



**Ishrahly**  
**Modeling Human Urinary and Digestive**  
**Systems**  
**Using Three JS**

A Graduation Project Proposal Presented to the  
Faculty of Information Technology  
In Partial Fulfillment for the degree of Bachelor in Multimedia and Web Development  
The Islamic University Of Gaza

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August / 2019

# Abstract

The number of Internet users has increased recently, especially children. There are a lot of websites for different purposes: educational, commercial, entertainment, etc.

In this project, we develop an educational site for school students of Palestinian curricula, especially in the subject of life sciences, in particular, the human organs. We choose this area to cap the lack of explanatory materials that facilitate the student to understand and study. We target students from grades 4 to 10. We make a 3D model prototype for the digestive system and the urinary systems. We use an agile methodology to develop project phases. The student can navigate between the digestive system and the urinary systems through the controls, and he/she can rotate the 3D model to discover parts of the system, the site also shows the description of each organ.

The site has been tested on students and students who studied using the site obtained 57.1% and the ones who studied from the paper sheets obtained 42.9%. As a result of this project, the site presents a part of content of the Palestinian curriculum in a more realistic and clear way and this makes it easier for the student to imagine the scientific material.

## أشرحلي: نمذجة الجهاز البولي والهضمي في جسم

### الإنسان باستخدام مكتبة Three JS

#### المخلص

في الآونة الأخيرة زاد عدد مستخدمي الانترنت وخاصة من الاطفال، أصبح هناك الكثير من المواقع الالكترونية في مجالات مختلفة (التعليمية، الترفيهية،... وغيرها). في هذا المشروع نقوم بتطوير موقع تعليمي لطلاب المدارس الفلسطينية في مادة العلوم الحياتية قسم "أجهزة جسم الانسان" لوجود نقص في المواد التوضيحية المتوفرة في هذا المجال. استهدفنا الفئة ما بين الصف الرابع والعاشر ونقوم بتصميم نموذج ثلاثي الابعاد للجهاز الهضمي والجهاز البولي المقترح في المنهاج. يمكن للطلاب التنقل بين الجهاز الهضمي والبولي من خلال ادوات التحكم. ويمكنه أيضا تدوير النموذج لاكتشاف الاعضاء ، كما يعرض الموقع شرح لكل عضو. تم اختبار الموقع على الطلاب ، الطلاب الذين درسوا باستخدام الموقع حصلوا على نسبة 57.1% أما الطلاب الذين درسوا من أوراق العمل والكتاب المدرسي حصلوا على نسبة 42.9%. بالتالي أصبح لدينا موقع يقدم محتوى المنهاج الفلسطيني بطريقة أكثر واقعية ووضوح تجعل الطالب قادر على تخيل المادة العلمية بشكل أفضل.

## Acknowledgement

All Thanks

To Allah

Who gave us the ability to successfully complete the graduation project

All Thanks

To our parents

Who gave us great support and help to reach this achievement

All Thanks

To our teachers

Especially Our supervisor, **Dr. Motaz Saad**

For his efforts with us during the project

All Thanks

To everyone who encouraged us to successfully finish  
the graduation project

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## List of Abbreviations

#	Word	Abbreviation
1	ILP	Interactive Learning Program
2	MTL	Material Template Library
3	OBJ	Wavefront OBJect
4	FBX	Filmbox
5	COLLADA	Collaborative Design Activity

Table 0-1 List of Abbreviations

# **1 -Chapter One**

## **Introduction**

## 1.1 Introduction

Internet users have increased recently, and there are now more than 4 billion [1] people around the world that uses the internet, Children's Access to and use of the Internet In 2015 [2], about 71 percent of children ages 3 to 18 years old use the Internet.

According to the Palestinian Center for Statistics 2016/2017 [3]

In the primary stage (elementary and preparatory), 42,723 students were enrolled in all the educational sectors in Gaza.

The table shows the number of students who benefiting from the site in Gaza:

Education Sector	Fourth Grade	Sixth Grade	Tenth Grade	Total
UNRWA Schools	30503	28627	–	59130
Private Schools	2031	1591	743	4365
Public Schools	17022	16888	33188	67098
<b>The Total 130593</b>				

Table 1-2 students number for the grade (4-6-10) of Gaza schools

According to a survey that we conducted, traditional education lacks explanatory tools that provide a student a comprehensive view of the curriculum, especially the science book, which contains the explanation of human organs in traditional ways such as pictures and writing.

We asked students what is the human body system that is difficult to understand in the class and difficult to study at home. The proportion of Urinary system was 55.1% and the Digestive system 12.2% and the Respiratory system 32.7%. Also, we asked teachers about the system that

they have a difficult to an explanation to the students. The proportion of Urinary system was 20% and the Digestive system 60% and the Respiratory system 20%.

Based on these results we decided as a preliminary stage, modeling of the digestive system and urinary system in the human body in this project.

### Result of student survey:

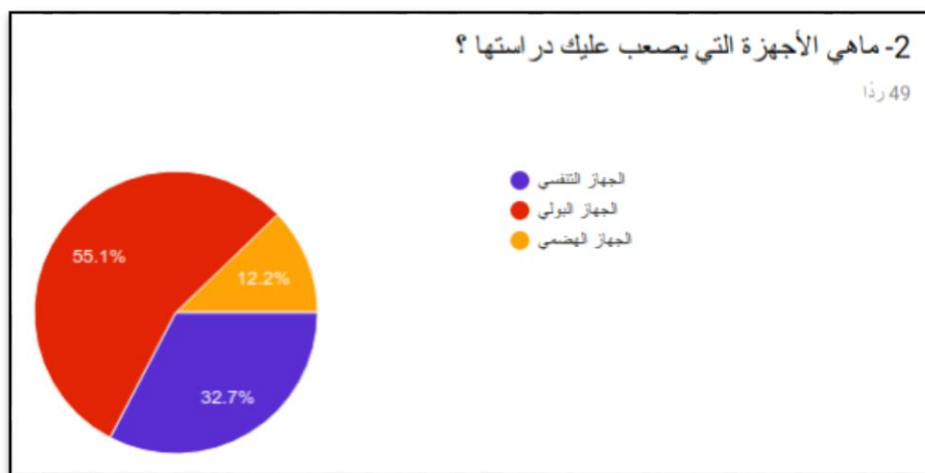


Figure 1-1 Student Survey

### Result of teacher survey:

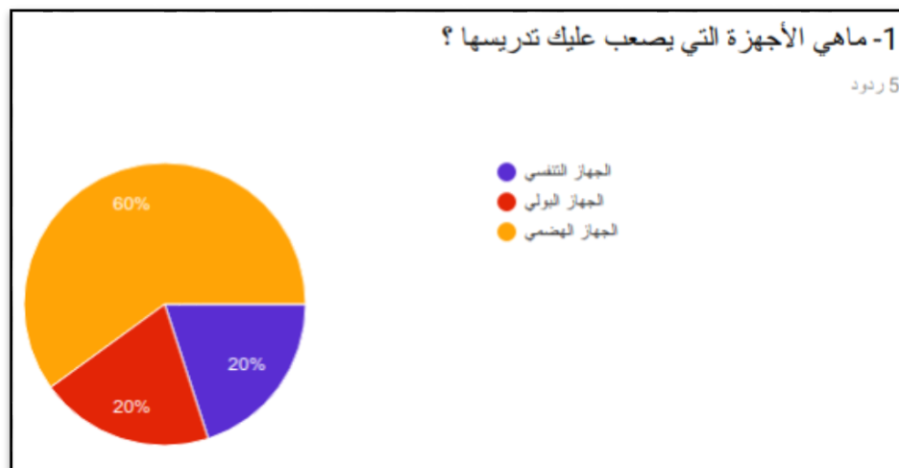


Figure 1-2 Teacher Survey

Educational materials can be presented in different ways like photos and videos, one of these way is to present materials as a 3D model. The technique of creating 3D was first invented in 1838, 3D means three-dimensional [4], and i.e. something that has a width, height, and depth (length). Our physical environment is three-dimensional and we move around in 3D every day.

3D has been very popular in the world, has been used in many medical, educational and entertainment fields in the form of videos, applications, and games. There are a lot of applications and sites that support the explanation of the human body in a 3D, Such as an Anatomy application [5] that displays the human body in full with the possibility to describe all organs and uses the technique of 2D, 3D and provides a description for each organ in English. In addition, there is **Sketchfab** website [6] that displays all the human systems in the form of 3D and presents a simple description of the entire organ. However, these examples do not provide functionality to simulate a human system for the Palestinian curriculum.

So the aim of our project is to develop a web site that displays 3D models of human systems of the Palestinian curriculum with a description in Arabic.

We chose our project to be a website and not a video so we allow the student to see the organ in a way closer to reality and be able to control while the video is one of the traditional ways that does not make the student part of the experience and it's not interactive. Our project is also not a mobile application so the teacher can show it to students using the projector so that students can use it while they are at home using the computer and most students do not have mobile phones.

## **1.2 Statement of the problem:**

The problem is the inability of the student to understand the lessons related to human body organs because the explanation is traditional through the thumbnails in the book of Palestinian curriculum. The teacher and students find it difficult to use these methods to communicate the information to the student.

## **1.3 Objective of the work:**

### **1.3.1 Main objectives:**

The main objective is to make 3D models of human systems (urinary and digestive) and render them in a web page explains these models and the details of the parts for organ of a human being within the Palestinian curriculum.

### **1.3.2 Specific objectives:**

- Conduct a survey.
- Choose system of the Respiratory system, the digestive system, and Urinary system based on a survey.
- Learn how to make realistic textures.
- Learn how to use WebGL technology.
- Learn how to combine model and textures.
- Design model.
- Make model textures.
- Compiling the scientific material from the Palestinian Curriculum.
- Add controllers to interact.
- Make an instructional video on how to use the site.
- Designing a logo.

- Choose a suitable name for the site.

