



A Multimedia Courseware for Human Heart Anatomical and Functional Illustration

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ABSTRACT

Advances in computer science have provided unique opportunities to apply Interactive Multimedia (IMM) courseware to a wide variety of medical and health care functions. Courseware can be called an easy to learn, teachable and course materials which is an important in Information Communication Technology world today. It helps the learners/students to improve their knowledge, skills and creativity. One area which holds the high ability for using computer systems is medical and health science education. This paper describes the design of an IMM courseware for learning about Human Heart. It proposes a Human Heart Anatomical and Functional Illustration (HHAFI) courseware for students, health officials and everyone interested in having a healthy heart. The HHAFI courseware is implemented by Toolbook Instructor and presented on Windows platform. The courseware includes an introduction that describes the heart and recall such as mechanisms of the heart, heart diseases, healthy tips and living a healthy lifestyle. The HHAFI courseware is tested with the student to identify the improvement in their knowledge and measure the level of interest in the topic. The HHAFI courseware provides learning and interactive training functions for interested individuals.

Key words : Interactive Multimedia, ADDIE methodology, Cognitive Theory of Multimedia Learning (Mayer), human heart courseware.

1. INTRODUCTION

Highlight The increase in growth of a number of techniques used in interactive multimedia learning results in expanding the study in novel types of mixed media production and sharing capability. Human-Computer link configuration is the utilization of link operators on-screen enlivened casts

which is one of the modern and dynamic methods. This Interface agent/operator helps PC links to be progressively humanlike or increasingly "social" with individuals [1].

In instructive courseware, the interface/link specialists have moved toward becoming understudies not just the instructors in the new PC era and yet, they began giving instructive data satisfying the roles of instructor and teachers [2].

The improvement in vogue Multimedia has started to resuscitate rapidly for instructive innovation. Mixed media is the utilization of a PC to "associate" media-content, designs, sound, and image/video which can change training. The key to the potential of mixed media is in its ability to integrate two ground-breaking techniques which when in hybrid, change data innovation [3]. The first is the PC's capacity to display a lot of media designs, independently or at the same time, to the client. Secondly, it can give nonlinear connections inside and between these media patterns. Interactive Multimedia (IMM) implies the mix of collective data forms inside a consolidated setting. IMM had its unassuming inceptions in the early endeavours to join content and designs on a solitary screen and to give important sounds via a PC controlled speaker. IMM courseware has given a pathway for understudies to learn using PCs at any time and location [4], [5]. In teaching, the use of courseware has been a limitation to educators since they have to influence sufficient utilization of it so as to build up understudy's learning abilities and improve learning.

By utilizing courseware to teach, the teacher helps the student to upgrade their creativity which also helps to increase their self-assurance. It additionally gives ground to creating autonomous learning abilities and all the while, drawing in understudies in their learning and creating confidence [1], [3]. It is likewise vital in educating and learning science [4], [5]. It impacts the concept of what is instructed and upgrades understudy's which enables the student to easily remember what has been taught.

Medical science courseware can be taken as an innovative exercise for understudies since it entails a lot of diagrams and understanding. In order to explain and understand human

heart, students need time to explore and be highly imaginative. Thus, finding a solution to this issue entails some accelerated and motivating learning techniques [2]. This paper proposes a Human Heart Anatomical and Functional Illustration (HHAFI) courseware that provides learning experience beyond the classroom. The rest of the paper includes five Sections that illustrate the literature review, methodology, modelling and design, implementing the HHAFI courseware and the summary of the work.

2. LITERATURE REVIEW

This section explains deeply some review of the article that is related to our project and the tools used to develop this multimedia courseware. It is divided into three subsections that cover review to the topics of interactive multimedia, and interactive multimedia courseware. It ends up with the review of the related work on developing interactive multimedia courseware.

