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Diagnosing Pilgrimage Common Diseases by Interactive Multimedia Courseware

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Abstract:

In this study, we attempt to provide healthcare service to the pilgrims. This study describes how a multimedia courseware can be used in making the pilgrims aware of the common diseases that are present in Saudi Arabia during the pilgrimage. The multimedia courseware will also be used in providing some information about the symptoms of these diseases, and how each of them can be treated. The multimedia courseware contains a virtual representation of a hospital, some videos of actual cases of patients, and authentic learning activities intended to enhance health competencies during the pilgrimage. An examination of the courseware was conducted so as to study the manner in which the elements of the courseware are applied in real-time learning. More so, in this research, a discussion on the most dangerous diseases which may occur during the season of pilgrimage is provided. The use of the multimedia course is able to effectively and efficiently provide information to the pilgrims about these diseases. This technology performs this task by using the knowledge that has been accumulated from past experience, particularly in the field of disease diagnosis, medicine and treatment. The courseware has been created using an authoring tool known as ToolBook instructor to provide pilgrims with quality service.

Key words: ADDIE Model, Diseases of pilgrimage, Learning Theory, Multimedia courseware

Introduction:

The Kingdom of Saudi Arabia is the country of the two Holy Mosques, therefore, attracting millions of pilgrims from different parts of the world. Due to the spread of diseases caused by overcrowding during the Hajj season, we seek to provide a service to pilgrims. The service will help the pilgrims understand the diseases that they could contract during the Hajj season. The Hajj (pilgrimage) is a special event performed by Muslims ¹. Over 2.5 million Muslims travel to Mecca in the Kingdom of

Saudi Arabia within the twelve lunar months of The Islamic calendar. Even though, the real Hajj is performed within a time frame of 5 day, which begins from the 8th -13th of Dhul-Hijjah, the government of Saudi issues a 40 days visa to pilgrims so that they can pay visits to holy sites in Mecca and within the region of Al-Madinah Al-Munawarah. The following figure show pictures of Mecca and pilgrims during the Hajj season (Fig.1).

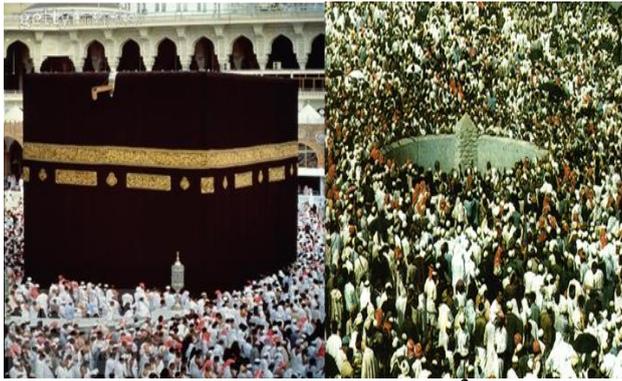


Figure 1. Mecca during Hajj season ²

Several flights begin to arrive Saudi 20-25 days prior to the Hajj dates ^{2,3}. This is one of the most important principles of Islam, and it is only those that are capable of travelling and can afford to embark on the journey that is obligated to perform the Hajj once in their entire lifetime. Performing Hajj rituals involves travelling from a Holy site to another on foot or occasionally by bus. At this time, the road traffic is heavy and amounting to several hours of standstill traffic jam for a journey of few kilometers. This results in physical stress and possible exacerbation of preexisting diseases like diabetes mellitus, cardiovascular disease and renal diseases. Some of the factors that have contributed to the problems of pilgrims during the Hajj season include body fluid disturbances, congestion, exhaustion and excessive temperatures that in turn results in some kinds of disease ⁴. More so, the risk of the transmission of communicable diseases is high during Hajj period because of overcrowding. This makes the provision of healthcare facilities to these 2.5 million people that come from the different parts of the world a huge challenge for the concerned authorities. Several studies on the existing health issues related to Hajj pilgrimage have been carried out ⁵⁻⁷.

In this study, the most dangerous diseases that spread during the pilgrimage season are documented. The study also provides an integrated classification of diseases according to the symptoms reported by the virtual patient; the symptoms could include high temperature, headache, or body pains. More so, some of the symptoms are categorized based on results of laboratory test performed to determine the level of sugar in blood and proportion of salt in the urine, as well as measurements of heartbeat and blood pressure. This technology performs this task by using the knowledge that has been accumulated from past experience, particularly in the field of disease diagnosis, medicine and treatment. The courseware has been created using an authoring tool known as ToolBook instructor to

provide pilgrims with quality service. There are many organizations that can benefit from this paper, including the Ministry of Health and Hospitals and the Committee on medical education of pilgrims. The paper will also help physicians in diagnosing common Hajj diseases, as well as in training students enrolled in medical schools. The system will further be expanded by including all the diseases that are spread during Hajj.

The current study is organized as following: Section2: Literature review and problem statement. The aim and objectives of the study is presented in Section 3. Section4 explains the materials and methods for ADDIE methodology. The multimedia courseware results for diagnosing common diseases of pilgrimage are discussed in Section 5. Finally, the conclusion of our study is presented in Section 6.

