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SELF- DOCTOR

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Abstract:-
The aim of this project is to develop a program entitled as 'Self Doctor' SD that motivates children to discover health and its importance in life. In fact, there are hundreds of games which are related to health, and each one focuses on a different target. However, few ones are found which concentrate on teaching the children the ability to diagnose, identify symptoms, and treatment for simple health issues.

1. INTRODUCTION: - Nowadays technology is expanding in numerous ways. This increases the opportunity of using different routes in order to support and mount the path of education. Learning is considered to be a process in which knowledge is developed through experience [1]. Information and communication technology (ICT) is continuously expanding the boundary of education [2]. Mobile devices has developed over recent years that they have overtaken the propagation of computers in social contexts [3]. Today, different technological trategies and devices are developed in portable form and people have become adapted to them. The evolution of handheld portable devices and wireless technology has shown huge changes in educational field [4]. Any researchers have discovered that implementing the mobility of mobile devices can lead to improvement in educational path in different environments. It has been shown that it is increasingly being used for grammar, vocabulary, and speaking in both formal and informal scenarios. In addition, mobile technologies support social communication which motivates children to cooperate in learning environments. Therefore, advance in such technologies enabled teachers to deliver educational messages more easily and flexibly. With new technologies including mobile computers, Medical technology is necessary for better life quality in almost all areas of the world [6]. The history of computerization in medical field started in 70's, and the growth of internet improved cooperation among clinicians [7]. It is stated that information technology (IT) has a great role in improving quality, safety, and efficiency of health care. This improvement is obtained through providing different ways to enhance education in the medical field [8]. For instance, telemedicine which is the utilization of electronic communication and information technologiesin delivering clinical services when subjects are at different locations is widely used in the recent years. Related to this is a broader term calledtelehealth, in which this technology encompasses distance education, and other applications which supports health services. In addition, videoconferencing and remote monitoring of vital signs are also included under the broad term of telehealth [9]. Furthermore, other technologies are also entitled under health services. These include, electronic material management (EMM) which is used to track and manage medical supplies, pharmaceuticals, and other resources. In addition, clinical decision support system (CDSS) also help doctors and nurses with real-time diagnosis and treatment interventions. It includes drug interaction prescription warnings and clinical protocols [8]. Therefore a close relation was detected between information technology and medical field. In addition, due to the availability of mobile devices between all age stages, especially the so called 'early adopters' a project was considered to be undertaken in order to build up an educational program in mobile portable devices to enhance education and learning patterns [3].

1.2 OBJECTIVES OF PROJECT

Objectives of the project include:

- To lead the growing generation to a wider knowledge about healthy lifestyle.
- To expand the delivery of healthcare.
- To increase the motivation of developing a healthy body.

The target audience includes children and adolescents between 11-18 years old under constant use of portable mobile devices. These children should be able to read and understand English language.

1.3 SOFTWARE REQUIRMENTS

As a developer, software requirements are

Windows System in addition to Android Development Tools (ADT), Java software development kit, Eclipse for Java developers [10]. Furthermore, the minimum software requirement to use this application is SDK version "10", which is called GINGERBREAD, and target SDK version is JELLYBEAN "18". Statistics has shown that 21.2 % of worldwide population uses GINGERBREAD, and 35.9% uses JELLYBEAN.

2. ANDROID

Android is a Linux-based operating system designed for cell phone devices, tablet PCs, netbooks, and other mobile systems [11]. It is combined with OS features such as effective shared memory, UNIX user identifiers (UIDs) and file permissions with safe Java language [15].The architecture of Android is explained as a personalized implanted Linux system which interacts with the phone hardware and off-processor cellular radio. The Binder middleware and application API runs on top of Linux. Thus the application's interface to the mobile device is through these APIs. Each application is performed within a Dalvik Virtual Machine (DVM) running under a unique UNIX uid. It is stated that Android applications are written in Java, but run in the DVM [12]. Being programmed with Java, Android is enhanced with its own security system tuned for mobile environment [15]. The existing security model is employed at two layers: an application level permission model (aka Android permissions) which is imposed by the Android middleware and controls access to application components and system resources. A kernel level sandboxing and isolation mechanism lies underneath the user visible Android permission model and is normally operated invisibly to the app developers and users [13]. In cases, if unprivileged malware gets installed on an Android device, it can still temporarily crash the user's applications. Thus, in such state users will have to identify and remove the hostile application. Therefore, Android minimizes the extent of such possible exploitation by requiring the user's permission for programs that do uncommon things such as directly dialing calls, destroying address books, and disclosing

