

An-Najah National University



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Eco Adventure

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DISCLAIMER STATEMENT

This report was written by students Manar Mayyaleh and Ileen Shaar at the Computer Engineering Department, Faculty of Engineering, An-Najah National University. It has not been altered or corrected, other than editorial corrections, as a result of the assessment and may contain language and content errors. The views expressed in it and any outcomes and recommendations are solely those of the student(s). The An-Najah National University accepts no responsibility or liability for the consequences of using this report for any purpose other than what was intended.

Abstract

This project aims to create an Arabic-language smart educational mobile application for children. The target age group is children from 7 – 10 year-old. This application is called “Eco Adventure” and aims to help kids understand what climate change means. Also, it introduces children to the concept of climate change, its consequences, and causes simply and clearly.

This application is distinguished from other applications by being designed in Arabic and it targets children in the primary school which makes it easy to understand and use.

Eco Adventure is tested by being applied to a group of children in the primary school who had no information at all about climate change, its concept or any of its causes and consequences. Based on the experiment, they showed strong interaction and integration with the app. They got to know some methods to reduce climate change after using and accomplishing the levels of the game.

1. Introduction

Changes in climate over time are characterized by long-term changes in temperature and weather patterns. There may be natural causes for these shifts, such as variations in the solar cycle. As a result of burning fossil fuels like coal, oil, and gas since the 1800s, human activities have been primarily responsible for climate change. (Climate, n.d.)

The combustion of fossil fuels releases greenhouse gases, which form a layer around the earth, trapping the heat of the sun and rising temperatures. Methane and carbon dioxide are examples of these gases produced when gasoline is used to fuel cars or coal which is used to heat homes. Also, landfills are a major source of methane emissions. Energy, industry, transportation, buildings, and logging are among the most important factors and main sources of emissions, as emissions continue to rise, the Earth's temperature has increased, making it warmer than it was in the nineteenth century.

Climate change is more than just a rise in temperatures, Earth's movement follows a specific system, so changes in one region can impact other regions. (Effects of Climate Change, n.d.)

As a result of climate change, we are experiencing severe droughts, rising sea levels, floods, melting polar ice, and catastrophic storms.

The effects of climate change are serious, especially for those living in developing countries or on small islands. Increasing sea levels lead to flooding, which leads to the eviction of entire populations, as well as severe droughts that could lead to famine. (C, n.d.)

2. LITERATURE REVIEW

One of the goals of sustainable human development is to preserve the climate, which attempts to reduce the harmful impact of productive activities on the environment, rational consumption of non-renewable resources and promotes the use of renewable energy and waste recycling.

The states are responsible for reducing the causes of climate change by reducing energy consumption, waste recycling, etc., but the greatest responsibility lies with us. Therefore, individuals must be educated in the early stages. While you can't solve climate change issue for your child, you can help them discover the facts, and find ways to take action. (Talking to your child about climate change, n.d.) (COP27, n.d.)

The Peace Journey Foundation has created Eco-Challenges and International Travel Opportunities that encourage urban gardening in cities and around the world since 2000 to increase student challenges to climate change. The development of technology made it possible to develop applications to raise awareness of climate change for children who do not have the opportunity to take part in such events. (unep_arabic, n.d.)

The My Green World website offers a Kids Corner that provides a range of curriculum-approved learning programs to inspire children and educators to participate in wildlife and environmental conservation. There is also a Climate Kids on NASA's website dedicated to introducing children to climate and educating them about preserving it. (Kids Corner, n.d.) (Climate Kids, n.d.)

Almost all of these websites and applications are in English, so they are most useful to children who are proficient in that language.

As a result of a preoccupation with other issues, such as war, climate change is not as important as other issues in the Arab world and it's not a priority for them. In schools, focus on it comes at certain stages, and few applications raise awareness of climate change in the Arabic language.

Therefore, we developed an application that aims to raise awareness of climate change, its causes, consequences, and methods of prevention in Arabic.

3. METHODOLOGY

In this research, we have developed a Mobile application called Eco Adventure that educates children in the primary school and targets the ages of 7-11 years about the concept of climate change and its consequences, as well as the causes that lead to it, and finally, the methods of prevention to reduce it by going through a series of adventures that they challenge to solve the problem of climate change, as it is not considered a basic curriculum for this age group.

Eco Adventure is displayed on tablets in an amusing way delivering the idea better than being lectured.

3.1 APPLICATION DEVELOPMENT PROCESS

In this part, the game concept and development process will be shown.

3.1.1 Eco Adventure Game Concept

In other words, Eco Adventure is a Mobile learning application designed to raise awareness of climate change, its causes, results, and how to reduce it among children. All this is shown sequentially, and it is divided into Four sections that present the problem and what climate change means, and then the second section that is about the results, and a third one which deals with causes and these three sections contain short tests to see how much information is stored, and the last section is the riddles level that will help the children find the solutions that must be followed to limit climate change.

When the child enters the game, they can choose the character they prefer to play with.



Figure3.1 Choose Character1:Boy

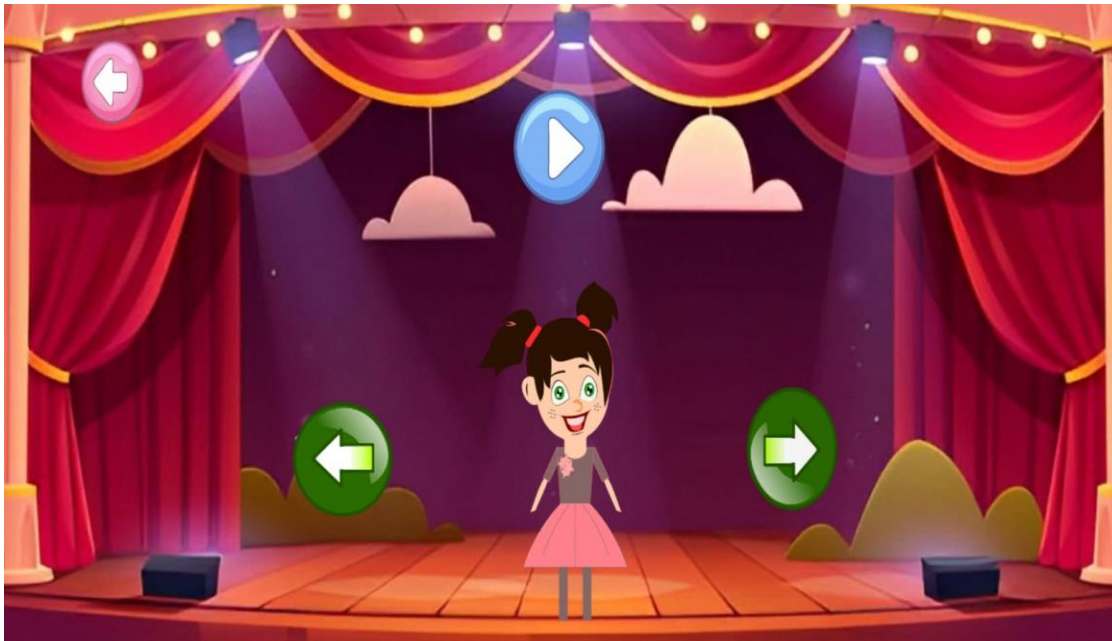


Figure 3.2 Choose Character2:Girl

After choosing the preferred character which we designed on Inkscape, the character is presented with a scene while walking with ice cream in its hand, but it melts very quickly due to the high temperatures resulting from climate change, and from here the adventure begins to find out what climate change is.