Literature Review and Problem Statement

For quite a long while, motorized instructing ideal models were created for medical instruction. For instance, the internet has numerous coursewares for introduction and testing implementations. Many tools are proposed to help in diagnosing different types of diseases with the aid of computers and advanced algorithms as in ⁸⁻¹¹ for example. Numerous courseware sites imply data push ideal models, for example, slide display, HTML, PostScript, or PDF records having book-like formatting, and connections to different sites (push innovation inclusive) ¹².

Business applications are not common for medical science. With the spread of the internet and smartphones, so many applications are available or people at their fingertips. For example, is the prevalence of open courseware collections. Universities in the world over have begun to give their significant data to the entire populace in the form of sound, video/image, and content records (interactive/mix media) ^{1, 13, 14}. These subjects do not normally win you an award explicitly most times; however, they help to expand people's knowledge. A tremendous number of university courseware collections are available on the internet. Majority of this courseware is open courseware usually in PowerPoint presentation. Some tools are used for diagnosing complicated cases of diseases such as cancers or Parkinson's disease as in ¹⁵⁻¹⁷. Numerous works have been done related to IMM courseware, and a few of them are discussed below: The utilization of mix media courseware for instructing and studying has added to and improved the traditional training field into another level. The courseware utilized as Computer Assisted Instruction (CAI) and Computer Assisted Learning (CAL) instruments provide a useful effect on

comprehension and imaginative reasoning for the understudy. Thus, bunches of courseware are being built however just few courseware emphasize on UI structure that is appropriate for the client benefits and inclinations. Subsequently, numerous courseware created is unsuccessful and not ideal to be used in educational institutions. Muda and Mohamed¹⁸ integrated client adaptive/robust strategy with a narrating view in creating mix media courseware dependent on the decent variety of the UI methodology. Client adaptive methods permit the client-framework collaboration to be adapted to an alternate client and distinctive utilization scenario, while narrating method is utilized to pull in client toward the substance conveyed. In Malaysian grade school, the courseware as in CAI-CAL can be utilized in delivering lessons in religious studies. Intended clients are understudy in year 5 and 6 inside the age range of 11 and 12 years in Malaysia. The courseware created dependent on adjusted educational archetype and comprises of 4 primary components. In light of client adaptive/robust method, the courseware will offer a couple of options for the client as indicated by their inclinations and after that by giving basic exercises, it will recognize the sort of client either graphics or intuitive/interactive individual. The structure plan and educational archetype utilized in building up the courseware could create another point of view in interactive media courseware development while the intelligent substance of religion fused into the model could be drawn in light of a legitimate concern for the understudy to get familiar with the topic so as to deliver excellent understudy with a decent demeanour for the nation in creating learning and a successful society.

Nur Fathyah Binti Abd Rahman¹⁹ created an animated pedagogical agent courseware on photosynthesis for school kids which purpose is to integrate multimedia element to help learners more understanding and to improve the technique of learning from books to courseware where combining the teaching concept through the courseware. J'an Tur'an et al.²⁰ proposed a multimedia program package ADAFOX for modelling of digital and analogue fiber optic networks, it is computational help for fiber optic designers to use in the development of networks that comply with given system performance specifications. The proposed paper gives the results of the developmental work related to design multimedia Computer Aided Design and CAE tools for digital and analogue fiber optic networks design and analysis. Tae Rim Lee²¹ created a courseware which aim focuses on the teaching of biostatistics to health professionals with computer-based

supplements; courseware, digital library of TV lectures on SAS and interactive communication through the internet. The students were motivated by the course materials and expressed that they had a better understanding of reality, and the feedback through e-mail which encouraged the students.

However, the most dangerous diseases that spread during the pilgrimage season are documented. The study also provides an integrated classification of diseases according to the symptoms reported by the virtual patient; the symptoms could include high temperature, headache, or body pains. Our diagnosing of pilgrimage common diseases by interactive multimedia courseware overcome the limitations and challenges of pilgrimage common diseases by the courseware has been created using an authoring tool known as ToolBook instructor to provide pilgrims with quality service.

The Aim and Objectives of the Study

The aim of this study is to create awareness among pilgrims about the common diseases that spread during the season of Hajj (pilgrimage) in Saudi Arabia. This is achieved by providing information about the symptoms and treatment of these common diseases based on their unique symptoms. It is hoped that this will help in reducing the rate at which the diseases spread by providing some recommendations to the pilgrims. The general objective of the research is to produce multimedia courseware for the diagnosis of the most common diseases of Hajj (pilgrimage). The general aim of the study can be achieved by accomplishing the following specific objectives:

- To create awareness on the common diseases that spread in the season of Hajj (pilgrimage) in Saudi Arabia, and
- To provide some information about the symptoms of these diseases as well as how each of them can be treated according to their special symptoms. This is geared towards reducing the spread of the disease through the provision of some recommendations and guidance.
- To create a learning theory that describes what the learners should be able to do upon completion of a major segment of instructions. This will help the pilgrims to acquire knowledge on the symptoms of the diseases, as well as knowledge on the diseases can be avoided. They will also acquire knowledge on the treatment for each disease.