the user's private data [14]. In the last few years, it has grown among other mobile platforms in popularity. Phones based on Android system are obtainable from all main cellular providers, especially in the U.S. market. Therefore, it can add an advantage to students by bringing smart phones and tablet functionalities to a wider cross-section in use. It is also developing the amalgamation of mobile technology into new educational experiences and give the students new ways to interact with content. Android as other Apple iOS products, can assimilate and inter-communicate with laptops, netbooks, and tablets. Thus, this enhances the learning abilities among individuals as data can be easily moved from mobile phones to other locations [13].

3. HEALTH INFORMATION TECHNOLOGY

There has been a dramatic improvement made by the informatics community on developing a systematic approach to health IT over the past twenty years. Thus achievements are vital in standardizing the growth of telemedicine applications [15]. Telemedicine is described as the provision of clinical services at different locations by the use of electronic communications and information technologies. In most cases, it is reflected as a tool that can be used by health providers to extend the medical practice outside the walls of usual practice. As a matter of fact, Telehealth is closely entitled as an associated term with telemedicine. For instance, videoconferencing, e-health such as remote control of vital signs, and expansion of medical education are all considered to fall under the category of telemedicine and telehealth [15]. There are different purposes for delivering remote health services, such as specialist referral services. This involves the patient to been seen by the consultant over a live, remote access with the transmission of diagnostic images and videos. Direct patient care and monitoring also send information to a monitoring station for interpretation. This is for either diagnosis, treatment plan, medical prescription or advice. Some other services such as using telemetry devices to record vital signs such as blood pressure, heart rate, oxygen saturation can aid the visiting nurse in her care with the patient [15].

3.1 THE INTERRALATIONSHIP BETWEEN HEALTH INFORMATION TECHNOLOGY AND TELEMEDICINE

Telemedicine, which is considered to be a distant health care service delivery, has improved through the use of telecommunication technology. The World Health Organization (WHO) stated that it is the act of different health related activities carried by communication technologies. In addition, telemedicine is thought to reduce the difficulties associated with the geography of medical service [6]. A study conducted by Garingo et al. revealed that the robotic telemedicine system was reasonably able to accurately identify and ass's patients [19]. The objectives and accomplishments of telemedicine and health IT are complementary. Telemedicine delivers health care services by making use of health information technologies. However, health information technologies enable the delivery of health service components over distance. In constant, health information technologies boosts the function of telemedicine [15]. Advantages of telemedicine include facilitating complex procedures by expertise doctors. Some advanced guidance can also be offered when abnormal or unexpected operative findings are discovered, thus offering good assistance in emergencies
[17].

3.2 TELESURGERY

The Green Telepresence System was the first prototype of telesurgery robot developed at Stanford Research International (SRI). It was primarily used for open surgeries in 1991. In addition, the rapid spread of laparoscopic techniques enhanced the use of information technology with surgeries [16]. Other highly precised ophthalmic surgeries were targeted by the use of Robot Assisted Microsurgery System (RAMS), which was developed in 1993 by NASA Jet Propulsion Laboratory (JPL) [16].

3.3 E-DOCTOR

This was established to focus on disease prevention and support medical facilities worldwide. It is equipped with a variety of medical inspections such as blood pressure, heart rate, temperature, blood saturation. Some interfaces such as Bluetooth and USB can be connected to the main unit. This application is linked to a central operating center (COC) through satellite linkage [18]. The first intercontinental procedures were conducted in 1990's, and pilot networks were established in the mid of the 20th century [16]. The medical application of E-doctor is linked to a Central Operating System (COS) through a satellite linkage. Large database is placed in the server with all medical analysis and diagnosis. In addition, webcam can also be used in E-doctor as an external peripheral to allow the users to show doctors some extreme emergency situations such as injuries and etc. [18].