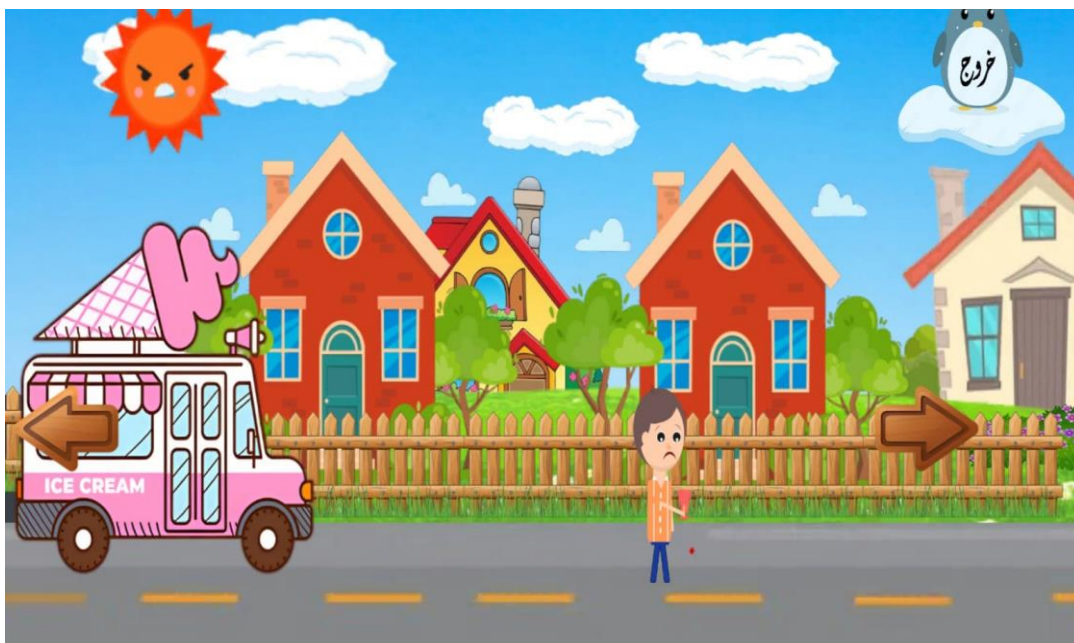


Figure 3.3 First Scene

First section:

The first section consists of two parts. The first part is an introductory video about what climate is and why it changes. The second part is a simple quiz to find crosswords for some words that make up the definition. When they are being accomplished, the definition is written in Arabic with a sound, making it easier for the child to understand, enabling them to recognize again what climate change is, if the child collects the appropriate points on this quiz, they pass the level and the next section is open.



Figure 3.3 Definition Quiz



Figure 3.4 Definition of Climate Change

The quiz also contains a timer to stimulate the child to think and search for better understanding. When the timer ends, the game board will appear to the child again with different locations for the words to make it more challenging

Second Section:

The second section consists of four parts. The first part is the scene in which the child walks and sees the catastrophic phenomena caused by climate change, such as the melting of ice, the rise in sea level, the increasing explosion of volcanoes, and also hurricanes. all that accompanied by a voice for each scene that tells him what is going on around him.

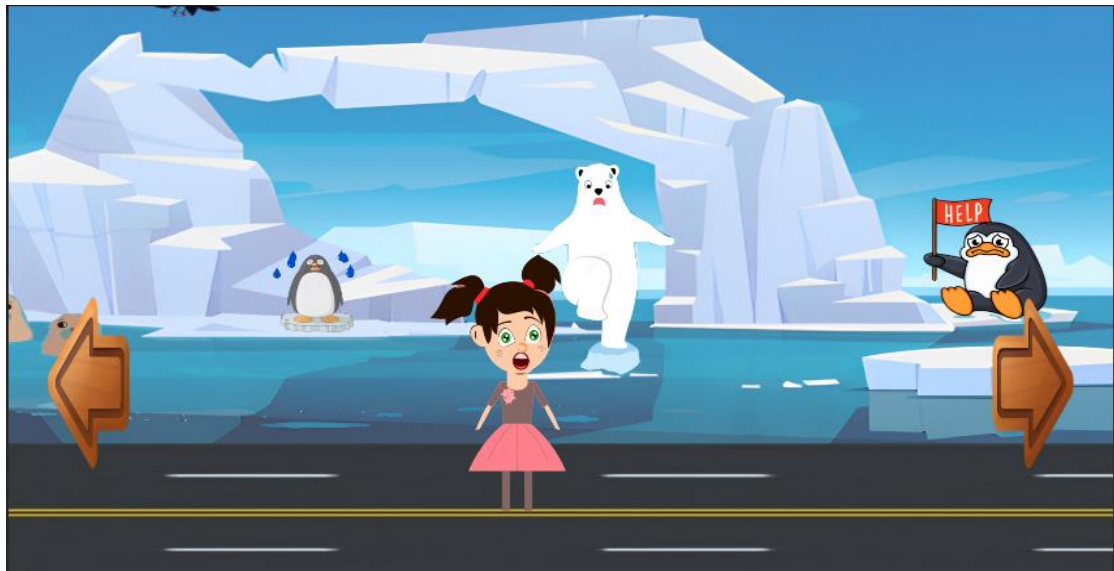


Figure 3.5 Melting polar ice



Figure 3.6 Volcanic eruptions



Figure 3.7 Rising sea



Figure 3.8 Hurricane occurrence

After showing all the scenes, it is the turn of the tests to find out the extent of the child's learning and understanding of the situation and its dangers.



Figure 3.9 Result menu

We have two tests, the first test is a set of questions about each event and its impact. Each correct answer increases the child's points, and he has three attempts. If he loses them, he repeats the test, and all this information is sent directly to our database. When the child gets a few points the next time, when he enters the section He returns directly to the scenes to watch them, but if he achieves high results, he enters directly to the exams section, and this test is providing with sound, and the child is allowed through the audio replay button again for each question Also, the options in this quiz are animations that work when you check them, not just phrases.



Figure 3.10 Result Quiz

The second test is based on connecting and placing only humans, animals, and plants in their appropriate places to educate the child that those affected by the climate crisis are these three categories. There are three attempts with the child, if he loses them, and he chooses something other than the mentioned categories, so he plays again.

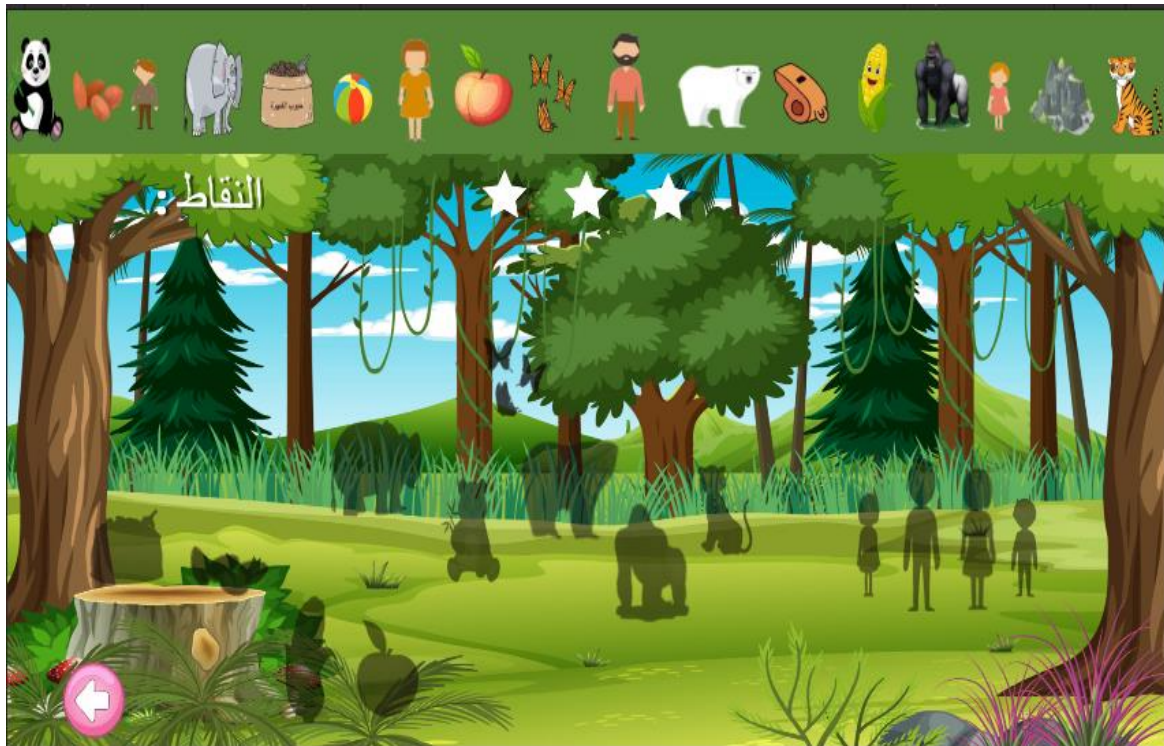


Figure 3.11 Affected Groups

The points of these tests allow the child to play puzzles in this section that can only be accessed with a certain high number of points, and this is an incentive for the child to finish the tests with high marks.