2.1 Interactive Multimedia

Interactive Multimedia (IMM) sometimes called hypermedia, or integrated media is the latest great advancement in classroom innovation and potentially an incredible asset for ecological training. IMM covers tons of territories. "Interactive" implies this new apparatus gives various options and as the program unravels, the client picks which successions or courses/topics to examine. The introduction "interacts" with the client by giving feedback to the decisions made. "Multimedia" implies designs, music, audio cues, voice, video/image, and movement, in any way it is combined inside the very project [3]. The aforementioned contents are the elementary units of a mixed media item; however, the major thing is the understudy's capacity to interface with the data or pictures by utilizing the PC [6].

The strength of this tool that differentiates it from prior educational technologies is known as Intuitiveness/Interactivity, for example, slides, film, and video. Multimedia provides a "hook" which helps change understudies from inactive beneficiaries of data to proactive members in their training procedure [5]. IMM can be defined as when the multimedia users are allowed to control the elements that are delivered and when they are to be delivered., Interactive multimedia (IMM) application provide the user with rich media content that has entertainment value in it which traditional method didn't offer [7]. The most widely recognized IMM link is a hybrid of a visual (for example a showcase, console, and mouse) with a voice input/output (utterance/discourse acknowledgement, utterance blend/fusion and taped sound).

2.2 Interactive Multimedia Courseware

The vast majority of individuals are regularly intrigued with mechanical gadgets, just as mechanical resolutions for entangled social issues. During the 1960s, training instruments were taught as moderating the fatigue of training

and enhancing scholastic execution. The teaching mechanisms employed information-push technologies which are mainly of optical footage-ribbons and sound chronicles, with reactions from various option tests. In this case, a human educator drove the discourse and gave answers to understudy inquiries/queries [1]. With the availability of progressively potent PCs and programming between the 2000s and 2019s, intuitive/interactive PC links encouraged a more sway method to deal with instructing and examining. The current target moved towards 3D substance creation or higher, and execution monitoring, improved by intuitive exhibitions or movements.

Interactive/intuitive mixed media is briefly learned, is to a greater extent relished and builds users' comprehension level. Education was better when the information was presented via multiple media than traditional classroom lectures [4]. Each section can stand on its own, so users can go in-depth into the subject zones they have to study and know and leave out those they do not. As a rule, applications incorporate the choice to customize the application for explicit utilization where the user can pick components, modify the substance in certain areas. Intuitive education with video/images, sound, designs, and input keep learners interested and strengthen aptitudes. Through consistent work, learning is comprehended, assimilated and incorporated within everyday execution [7].

2.3 Related Work

For quite a long while, motorized instructing ideal models were created for medical instruction. For instance, the internet has numerous courseware for the 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 examples. 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], [31]. 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 Learning (CAL) and Computer-Assisted Instruction (CAI) instruments to provide a useful effect on comprehension and imaginative reasoning for the understudy. Thus, bunches of courseware are being built however just a few courseware emphasize on User Interface (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 Mohamed [18] integrate 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 an understudy in year 5 and 6 inside the age range of 11 and 12 years in Malaysia. The courseware created dependent on the 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 draw in light of a legitimate concern for the understudy to get familiar with the topic so as to deliver excellent understudy with a decent demeanor for the nation in creating learning and a successful society.

Zaini and Ahmad's work [6] shows research on understudies' inspiration towards studying Math utilizing interactive media courseware for the theme of Loci in 2 Dimensions. Earlier, an investigation was carried out utilizing consultation and review. The courseware utilized in the initial investigation depended on the courseware for form 2 provided by the Ministry of Education. The review inquiry which depended on Instrument Material Motivation Survey (IMMS) has been disseminated to explore the shortcomings of the courseware as far as inspiration is concerned. A school in Perak provided thirty correspondents and these correspondents were engaged with the investigation. The outcome demonstrates that the understudies have low inspiration towards the present courseware.