#### **1.4 Importance of Project:**

- The ability to explain the human organs in science to the student in a way closer to reality.
- It makes it easier to identify human body organs and the ability to detect parts.
- Make the Understanding easier
- Transform the traditional teaching method into an interactive one in Palestinian schools.
- Simulation of the human organs prescribed in the science book.
- The ability to publish this site in Palestinian schools and thus develop the educational process in Palestine.
- Develop intelligence and cognitive level for kids and making them love to learn.
- Helps to see the models in a way that helps to explain the parts and bring them closer to the mind
- Easy to open the location of all places and devices

## **1.5 Scope and limitations of the work:**

### **1.5.1 Scope:**

- Our Website contains 3D model of the digestive system, and Urinary system.
- The site for a Palestinian curriculum only and especially science book.
- The site in Arabic only.

### **1.5.2 Limitations:**

The project does not simulate all the human beings in the curriculum in our project.



# **2 -Chapter Two**

## **Related Work**

## 2.1 Review of Related works:

This section reviews some of works that are related to our project.

### 2.1.1 Sketchfab [8]

It is a website was started in early 2012, empowering a new era of creativity by making it easy for anyone to publish and find 3D content online. With a community of millions of creators who have published millions of models, like many 3D models for the human body and organs like the brain and eyes.

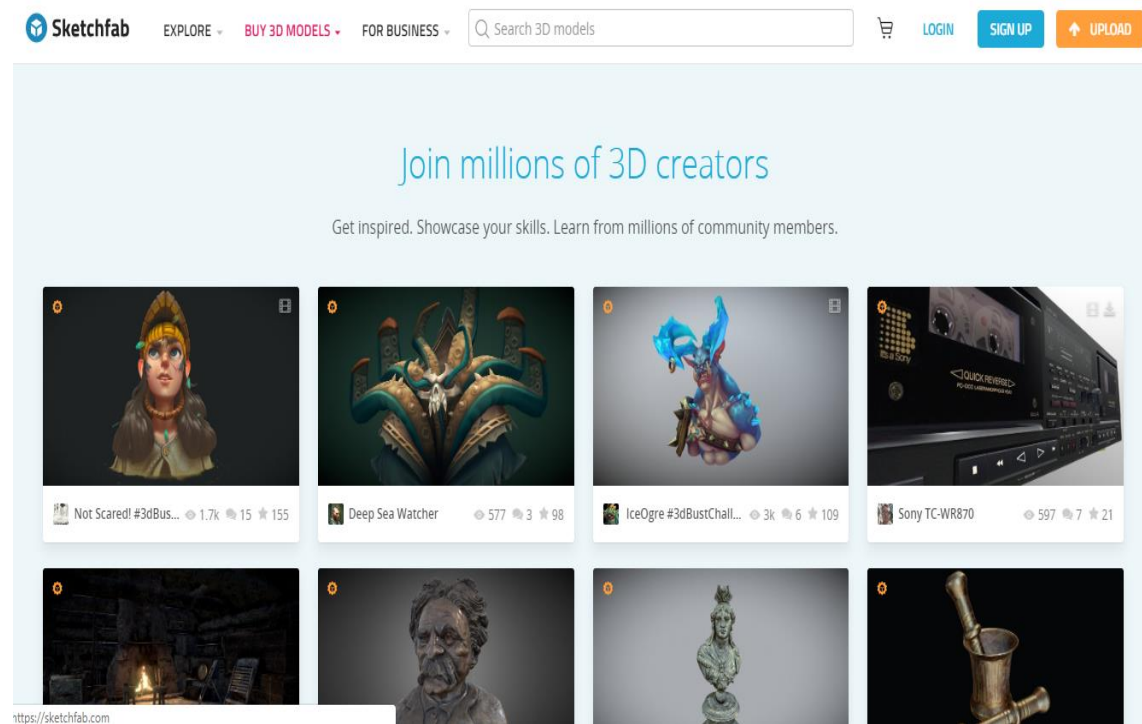


Figure 2-3 Sketchfab

### 2.1.2 MakeMeGenius (website and YouTube channel) [9]

It is a channel on YouTube containing many educational videos for children, including videos explaining the human body systems in English with writing organs names and a description of each organ, they also have a website that offers many explanations on many topics.

### 2.1.3 Rawafed Educational [10]

Rawafed is a website established by the Ministry of Education and Higher Education in Palestine. It offers many videos for different ages and in many articles. But the videos they offer explain in English.



Figure 2-4 Rawafed Educational Home Page

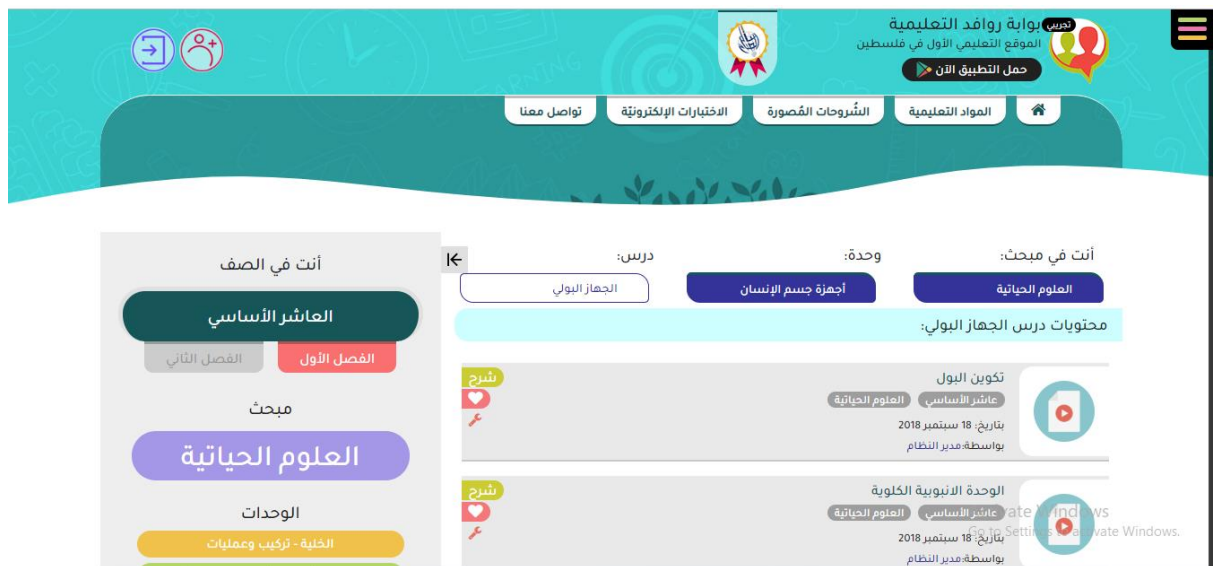


Figure 2-5 Rawafed Educational Tenth Grade Content Page

### 2.1.4 Health Line [11]

Health line is a website that displays 3D model for the entire structure of the human body contains the human organs and when the pressure on a specific organ, the site organ that you chose with some details and explanation in English about that organ. Display organ name and then move on a new page displays a 3D model for the organ that you chose with some details and explanation in English about that organ.

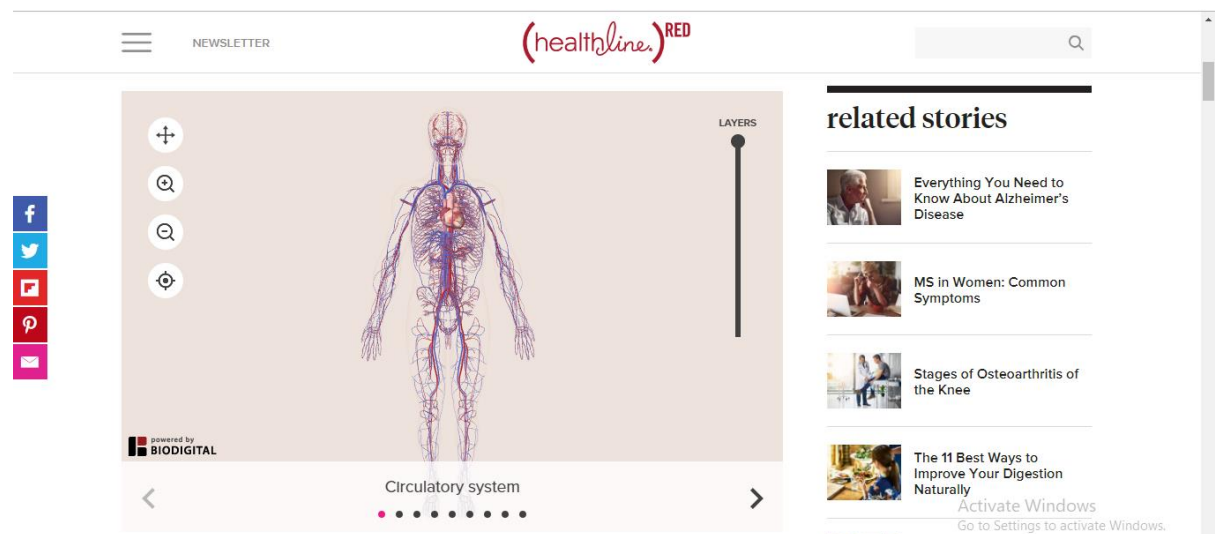


Figure 2-6 Healthline Main Page

### 2.1.5 ILP (Interactive Learning Program) [12]

A website created by UNRWA that provides an explanation of Arabic and mathematics only through a series of books and videos as well as a system of education through games.



Figure 2-7 Interactive Learning Program Main Page

## 2.2 The difference between our project and related works

- Most previous sources do not support Arabic.
- Sites that explain the Palestinian curriculum do not include a science curriculum such as ILP.
- Some sites offering 3D models only allow these models to be purchased.

# **3 -Chapter Three**

## **Methodology**

### **3.1 Methodology**

We use Agile XP methodology in our project because it is flexible, adapt to changes, and early warning of problems, and we use programming technology (Three JS).

**During** the project life cycle, we proceed in five stages as follows:

#### **Phase 1: Project Planning:**

At this stage, we defined the tasks required to complete the project, distribute the tasks to the team members, prepare the programs and equipment necessary for the work and determine the duration of each task.

