USER MANUAL

AR-T - AUGMENTED REALITY LEARNING APPLICATION FOR TECHNICAL GRAPHICS

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OVERVIEW

AR-T is an Augmented Reality based learning app for Technical Graphics. The main aim of the app is to act as an educational tool in aiding the learning of the Junior Cycle Subject Technical Graphics (TG). TG is an introductory subject into the area of 3-D object representation and it is therefore important that students have the best learning experience they can have, to set them up for the subject in the future.

The idea for this project, and for this application, stems from the unsatisfied need for better and more immersive resources for teachers in teaching such an abstract and difficult subject. It is the aim of this app to help students gain a greater grasp of the basic concepts and a greater understanding of 3-D object representation.

ANDROID APP INSTALLATION & WEB APP URL

AR-T is an Android Application and will be targeted at devices Android 7 or higher (Minimum SDK version 24).

Due to hardware limitations, the devices that support the hardware needed to run the Augmented Reality can be found at this link - https://developers.google.com/ar/discover/supported-devices

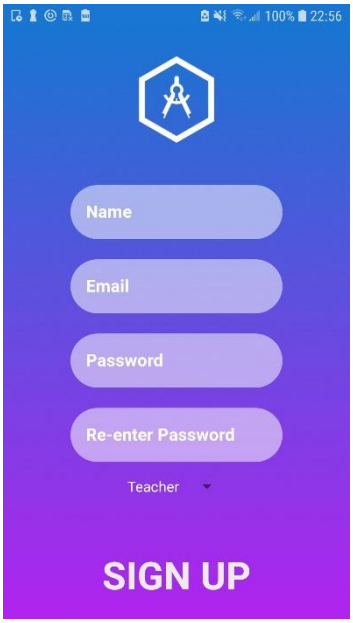
The Android Application can be installed by downloading the app APK from the build folder of the project Gitlab. Once this file is downloaded, it can be transferred onto the device and the user can simply open the APK and it will be installed on the device.

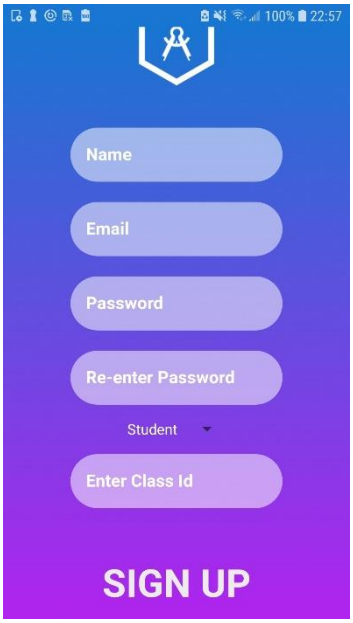
The AR-T web app login can be found at this link - https://secure-thicket-86599.herokuapp.com/login

ACCOUNT

REGISTRATION

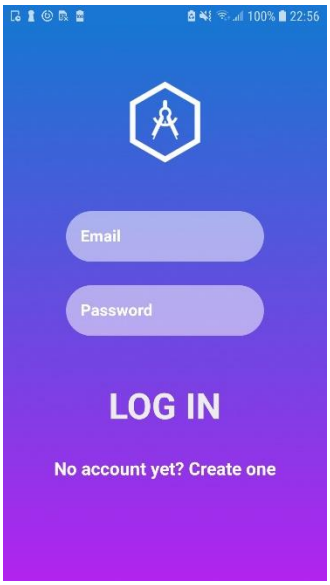
Once the AR-T app has been downloaded and installed on the users device they can then proceed to registration. Teachers may register by entering their name, email and password. Students must additionally enter their class id. This will be provided to them by their teacher and gives them direct access to their classroom.





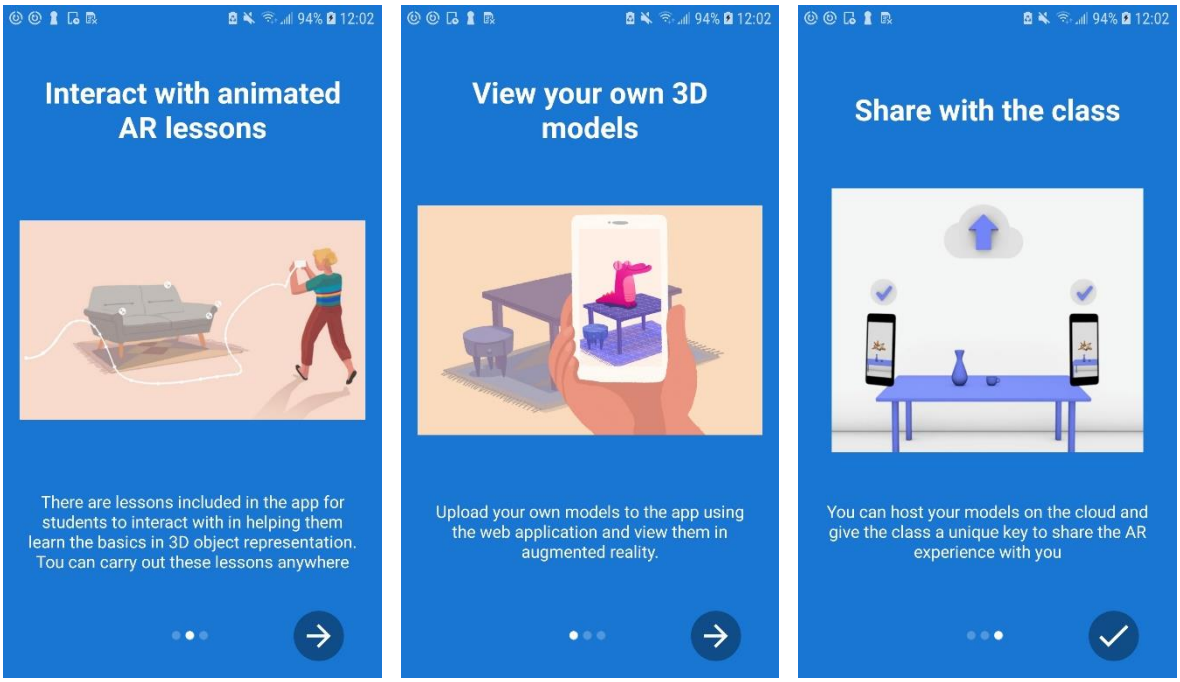
LOGIN

To log into the app, the user can simply enter their email and password. Depending on whether the user is a teacher or student, they will be navigated to the appropriate screen.