3.4 TECHNOLOGY AND HEART ATTACK

Patients with cardiopulmonary diseases who are at risk of having heart attack have an advantage of the new technology treatments in increasing their life expectancy by one year. It is stated that about 70% of improvement in the mortality rate among heart attack patients is a result of enhancement in technology [6].

4. SOFTWARE METHDOLOGY

The procedure of constructing computer software and information system is always tested by different development methodologies. Hence, software development life cycle (SDLC) is one of many and is considered to be a method used for

designing, developing, and sustaining information. Many SDLC models exist, such as the Waterfall, spiral, incremental, rational unified process (RUP), rapid application development (RAD), and agile software development. For testing this application the waterfall model was used which is also known as a linear-sequential life cycle model [20].. This model is known to be one of the first process models that were introduced and the simplest to understand [21]. It is encompassed with five phases which are business analysis, design, implementation, testing, and maintenance which are all needed to be completed sequentially in order to develop a software solution [20]. In addition, each phase must be completed before the next phase begins with no overlaps. As an illustration, the outcome of one phase acts as the input of the next phase consecutively [21].

4.1 PHASES OF WATERFALL MODEL

The sequential phases in Waterfall model are:

A- Analysis:

It is often known as software requirement specification (SRS). It defines both functional and non-functional requirements. The functional requirements are stated by the mean of the cases which describe the users' interactions with the software. Such requirements include purpose, scope, outlook, tasks, software and user characteristics, functionalities specification, and interface and database requirements. The non-functional requirements refer to various criteria, and limitations enforced on the design and operation of the software. It includes reliability, scalability, testability, availability, maintainability, performance, and quality standards [20].

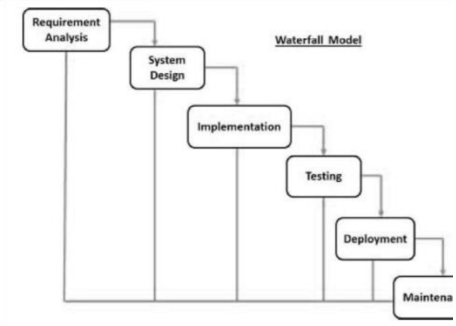


Figure 1: Waterfall model [21].

The requirements of the system are taken and recorded in a requirement specification document [21].

B- Design:

In this phase, the condition specifications from the first phase are detected and the system design is arranged [21]. Furthermore, planning and problem solving for a software solution is processed. Planning includes algorithm design, software architecture design, database conceptual schema and logical diagram design, concept design, graphical user interface design, and data structure definition [20]. It is stated that designing in this level helps in the specification of hardware [21]. To make my application interesting I have used Comic Sans MS for the font, 20 pt, with different font colors. Pink color boxes with green font color was used to represent the symptoms, green boxes with purple font color for treatment, and blues boxes with green font for prevention. Different pictures were used to represent each health issue in order to provide an easier demonstration for the children.

C- Implementation:

Referring to the input of the system design, the system is first developed in small programs known as units, and this is integrated into the next phase. Thus, each unit is developed and its functionality is tested which is referred as unit testing [21]. The design qualifications are concentrated into executable program, database, website and software element through programming and deployment. The actual code is written in this phase and collected into an operational application; hence the database and text files are formed [20].

D- Integration and testing:

It is also known as verification and validation in which the software solution is checked with the original requirements and specifications. As a matter of fact, verification is the process of evaluating the software in determining whether the products matches the condition at the beginning of the phase. While v
the development process to decide whether it satisfies the identified requirements [20]. After testing each unit, all units developed in the implementation phase are assimilated into a system [21]. alidation is the evaluation of the process during or at the end of

F- Deployment:

When the functional and non-functional testing is performed, the product is organized in the environment which fits the customer wants and therefore released in the market [21].

