system.

**Users can later change their password.

Delete a User Profile

Click on the "DELETE" button (picture 10 – arrow 3) and the user profile will be deleted. Please be careful with delete option there is no way to restore deleted user profile, you will need to recreate it.

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My Profile

My Profile tab (picture 11) is the place where you work with your own user profile, with the ability to edit the data about your profile.

The screenshot shows a user interface for updating a profile. On the left is a dark sidebar with navigation options: Dashboard, Questions, Teams, Team Members, Locations, Competitions, User Profiles, My Profile (highlighted), Downloads, and Collapse Menu. The main content area is titled 'ABOUT' and displays user information: First Name: Martin, Last Name: Serafimov, Email: martin@techko.net, and Your School: Ljupcho Santov. Below this is a form to 'Update your profile' with two tabs: 'Password' and 'Personal'. The 'Personal' tab is active, showing four input fields: 'Name' (containing 'Martin'), 'Last Name' (containing 'Serafimov'), 'Email' (containing 'martin@techko.net'), and 'School' (a dropdown menu with 'SOU Ljupcho Santov Kocani' selected). A blue 'UPDATE' button is at the bottom right of the form. Red arrows numbered 1 through 6 point to the input fields and the button. Arrow 1 points to the Name field, arrow 2 to the Last Name field, arrow 3 to the Email field, arrow 4 to the School dropdown, and arrow 5 to the UPDATE button. Arrow 6 points to the Password tab.

picture 11

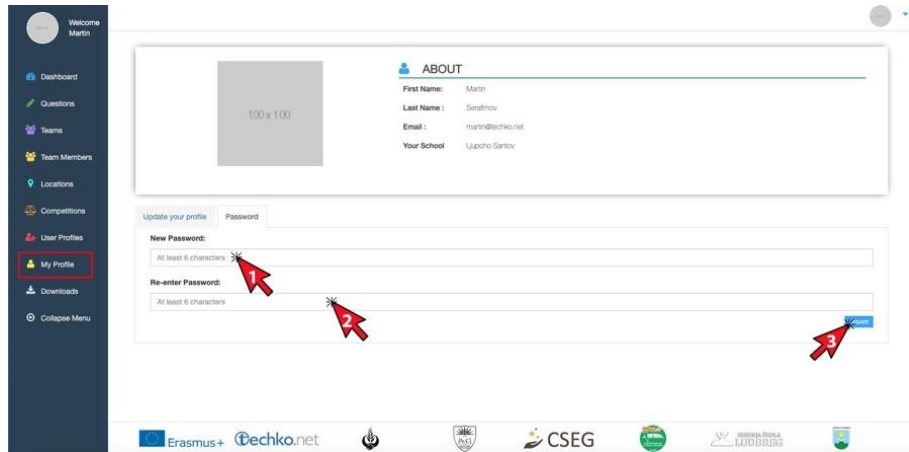
Update Your Profile

Displays information about your profile and with simple edit of the fields you can edit your information.

1. Update your first name by changing the first line (picture 11 - arrow 1)
2. Update your last name by changing the second line (picture 11 - arrow 2)
3. Update your email by changing the third line (picture 11 - arrow 3)
4. Update your school by changing the fourth line (picture 11 - arrow 4)
5. To save the changes click "UPDATE" button (picture 11 - arrow 5).

Change your Profile Password

In order to change your profile password click on the "Password" tab (picture 11 - arrow 6) and a new form will be shown (picture 11/1):



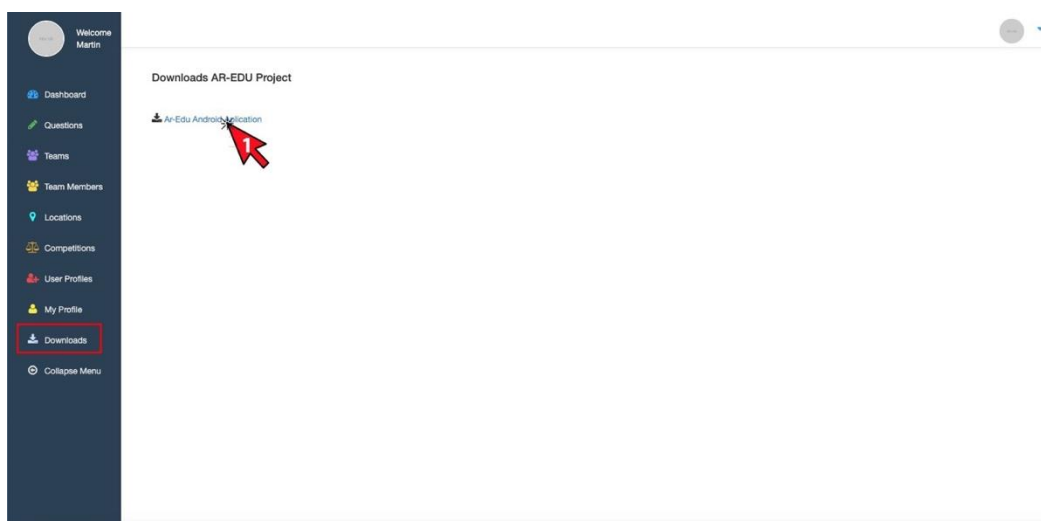
picture 11/1

In order to change the password once you are at the password screen (picture 11/1) you need to :