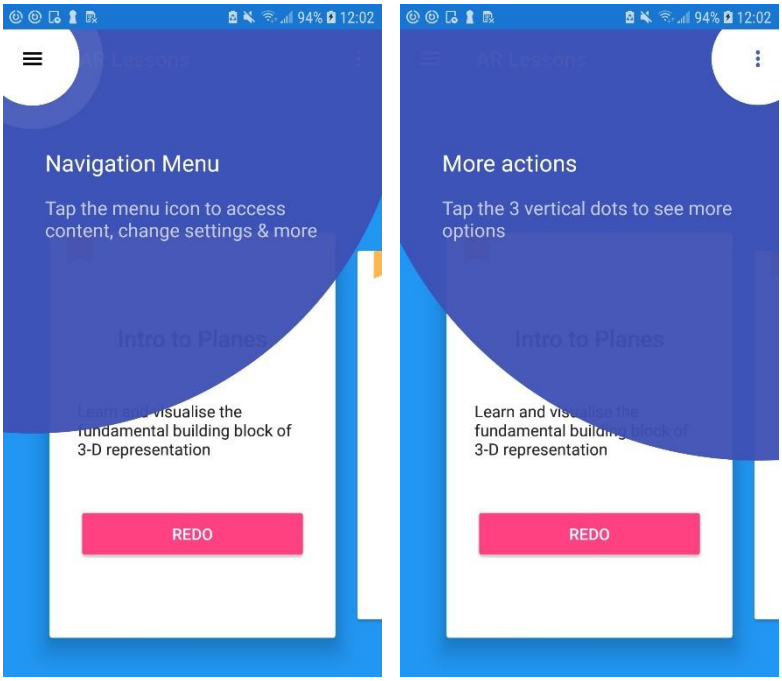
GUIDED TOUR

When the user logs into the app for the first time after installation, they are greeted with a guided tour to give them an overview of the main features of the app. Once the guided tour has been shown, it will not be displayed again, unless the user chooses to turn it back on in settings.



Once the user moves past the guided tour the they are brought to their main screen as normal, but the main features of the app are highlighted in what is known as a 'Showcase View'. This follows standard android design principles and aims to help users get used to the app.

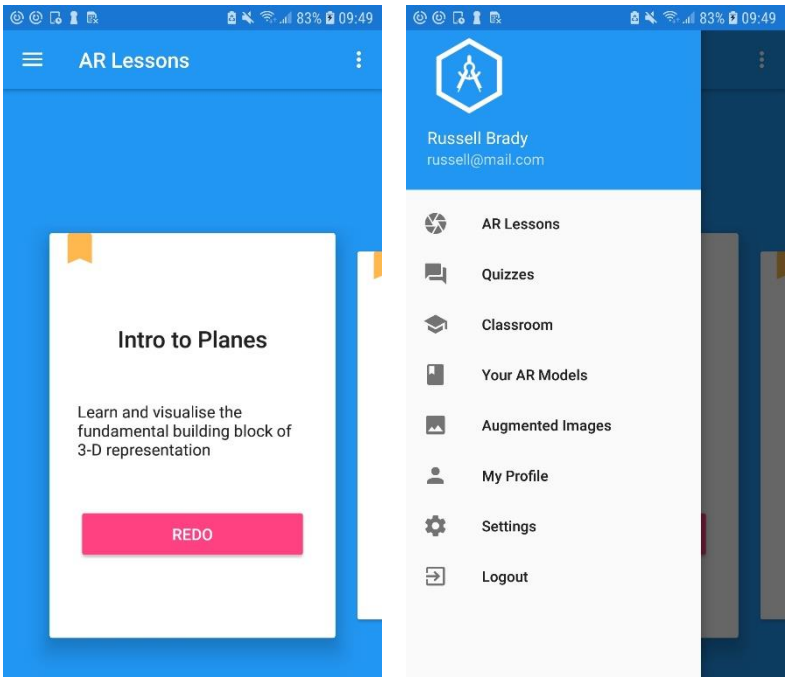
Like the guided tour, once this showcase view has been shown once, it will not be shown again unless it is turned back on by the user in the settings screen.



STUDENT

AR LESSONS

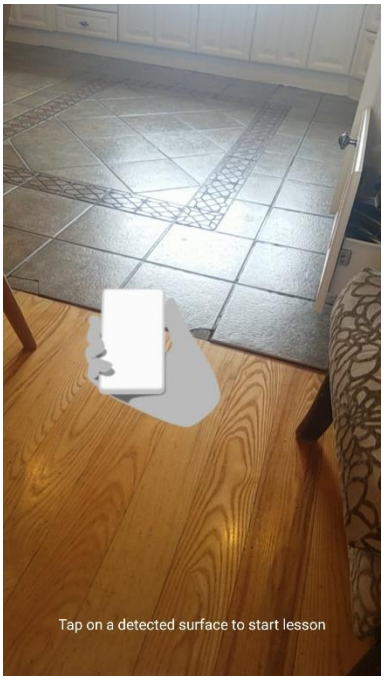
When the student logs into the app the are brought directly to the lessons screen. There are several different lessons which the student can complete. These lessons cover different topics of the course and aim to provide students with a different type of learning experience by integrating augmented reality in the learning process. The screenshots below show the lessons screen which appears when the student logs into the app. The navigation drawer can be accessed in the top left corner and allows access to the other features of the app. The student's navigation drawer is different to that of what the teacher sees as they have access to features the teacher does not.