G- Maintenance:

The software solution is modified in this phase after delivery and deployment to improve the content of the output, correct the errors, and enhance the quality and performance. Some other activities are undergone such as acclimatizing the software to its environment, accommodate the recent and new user requirements, and in addition, increase the software dependability [20].

4.2 WATERFALL MODEL ADVANTAGES AND DISADVANTAGES

Advantages:

- Easy to understand and apply.
- It is broadly used and known in theory.
- Phases are processed and completed once.
- Works better with smaller projects where the requirements are fully clear.
- The stages are clearly defined.
- Easy to arrange duties.
- Identifies milestones in a well understandable way.
- The process and results are well documented.

Disadvantages:

- The working software is not produced unless during late life cycle.
- There are high amount of risks and uncertainty.
- It doesn't act as a suitable model for complex and object-oriented projects.
- It acts as a poor model for long projects.
- It doesn't fit models that are at moderate to high risks of changing.
- Measurement of progress is difficult with this model.
- Modifying a scope during a life cycle can end a project.
- Changing the requirements is not accepted easily.

4.3 HUMAN COMPUTER INTERACTION (HCI)

The concept of HCI was first automatically characterized with development of computer. HCI, also known as Man-Machine Interaction is a design that creates a adequate environment between the user, the machine (computer), and the needed services to reach an optimum performance in the quality of the service. An interface mainly depends on the number and the diversity of the inputs and outputs in order to enable the users to interact with the computer system. The success of a good HCI design is determined as being subjective and is relied mostly on the context. For instance, it depends on using commands, menus, graphical user interface, or virtual realities. Discussing the architecture of HCI, the most important point will be its configuration. Unimodal HCI systems depend on one modality, and it is divided into different categories such as visual based, audio based, sensor based. However, multimodal HCI systems refer to combination of modalities. In illustration, lip movement which is visual based helps in speech recognition which by then assists gesture recognition by command acquisition which is again visual based [22]. HCI is mainly considered to be friendly use software, and easy to practice. Thus, the goal of the project was to produce a game which would be easy to use by most children. It was made colorful and bright to attract their attention and increase their interest in it. This would by then help the younger society to be more educated regarding some basic health issues and in addition use the application easily. [23].

5- Application's Design

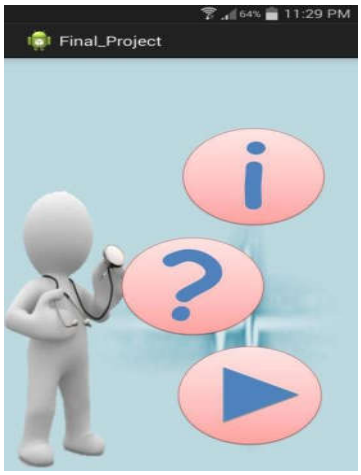


Figure 2: Activity one

Activity one: It consists of 3 buttons.

- Button one: It comes under the heading "About", in which it clears out that the game is proposed under the ministry of health and it consists of information related to the game features.
- Button two: The game specifications and instructions are given here, where the player's age range is set out and in addition, the players have to know their weight and height to be able to start the game. Button three: "Play", this is where the game is started when this button is clicked.

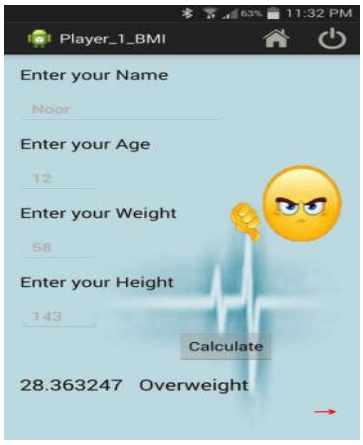


Figure 3: Activity two

Activity two: It consists of different text fields, in which the players enter their name, age, weight, and height. At the end of the page, "calculate" button is present in which it calculates the BMI after the after the weight and the height is entered. After the calculation procedure is performed, a pop out message will appear indicating the result of the BMI.