Figure 12 Entry permit for games.

When the children achieve high points, the puzzle opens:

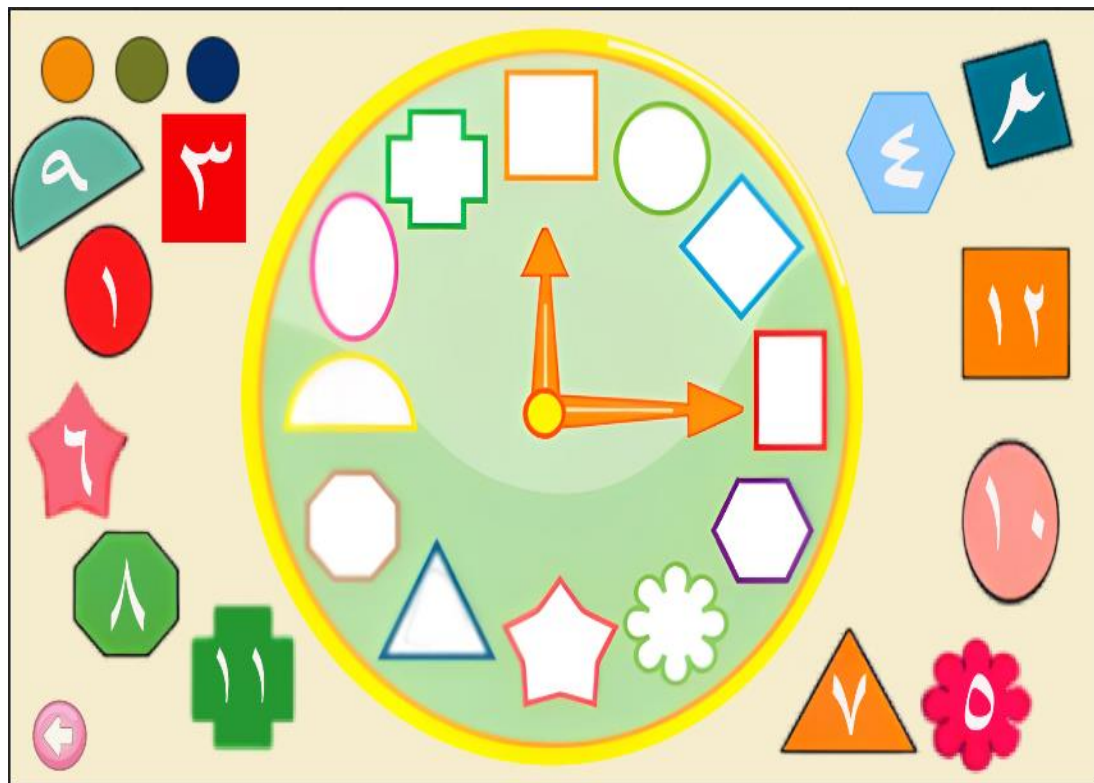


Figure 3.13 Puzzle1

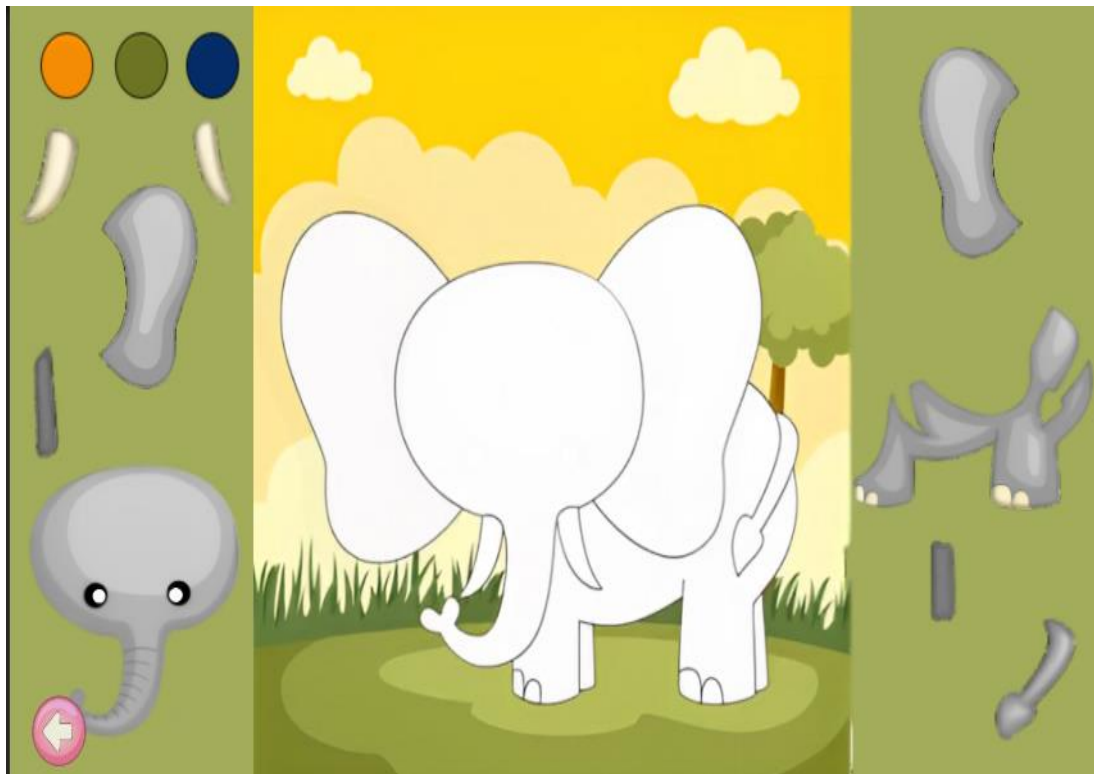


Figure 3.14 Puzzle2

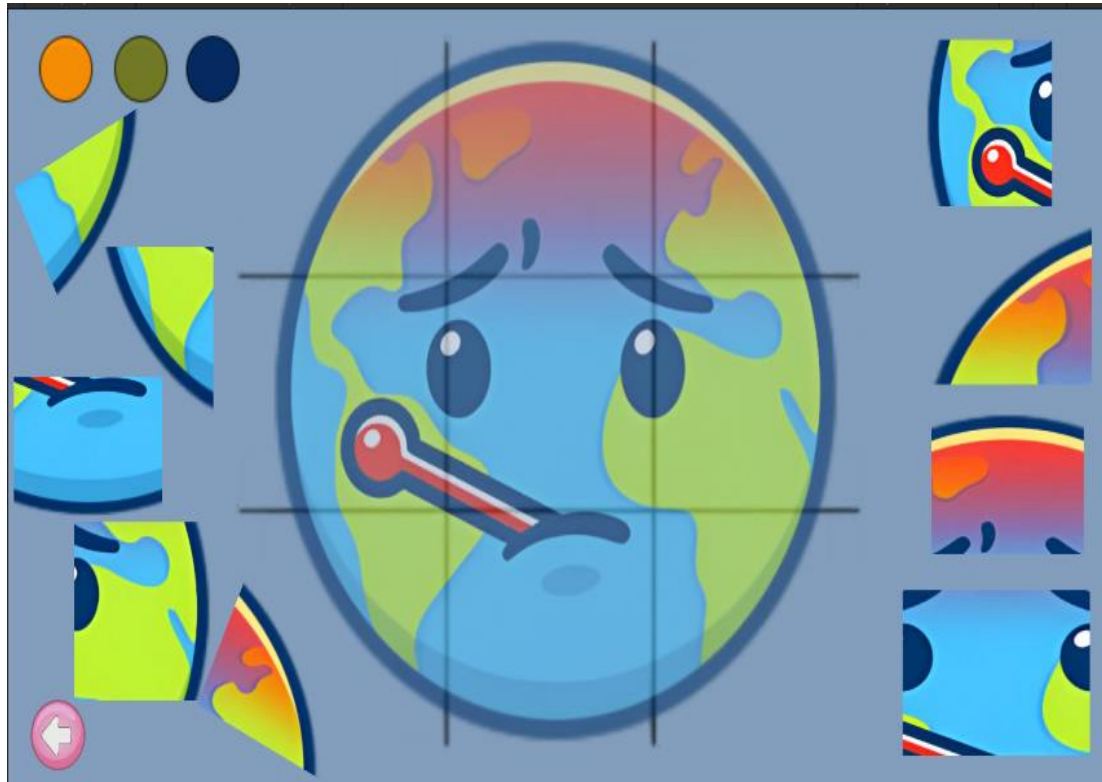


Figure 3.15 Puzzle3

Third Section:

In this section, we have two parts, scenes about the causes of climate change, these scenes open sequentially and cannot be accessed until the previous one is finished, and the last part is a quiz to examine the information that the child has gained.

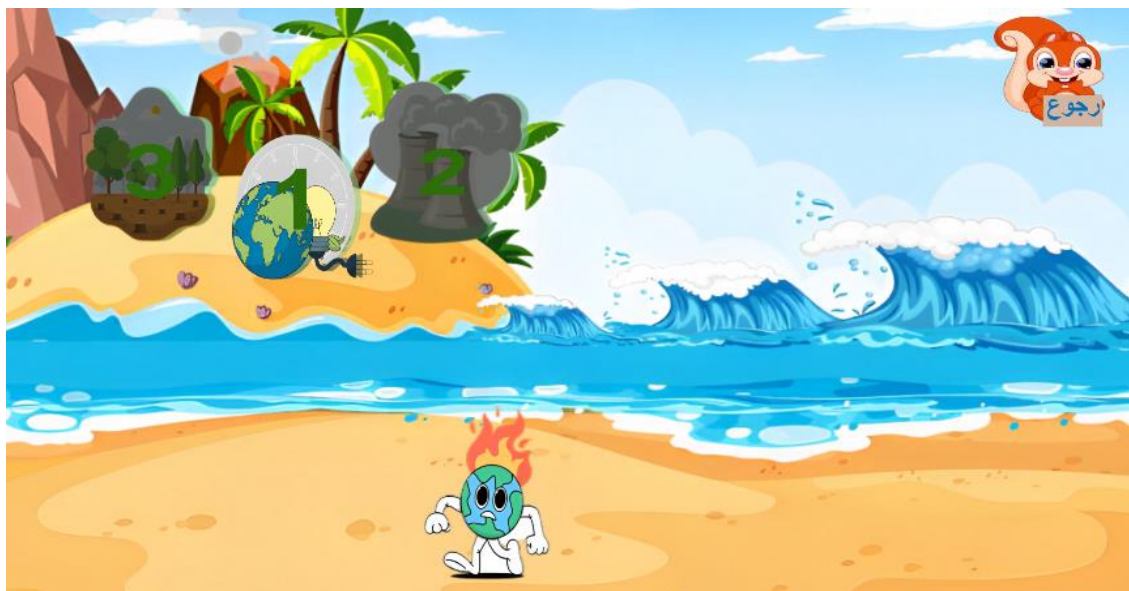


Figure 3.16 Causes menu

The first scene starts from the first place in the child's life, which is the house, where it shows that the increasing consumption of energy and electricity is one of the causes of climate change.



Figure 3.17 Home scene

The following scene allows the child to walk in the street to see the emissions of gases from cars and factories, and toxic air pollutants, one of the most important factors in climate change.