#### **Phase 2: Analysis and Risk Management**

Based on the project planning phase, we analyzed the data by analyzing the content of the Palestinian Curriculum for Life Sciences inadequate stages, especially the chapter of human organs. And the work of the questionnaires for students and teachers to choose the human system on which the project based on the final results. This is done by presenting a sample test and asking some questions to help know the human system.

#### **Phase 3: Design**

In this phase, we designed the selected organ of the modeling and design textures, and for the site, we designed the logo and interfaces and identify the appropriate colors for the selected age group.

#### **Phase 4: Implementation**

At this stage, all the previous tasks are implemented and the actual implementation of the project is started by simulating the model, programming the site and adding the model.

### **Phase 5: Testing**

At this stage, testing the model within the site and then display the site on the target sample to test ease of use and the ability of the student to understand and deal with observations.

### **3.2 Team Management:**

Project staff consists of two members:

#### **3.2.1 Team member:**

- Reem Khader Sheikh Khalil.
- Walaa Medhat Mohtaseb.

#### **3.2.2 Team Work Table:**

<b>Phase Task</b>	<b>Staff Member</b>
Analysis	Reem K. Sheikh Khalil Walaa M. Mohtaseb
Modeling & Texturing	Reem K. Sheikh Khalil
Development	Walaa M. Mohtaseb
Design	Reem K. Sheikh Khalil Walaa M. Mohtaseb
Test	Reem K. Sheikh Khalil Walaa M. Mohtaseb
Documentation	Reem K. Sheikh Khalil Walaa M. Mohtaseb

**Table 3-3 Team Work Table**



### 3.3 Project scheduling and Time Table:

#### 3.3.1 Time Table:

The Time Table of this project based on Software Development Methodology.


























	Task Mode	Task Name	Duration	Start	Finish	Description
		▲ Sprint1	30 days	Tue 2/26/19	Mon 4/8/19	
		Design Model Prototype				We create a simple 3D model to test it.
		First Scene Prototype				We prepare a scene and put camera, light and test model.
		Simulate Urinary Model				Start simulate real Urinary model with details.
		Fix Light & Camera				Prepare adjusted light and camera.
		Create JSON file				Prepare JSON file contain all Human Systems informations.
		Fix Deploy				Build project in heroku server.
		▲ Sprint2	30 days	Tue 4/9/19	Mon 5/20/19	
		Kidney Anatomy				Start anatomy kidney to three layers.
		Install Exports Plugin				Activate OBJ export and export the first file.
		Create Sene Controller				Add controller panel to control scene object.
		Simulate Digistive System				Start simulate real Digistive model with details.
		Coloring Models				Add color to models as an initial phase.
		Activate Hover Controller				Built function to determine which Organ the mouse was passed on.
		Show Description				Prepare function to render information from JSON file.
		▲ Sprint3	30 days	Tue 5/21/19	Mon 7/1/19	
		Collect Texture Images				Search about real Organ image and edit it in Photoshop.
		Texture Mapping UV				Maping texture image into model.
		Final Model Edit				We do finishing to models.
		Export OBJ, MTL Files				Convert Maya Model to OBJ and MTL Files to use it in web.
		Show Texture				Edit MTL file to show the texture on web.
		Set Model Controller, Light and Possition				Add model to scene and set controller, adjusted light and possition.
		▲ Sprint4	30 days	Mon 7/1/19	Fri 8/9/19	
		Create Website Templet				Build three pages and navigate between it.
		Connect Scene With Template				Link scene with our template.
		Create Demo and Background Video				Montage Background video and the final Demo to explain how to use our Website.
		Design Logo				Design Logo using Illustrator.
		Deploy Website in Server				Deploy our Website in online server.
		Write Document				We write all project stages details.

Figure 3-8 time table

### 3.4 Tools and equipment:

#### 3.4.1 Tools:

##### 1. Figma:

Figma is a cloud-based design tool that is similar to Sketch in functionality and features. We use it to design site interfaces.

## **2. Photoshop:**

We use it to design models textures.

## **3. Illustrator:**

We use it to design a logo.

## **4. Adobe Premiere:**

We use it to make the demo and background site video.

## **5. Trello:**

We use it to manage our project.

## **6. Google Drive :**

We use it to make a survey and to share the files.

## **7. Microsoft Office:**

- Word: we use it to write documentation.

- PowerPoint: we use it to make a presentation for our project.

## **8. Atom:**

We use the editor to write code.

## **9. GitHub:**

We use it to keep version control to our system.

## **10. GitLab:**

We use it to keep version control to our system.

## **11. Maya:**

Maya is an animation and modeling program used to create three-dimensional and we use it to simulate the models.

### **3.4.2 Equipment:**

- Laptop

### **3.5 Programming Languages and Libraries:**

- JavaScript

- Express.js:

We use it in the backend to build the server.

○ **Three.js:** [7]

We use this library to load a model on the web and make a controller.

○ **Node.js:**

We use it to build a node project and to use the modules available.

# **4 -CHAPTER Four**

## **Design**

## 4.1 Website Design

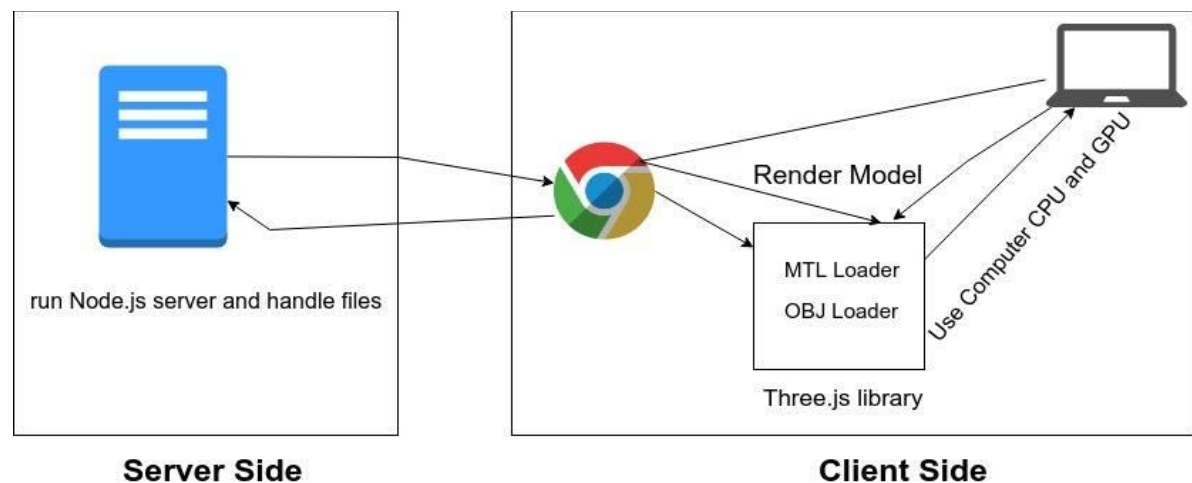
In this chapter, we describe the design of our project.

### 4.1.1 System Architecture

We have two sides, the client side and the server side. The Client side requests from server side the model files, and then the browser render the model help with CPU and GPU.

We use Three.js library to render model. The renderer renders the scene and the scene has three main elements (Camera, Mesh, and Light).

The Mesh consist of the Geometry and the Material.



How Three.js Work:

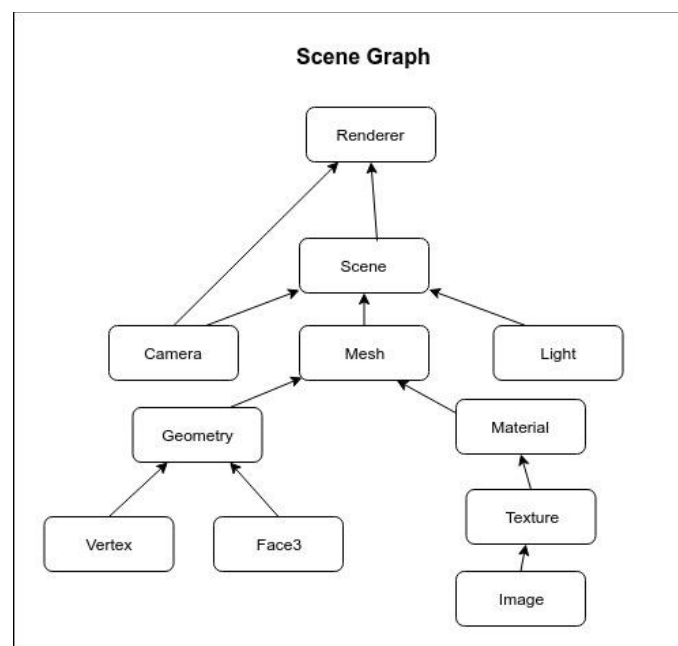


Figure 4-9 System Architecture

## 4.1.2 Layouts

### Landing Page Wireframe:

We have a Navigation in the right of screen that have 3 main pages. “page 1” is the landing page, “page 2” have a content about us and “page 3” contain a video about how to use the site.