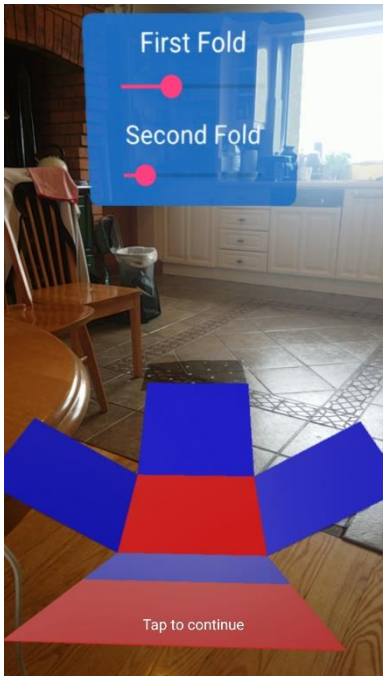


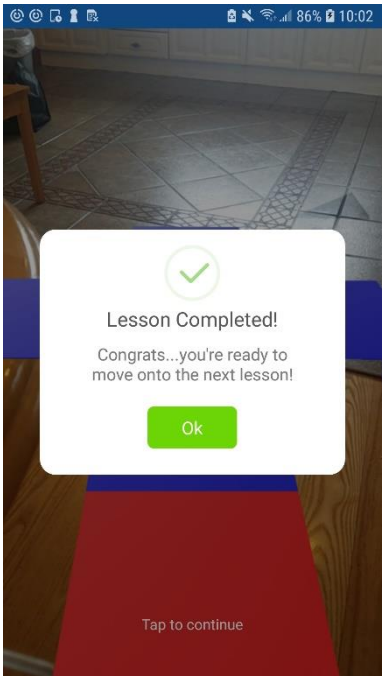
If the lesson has not been previously completed by the student the button text says 'START', however in the image above 'REDO' is the button text as the user has previously completed the lesson. This information is held in the database and fetched when the student logs into the app.

Upon entering a lesson, the student is directed to a screen which details a description and the learning aims of the app. A floating action button directs users into the lesson where it is then started.

When the student enters the lesson, an animation appears on the screen directing the user as to how to detect a surface. There is also a prompt at the bottom of the screen which tells users to tap on a detected screen once it is detected to start the lesson. Once a surface has been detected and the user taps on the screen, the lesson begins, and the student can tap on the bottom of the screen to move onto the next part of the lesson. Once the lesson is complete a dialog appears and on pressing the OK button the lesson ends.

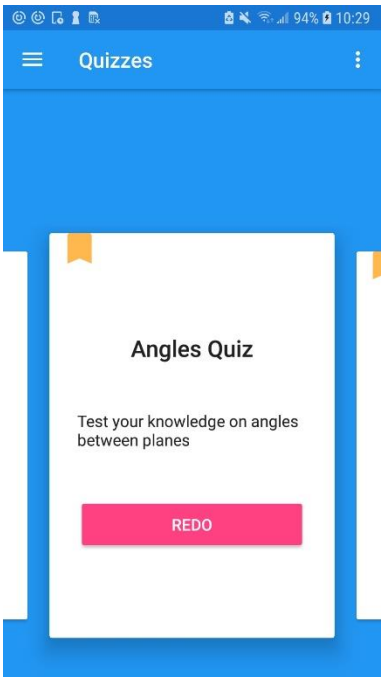




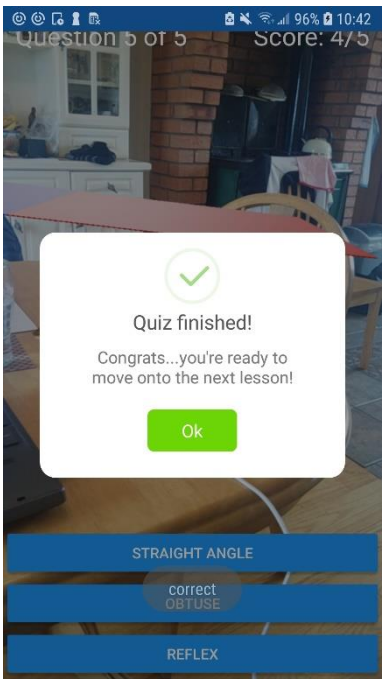


QUIZZES

There are quizzes in the app which are based on the lessons. The main aim of these quizzes is to reinforce the learning experience of the app. The student can navigate to the quizzes using the navigation drawer. The quizzes screen looks like the lessons screen as can be seen below. Like the lessons screen, if the quiz has been completed, the button of the quiz will say 'REDO'. Otherwise, the text will read 'START'.

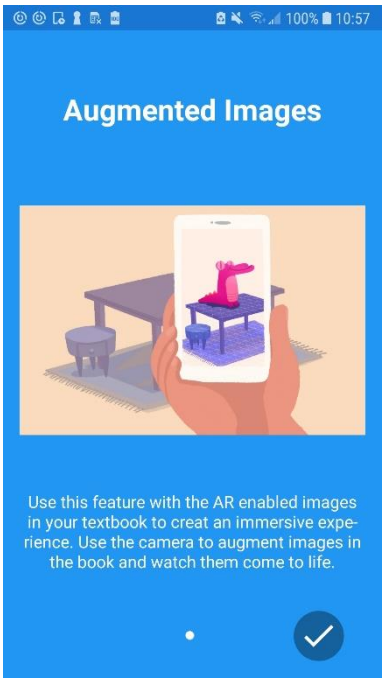


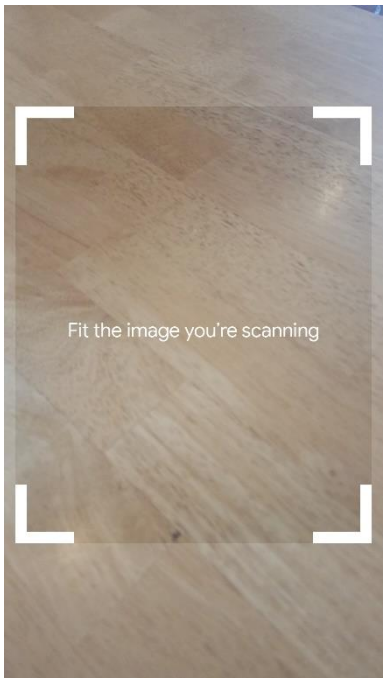
On entering the quiz, the student is prompted to detect a surface and once this is done, to tap on the surface to start the quiz. Once the quiz starts, the student answers several questions which are displayed on the screen where the user tapped. Once the quiz is finished a dialog appears and on clicking OK, the quiz is ended and exited.