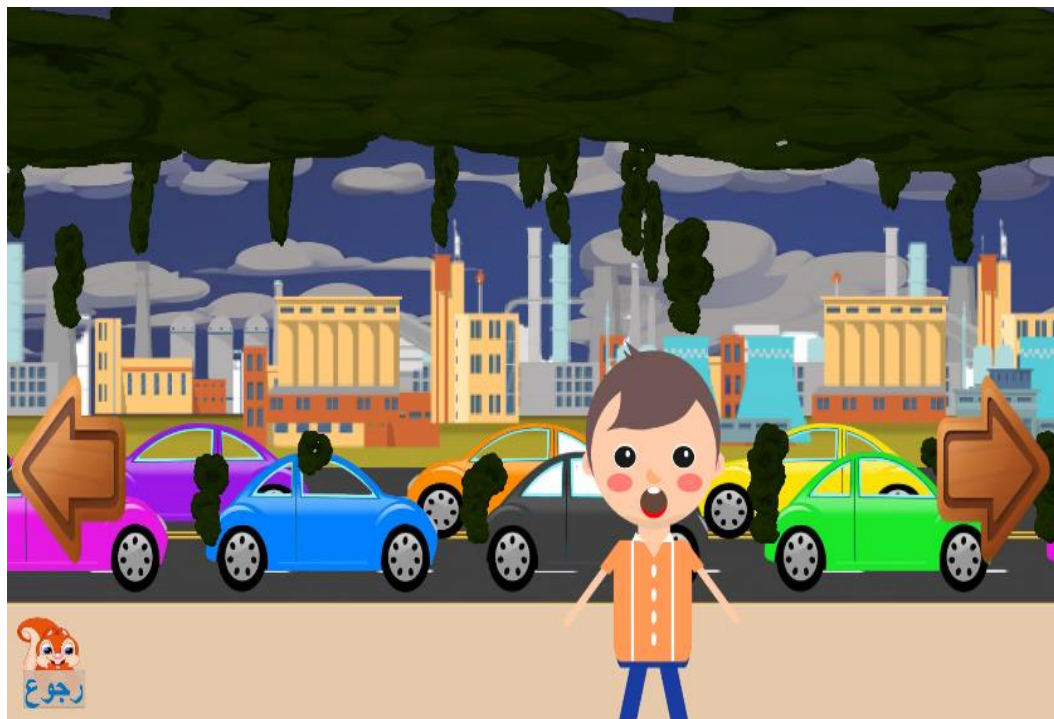


Figure 3.18 City scene

The last scene is for the forest, where the child goes and sees the transformation in it before and after cutting the trees, and how it became dry and its temperature is high due to the emission of greenhouse gases by cutting trees that trap heat in the atmosphere.



Figure 3.19 Forest Scene

Causes quiz:

At the end of the section, we have a quiz to test the child's information. When the child answers correctly, the answer is colored green, but when he chooses the wrong answer, the correct answer will light up green so that the child knows what the correct answer is. Also, with this quiz, after the experiment at school, we made the questions that the kids answered wrong the most repeat with different options order to confirm the information, and also everything is stored in the databases. When the child gets a few marks the next time, he will return to the scenes to watch it again, not to the quiz, and a button named Test will appear to enable him to go to the quiz whenever he wants.