Range	**Category**
BMI Value < 16	Severely underweight
BMI Value < 18.5	Underweight
BMI Value < 25	Normal
BMI Value < 30	Overweight
Other	Obese

Table 1: Classification of BM

Figure 4: Activity three

Activity three: It consists of 3 button in which each one describes a specific health issue such as headache, cold, and diarrhea. Each player is required to choose a button in order to start the game, and by pressing any one it will lead you to the page in which the symptoms are listed.

Figure 5: Activity four

Activity four: This page consists of symptoms of each health issue. Five buttons appear to introduce each symptom in a different pink box. Among these boxes, 3 of the chosen ones will appear to be true with a green tick mark on the top, and 2 false answers which will appear with a Red Cross mark.

Figure 6: Activity five

Activity five: This page consist of treatment of each health issue. Five buttons appear to introduce each symptom in a different green box. Among these boxes, 3 of the chosen ones will appear to be true with a green tick mark on the top, and 2 false answers which will appear with a Red Cross mark.

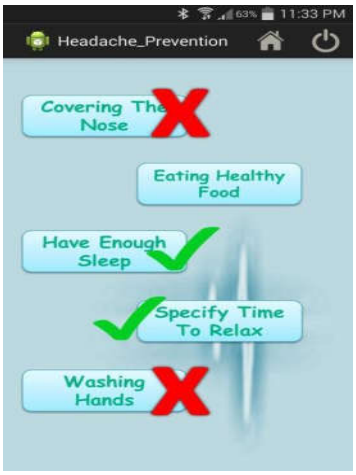


Figure 7: Activity six

Activity six: This page consist of prevention of each health issue. Five buttons appear to introduce each symptom in a different blue box. Among these boxes, 3 of the chosen ones will appear to be true with a green tick mark on the top, and 2 false answers which will appear with a Red Cross mark.

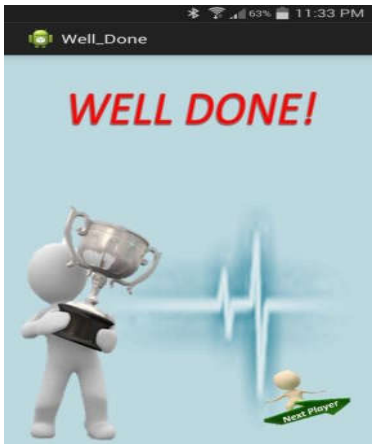


Figure 8: Activity seven

Activity seven: A pop out message will appear "Well done", and a button is present that leads to activity 2 for a new player to start the game.

5. IMPLEMENTATION

The awareness of an application or design is usually called implementation. It had one key activity which is deploying the new system in its objective situation. The actions include preparing to turn the system over to maintenance personnel. "Many of the details only become known to us as we progress in the implementation." – David Parnas Implementation methodology can be described as an incorporated management information system, which is defined as a well-structured and a recognized description of activities conducted by an implementation team. It is also considered as a plan and a guide, to make the process easier and more efficient [24]. In short, it is the stage of a project during which theory is turned into practice [25]. Models of life cycle of information system allow the understanding of processes to be better and this makes a reduction in the possible risks associated with implementation [24]. Thus, successful implementation phase requires good system deployment and training on the system.

The principle of this phase is to deploy and facilitate operations of the new information system in the production settings.

5.1 STAGES OF IMPLEMENTATION

- **Coding:** The system design needs to be implemented to make it a workable system [25]. This identifies the design of the document into executable programming language code. The output of the coding phase is considered to be as the source code for the software that acts as input to the testing and maintenance phase [24]. The programs coordinate the data movements and control the whole process in a system. A well written code reduces the testing and maintenance effort [25].
- Integration and testing: Before actually implementing the new system into operations, a test run of the system is done removing all the bugs, if any [25]. It includes recognition of errors in the software. This process begins with a test plan that recognizes test-related actions, such as test case generation, testing criteria, and resource allotment for testing. The

code is tested and mapped against the design document created in the design phase. The output of this phase is a test report containing errors that occurred while testing the application [24].