Based on the five phases—Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model, the use of a basic ToolBook (ToolBook instructor) is used in providing teachers with the activities which they can incorporate into their own instructive materials. ToolBook instructor

helps teachers in the configuration of the course process that enhances improved learning.

Materials and Methods:

ADDIE methodology is developed so it can successfully prepare programs for different subjects. The ADDIE is popular in Instructional Systems Design (ISD), Instructional Systems Design and Development (ISDD), Systems Approach to Training (SAT) or Instructional Design (ID). Most of the instructional plan models that are currently available today are varieties of the initial ADDIE presented in ^{22,23}. The ADDIE presented in those works is essentially conventional, efficient, well-structured and used by designers, instructional originators and coaches to improve learning. The model cannot be implemented in a random and disorganized manner. It is intended to guarantee:

- The accomplishment of course objectives by learners.
- The assessments of people’s needs.

- The planning and improvement of training materials.
- Assessment of the efficiency of the training program with detailed and quantifiable results.

Past studies on ADDIE have argued that more than 100 Instructional System Designs (ISD) are used around the world, and all of them were developed based on the conventional ADDIE. The conventional ADDIE involves some stages which include, design, analysis, development, implementation and evaluation, with each stage leading to the next.

The systems actors of our study include four actors which are: patient, doctor, intermediacy (which is the application programming interface used) and the administrator as we shown in Fig.2. The use case diagram of proposed diagnosing pilgrimage common diseases by interactive multimedia courseware and the sequence diagram for the operational model are shown in Fig. 2 and 3.

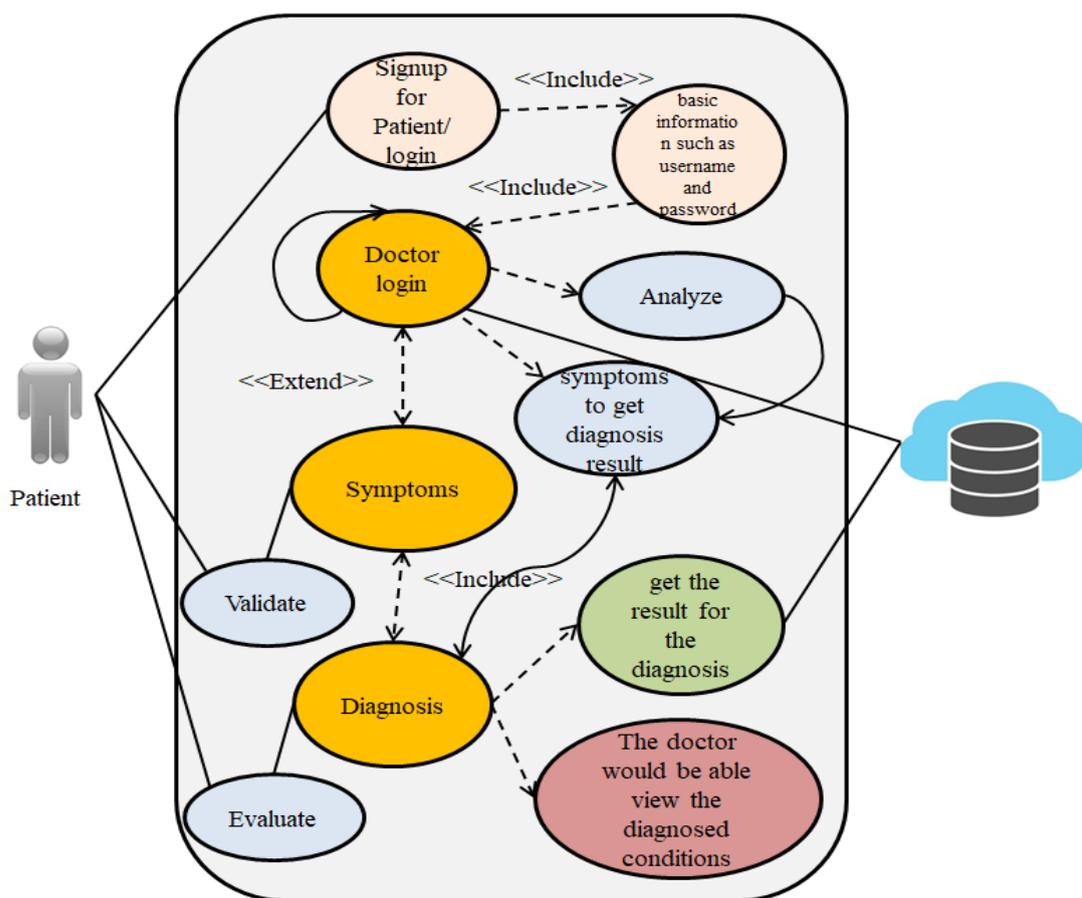


Figure 2. The use case diagram of proposed diagnosing pilgrimage diseases by interactive multimedia courseware