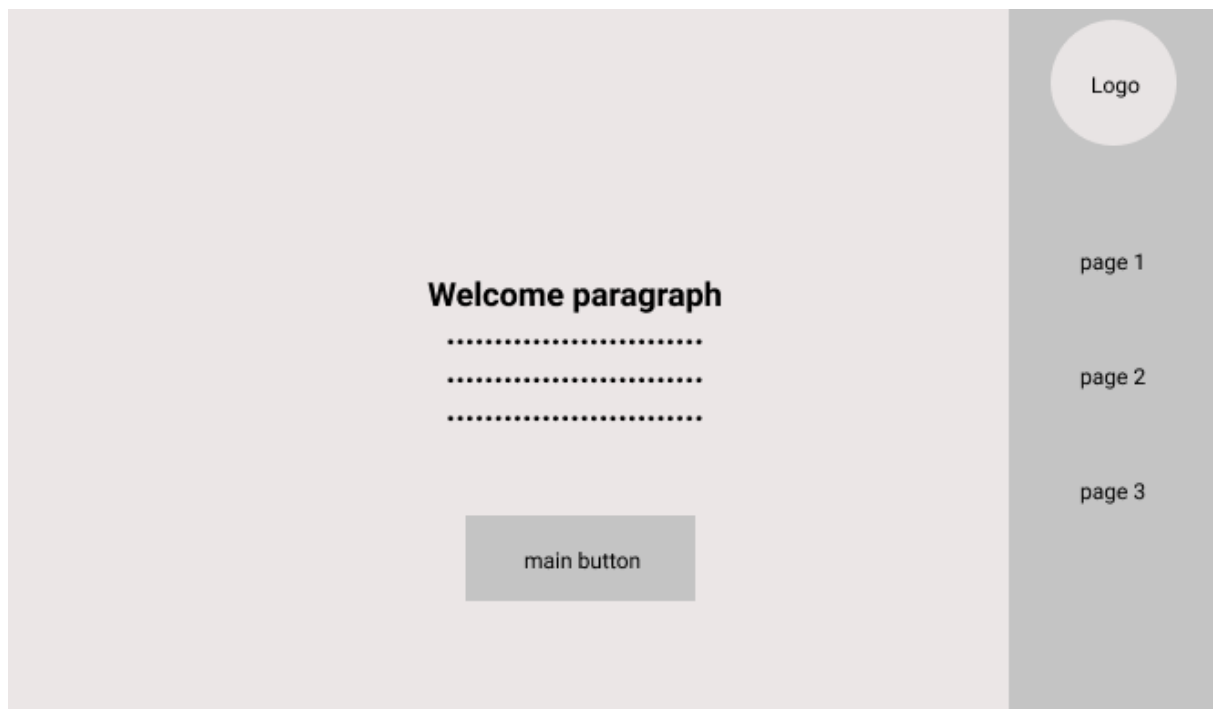


Figure 4-10 Landing Page Wireframe

### Home Page Wireframe:

In the “Model area”, the model will be loaded from MTL and OBJ Files that described in “Figure 4-6 and 4-7”, in the “Controller area” we have a controller for light, rotation, font size and navigate between the models. The “Description area” shows description from JSON file that explained in the “Figure 4-11 JSON object”.

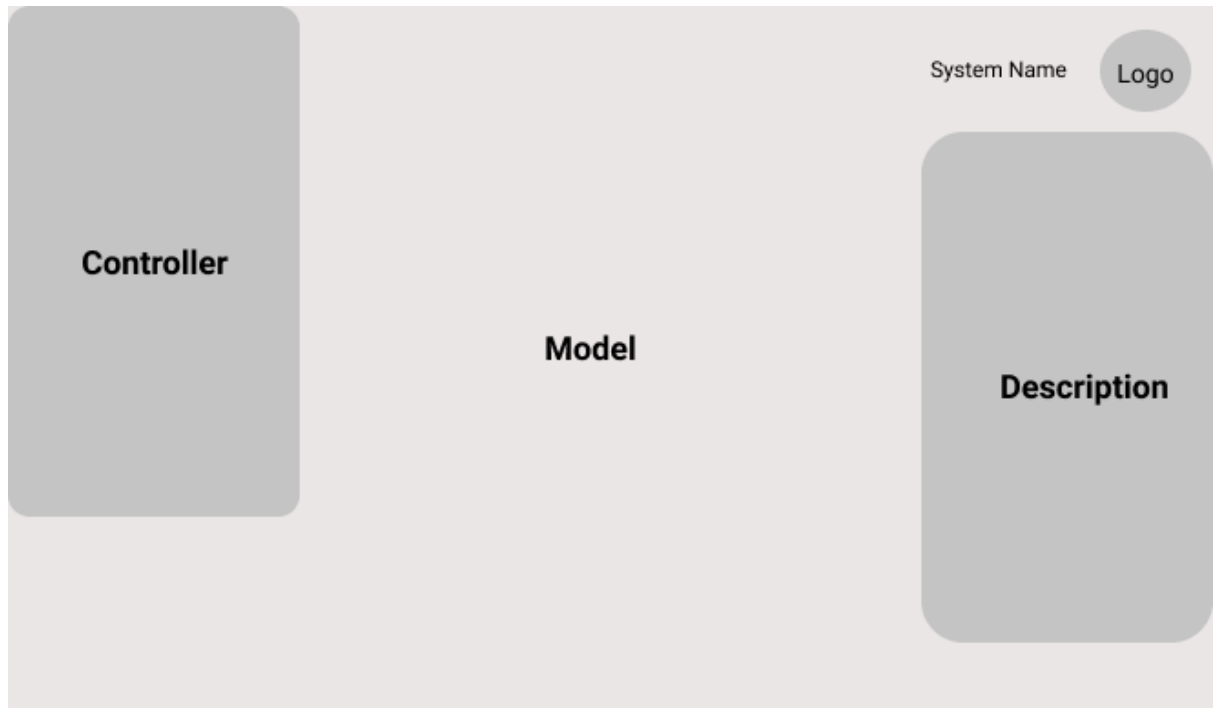


Figure 4-12 Homepage Wireframe

### 4.1.3 JSON Object Structure

Here are some examples of JSON object structure that we generate and use in our system.

#### Example:

```
{
  "urinarySystem": {
    "title": "الجهاز البولي",
    "info": [{
      "الكليتان": [
        "تقعان في الجهة الظهرية من تجويف البطن، مدفونتان في أنسجة شحمية",
        "غالباً تكون الكلية اليسرى أعلى قليلاً من اليمنى بسبب وجود الكبد",
        "تحتوي الكلية على منطقة خارجية تسمى القشرة (داكنة اللون)",
        "ومنطقة داخلية تسمى النخاع يتكون من تراكيب مخروطية تسمى أهرامات الكلية،",
        "وأنابيب صغيرة في حوض الكلية",
        "يصل الدم الى الكلية عبر شريان كلوي لتصفيته، ويغادرها بعد تنقيته عبر وريد كلوي",
        "يوجد أعلى كل كلية غدة فوق كلوية (الكظرية) تفرز هرمون الأدرينالين في حالات",
        "الطوارئ والخوف الشديد، وهرمون الكورتيزول الذي ينظم عمليات الأيض في الجسم"
      ]
    },
    {
      "الحالبين": [
        "هي أنابيب ضيقة في الجهاز البولي تقوم بحمل البول من الكليتين إلى المثانة عن طريق",
        "شد ورخي العضلات في جدران الحالب، حيث يتم إفراغ كميات صغيرة من البول من الحالب إلى",
        "المثانة كل 15 إلى 10 ثوانية كل"
      ]
    }
  ]
}
```

Figure 4-13 The JSON object of the description of the urinary system



## 4.2 Models Design Steps:

This figure shows the model creation steps.

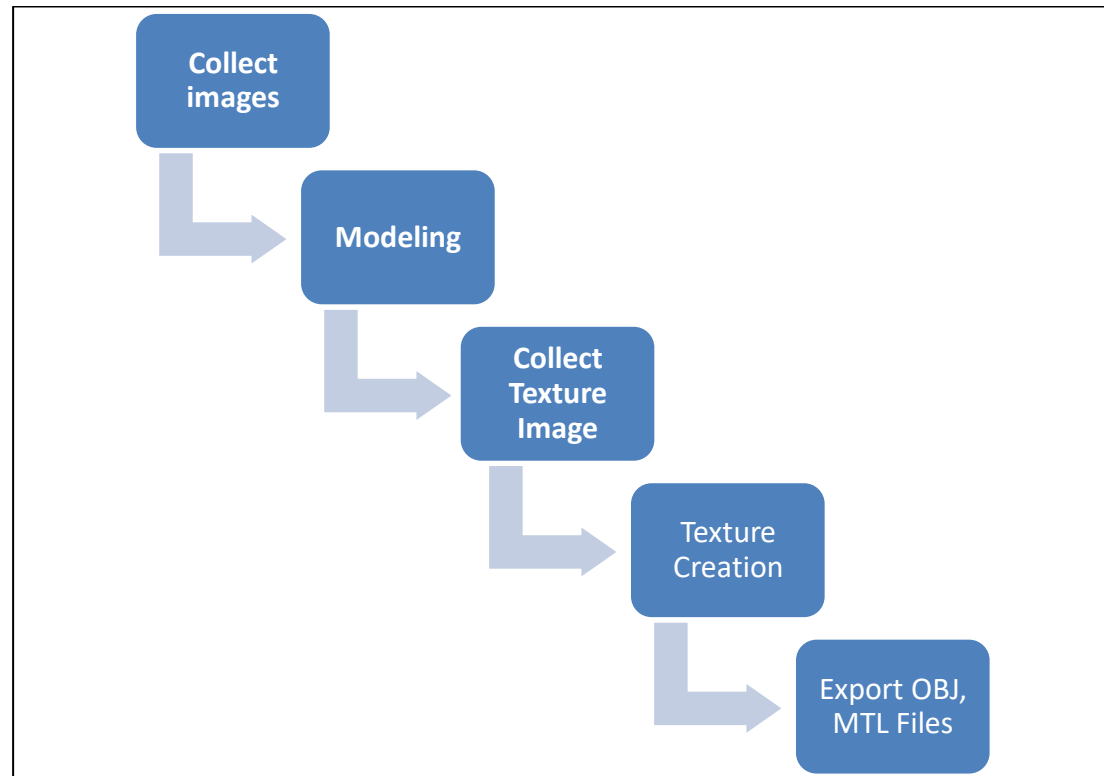


Figure 4-14 Model System Steps

### 4.2.1 Step 1: Collect Organs System Images

At this stage, images of the digestive and urinary tract are collected from science books in the Palestinian curriculum and other sources for each organ.

### 4.2.2 Step 2: Modeling

We started the first phase in modeling the Organs based on the images that were assembled.

We dissected the Organs, then we represented each organ and then started adding more details to make it look more realistic.

In the last step of the stage, we assembled the organs to form one System of the human body.

### 4.2.3 Step 3: Collecting Texture Image

At this point, we compiled and configured the texture using Photoshop. At this stage, we searched and found real organs to take an integrated picture

### 4.2.4 Step 4: Texture Creation

At this stage, we cover the models with the texture that is put on the models, to look more realistic.