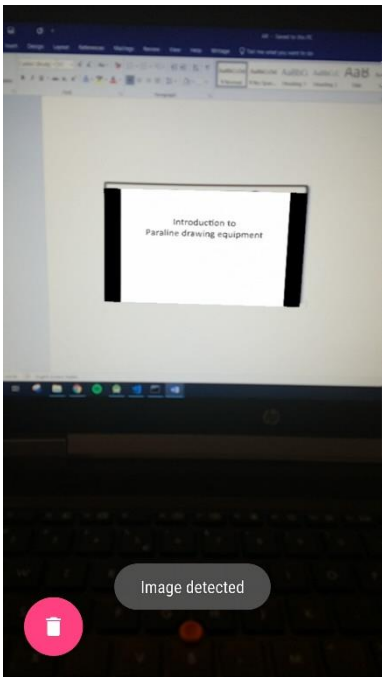
AUGMENTED IMAGES

When the student enters the augmented images section of the app, they are greeted with a splash screen which details the function of the feature. Following this, the camera is opened with a prompt to fit the augmented image the user wants to scan.





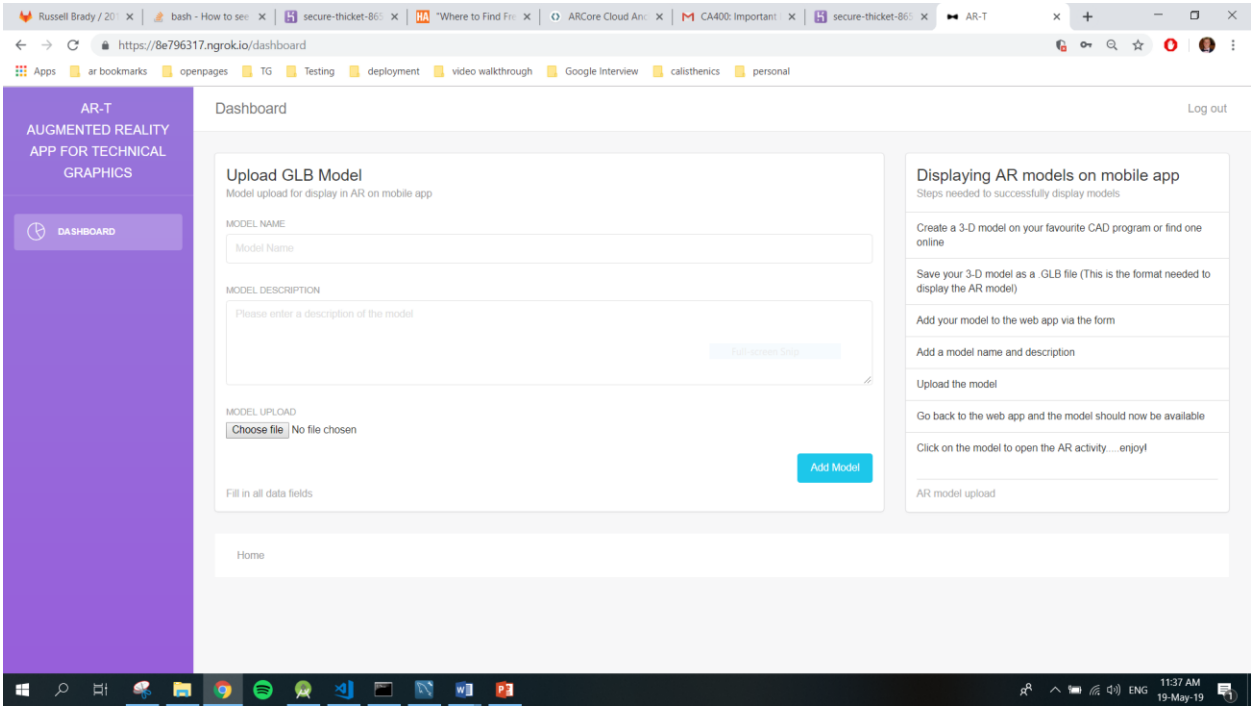
This feature can detect predefined images which overlay augmented reality 3-D models and video once they have been detected. The student must point the camera at the image at proximity for it to be detected by the app. Once an image is detected, the fit to scan image is removed and a button appears which allows the user to delete the current AR models which are appearing on the screen. Here is an example of video and 3-D models being created through this feature.



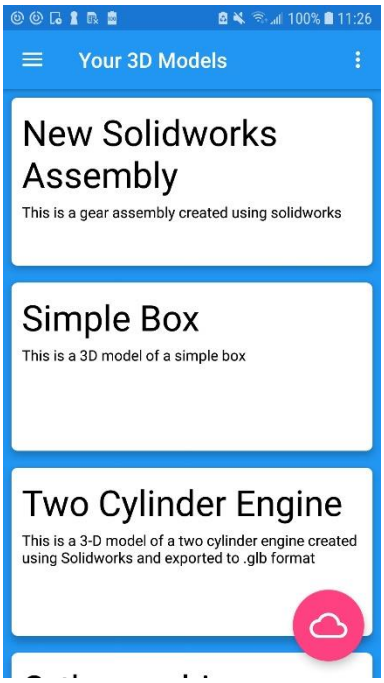
YOUR 3-D MODELS

This feature allows students to view 3-D models they have created using CAD software in augmented reality, and to share their experience with their classmates and teacher.