Figure 3.20 Causes Quiz



Figure 3.21 Show the correct answer

Four Section:

The last section is the prevention section, a group of games that guide the child to the things that must be done to reduce climate change and its damages. It contains five parts, each part contains one or more stage.

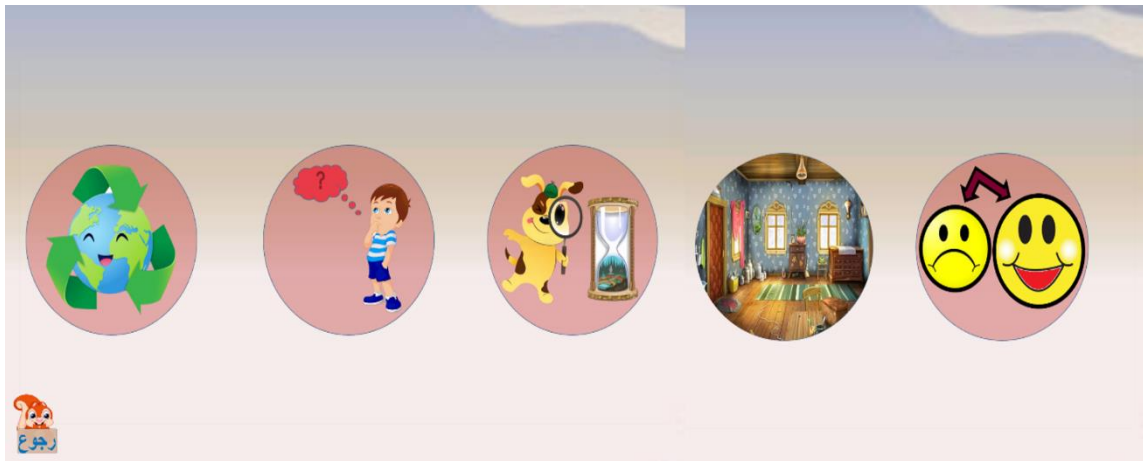


Figure 3.22 Prevention method menu

The first part teaches the child about recycling. It contains two stages, in which there are three containers. Each container is designated for a specific type. The child drops each object to the appropriate container for it if is true the container light green if wrong light red, when the child drops the object between the containers, the game is restarted from the beginning. when the first level ends with high score, the next level opens.



Figure 3.23 Level 1 of recycling

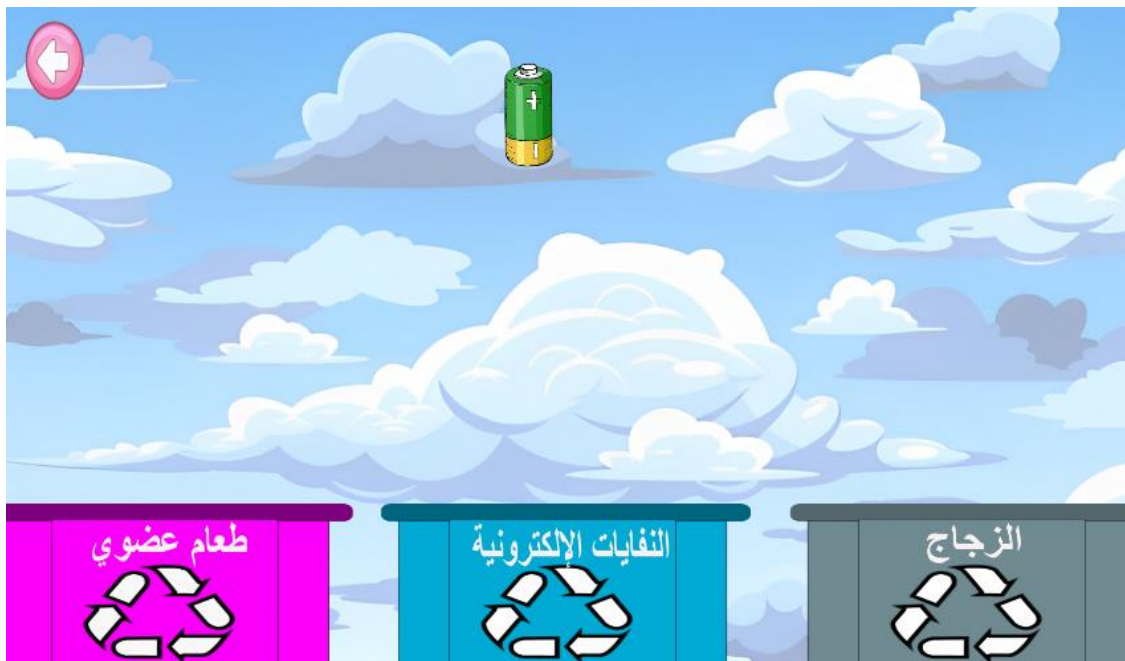


Figure 24 Level 2 of recycling

The second part contains three levels. Play with the opponent.



Figure 3.25 Play with the opponent menu

In the first level, we have 4 means of transportation, arranged according to the most efficient and the most environmentally friendly. The child earns a point if he chooses a means of transportation that is more environmentally friendly than the opponent, but if the two choose the same means of transportation or if the child chooses the means of transportation that is more harmful to the environment, he does not receive a point and repeats the attempt. To move to the next level, a number of scores must be collected.

The arrange of the transportation a bicycle, an electric car, a train, and then a car.



Figure 3.26 Play with the opponent level 1

The next level of playing with the opponent is the same principle as the first level, but this time choosing between the most environmentally friendly light sources.



Figure 3.27 Play with the opponent level 2

The last level of playing with the opponent according to the appropriate quantity and quality of food.

The arrangement of food is a vegetable dish, a fast food dish, and finally a feast for two.



Figure 3.28 Play with the opponent level 3

The third part is the search for the tools used for agriculture hidden in the old house, when the child collects them completely, he helps plant a new tree to encourage and motivate them to plant trees to obtain a healthy environment and limit climate change.



Figure 3.29 Hidden Tools



Figure 3.30 Planting new trees

The fourth part of this section allows the child to enter the house and turn off all unused energy sources, and whenever one of them is turned off, a point is awarded to him.



Figure 3.31 Reducing home energy consumption 1

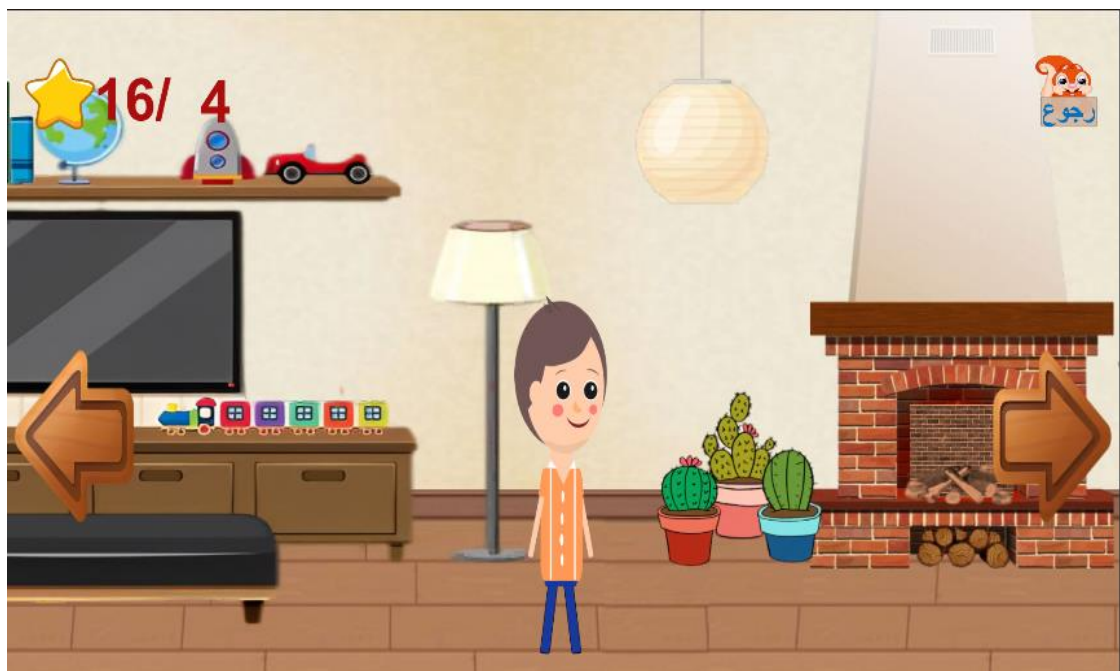


Figure 3.32 Reducing home energy consumption 2



Figure 3.33 Reducing home energy consumption 3



Figure 3.34 Reducing home energy consumption 4

The last part consists of two levels, connecting points to each other.