### 4.2.5 Step 5: Exporting OBJ, MTL Files

We have exported samples and raw materials from the Maya program using the OBJ export property So that we can use them in the web by uploading these files to the web through the three.js library that helps us to display three web forms.

#### 4.2.5.1 MTL File Format:

The accompanying MTL file specifies the color and texture of the model.

An MTL file may define many materials. Materials are defined with the **newmtl** command.

```
newmtl <name>
```

The properties of the material are defined subsequently. Here are some commands that define properties:

- **Ambient Color Command**

This command defines the ambient color of the material to be (r,g,b). The default is (0.2, 0.2, and 0.2).

Command:

```
Ka <R G B>
```

Example:

```
Ka 0.2 0.3 0.2
```

- **Diffuse Color Command**

This defines the diffuse color of the material to be (r,g,b). The default is (0.8, 0.8, and 0.8).

Command:

```
Kd <R G B>
```

Example:

```
Kd 0.8 0.8 0.7
```

- **Specular Color Command**

This defines the specular color of the material to be (r,g,b). This color shows up in highlights. The default is (1.0, 1.0, and 1.0).

Command:

```
Ks <R G B>
```

Example:

```
Ks 1.0 1.0 1.0
```

- **Illumination Mode Command**

Denotes the illumination model used by the material. Multiple choices are available, which are listed from 0 to 10.

Command:

```
illum <value>
```

Example:

```
illum 4
```

This is a full example of MTL File:

```
newmtl blinn3SG
illum 4
Kd 1.00 1.00 1.00
Ka 0.00 0.00 0.00
Tf 1.00 1.00 1.00
map_Kd antomy k.jpg
bump 3k.png -bm 0.288889
Ni 1.00
Ks 0.00 0.00 0.00
newmtl initialShadingGroup
illum 4
Kd 0.50 0.50 0.50
Ka 0.00 0.00 0.00
Tf 1.00 1.00 1.00
Ni 1.00
newmtl pasted__blinn1SG
illum 4
Kd 1.00 1.00 1.00
Ka 0.00 0.00 0.00
Tf 1.00 1.00 1.00
map_Kd awr (2).jpg
bump awr bump.jpg -bm -0.422222
Ni 1.00
Ks 0.49 0.49 0.49
newmtl pasted__pasted__pasted__lambert2SG1
illum 4
Kd 0.14 0.00 0.00
Ka 0.00 0.00 0.00
Tf 1.00 1.00 1.00
Ni 1.00
newmtl pasted__pasted__pasted__lambert2SG2
illum 4
Kd 0.14 0.00 0.00
Ka 0.00 0.00 0.00
Tf 1.00 1.00 1.00
Ni 1.00
```

Figure 4-15 MTL file format

#### 4.2.5.2 OBJ File Format:

In simple words, the OBJ file format stores information about 3D models [7]. It can encode the surface geometry of a 3D model and can also store color and texture information. This format does not store any scene information (such as light position) or animations. The full name of this file type is “Wavefront OBJect”. It is simply referred to as the OBJ file format.

The most commonly used file formats in 3D Graphics applications are OBJ, FBX, and COLLADA. The most important difference between the OBJ file format and the other is the support for scene information (such as light sources) and animations. The OBJ file format does not support scene information and animations while FBX and COLLADA does. Therefore, if you need animations for your game or movie, then you better use the FBX and COLLADA format.

- **OBJ Specification**

The OBJ file format is an ASCII file format. If you are really hardcore, you can edit the files in a text editor.

The first character of each line is very important. It specifies the type of command. If the first character is #, that line is a comment and everything else in that line is ignored. Blank lines are also ignored.

- **The Comment Command**

Command:

```
# <a comment line>
```

Example:

```
# This file uses centimeters as units for non-parametric coordinates
```

- **Loading the Material Library**

The material library can be loaded using the "mtllib" keyword.

Command:

```
mtllib <filename.mtl>
```

Example:

```
mtllib full-textuer-uninery.mtl
```

- **The Vertex Command**

“V” used to specify the vertices of the polygon by its three Cartesian coordinates x, y, and z.

Command:

```
v <x y z>
```

Example:

```
v 2.232978 -3.736446 -0.218265
```

- **The Vertex Normal Command**

It specifies the normal vector to the surface. x, y and z are the components of the normal vector.

Command:

```
vn <x y z>
```

Example:

```
vn 3.232978 -5.736446 -0.218265
```

- **The Vertex Texture Command**

The vertex texture command specifies a point in the texture map, which we covered in an earlier section. U and V are the X and Y coordinates in the texture map. These will be floating point numbers between 0 and 1.

Command:

```
vt u v [w]
```

Example:

```
vt u v [w]
```



**This figure show full example of OBJ file format:**

```
# This file uses centimeters as units for non-parametric coordinates.

mtllib full-textuer-uninery.mtl
g default
v 2.232978 -3.736446 -0.218265
v 2.686344 -4.623270 -0.136209
v 2.643226 -4.668031 -0.219356
v 2.579717 -3.376284 -0.111732
v 3.041887 -4.276194 -0.195339
v 2.991476 -4.323377 -0.117828
v 2.221178 -3.751802 -0.319715
v 2.631109 -4.682748 -0.315099
v 2.630186 -3.326960 -0.194049
v 3.062620 -4.258624 -0.289104
v 2.651843 -4.665179 -0.408864
v 2.639312 -3.323935 -0.394951
v 3.050498 -4.273338 -0.384847
v 2.702257 -4.618001 -0.486374
v 2.242111 -3.733423 -0.419167
v 2.424217 -3.534153 -0.044117
v 2.835618 -4.474412 -0.054497
v 2.342859 -3.618643 -0.069114
v 2.507389 -3.449032 -0.059083
v 2.919031 -4.392978 -0.068370
v 2.753906 -4.555283 -0.078319
v 2.275703 -3.689686 -0.130266
v 2.596588 -3.370699 -0.482951
v 3.007383 -4.318102 -0.467993
v 2.774696 -4.548392 -0.535832
v 2.292577 -3.684095 -0.501485
```

**Figure 4-16 OBJ file format**

### 4.3 Logo Design:

The logo site of "Ishrahly" is presented in Figure 4-8. The book in the logo is a symbol for study, and the brain represents the autonomy of the human systems, in addition, the brain is the member that receives knowledge. The blue color is a special color for education, and the red is the blood color.



Figure 4-17 Website Logo Design

## 4.4 Video Production:

We produced two videos to demonstrate our site. The first one shows the modelling phases using Maya, and the second one shows how to use the educational site. We filmed the screen while using the site with an audio commentary explaining the steps to show how to use the site. We used Adobe Premier to video production.

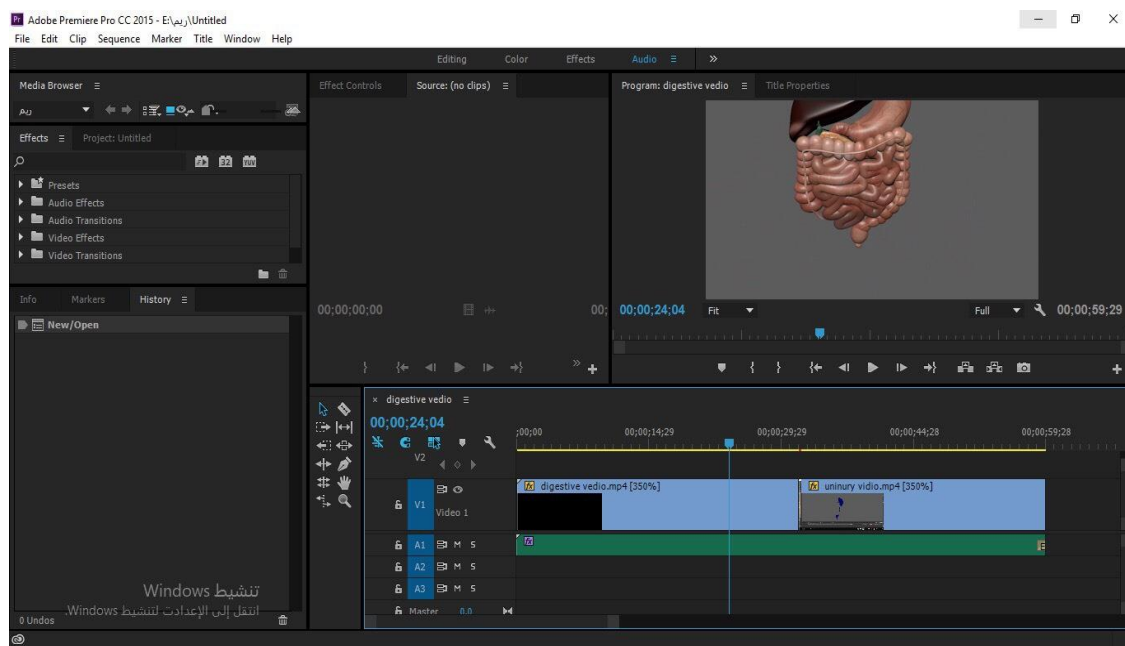


Figure 4-18 Video production

# **5 -CHAPTER Five**

## **Implementation**

## 5.1 Implementation

In this chapter, the actual implementation of the project is started by simulating the model, programming the site and adding the model.

### Phase1: Modeling the Urinary and Digestive System

We started modeling organs and then merging them to form the system, first the urinary system and then the digestive system.