1. Type the new password in the first field (picture 11/1 – arrow 1),
2. Retype the new Password one more time in the second field (picture 11/1 – arrow 2)
3. Click the update button (picture 11/1 – arrow 3).

Downloads

In the Downloads tab (picture 12) you will find all the useful downloadable information and files, like for example there is a link to the AR-EDU application (picture 12 – arrow 1) that you need to download to the team smartphone in order to be able to participate in the.



picture 12

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AR-EDU Mobile Application

Introduction

AR-EDU is a mobile application for educational purposes and represents knowledge quiz that lets you test knowledge in STEM subjects in a fun and active way by following a map with hidden questions based on your location and hunting the question through your phone camera using 3D Augmented Reality on your phone screen, integrated in real time in their actual size and environment.

AR-EDU mobile application is an Android application developed for the purpose of the AR-EDU project. The application needs to be installed on the team android smartphone and then assigned to a team by scanning a QR code from the hive.mk backend.

Quiz Rules

When you run the application you need to scan a QR code to join the appropriate team and become part of the competition. The QR code is available by clicking the "ASSIGN DEVICES" button in the teams tab on the hive.mk administrative backend. Each team has a different code that is generated when the team is created and by that code is recognized into the system.

After you have successfully scanned the code, a location map with the first question location will be shown. The team needs to arrive at the specified location and once enters the perimeter of the question location the phone camera will turn on automatically and the team needs to use the phone as a

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viewfinder to find the hidden 3D Augmented Reality object presented by the logo of the AR-EDU. Once the 3D Augmented Reality object is found through the phone the participant needs to touch the 3D Augmented Reality object (the AR-EDU logo) on the phone screen and that will trigger the first question.

Each question is shown for 30 seconds giving time for the participants to read the question, and then the possible answers appear with a 30 seconds timer to answer the question.

Question points:

- If the question is answered correctly in the first 10 seconds the team gets 30 points,
- if the question is answered correctly in between 10 to 20 seconds the team gets 20 points,
- if the question is answered correctly in between 20 to 30 seconds the team gets 10 points.

If the team answers the question incorrectly, a bonus question will be shown to them for new 30 seconds and then the possible answers will show for another 30 seconds the only difference is that this time the points are cut in half, meaning:

- if the bonus question is answered in the first 10 seconds the team will get 15 points,
- if the bonus question is answered in between 10 to 20 seconds the team will get 10 points,
- if the bonus question is answered in between 20 to 30 seconds the team will get 5 points.

If the team also answers wrong the bonus question it will get 0 points and a new question location will be shown on the map.

After answering correctly the first or the second question, the team will get a new question location on the map and they need to pursue it to that location.

The maximum number of points from all questions in all matches is 600 points.




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AR-EDU mobile application installation

To start usage of the AR-EDU application you need to:

Allow App Installations from Unknown Sources

First thing that needs to be done in order to be able to install the application on the team android phone you need to allow app installations from unknown sources:

1. From a Home screen, swipe up or down from the center of the display to access the apps screen.
2. Navigate: Settings  > Apps.
3. Tap Menu icon (upper-right).
4. Tap Special access.
5. Tap Install unknown apps.
6. Select the unknown app then tap the Allow from this source switch to turn on  or off .

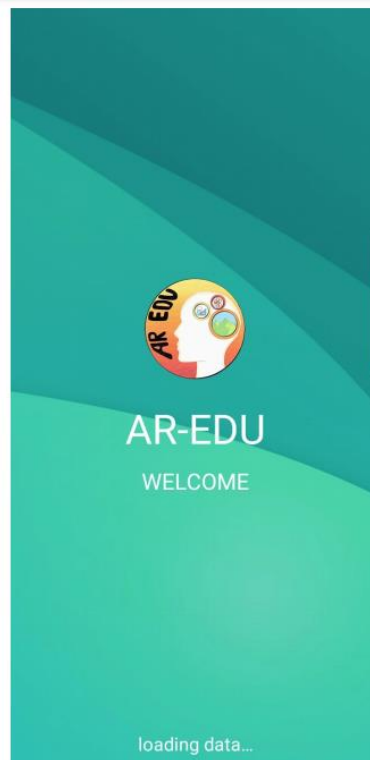
Download the Application

To download the application, open the link <https://hive.mk/downloads/ar-edu.apk> on the team android smartphone or tablet and then install it by following the on screen instructions.