Figure 3.35 Matching menu

At the first level, connecting each corrective action with its opposite. For the child to understand what are the correct actions to be followed.



Figure 3.36 Matching level 1

The final level is to connect renewable and non-renewable energy sources in right place.



Figure 3.37 Matching level 2

3.1.2 Eco Adventure Game Engine:

In this project, we choose Unity as a game engine. It provides a great experience, the platform provides a comprehensive set of software solutions to create, run and monetize interactive, real-time 2D, and a big community for game developers. We use C# language for developing this game, also for the IDEs that we used for coding Microsoft Visual Studio. (Unity, n.d.)

3.1.3 Eco Adventure Database System

We used the database Playfab from Microsoft Azure's which is a complete backend platform for live games with managed game services, and real-time analytics. To track data for all players because it's very efficient to remove the challenges of building, managing, and running low-latency multiplayer servers at scale with a complete back-end solution. In addition, use multiple forms of built-in authentication to track players across devices. It allows for the creation of easy and quick leaderboards and runs content experimentation to deepen player engagement. Finally, deepen player engagement with sophisticated LiveOps tools by creating rich player segments and running A/B experiments. We used platform-specific authentication in PlayFab to make logging in and signing up easier. Users log in with the device identifier (for Android). Android's device identifier is unique to each user and only changes if the user resets the device. (Playfab, n.d.)

When the child enters the game for the first time, the Signup page appears for him/her, where he/she enters his/her name and password to obtain an account in the game, and after that, every time he/she puts his/her name and password to enter, he/she completes the game from where she/he stops last time and everything remains saved in terms of opening closed levels or any points he gets on it through it.



Figure 3.38 Signup scene

3.1.4 Eco Adventure Game Design

The main scene of the game is the main menu that appears after the first scene of the child with the ice cream that melts from the high temperature. The menu contains the four main sections of definition, causes and damages, as well as methods of prevention. These sections are closed, only the first section is open, as it is the beginning of the adventure.



Figure 3.39 Main Menu

3.1.5 Eco Adventure Feedback System

In order for the child to see progress in the levels, we put a star system, the stars appear above the sections that express the points. What the child achieves during the game is extinguished at the beginning and then lights up according to the points collected. If he/she collects high points, the three stars light up in golden color.



Figure 3.40 Main menu with star 1



Figure 3.41 Main menu with star 2

We designed the system to demonstrate the process that which we light stars.

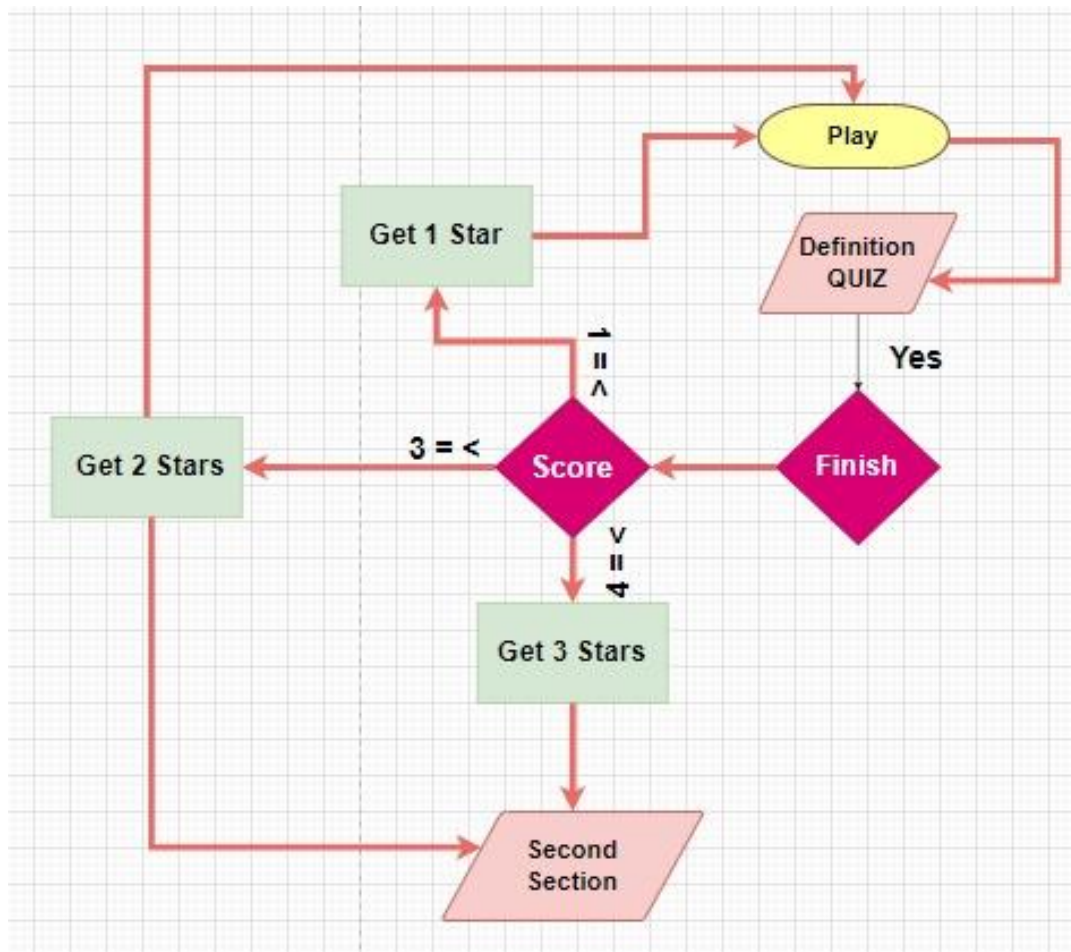


Figure 3.42 Get stars system

We also have a feature that the child can give his opinion and experience with the game through a button on the Signup page, then it will be sent to the admin's google form, which enables us to collect information about the effectiveness of the application.

←

ما هي ملاحظاتك

ما هي أكثر مرحلة أعجبتك؟

اكتب اسمك:

المرحلة ١
المرحلة ٢
المرحلة ٣
المرحلة ٤

هل أحببت اللعبة؟

جدا
عادي
لا

ما هي الصعوبات التي واجهتك أثناء اللعب؟

ما هي لعبتك المفضلة في اخر مرحلة؟

ما هو أكثر شيء أعجبك باللعبة؟

الصوت
اللاعبين
الصور

لعبة التخمين
لعبة التوصيل
لعبة اعادة التدوير
لعبة ايجاد القطع المخبأة
لعبة داخل المنزل

Figure 3.43 Feedback 1

ما هي لعبتك المفضلة في اخر مرحلة؟

ما هي اللعبة التي واجهتك بها صعوبة في اخر مرحلة؟

لعبة التخمين
لعبة التوصيل
لعبة اعادة التدوير
لعبة ايجاد القطع المخبأة
لعبة داخل المنزل

لعبة التخمين
لعبة التوصيل
لعبة اعادة التدوير
لعبة ايجاد القطع المخبأة
لعبة داخل المنزل

ما هو أكثر شيء أعجبك باللعبة؟

الصوت
اللاعبين
الصور

ارسال

Figure 3.44 Feedback 2

18 responses

Name:

منار

Do you like the game?

a lot

most liked stage

stage4.

any difficulties?