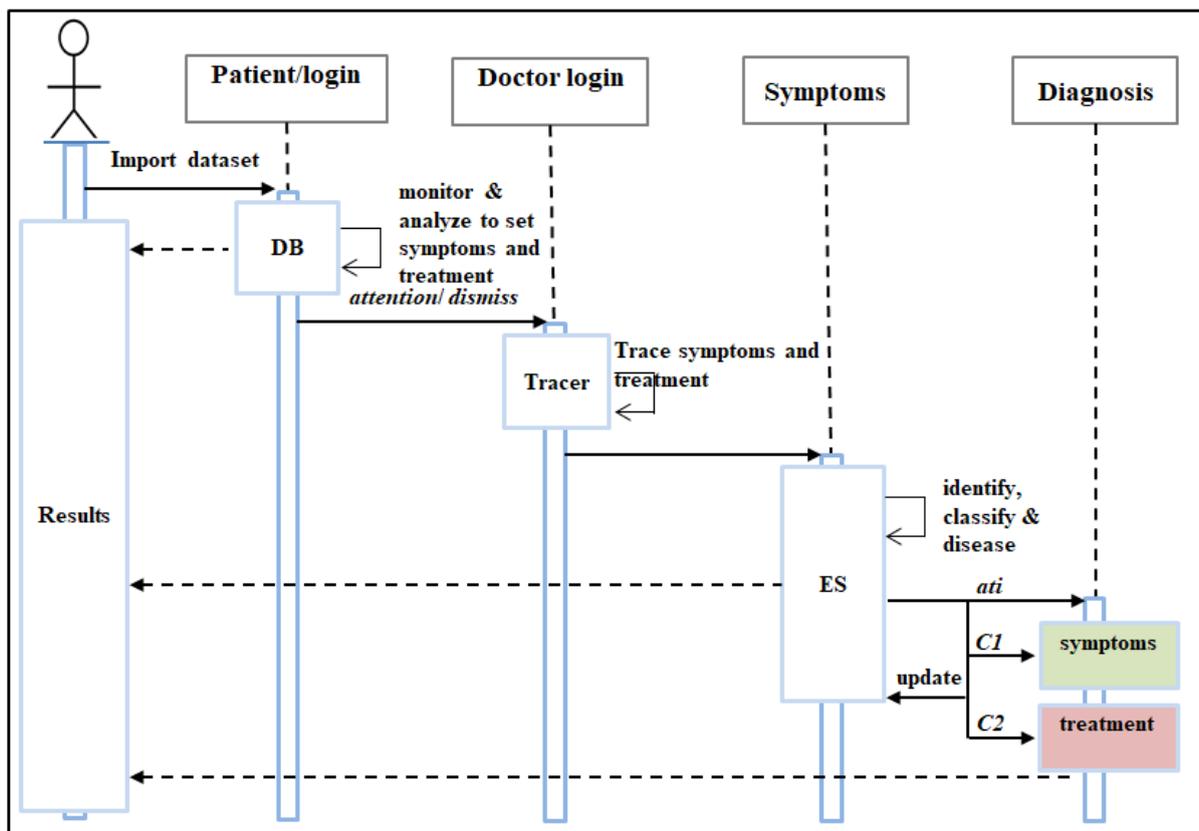


Figure 3. The sequence diagram for the operational model

The Research Framework

This work aims at enhancing a straightforward ToolBook known as ToolBooL instructor. Based on the ADDIE model, the ToolBook would be enhanced to provide instructors with the activities they will need for preparing their own basic teaching materials while checking correspondence with learners. Stages of teaching and learning which facilitate the process of course configuration are supported by ToolBook instructor which gives an instructing and learning stage that encourages a course configuration process with accentuation put on the utilization of innovation upgraded learning. Figure 4 below illustrates the connection between the stages in this model.

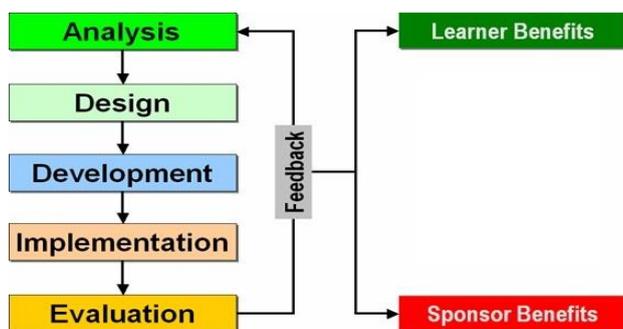


Figure 4. The research framework²²

During the analysis stage, we characterize and create a clear picture of the needs, requirements, abilities, existing information and the ideal result of the preparation. In the design stage, an attempt is made to recognize explicit learning targets, subject matter, introduction strategies, media, student activities and appraisal criteria to be utilized. In the development stage, the learning materials to be used for the planning are created. The created arrangement is conveyed to the pilgrims. After conveyance, the next stage is the evaluation stage which involves evaluating the viability of the subject matter and materials used in the preparation of the program. It is based on this that adjustments are made prior to progressing to the next stage.