- Installation: The new system is installed and rolled out [24].

5.2 THE MAJOR STEPS IN IMPLEMENTATION STAGE ARE [25]:

- Acquisition and installation of hardware and software
- Conversion
- User training
- Documentation

The system enters the maintenance phase for the rest of the operational period after the implementation phase.

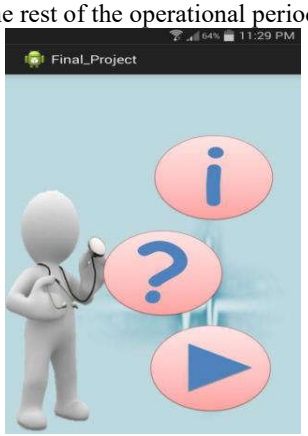


Figure 9: Activity one

In this activity you will find three clickable buttons which are 'information', 'about' and the 'play' button. When the user clicks on the information button, he will be directed to a page where information about the game is given on how to play and what to do. Whereas 'about' button explains what the game is about, specifying the feature such as age group in which the application was developed for, and the relation of health development applications with educational enhancement. After clicking the play button user will be directed to start the play.

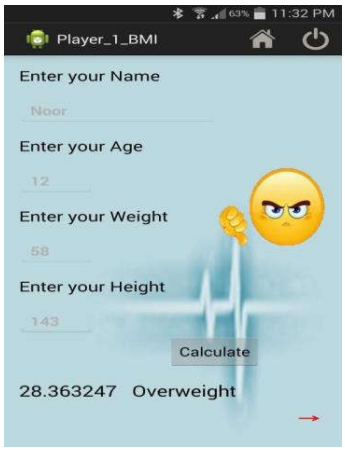


Figure 10: Activity two

In this activity there are different text fields, in which the players can enter their names, age, weight, and height. It also consist of a "calculate" button where it basically calculates the BMI after the weight, and height is entered. Once the calculation is completed, a pop out message will appear indicating the result of the BMI. A red arrow will be shown at the end of the activity, and by clicking on the red arrow it will take you to the next activity where the player can start the game.

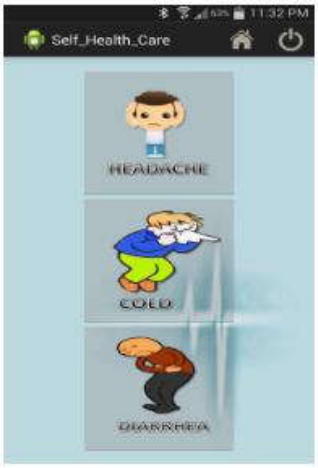


Figure 11: Activity three

Activity three consists of 3 buttonswhere each one of them defines a specific health issue such as headache, cold, and diarrhea. Every player is required to choose a button in order to start the game. In the screenshot it shows that the user has clicked on the headache button, by pressing this button it will direct you to the activity that contains the symptoms. The activity will have three correct answers, and two incorrect answers. When the player clicks on any of the buttons, a popup image will appear showing a green tick mark or a Red Cross mark. It will also show a popup message that will appear in the bottom of the activity where a message with the text written in the clicked button is shown. When the user clicks on all three correct answers, it will automatically take the player to thenext activity which will be the treatment activity. This will continue to go on until it reaches the prevention activity.

Figure 12: Activity four

In this activity there are different text fields, in which the players can enter their names, age, weight, and height. It also consist of a "calculate" button where it basically calculates the BMI after the weight, and height is entered. Once the calculation is completed, a pop out message will appear indicating the result of the BMI. A red arrow will be shown at the end of the activity, and by clicking on the red arrow it will take you to the next activity where the player can start the game.

Figure 13: Activity five

Activity five consists of treatment related to each health issue. Five buttons appear to introduce each symptom as different buttons. The concept of this activity will be similar to activity four. There will be three correct answers, and incorrect. After the player clicks on all the three correct answers activity six will be loaded.