The rise of innovation had empowered the improvement of different imaginative instructing-learning apparatuses in training. The happiness is given by mix media (sight and sound) can expand student's inspiration and inclusiveness accordingly enabling them to hold the training procedure in a more drawn out time in contrast with utilizing conventional classroom technique. As moderate students, it is hard to keep up with their learning considerations for quite some period,

mix media courseware is considered to help them. Abdollah *et al.* [7] present the discoveries from an introductory examination of moderate students carried out in a specialized curriculum educational institute. In this research, a subjective approach utilizing a consultation with specialized curriculum instructors and class perceptions were carried out to comprehend the moderate student's instructing-learning circumstances overall. The significant discoveries from the examination are moderate student's learning premium and behavior while utilizing a PC and the possibility that interactive media courseware can acquire inspiration and expanding their enthusiasm for learning. A few rules for structuring interactive media courseware for moderate students are recommended. In this work, a theoretical system is additionally being delineated as a guideline or aid in leading further research. All these introductory discoveries will help with planning interactive media courseware and will effectively encourage moderate students and customized curriculum instructors.

Computer/PC Based Learning (CBL) in instructing and learning procedure is turning into a marvel in the instructive sector. CBL suffice to set up increasingly powerful learning conditions than conventional instructing techniques. Nonetheless, investigative surveys show that a lot of instructors don't utilize CBL to promote and additionally enhances the nature of learning situations. In Han *et al* [19], they discuss the potential of CBL and its constraints with respect to this problem which is concentrating on the boundaries of coordinating the innovation within instructing and learning procedure amongst instructors in Malaysia and furthermore in Math studies.

There are diverse instructing procedures that teachers can utilize to enhance understudy education. It is of utmost significance to choosing to fit instructing methodologies in nursing in order that the preparation is additionally engaging and progressively viable. Xu [20] introduces ten teaching strategies with the aid of ToolBook to enable educators to figure out ways to include the instructing procedure in nursing training. Utilizing these methodologies help to retain the data related to the students' exercise. The choice of training procedures suitably is of incredible significance for nursing teachers to convey brilliant instruction.

Chronic kidney illness/disease (CKD) is a severe and incessant situation in which the kidneys' capacities' advancement is failed or hindered in the body. Immediately the kidneys are harmed, the discharge procedure in the body can't be done adequately. Critical data is required for CKD sufferers, for example, nourishment sustenance, results and furthermore everyday wellbeing services handling. Hence, the focal point of this task is to build up a mixed media application for sufferers of CKD that can give self-care aids to their day-to-day life. Rosmani *et al* [21] use Adobe Flash CS5.5 that gives the result as a CKD sufferer self-care aids flash apparatus. Along these lines, a basic site of CKD sufferer self-care aid has been created utilizing Adobe Dreamweaver that operates as an instrument to disperse this interactive media application. From this task, another

intelligent structure of CKD self-care administration was made and progressively successful data avenue or medium is produced for them. Heuristic/inquisitive assessment and ease of use tests have been carried out on the specialists and genuine clients to guarantee that the program conveyed conforms to the clients' desires.

3. METHODOLOGY

The aim of this project is to help students, health officials to identify and to learn about the heart which has been difficult to them due to the usage of traditional teaching methods. Most students have difficulties in the ability to understand and remember the lesson learnt about the heart because of its abstract nature which is not easy to comprehend. They forget easily things learnt in class especially the diagram. Their most perception of the human heart is confusing in a certain area. Today lecturers use conventional way to teach medical students. The tools that they were using are including chalk and blackboard. This technique sometimes makes students feel bored. Therefore, our group came up with the idea of developing an IMM courseware for the human heart, titled a Human Heart Anatomical and Functional Illustration (HHAFI) courseware. The HHAFI courseware is not limited only to the student, but open to everyone in other to learn about the heart and related healthy lifestyle that prevents heart diseases. Our team kept on finding the best way to learn the human heart by using ToolBook to develop the IMM courseware. Methodology refers to sets of strategies and there are numerous types of system, so in picking the right one, it is critical to ensure the undertaking follows the standards and strategy in the picked procedure. This work adopted ADDIE methodology in the construction of the HHAFI courseware. ADDIE is a popular method of Instructional Design (ID), Instructional Systems Design (ISD), Systems Approach to Training (SAT) or Instructional Systems Design and Development (ISDD). A large number of the educational plan archetypes are varieties of the initial ADDIE methodology [14]. Past studies on ADDIE have shown that for the most part ISD are utilizing it in the evaluation, structure, improvement, execution and assessment stages. The ADDIE is essentially efficient and well-structured modelling to the HHAFI courseware because it ensures:

- The accomplishment of course objectives by learners.
- The assessments of users' requirements.
- The planning and improvement of training materials.
- The assessment of the efficiency of the instructional program without knowing the details.

3.1 Learning Theory

There are various types of learning theories and they include Cognitive hypotheses, Assimilation hypothesis (Ausubel), Schema Theory, Attribution hypothesis (Weiner), Mental Archetypes (Johnson-Laird), Component Display Theory, Gestalt Psychology (Tolman), Cognitive Theory of

Multimedia Learning (Mayer), Elaboration Theory (Reigeluth) and Stage Theory of Cognitive Development (Piaget). For the purpose of this research, we will elaborate on Attribution theory (Weiner), Cognitive Theory of Multimedia Learning (Mayer) [22]. The "interactive media rule expresses that individuals gain all the more profoundly and increasingly when sounds and sights are combined over when sounds only are used. Just incorporating words to images isn't a competent and efficient method to obtain mixed-media learning. The aim is to instruct media with respect to human brain functions. This sets the foundation for Mayer's cognitive theory of mixed-media learning. This theory submits 3 postulations with regards to education with mixed media.

- Two different media exists (sound-related and sight-related) for preparing data (additionally alluded to as Dual-Coding hypothesis sometimes);
- Every avenue/medium has a constrained limit;
- Learning is a procedure of sifting, choosing, sorting out, and incorporating data dependent on earlier information.

People can handle just a small measure of data in a medium in a specific time, and they make acquired data sensible by effectively obtaining mental portrayals. Mayer in addition, explains the job of 3 memory stores: sensual (it gets stimulations and keeps it for a short period), working (where we process data effectively to produce mental build ups), and long-run (which is the storehouse of everything learned) [23]. Mayer's subjective theory of media learning expresses the notion that the mind doesn't decipher a mixed media demonstration of words, images, and sound-related data together; instead, these components are chosen and composed progressively to deliver sensible mental build-ups. In addition, Mayer emphasizes the significance of learning (in light of the testing of substance and showing the timely transfer of knowledge) when novel information is incorporated with prior knowledge.

Four types of questions are given to the users in order to evaluate their learning ability and the learning method. The first type (A) has a set of matching questions, the second set (B) has multiple-choice questions, the third set (C) has a filling in the blank questions and the fourth set (D) has true or false questions. Figure 5 shows the four test options that our users perform to evaluate the learning model of the courseware. Each of the tests has a subset of IMM questions. Evaluation score is provided at the end of each segment and the overall results also provided along with the correct answers at the end of the test.

3.2 Authoring Tools

Recently, e-learning is turning into an important piece of educating and instructors are hunting down the best technique to present their courses. Learning Object (LO) has become the little subject entity that can be devised to be used

again, be custom-made and adaptable. Educators want to discover writing devices for making intelligent LO very quickly and readily [23]. There are numerous apparatuses which are mostly referred to, for example, Microsoft PowerPoint, FrontPage, Dreamweaver and Flash. Be that as it may, the creator and anyone who utilizes these instruments is required to exhibit great expertise to produce an intuitive series. Some tools, for example, Articulate, Adobe Captivate, Course Lab and Generative Learning Object (GLO) create series and LOs beyond the requirement for a level of programming [4]. In this manner, what we need is an apparatus that can enable us to create interactive courseware within a limited time and resources available.