لا شيء

Favourite game

guessing, Matching, recycle, hidden items, home.

What is the most thing you liked about the game

the images

most difficult game

Matching.

The audio for the game was recorded at the Faculty of Mass Communication at An-Najah National University.

3.2 PROCEDURE

We applied the game to a group of first, second and third grade students, about 20 and more students from Asmaa Bint Al-Siddiq School, as their school curriculum is not given about climate and climate change, so they do not have information at all. We asked them some questions before starting the game and repeated them after. Also, we applied it to young in family children of the same age group

Results and Discussion

We did the study on 30 children from the first, second, and third grades, most of them are females, female (90%) and male (10%), and most of them are 8 years old.

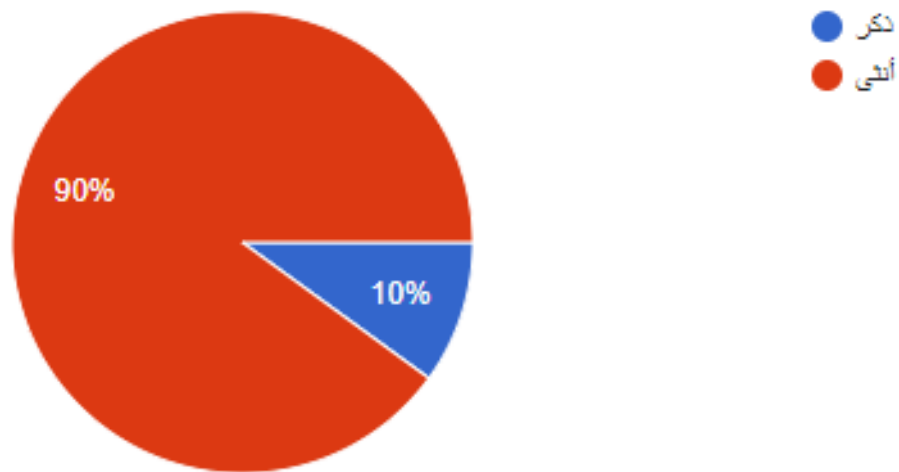


Figure 3.45 Age Distribution Chart

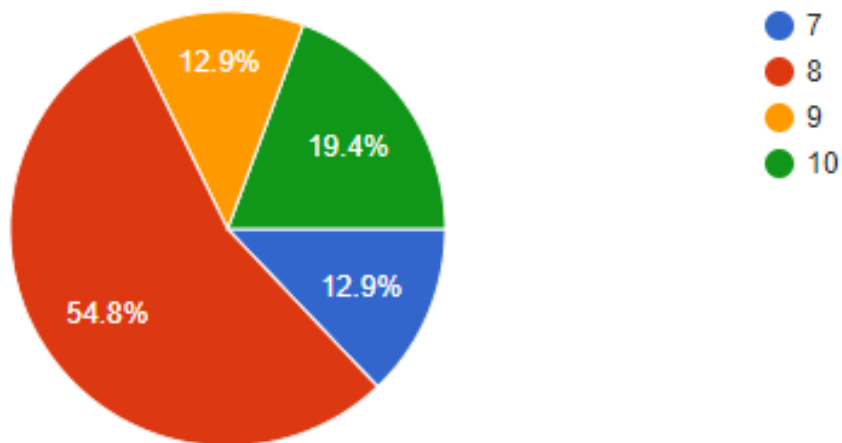


Figure 3.46 Gender Distribution Chart

We noticed the interaction of the second and third grades with the game more than the first graders, as shown in the chart below that present the age with score.