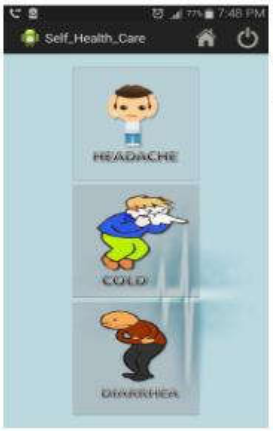
Figure 14: Activity six

Activity six contains the prevention of each health issue . Five buttons appear to introduce each symptom as different buttons. The concept of this activity are similar to activity four, and five. There will be three correct answers and two incorrect. After the player clicks on all the three correct answers, activity seven will be loaded that has a 'well done' message for each player.

Figure 15: Activity seven

After each player finishes playing, activity seven will be loaded. In this activity a popup message will appear with "Well Done" message, and a button is presented that leads to activity two for a new player to start the game, except for the last

player. When the last player reaches activity seven, the following page will be loaded in which it will be representing the players result activity. The time taken will be measured in seconds for each player.



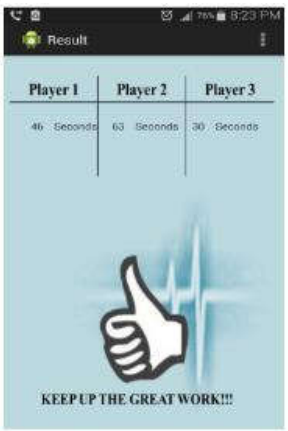


Figure 16: Activity eight **Figure 17: Activity nine**

6. MAINTENANCE

This phase is important to decrease the errors in the system during the life cycle of the system, and to make the system follow the flow to any variation in the working environments. Thus, it meets the scope of future improvements, enhancements, and functionality to meet the recent future needs. Thus, this stage is considered to be as a review of the system to know the capabilities of the system, the required or additional changes, and studying the performance. There will be some issues for sure with some users. By time there will be different updates for the applications, so it can be suitable with different versions and different versions and different mobile devices. Maintenance will be done according to the environment changes.

7. QUANTITATIVE RESEARCH

"Not everything that can be counted counts, and not everything that counts can be counted " (Albert Einstein) Most decisions are made using numbers in our daily life. Therefore, quantitative research, using numbers in suggestion is most commonly used. It is considered to be a more scientific approach and depends mostly on the way that the researcher chooses to define the variables [26]. Quantitative research uses a number of different methods to gather, understand, and report different frameworks. It largely uses questionnaires and surveys with a set of questions and answers. Answers can be measured in strengths of feeling such as 'poor', 'good', and 'excellent', or number scales out of 10 [27]. It is said to be generalizable, in which the results can be practiced on other contexts. Sampling is an important part in this method and it can be characterized into four types; convenience, purposeful, stratified, and random sampling. In most cases random selection is used as it represents the population of a larger group, hence more population diversity can be perceived. Reliability and validity are precise measures that can be generalized and are assumed to reflect an important part in the quantitative research. Quantitative data that are collected can be presented in three forms: raw data in which all studies begin with, aggregate data, and inferential data. Starting with the raw data, it is just a series of numbers that result from a survey that has not been analyzed statistically yet. When a data is manipulated to give a collective result for a series of data it is considered to be an aggregate data. Inferential data is where the results are statistically manipulated to make an assumption or demonstrate a relationship.

7.1 QUESTIONNAIRE

Many tools are used for gathering and recording information regarding an issue of interest; one among these ools is using a questionnaire. It is mainly made out of a list of questions, in which clear instructions are detailed [28]. The most important part is that it focuses on the objective of the research. Therefore, the focus of the questionnaire was to determine how clear and easy is the application to use. Also, to collect baseline information which can be followed by time to study changes. In addition, some other objectives where such as the extent to which the teenagers feel that the application is beneficial, and the level to which it promotes awareness among them.

7.2 STATISTICAL ANALYSIS

Out of 60 participants, 5% (3) viewed the clearness of the application poor, 18% (11) found it fair, 37% (22) found it satisfactory, 27% (16) found it good, and 13% (8) found it excellent.