Learning Theory

The learning theory term is used to describe what the learners should be able to do when they have completed a key segment of instructions. Therefore, in the case of diagnosis, the most common Hajj diseases, the pilgrims should be able to discover the symptoms of each disease, have the knowledge of how to avoid these diseases and know the treatment for the diseases. In addition, at the end of this course, the pilgrims are also expected to be able to create awareness about the diseases and give

recommendations on how to prevent or/and treat others. In order to avoid the diseases during Hajj, this course should be taken by the pilgrims before they embark on the journey to perform the Hajj. This will create awareness among the pilgrims while also teaching them the ways that can be used to prevent the diseases infection. For the information in this course to be clearly delivered to the pilgrims, a committee of technicians alongside the necessary facilities are required. For instance, if the information is to be relayed to all pilgrims, a large screen with the projector is needed. Finally, in order to obtain good results, this course should be administered to people within the age range of 25 to 55, since the majority of the pilgrims that perform Hajj are within this age range. Summary of the learning theory^{24, 25}:

- 1- People can learn by observing.
- 2- Learning can take place without performance.
- 3- Cognitive processing occurs during learning.
- 4- Cognition plays a role in learning.

Modelling and Design

The system provides multimedia courseware that uses a knowledge base consisting of a set of units that collaborate with each other to provide the appropriate medical solutions needed to solve the problem of Hajj diseases. The multimedia courseware is loaded with information and training, as well as principles and rules that specify the multimedia courseware that is required for determining a specific kind of disease. Moreover, the multimedia courseware is able to provide reliable therapeutic guidelines while suggesting appropriate treatment for the condition based on the symptoms.

Knowledge Base

The knowledge base contains systematic knowledge and news facts about common Hajj diseases. The systematic knowledge provides knowledge of the methods and procedures (rules) used in the identification of a particular disease. The reference of the diseases has been compiled and classified based on symptoms of each disease. This compilation was validated by professors and experts in the related field. Here, it is important to develop an effective methodology that can enhance the learning about these diseases. The following shows the list of rules for the knowledge base including diseases and their symptoms:

/Rule 1.1/ If symptoms are (sudden increase in temperature to 40-410C, dry skin and redness with, general weakness) then, the disease is (Sunstroke) .
The disease is exhaustion and its treatment is:
1. One liter of water with small spoon of salt .

2. Normal saline-Vitamins.

3. Analgesic.

/Rule 1.2/ If symptoms are (general weakness, thirst & nausea, abdominal discomfort), then the disease is (exhaustion).

The disease is Cramps and its treatments is

1. Analgesic (DiclofnacorProfine).
2. Muscle relaxing (Parafon, Maiojestic).
3. Hot compresses.
4. Normalsaline.
5. Salt tablets.

/Rule 1.3/ If symptoms are (pain around a particular muscle, lassitude) then, the disease is (cramps).

The disease is Pneumonia and its treatment is:

1. Antibiotic.
2. Ventolin.
3. Expectorate ejector (romilar, amidren).
4. Vitamins.

/Rule 1.4/ If symptoms are (shivering, headache, high temperature of 400 C, sweating, pain in back muscle) then the disease is (Influenza).

The disease is sunstroke and its treatment is:

1. Ice water for patient body.
2. Liquids in mouth and vein.
3. Analgesic (panadol).

/Rule 1.5/ If symptoms are (difficulty in breathing, pain in thorax, shivering and headache) then, the disease is (Pneumonia). If symptoms are (runny blood from inside nose) Then, the disease is (Nose-bleed).

The disease is Influenza and its treatment is:

1. Vitamin C.
2. Vevadool.
3. Generalize analgesic (profine).

/Rule 1.6/ If symptoms are (cough, high temperature, headache, pain in the throat), then, the disease is (sore-throat).

The disease is sore throat and its treatment is:

1. Vitamin C.
2. Vevadool.
3. Antibiotic.

/Rule 1.7/ If symptoms are (contractions in the intestines and diarrhea, nausea and vomiting, general weakness and exhaustion), then the disease is (staphylococcal -Bacteria cluster).

The disease is bacteria cluster and its treatment is:

1. Gastric wash.
2. Antibiotic.
3. Anti-diarrhoea (cabact-amudiom).

Multimedia authoring systems allow the user to create interactive instruction without programming, thereby extending the opportunities of courseware development to those who lack the time or the skill required for programming. In order to accomplish this system, Tool Book instructor is needed to

complete the entire courseware.

The Learning Model

The proposed learning model requires information in a profoundly individualized process. It has been demonstrated by related work that learning models can be used in real-time and they can be applied in practical education activities. This model helps teachers and pilgrims to understand that different individuals have special ways of obtaining information^{26,27,28}. This way, the teachers will be able to use different training techniques so that each pilgrim will be able to learn what is taught. The proposed model design includes three main functions: identifying the inputs/outputs of this courseware, developing this courseware by using ToolBook instructor and evaluating the effectiveness of this courseware. Figure 5 shows the model of this courseware²⁹⁻³⁵.