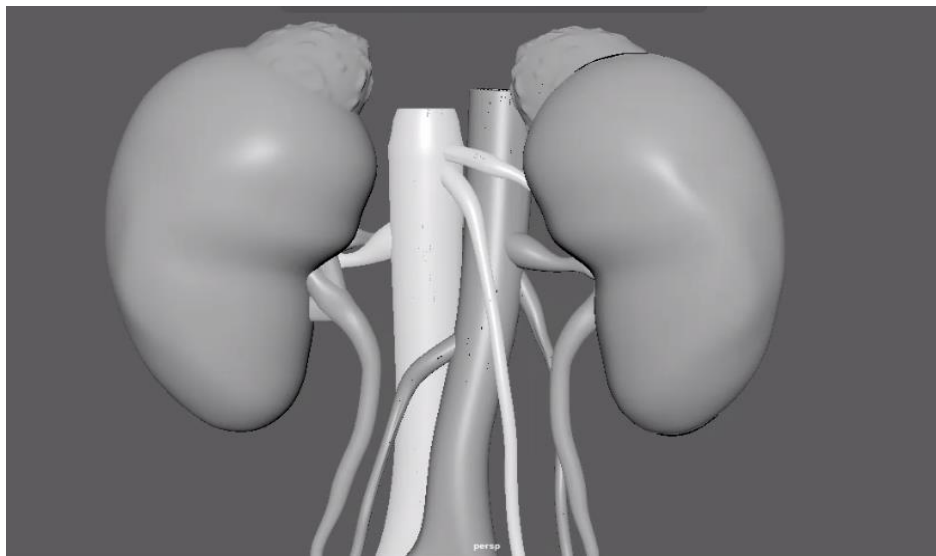


Figure 5-19 shows Modeling the Urinary system

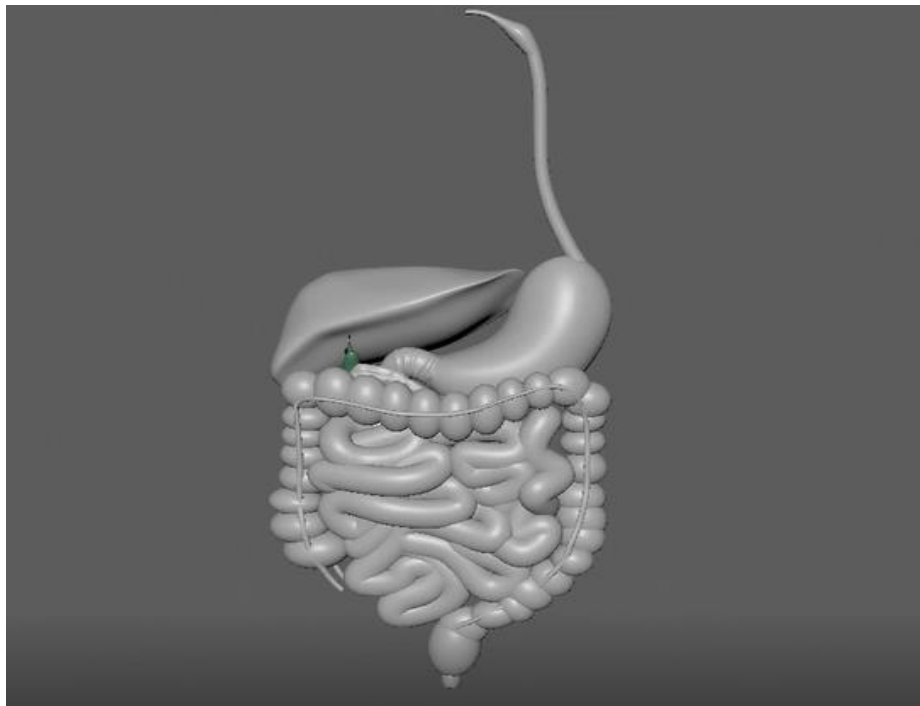


Figure 5-20 Shows Modeling the Digestive System

### **Anatomy of the Kidney:**

For further details and explanation, we performed the dissection of the kidney to elaborate the details later using the tissue, so that we can control it within the site has been dissected into three layers is Cover, cortex, and marrow according to the explanations of the Palestinian curriculum.

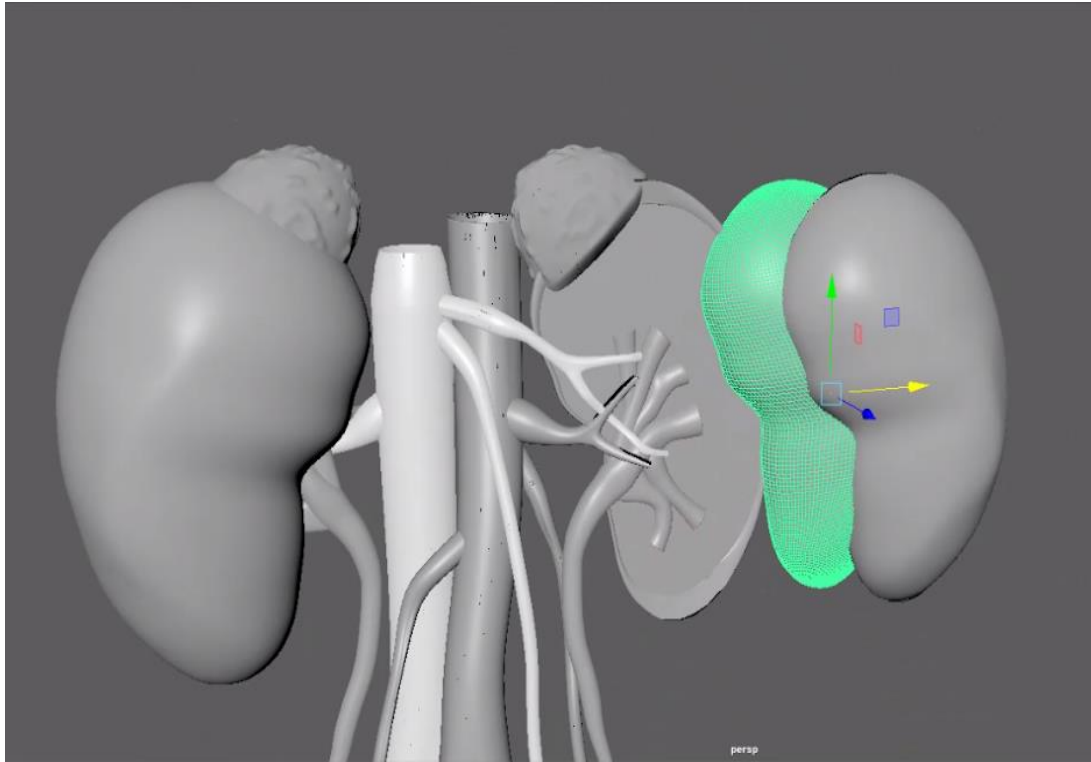


Figure 5-21 Figure Shows Anatomy of the Kidney

## Phase2: Texturing

We have manufactured all the textures using Photoshop. The model appears in a more realistic way instead of the usual colors a picture of the material.

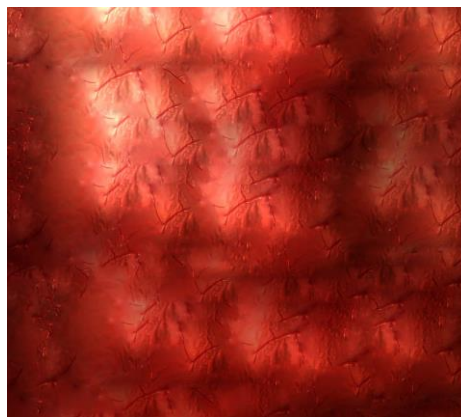
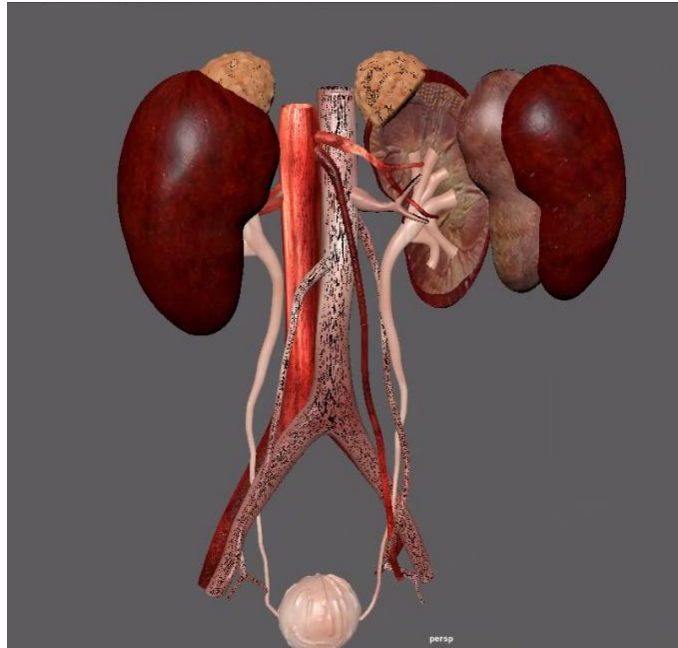
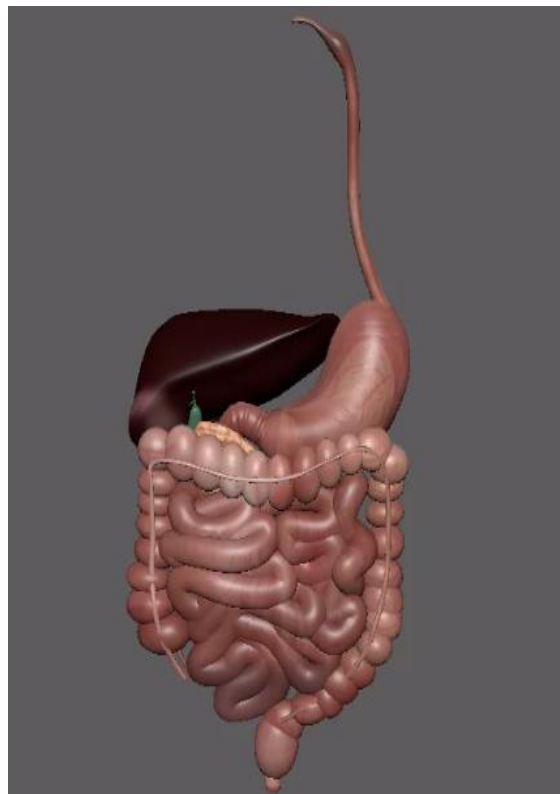


Figure 5-22 Shows Texturing

Here after designing the materials and put them on the model and the individual in the right way the model is ready for display.