AR-EDU mobile application Usage

First screen

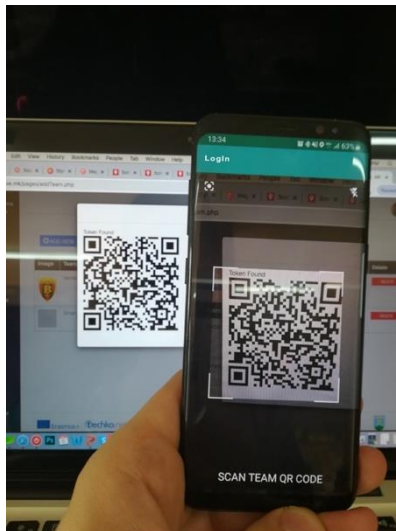
AR-EDU mobile application is an Android application developed for the purpose of the AR-EDU project and represents knowledge quiz that lets you to test student's knowledge in STEM subjects. Its using 3D Augmented Reality objects on your phone screen, integrated in real time in their actual size and environment. The first screen shown after activating the application is shown here (picture 13)



picture 13

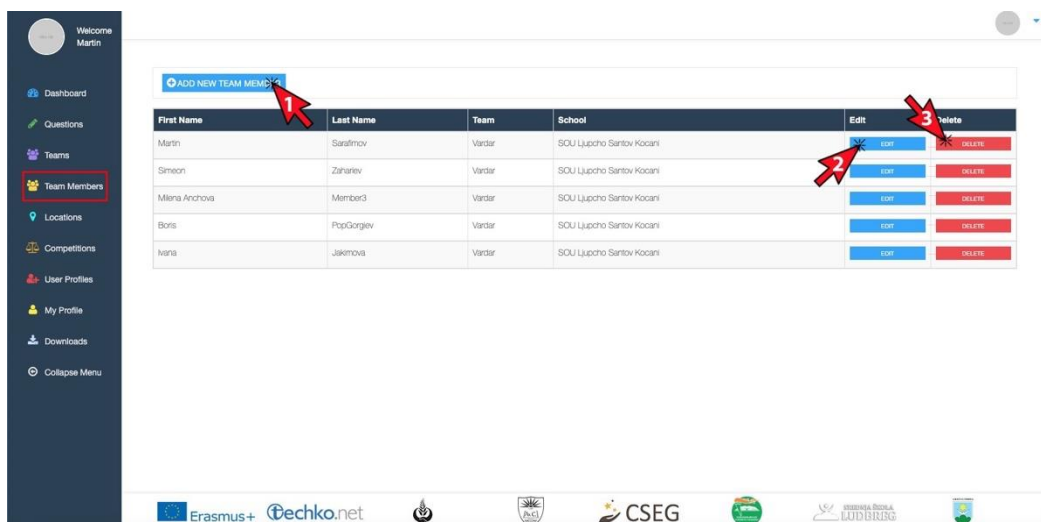
Log-in screen

On the first load after the splash screen (picture 13) is shown, a new screen appears with a QR scanner which is actually a Login screen (picture 14) that is used to assign the device to the team.



picture 14

To Login the new team and assign the device to the team the school administrator need to open the hive.mk then login to the administrative section and go to the Teams tab (picture 15)



picture 15

then the administrator should click the "ASSIGN DEVICE" button (picture 15 – arrow 2) and a new popup will show containing a QR code (picture 15/1):

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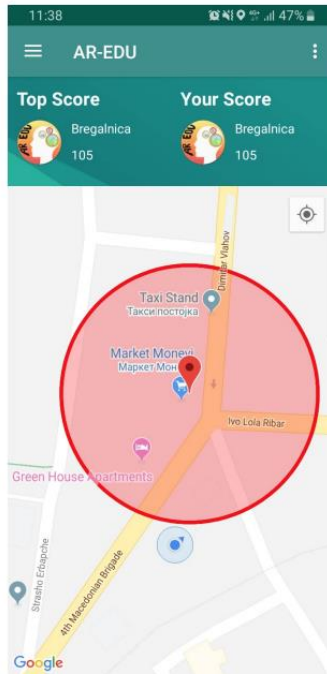


picture 15/1

once you see the popup you need to point the camera from the phone that will be used from the team on the competition (picture 14). After successfully assign of the team a map will be shown (picture 16).