Using the web application, the user can upload their CAD created 3-D models.

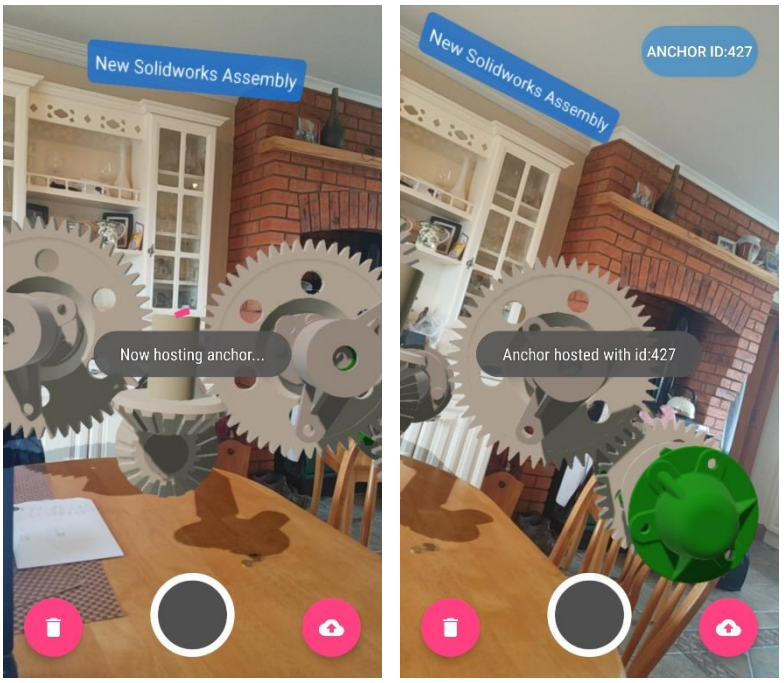


Once the model is successfully uploaded, it and all the user's other models can be seen on the android application once they are loaded from the server. The name and description of each model is shown on this screen.



When the user clicks on one of the items the camera is opened. The user must detect a surface on which to place the object and once this is done, and the object has been loaded from the server, they can tap on the screen to place the object.

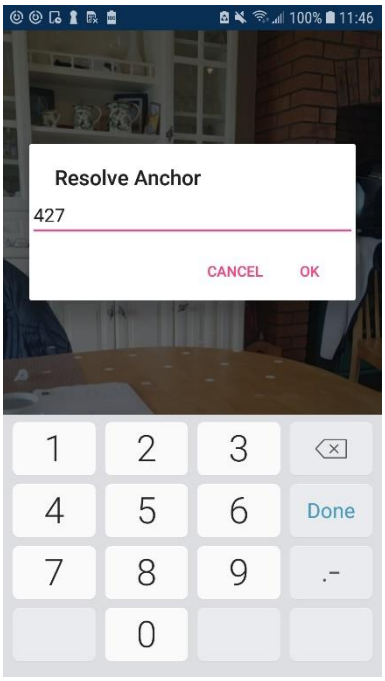
The screenshot above shows a gearbox assembly. The name of the model appears above it and the object can be rotated and resized by the user. They can delete the object, take pictures of the object using the camera button and host a reference to the model (Cloud anchor) to share it with their classmates and teacher.



The screenshots above show the user hosting this anchor, and then the anchor being successfully hosted. They can then give their classmates and teacher the anchor id for them to be able to resolve the model and view it.

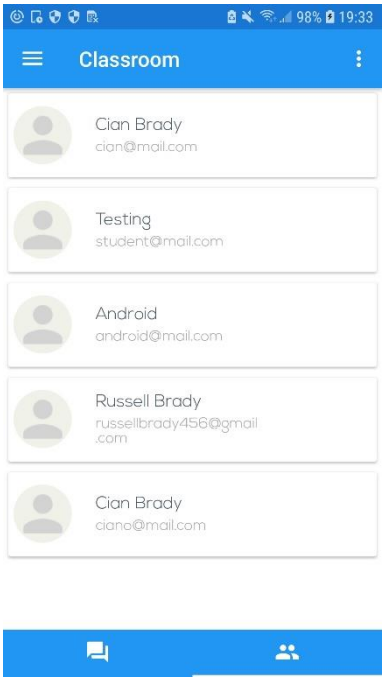
Other users can resolve a model by clicking on the floating action button in the 3-D models screen above. When they do this the camera screen is opened where they can resolve an AR model. A dialog pops up and the user enters the anchor id provided by the student who hosted the model.

Once they click OK, the AR model is fetched from the server and is placed in the same position as where it was hosted. This means multiple people can look at the same model in augmented reality.