**Figure 5-23 Shows Unirey system model**



**Figure 5-24 Shows Digestive system model**



## Landing Page:

In the landing page, we display video that shows the human system and contain a side navigation bar and content description about our site and main button to move to the model scene.

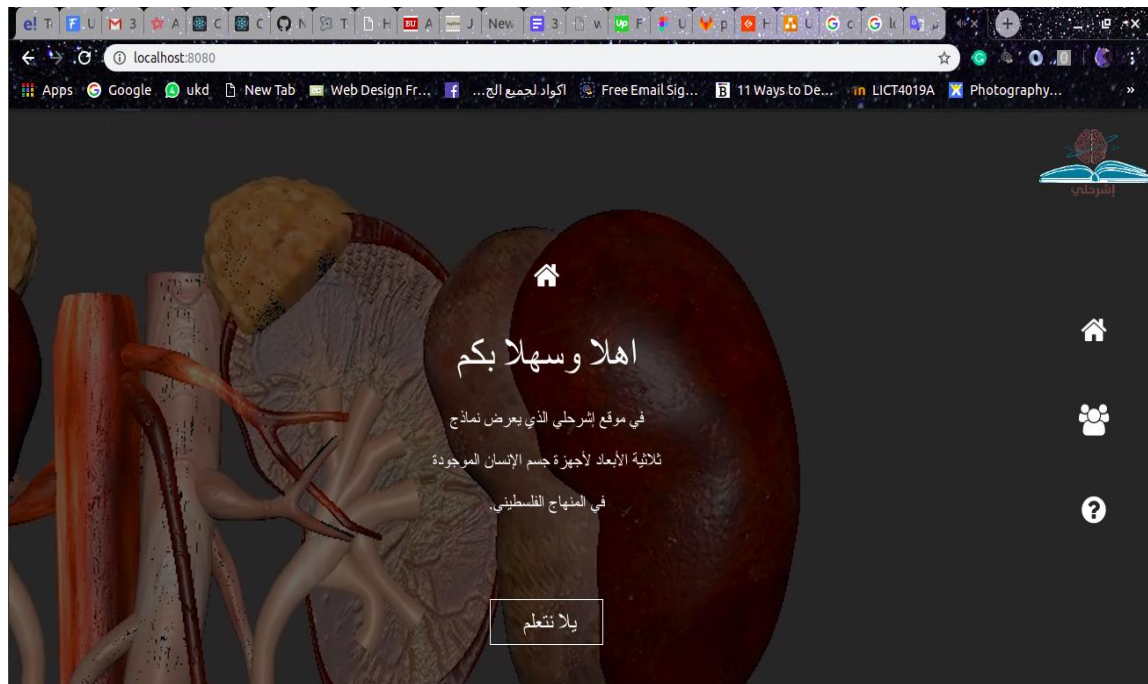


Figure 5-25 Landing Page

## Scene and Controllers:

We prepared the scene and put the appropriate lighting and equipped the camera and then we put controllers to control any part of the scene.

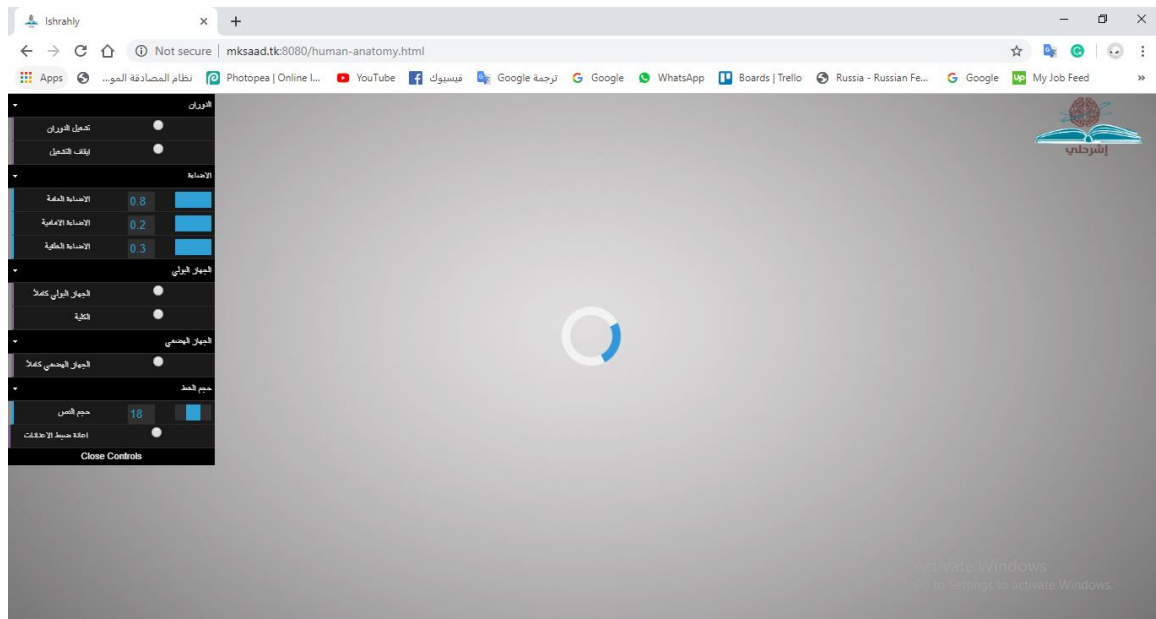


Figure 5-26 Scene And Controllers

### Load Model:

Then we loaded the model using a file loader like OBJ Loader and MTL loader, then we adjusted the lighting settings and put a controller to control the rotation.

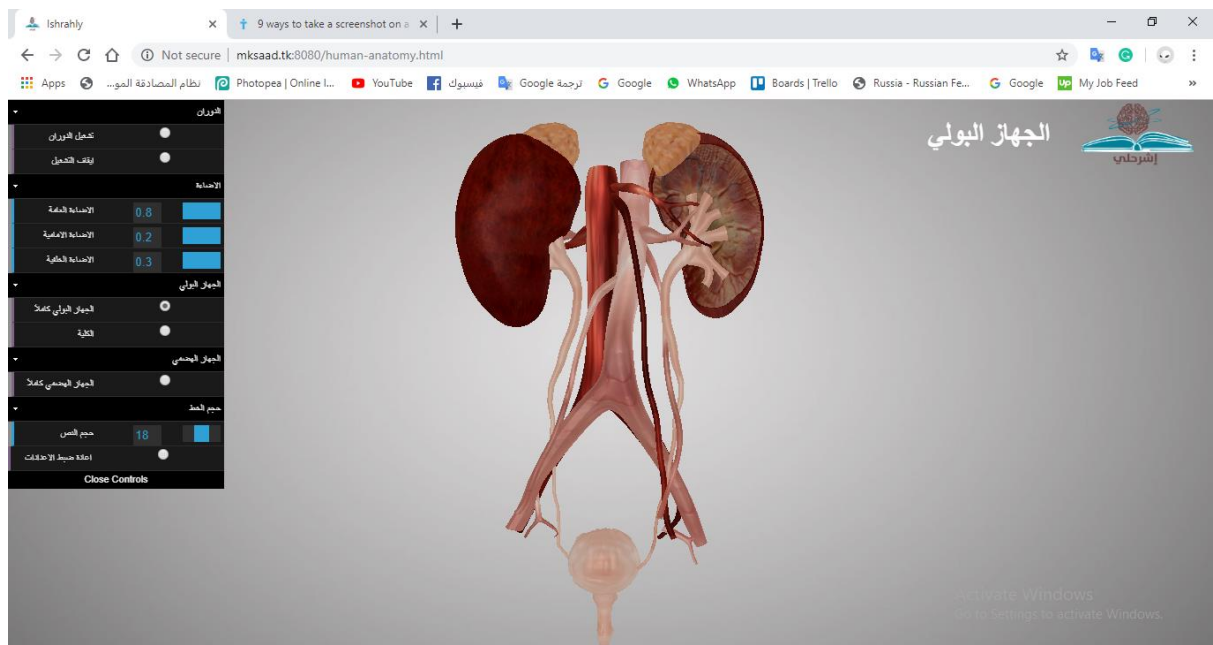


Figure 5-27 Load Model

## Select Organ and Show Description:

We built the functionality to determine which organ the mouse was passed on, and we also created the function to collect data about the organ from the JSON file we created.