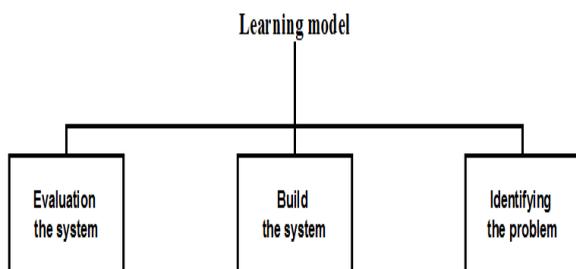


Figure 5. The Courseware model^{29,30}

Results

The multimedia courseware for diagnosing common diseases of pilgrimage is implemented by ToolBook instructor. The course in the proposed courseware consists of four main titles which are; introduction to the diseases, the symptoms of the diseases, the treatment of the diseases, and recommendations on how to avoid these diseases. The main goal of this system is to make people aware of the diseases that are common during the season of Hajj (pilgrimage) in Saudi Arabia and to provide some information about the symptoms of these diseases and how to treat each disease according to their special symptoms. It is hoped that the recommendations and guidelines given in the system will be effective in reducing the spread of the diseases. The following figures show the GUI of the courseware and the related diagnosis steps. Each step together with its contents about the diseases is explained. The courseware shows a brief introduction to the application and how the user can benefit from it. It also contains a demonstration video clip and read text button. The following figures shows the interface and the main functions of the application and the diseases, the related symptoms and treatment (see Figs. 6,7, and 8).