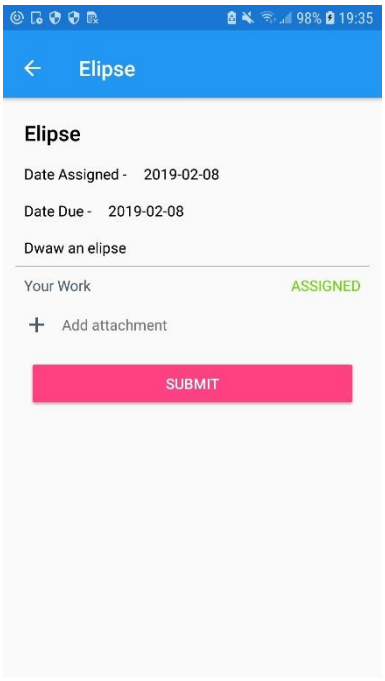


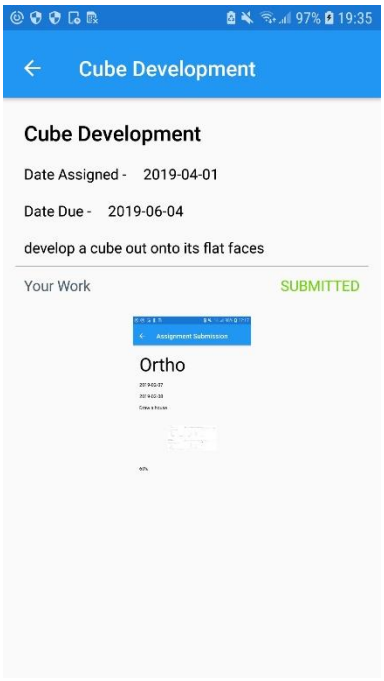
CLASSROOM

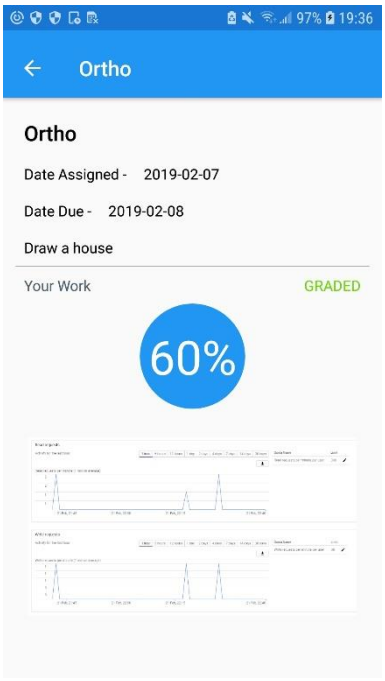
Students can access their classroom through the navigation drawer. This classroom contains all the assignments that have been assigned to them as well as showing a list of all their classmates. Each assignment is marked as having been graded, submitted or not answered.



The student can click into an individual assignment to submit an answer, view their submission or to view their grade if it has been graded by the teacher. The screenshots below show these three use cases. The uploaded images can be viewed in full screen by clicking on them.

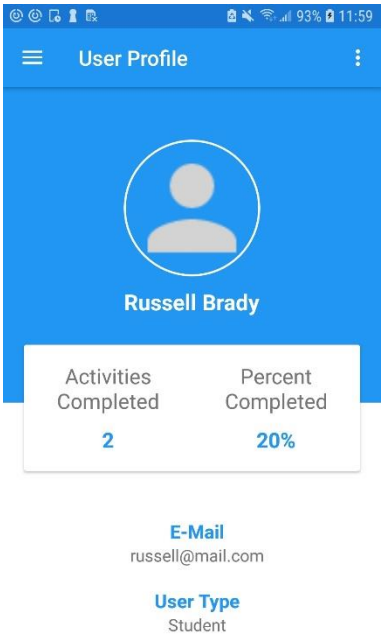






USER PROFILE

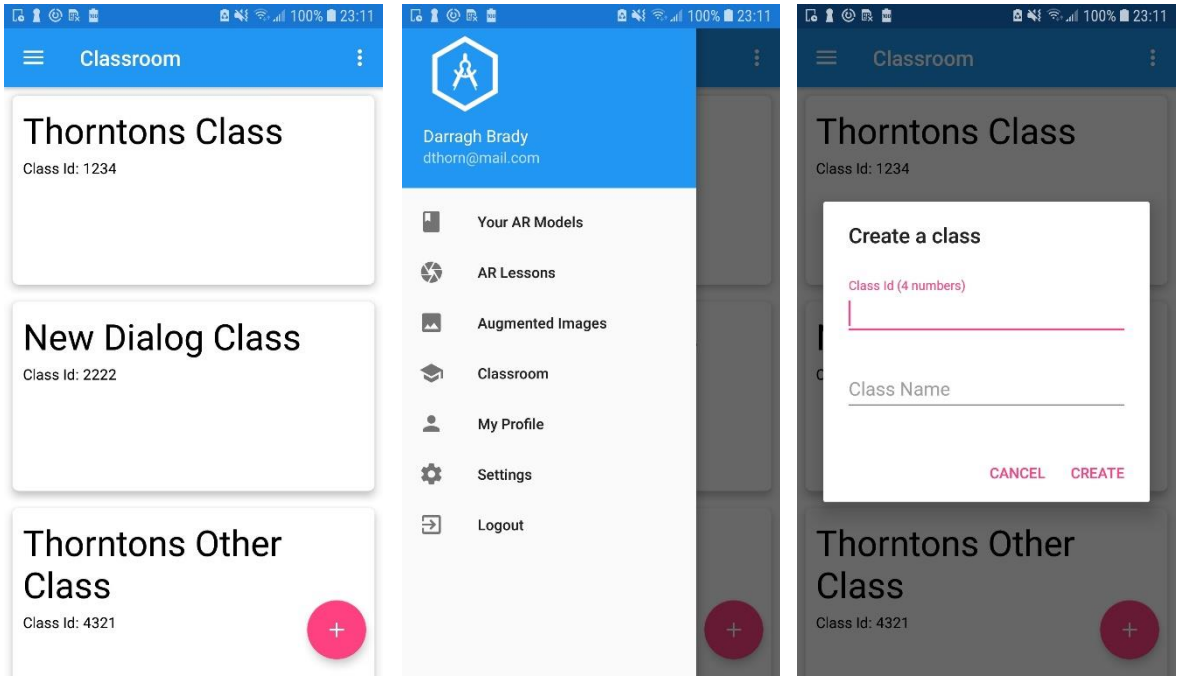
The student's user profile section gives an overview of their account as well as detailing the number of lessons completed and the percentage of lessons completed.