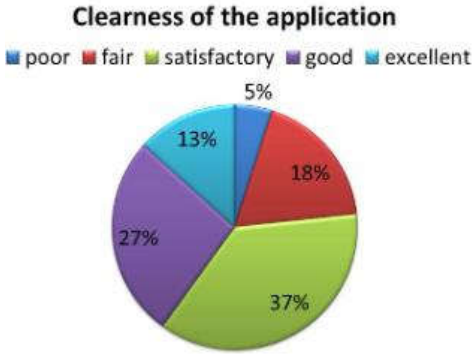


Figure 18: The percentage of the clearness of the application to the participants

The expected information was fair enough for 5% (3) of the participants, satisfactory for 35% (21), good for 53% (32), and excellent for 7 %(4)

.

Figure 19. Application containing enough expected information

2% (1) found the arrangement of the buttons fair, 36% (22) found it satisfactory, 42% (25) found it good, and 20% (12) found it excellent.

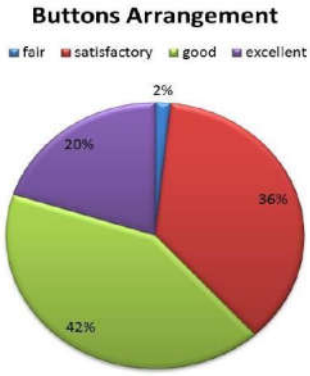


Figure 20: Clearity in the arrangement of the button

20% of the participants stated that the easiness of the application was satisfactory, 58% stated it as good, and 22% stated it being excellent.

Figure 21: Easiness of the application

The attraction of the application was fair for 7% of the participants, satisfactory was 46%, good for 42%, excellent for 5%.

Figure 22: Attraction

The navigation around the application was satisfactory for 10%, good for 68%, excellent for 22%.

Figure 23: navigation through the application

The application was satisfactory for 50% of the participants, good for 42%, excellent for 8%.

Figure 24: Easiness of the application

The organization of the menu was satisfactory for 12%, good for 40%, and excellent for 48%.

Figure 25: Menu organization

The easiness of the function was satisfactory for 20%, good for 10%, and excellent for 70%.

Figure 26: Function easiness

The organization of the buttons was satisfactory for 10%, good for 33%, and excellent for 57%.

Figure 27: Button organization

The buttons font was readable for 7% of the participants, good for 15%, and excellent for 78%.

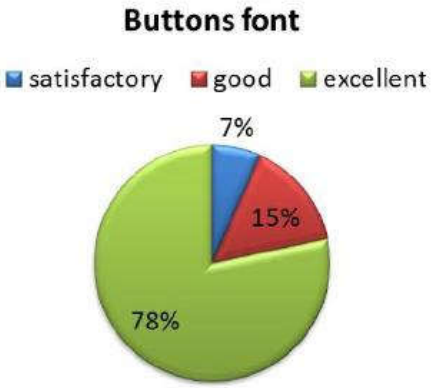


Figure 28: Buttons font

The function of the button was good for 20%, and excellent for 80%

Figure 29: Buttons function

The beneficence of the application was satisfactory for 15%, good for 38%, and excellent for 47%.

Figure 30: Beneficence of application

8. FUTURE PLAN

Every application should have a future plan, as it cannot remain the same without updating. Future plan for the application will be to load different languages especially Arabic so it can be suitable for everyone. Other than that there will be update for the application every now and then as there will be different updates for all android phones. An expansion in the age group can be also considered, reaching to higher groups other than teenagers. In addition, there is a future plan of adding more medical related topics to the application to expand the field of health related education. Such topics will be broadly discussed with adding videos for better illustration.

9. CONCLUSION

In conclusion, learning is considered to be a process in which knowledge is developed through experience. As health information technology has recently passed through vast improvements, the growth of medical applications was enabled. Therefore, as such expansions took place in numerous ways; the boundary of education through technologies such as mobile devices overtook the propagation in most social context.

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