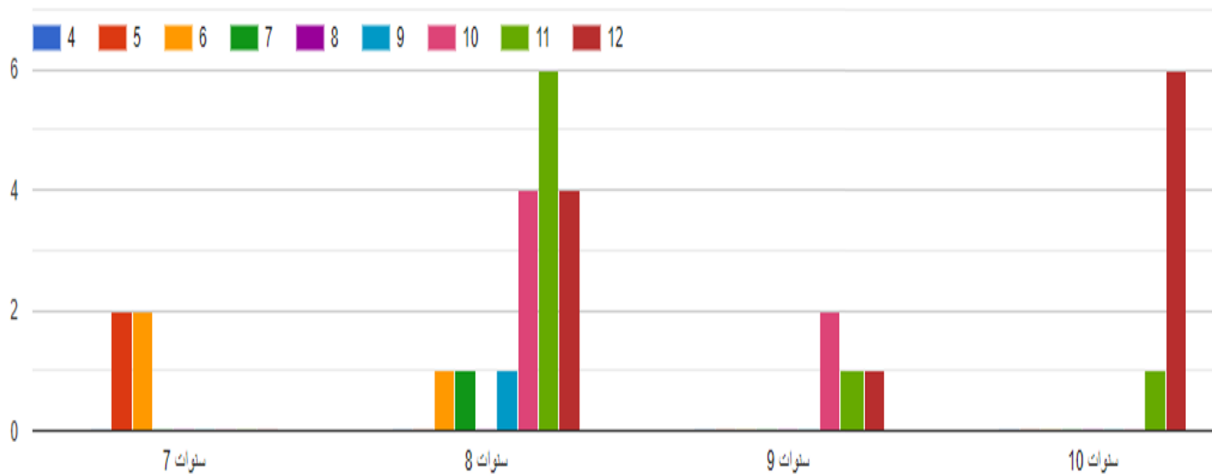
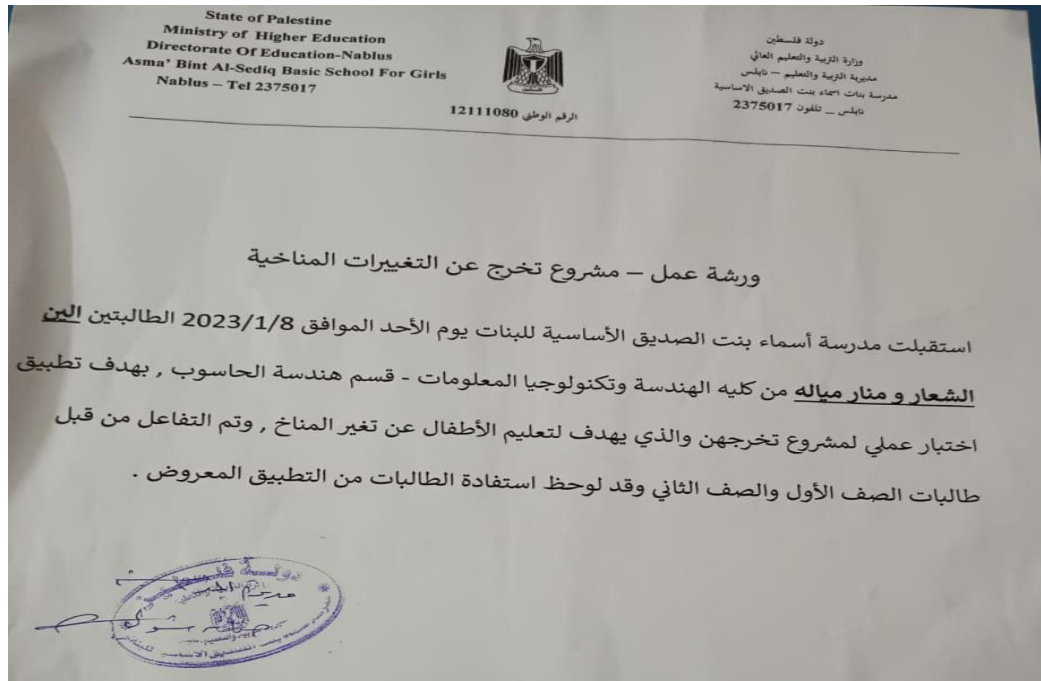
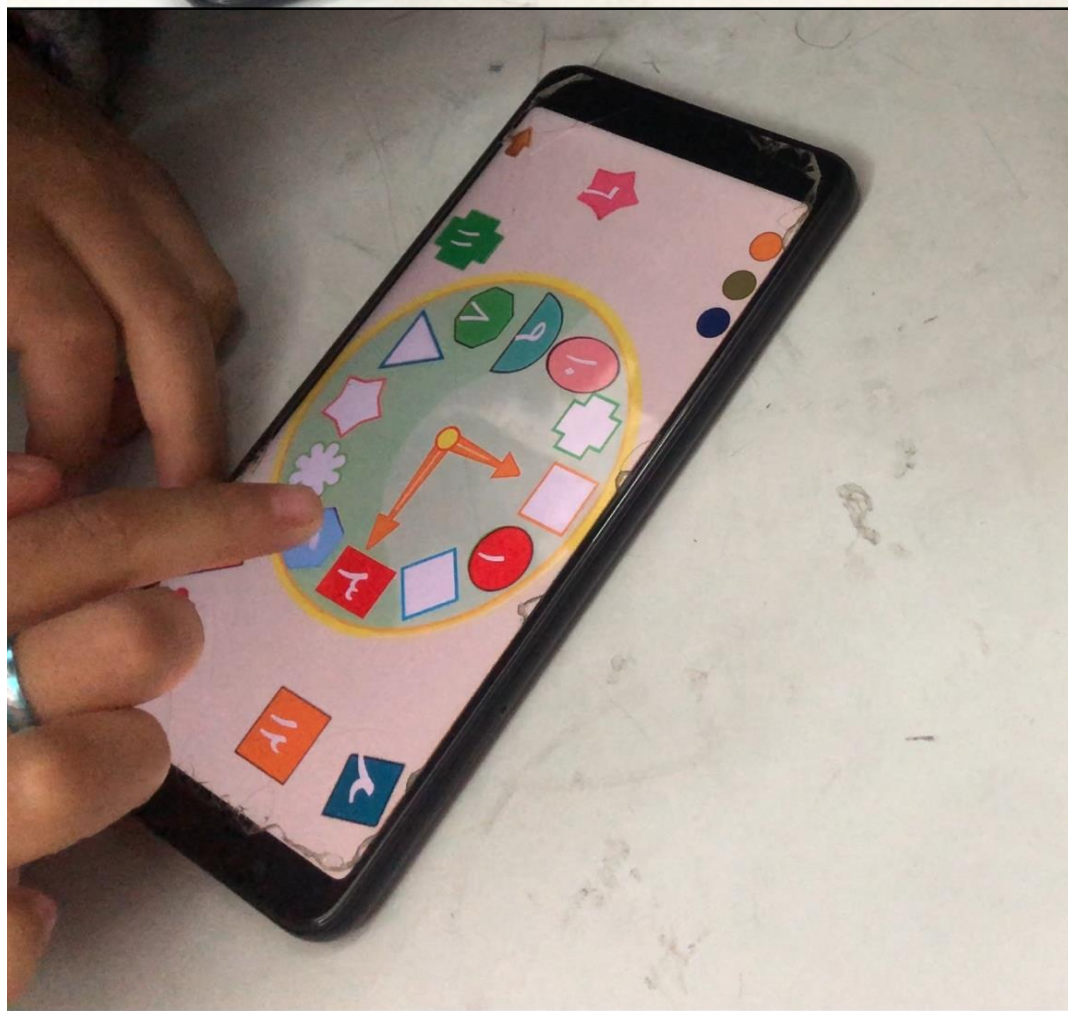
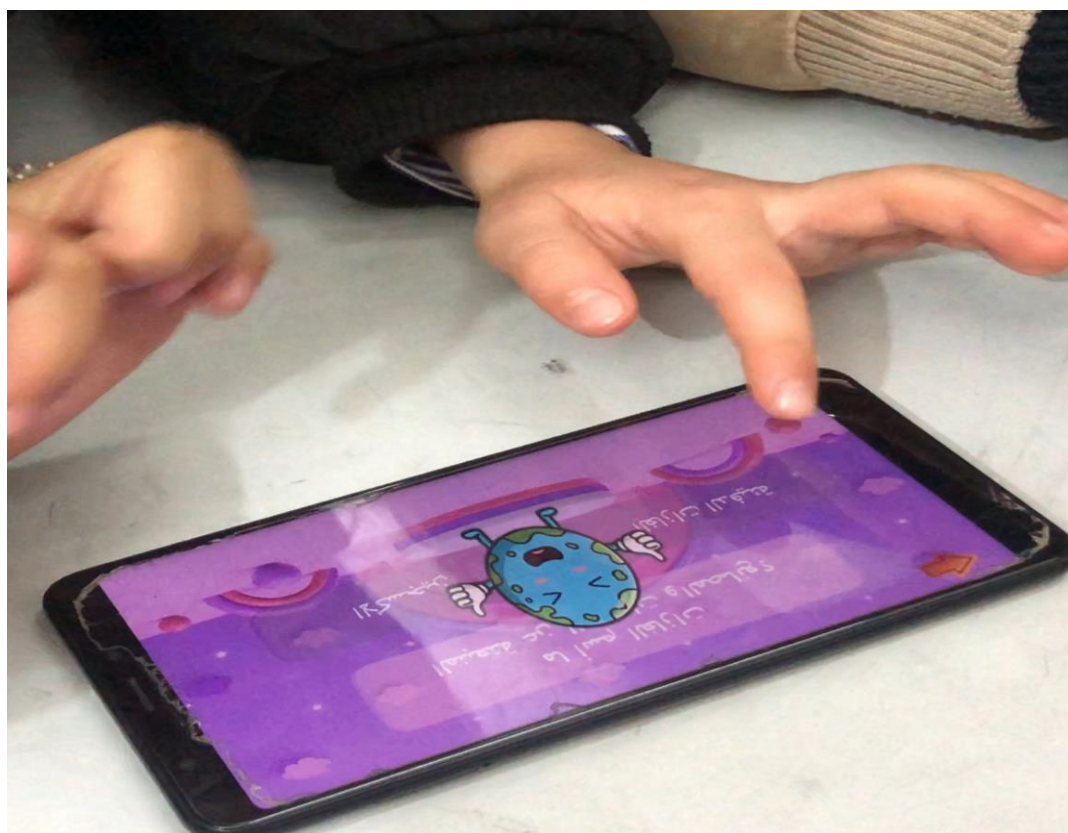


Figure 3.47 Average Of Score

Through this study, we made sure that when technology is exploited and employed for learning, it achieves more effective results than the usual study methods, especially through entertaining Mobile applications same as our application for a problem such as climate change that is difficult to explain to children of this age. We have achieved good results.







Conclusion:

In this project, we developed a mobile application in Arabic to increase children's awareness of climate change in primary school. The name of game is “Eco Adventure” aims to instruct the kids what climate change, its causes, consequences, and finally ways to reduce it.

The game was applied to female students in the first and second grades of Asmaa Bint Al-Siddiq School, who don't have an idea about climate changes, why it changes, and who are the affected groups.

Based on the results, the application generated good results since the students interacted with the game well and gained a great deal of knowledge about climate change and environmental preservation.

We also noticed that students in the older grades interacted better with the game than students in the first grade, because they are still learning the letters.

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