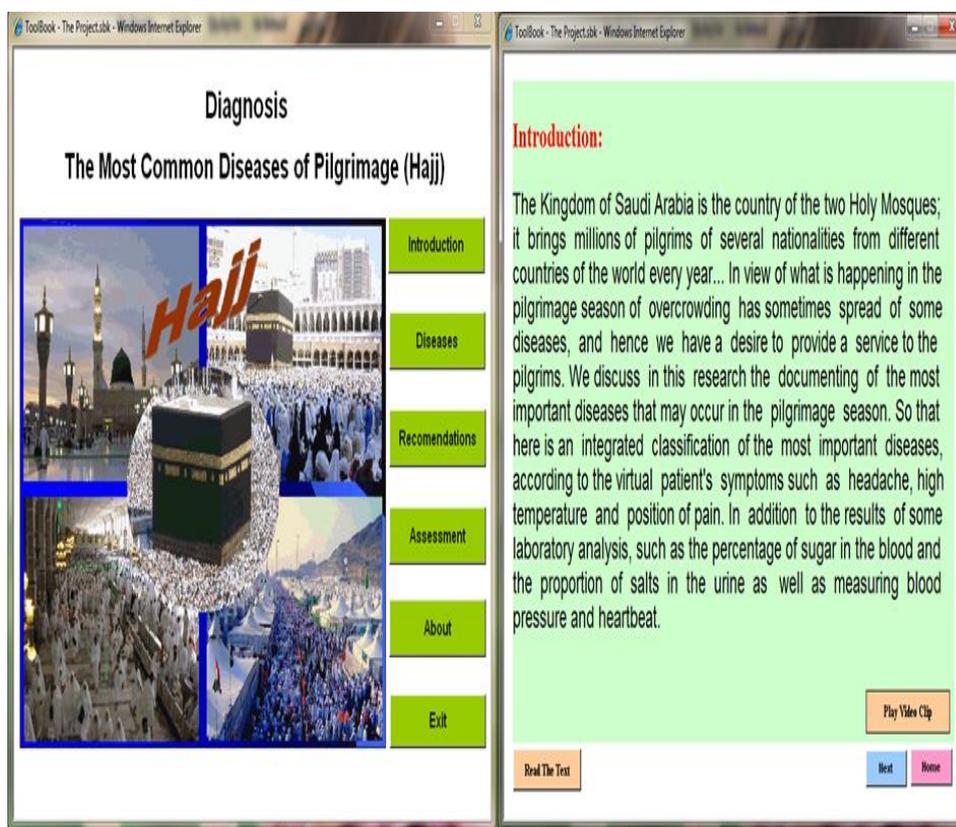


Figure 6. The graphical interface of the courseware

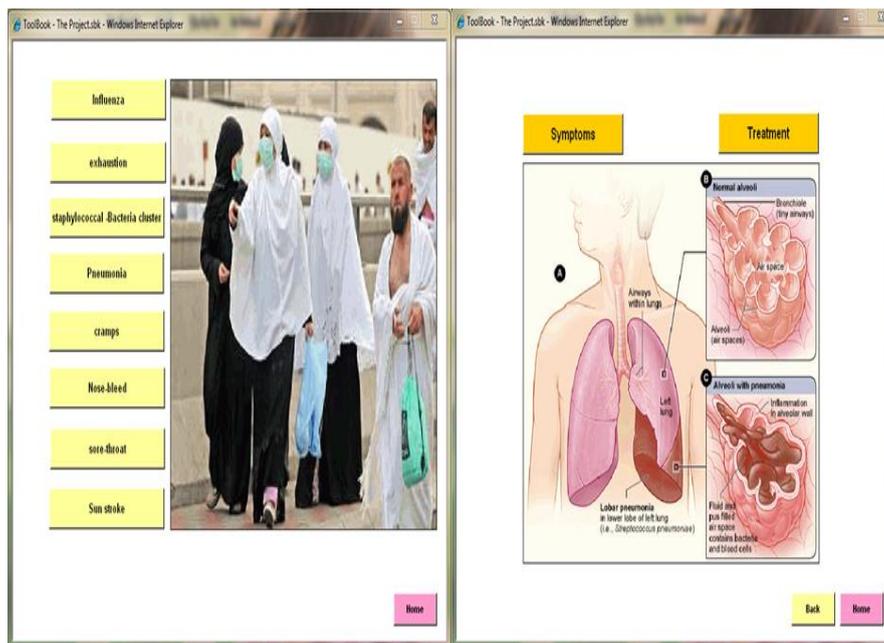


Figure 7. One of the diseases, the related symptoms and treatment

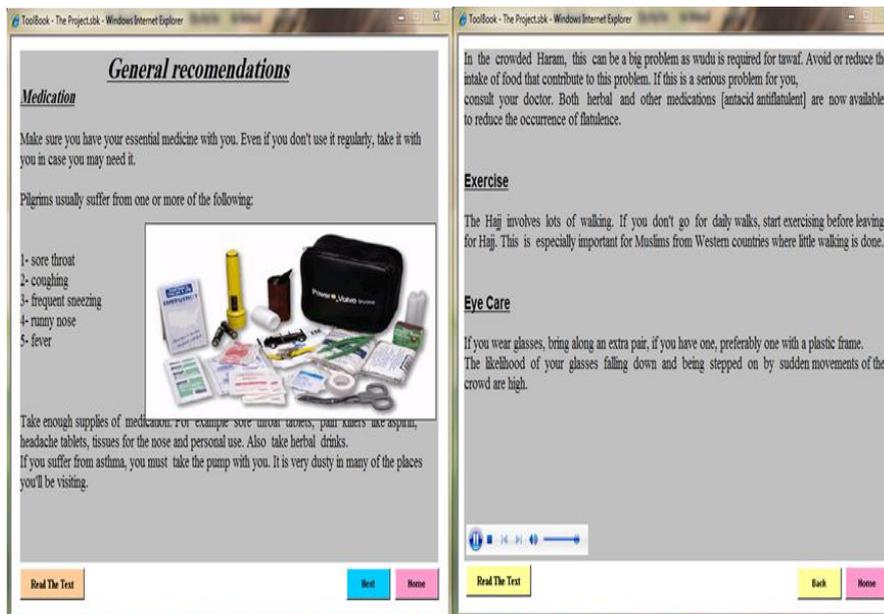


Figure 8. General recommendations during Hajj season

The assessment part consists of three different assessment items to measure the user understanding of these diseases and different questions as part of the assessment. Figure 6 shows a sample of choosing the right answer type of questions type and the sample of the true or false type of questions. The proposed learning model requires information in a profoundly individualized process. It has been demonstrated by related work that learning models can be used in real-time and they can be applied in practical education activities. This model helps teachers and pilgrims to understand that different individuals have special ways of obtaining information^{3,4,5}. This way, the teachers will be able to use different training

techniques so that each pilgrim will be able to learn what is taught. The proposed model design includes three main functions: identifying the inputs/outputs of this courseware, developing this courseware by using ToolBook instructor and evaluating the effectiveness of this courseware.

The Multimedia Courseware for Diagnosing Common Diseases of Pilgrimage is tested with people to identify the improvement in their knowledge and measure the level of interest in the topic. The Multimedia Courseware for Diagnosing Common Diseases of Pilgrimage courseware provides learning and interactive training functions for interested individuals. People are able to understand the roles of the heart by

studying the structure and to trace how the Diagnosing Common Diseases of Pilgrimage. They are able to identify the major Common Diseases of Pilgrimage. The Common Diseases of Pilgrimage courseware allows people to observe the parts of the Common Diseases of Pilgrimage. It increases the people understanding of the structures associated with the Common Diseases of Pilgrimage and the circulatory system. Finally, it gives people and the users an overview of causes of Pilgrimage diseases, methods of prevention of pilgrimage diseases, and the available methods of treatment.