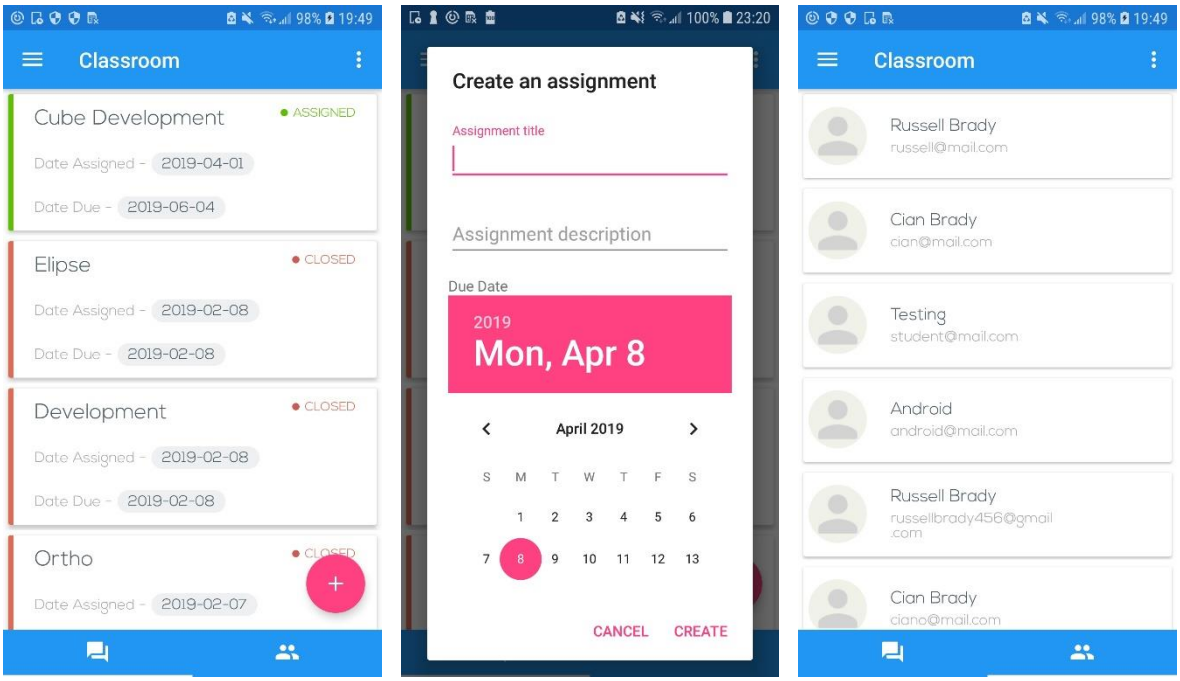
TEACHER

CLASSROOM

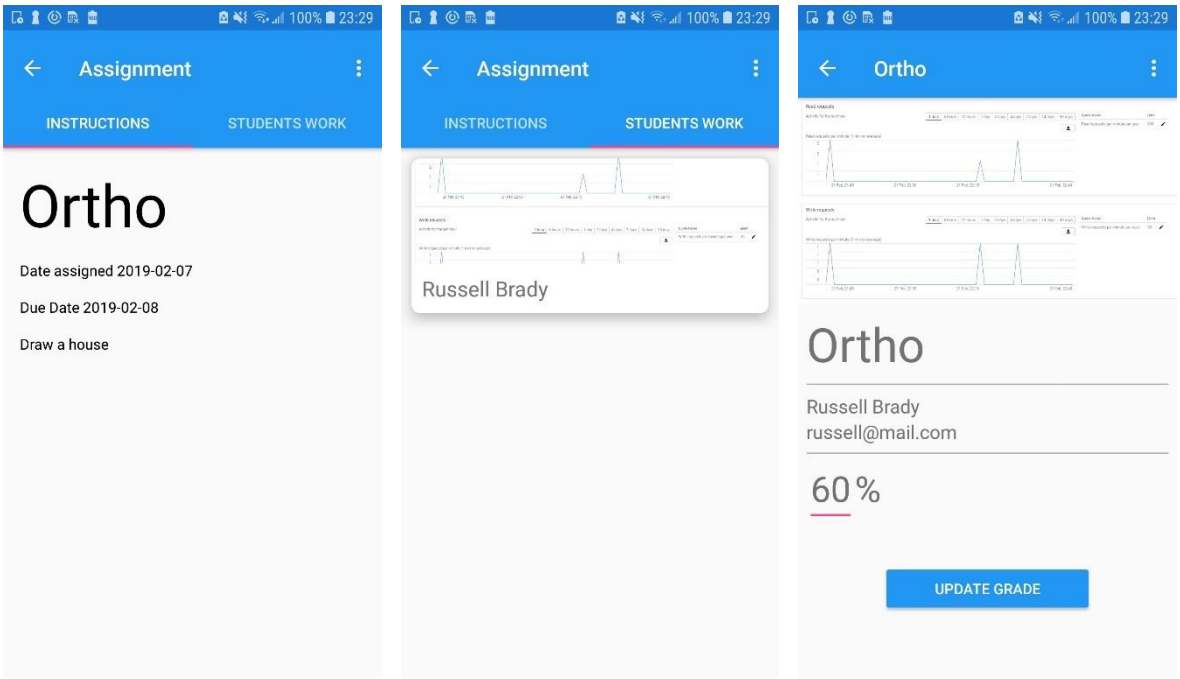
When a teacher logs in, they are directed straight to the classroom where all their current classes displayed along with the class ID. The navigation drawer can also be found in the top left corner of the screen which allows for navigation to the various features in the app. The floating action button allows the teacher to add a new class and specify the class ID.



If the teacher clicks on one of their classes, they are directed to the classroom of that class. This classroom contains a list of the class students as well as all the assignments which have been created in the class. The teacher can create a new assignment by clicking on the floating action button which is located on the assignments screen.