Map screen

When the competition start date arrives on the team application device the screen will show a Map with the first question location (picture 16):



picture 16

The team will need to orient itself using the map and find a way to get closer to the marked location.

IMPORTANT: *While on the move the team members should be aware of the surroundings and pay attention to the traffic and obstacles and at no point any member or other persons should be put at any risk, safety is priority number one, and the team members should take care of themselves and those surrounding them.*

Once the team arrives in a radius of 10m of the question location, the phone camera will be activated and should be used as a viewfinder to find the 3D Augmented Reality object (the AR-EDU logo) in the surrounding space (picture 17).

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picture 17

When the team finds the 3D Augmented Reality object (the AR-EDU logo) (picture 17) on the phone screen the participant needs to touch the 3D Augmented Reality object (the AR-EDU logo) on the phone screen and that will trigger the first question

Question screen

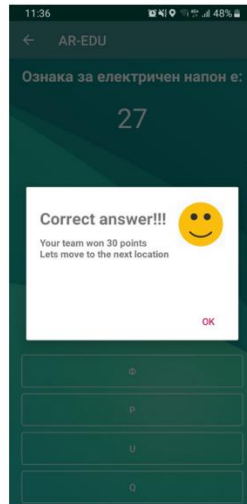
Once the 3D Augmented Reality object (the AR-EDU logo) is touched on the phone screen a question will popup.

The question is shown for 30 seconds giving time for the participants to read the question, and after 30 seconds the possible answers appear with a new 30 seconds timer to answer the question.

The answer will give points like follows (picture 18):

- If the question is answered correctly in the first 10 seconds the team gets 30 points,
- if the question is answered correctly in between 10 to 20 seconds the team gets 20 points,
- if the question is answered correctly in between 20 to 30 seconds the team gets 10 points.

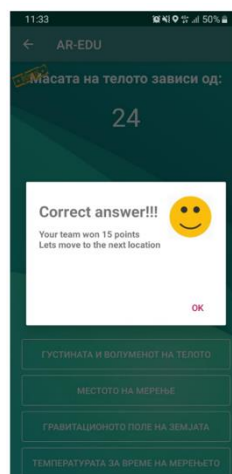
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picture 18

If the team answers the first question incorrectly, a bonus question will be shown for new 30 seconds and then the possible answers will be show for another 30 seconds, only difference is the points are cut in half, (picture 19) meaning:

- if the bonus question is answered in the first 10 seconds the team will get 15 points,
- if the bonus question is answered in between 20 to 30 seconds the team will get 10 points,
- if the bonus question is answered in between 20 to 30 seconds the team will get 5 points.



picture 19

If the team answers wrong the bonus question again it will get 0 points and a new question location will be shown on the map.

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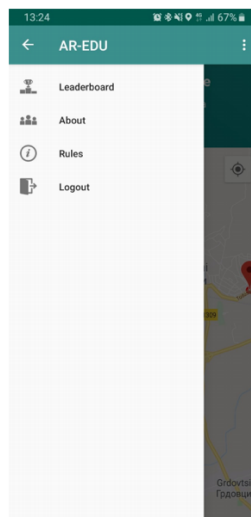
After answering correctly the first or the second question, or missing both of the questions the team will get a new question location on the map and they need to pursuit it to that location.

The maximum number of points from all questions in all matches is 600 points.

Application Menu Screen

The application has a menu which is presented by the burger icon in the top bar (picture 20). The menu consists of:

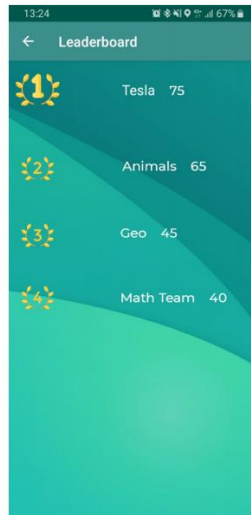
- Leaderboard - shows the Leaderboard statistics
- About – shows the about information
- Rules – shows the quiz rules information
- Logout – logs out the team from the current device.



picture 20

Leaderboard Screen

When you click on the leaderboard link located in application menu a leaderboard screen (picture 21) that shows total results for your and another teams in competition. On this screen you can also see how are you currently.



picture 21

About Screen

The about link located in the application menu opens the about screen (picture 22) that shows the about information for AR-EDU Quiz which is controlled by the admins.



picture 22

Rules Screen

The rule link located in the application menu opens rule screen (picture 23) that shows the rules for AR-EDU Quiz.



picture 23

Logout

If the user clicks Logout from the application menu the device will be disconnected from the server and the QR scanner appears in order to do the assign again (picture 24)



picture 24

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