The significance statement of the proposed diagnosing pilgrimage common diseases by interactive multimedia courseware can be summarized as follows:

- It provides an integrated classification of diseases according to the symptoms reported by the virtual patient; the symptoms could include high temperature, headache, or body pains.
- Some of the symptoms are categorized based on results of laboratory test performed to determine the level of sugar in blood and proportion of salt in the urine, as well as measurements of heartbeat and blood pressure.
- This technology performs this task by using the knowledge that has been accumulated from past experience, particularly in the field of disease diagnosis, medicine, and treatment.
- The paper will also help physicians in diagnosing common Hajj diseases, as well as in training students enrolled in medical schools. The system will further be expanded by including all the diseases that spread during Hajj.
- Our diagnosing pilgrimage common diseases by interactive multimedia courseware overcome the limitations and challenges of pilgrimage common diseases by the courseware has been created using an authoring tool known as ToolBook instructor to provide pilgrims with quality service.
- This work aims at enhancing a straightforward ToolBook known as ToolBool instructor. Based on the ADDIE model, the ToolBook would be enhanced to provide instructors with the activities they will need for preparing their own basic teaching materials while checking correspondence with learners.
- The systematic knowledge provides knowledge of the methods and procedures (rules) used in the identification of a particular disease. The reference of the diseases has been compiled and classified based on symptoms of each disease. This compilation was validated by professors and experts in the related field. Here, it is

important to develop an effective methodology that can enhance the learning about these diseases.

Conclusion

In this work, a system that is capable of diagnosing common Hajj diseases is designed, built and evaluated. The system is multimedia courseware for Hajj healthcare assistance that includes the diagnosis of a number of pilgrimage diseases. The diseases are classified according to the main display characteristic of the type of disease, as well as the symptoms and medical tests so as to distinguish between diseases with similar symptoms. There are many parties that can benefit from this research, including the Ministry of Health and Hospitals and the Committee on medical education of the pilgrims. The system proposed in this research can also assist in diagnosing common Hajj diseases, as well as in training purposes. It is clear that the World Wide Web, hypermedia, Information and Communication Technologies (ICTs), computer networks, and the Internet are convenient and dynamic means for providing basic education and high-quality training. Nonetheless, the task of changing an implementation plan from a mere representation to a total learning configuration is a challenge that requires detailed information of methods and computer training. ToolBook is a straightforward system that facilitates the process of course configuration with much emphasis being placed on the use of innovation to improve the process of learning. Instructors only require little efforts to make relevant inferences about the efficiency of the structure of the learning framework. This inferences made by the instructors can help in further improving this work. Future work can be done by training the doctors and workers on these applications and programs in real clinical use to check the role of multimedia courseware aided in fact offer assistance in planning them for the real-life setting of a hospitals and medical centers. This would moreover give feedback on capable of diagnosing common Hajj diseases that can be joined into future interactive media courseware in diagnosing common Hajj diseases.

Authors' declaration:

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are mine ours. Besides, the Figures and images, which are not mine ours, have been given the permission for re-publication attached with the manuscript.

- Ethical Clearance: The project was approved by the local ethical committee in University of University of Anbar.

Authors' contributions statement:

(Mazin Abed Mohammed): design, drafting the MS, revision and proofreading. (Itimad Raheem Ali): Conception, design, acquisition of data
(Omar Ibrahim Obaid): interpretation, drafting the MS, revision and proofreading

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تشخيص أمراض الحج الشائعة عن طريق برامج الوسائط المتعددة التفاعلية

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الخلاصة:

في هذه الدراسة، نحاول تقديم خدمة الرعاية الصحية للحجاج. تصف هذه الدراسة كيف يمكن استخدام مناهج الوسائط المتعددة في جعل الحج على علم بالأمراض الشائعة الموجودة في المملكة العربية السعودية أثناء موسم الحج. كما سيتم استخدام البرامج التعليمية للوسائط المتعددة في توفير بعض المعلومات حول أعراض هذه الأمراض، وكيف يمكن علاج كل منها. يحتوي البرنامج التعليمي للوسائط المتعددة على تمثيل افتراضي للمستشفى، وبعض مقاطع الفيديو للحالات الفعلية للمرضى، وأنشطة التعلم الأصيلة التي تهدف إلى تعزيز الكفاءات الصحية أثناء الحج. تم فحص المناهج الدراسية لدراسة الطريقة التي يتم بها تطبيق عناصر المناهج الدراسية في التعلم في الوقت الحقيقي. أكثر من ذلك، في هذا البحث، يتم تقديم مناقشة حول أخطر الأمراض التي قد تحدث خلال موسم الحج. إن استخدام دورة الوسائط المتعددة قادر على توفير المعلومات بشكل فعال وفعال للحجاج حول هذه الأمراض. تؤدي هذه التقنية هذه المهمة باستخدام المعرفة المتراكمة من التجارب السابقة، لا سيما في مجال تشخيص الأمراض والطب والعلاج. تم إنشاء المناهج الدراسية باستخدام أداة تأليف تُعرف باسم مدرب ToolBook لتزويد الحج بخدمة عالية الجودة.

الكلمات المفتاحية: نموذج التحليل والتصميم والتطوير والتنفيذ والتقييم؛ أمراض الحج؛ نظرية التعلم؛ مناهج الوسائط المتعددة.