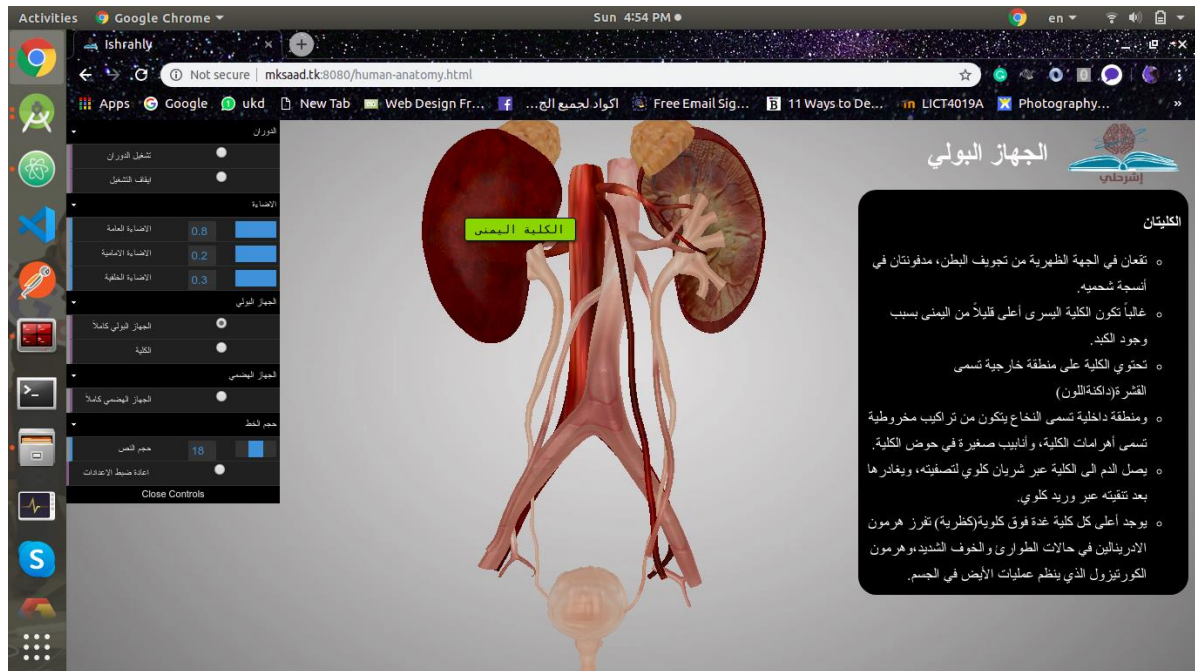


Figure 5-28 Select Organ And Show Description1

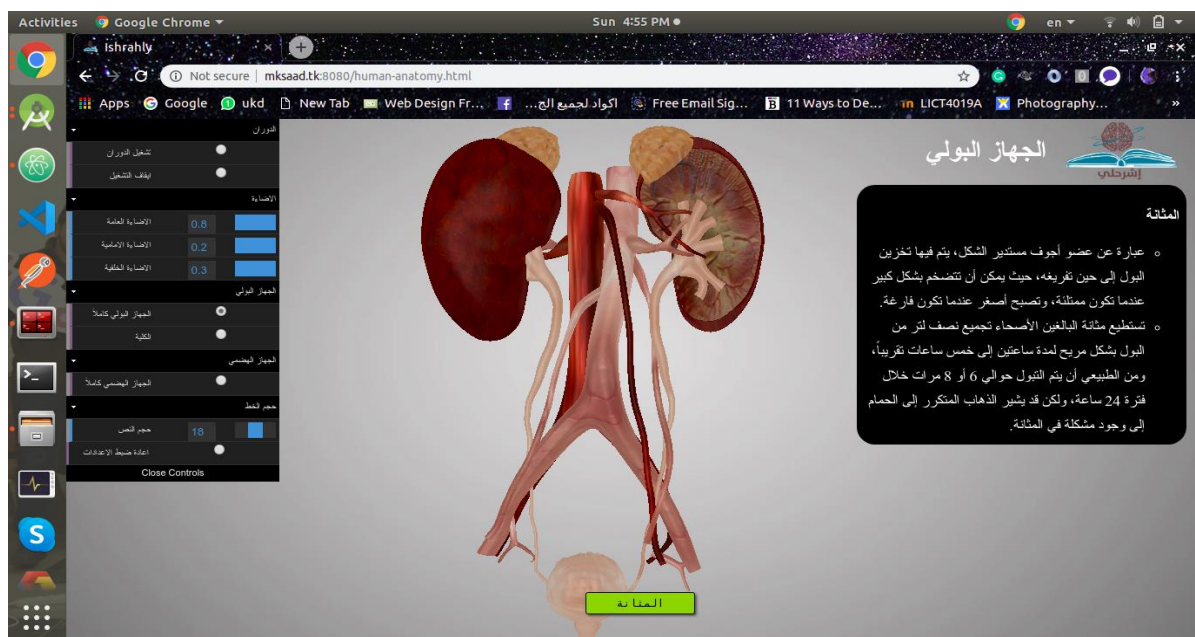


Figure 5-29 Select Organ And Show Description

# **6 -CHAPTER Six**

## **Testing**

## **6.1 Testing**

In this chapter, we test the model within the site and then display the site on the target sample to test ease of use and the ability of the student to understand and deal with observations.

The test scenario as follows: we select 10 students at levels 7 to 9 grade, then we split them into two groups A and B. Each group has 5 students. We asked the A group to study urinary system from the textbook and the B group to study the urinary system from our website. The study time is a quarter hour. Then we made a test for both group to measure their comprehension to the study materials. The test questions are in the appendix and the test time was quarter hour.

The test passed several stages and detailed for each stage:

### **6.1.1 Collected of Curriculum:**

We collected the curriculum (Worksheet)

### **6.1.2 Write Questions:**

We have written six comprehensive questions for all the information mentioned in the collected material we collected a sample of students in the preparatory stage who did not study this curriculum at all.

### **6.1.3 Test:**

Each test group was then made up of the same questions the end, the results were included by correcting scores for each group.

### **6.1.4 Results:**

Then collecting scores and estimating the proportions got the final result the site got 57.1% and 42.9 books as shown in the picture. Use group A and B naming for easier citation.

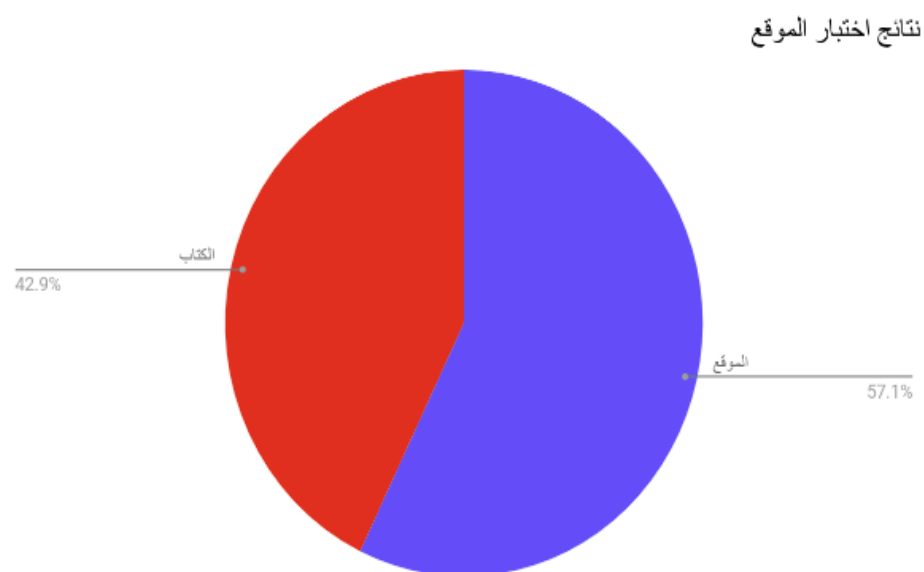


Figure 7-30Result

## **7- Conclusion**

As a result of the importance of Education and because of the lack of explanatory materials that facilitate the student to understand and study, we have implemented an educational website to help teachers and students.

For now, we present Ishrahly Website as the first release and we will continue developing it in the near future.

The most important functionalities are displaying a three-dimensional model of the human body in the Palestinian curriculum, especially the urinary and digestive systems.

With the ability to show a description of each organ within the device and control lighting, rotation and movement between devices. In the future work, we will enhance the implemented models and other human body systems to the site.

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- Appendix

Teacher Survey Questions:

ماهي الاجهزة التي يصعب عليك تدريسها ؟

حسب خبرتك ماهي الاجهزة التي تصعب على الطلاب فهمها؟

هل تعتقد ان هذه "العينة" قد تُسهل على الطالب؟ بنسبة كم؟

هل تفضل تدعيم الشرح بفديو ام بهذه الطريقة ؟

هل جربت استخدام وسائل أخرى للشرح غير الطريقة التقليدية؟

برأيك لو ان هذه الفكرة مُطبقة هل ستستخدمها في الشرح ؟

Figure0 1-8

Student Survey Questions:

هل تواجه صعوبة في دراسة اجهزة الانسان في مادة العلوم؟

ماهي الاجهزة التي يصعب عليك دراستها وفهمها؟

هل كان لديك فضول لرؤية الجهاز بطريقة اقرب للحقيقة ؟

هل ترى ان هذه العينة قد تسهل عليك الدراسة والتذكر ؟

هل حاولت اثناء الدراسة البحث في طرق غير الكتاب للتوضيح ؟ وهل كان الانترنت احد الوسائل التي استخدمتها ؟

Figure 0Student Survey 2-8

## Compilation of Curriculum:

**الكليتان:**

تقعان في الجهة الظهرية من تجويف البطن، مدفونتان في أنسجة شحمية غالباً تكون الكلية اليسرى أعلى قليلاً من اليمنى بسبب وجود الكبد.

تحتوي الكلية على منطقة خارجية تسمى القشرة (داكنة اللون) ومنطقة داخلية تسمى النخاع يتكون من تراكيب مخروطية تسمى أهرامات الكلية، وأنابيب صغيرة في حوض الكلية.

يصل الدم الى الكلية عبر شريان كلوي، ويغادرها بعد تنقيته عبر وريد كلوي يوجد أعلى كل كلية غدة فوق كلوية (الخطرية) تفرز هرمون الأدرينالين في حالات الطوارئ والخوف الشديد، وهرمون الكورتيزول الذي ينظم عمليات الأيض في الجسم.

**الحالبين:**

هي أنابيب ضيقة في الجهاز البولي تحمل البول من الكليتين إلى المثانة عن طريق شد ورخي العضلات في ثمانية 15 إلى 10 جدران الحالب، حيث يتم إفراغ كميات صغيرة من البول من الحالب إلى المثانة كل

**المثانة:**

هي أنابيب ضيقة في الجهاز البولي تحمل البول من الكليتين إلى المثانة عن طريق شد ورخي العضلات في ثمانية 15 إلى 10 جدران الحالب، حيث يتم إفراغ كميات صغيرة من البول من الحالب إلى المثانة كل

Figure 8-3 Compilation Of Curriculum

## Test questions:

1. اكتب أجزاء الجهاز البولي؟
2. اكتب اسم الجزئين اللذين يقومان بربط الكليتين مع المثانة؟
3. ماذا يسمى الوعاء الدموي الذي ينقل الدم الى الكلية لتصفيته؟
4. ماذا يسمى الوعاء الدموي الذي ينقل الدم من الكلية بعد تصفيته؟
5. ارسم الجهاز البولي؟
6. مم تتكون الكلية؟ (تشرحها)؟

Figure 8-4 Write Questions