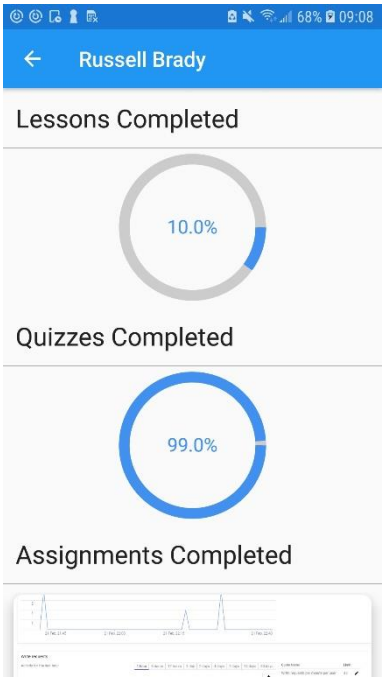


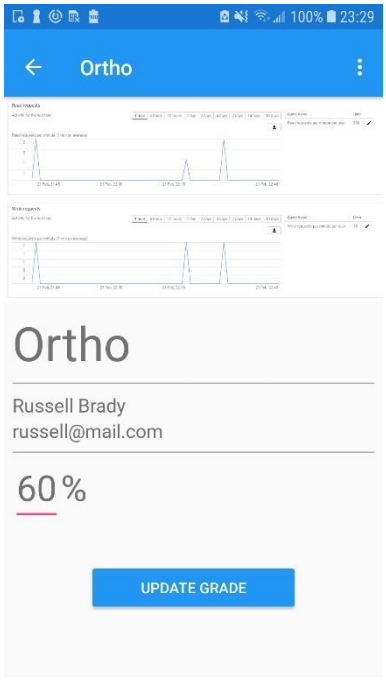
The teacher can then access an individual assignment to see the details and instructions of the assignment and the submissions which have been handed in by students. If the teacher clicks on an individual student's work, they can see their assignment submission and grade it.



If the teacher clicks on a student in the classroom they will be directed to a screen which gives details on how the student is progressing in the class, showing the assignments they have successfully completed as well as their progress completing the app lessons and quizzes. The teacher can click on one of the

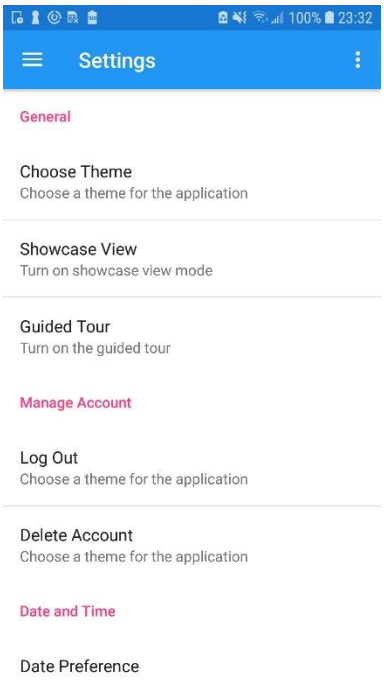
completed assignments in the list to view the student's submission and grade received as well as choosing to update their grade. These screens can be seen below.



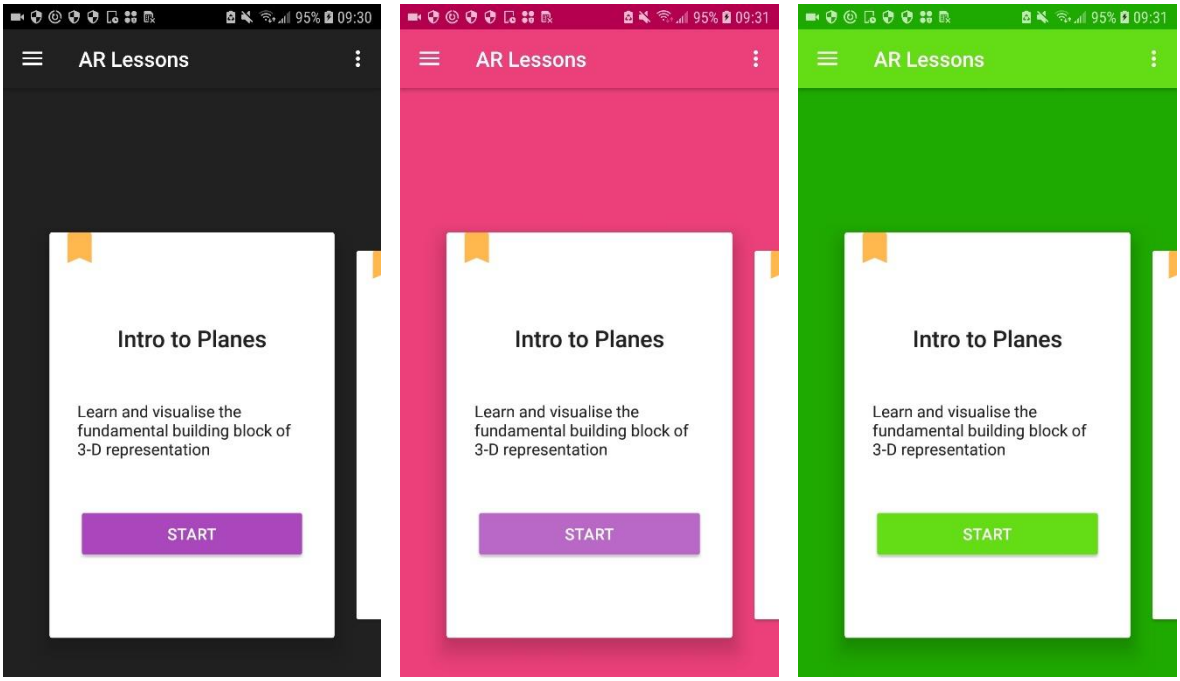


SETTINGS

In the settings screen the user can manage things such as the application theme colour, show the guided tour and showcase view as well as logging out and deleting their account.



Here is an example of the different themes that can be used within the app. These themes can be changed from the settings and persist while the user is logged in.



LOGOUT

The user can log out of the app by accessing the navigation drawer. They can log out directly from the navigation drawer however they may also do this from the settings screen to cover the case that the user enters the settings screen by using the menu option somewhere within the application. A dialog appears on clicking the log out button and the user can then click OK where they are then logged out of the app and directed back to the login screen.