Authoring tool such as ToolBook is a program that enables courseware developer to write using hypertext or multimedia applications and helps to compose utilizing hypertext or interactive media applications and help to make a complete application simply by connecting items together, for example, a passage of writing, a depiction, or a melody. A greater part of writing frameworks additionally bolster a scripting language for modern complex applications, advanced applications. Hence, these instruments give numerous avenues assisting the creator to make a decent e-content for courses. The authoring tool has in the essential attributes that facilitate the work than paper-content such as saving, adjustment, reusability and dissemination of data [20]. The grouping of writing apparatuses can be founded on various things, for example,

- **Intricacy/complexity:** The instruments can be characterized in the light of from elementary to sophisticated implying how straightforward or complicated the instrument is. The instruments end up basic when it supports drag-drop options, wizard, and so on. In constructing a course component, the instruments used are said to be sophisticated when there is a need for programming capacities or knowledge and specialized competency. Long periods need to be expended in making a course, particularly when a requirement for programming exists to make tests and checks or creating the course afresh.
- **Cost:** instruments can be named free and business. The majority of the tools need to be purchased and some of them have trailer versions with limited free functions.
- **Purpose/Reason:** The motivation behind some composing instruments focus on making courses. In any case, there exist some others of multi-purpose apparatuses which are not specific for making on the web courses, such as the gaming authoring tools.

3.3 Toolbook Instructor

Toolbook Instructor is an authoring tool used to create the human heart medical courseware. Due to the fact of the

comprehensiveness that programming dialects can give in mixed media writing is relinquished so as to lessen the multifaceted nature of programming [24]. Hence, mixed media advancement commonly happens in an Interactive/intuitive Development/improvement Environment/condition (IDE) that effectively conceals (from the designer) low-level programming intricacies that process mixed media items. These writing frameworks are very more than exceptionally structured, streamlined programming dialects; give straightforward, intuitive strategies that permit the arrangement of a mixed media of sight and sound application beyond the need for the client to secure particular experience and field aptitude.

ToolBook Instructor is a program/authoring tool used for making intuitive substance, tests, evaluations, and recreations. Utilizing ToolBook, courseware engineers will almost certainly make learning wizards that can be utilized under any working framework or OS, internet surfer, cell phone and gadget. This should be possible in light of the fact that the last outcome will be conveyed in DHTML, formatting that most working framework or OS can peruse. The program incorporates formats compatible with iPhones, one can even make books displayable on cell phones. Toolbook Instructor enables one to make Books of Pages that can accommodate content and illustrations [24]. PowerPoint animations can be imported into one's ToolBook. One can include the number of pages as desired to the ToolBook, adjust them and include any media needed, in as much as one has the source .tbk document. When the work is done, one can distribute the ToolBook in DHTML, picking the internet surfer needed to assist (for example Apple iPhone and iPhone Touch, Mozilla Firefox, Microsoft Internet Explorer, Safari and Chrome). Toolbook Instructor will at that point make the best possible DHTML documents. These programs can even transfer the DHTML documents to a server. ToolBook was developed by Click 2 Learn Company, the price is \$2,599 and used on Windows operating system. The characteristics of ToolBook that made us to use it include the support of (1) text format (RTF, TXT), (2) video format (AVI, MOV, MPEG, MPG, ASF), (3) sound format (CDA, MP3, WAV), (4) image format (BMP, WMF, DIB, GIF, DXF, CH3, CDR, JPG, SY3, PIC, PCD, DRW, PCT, EPS, PCX, TGA and TIF) and (5) animation (GIF). Toolbook offers EXE, CD and web file types to which exporting editable files.

3.4 The Research Framework

In creating the HHAFI courseware, the ADDIE methodology's 5 stages of (1) Analysis/Interpretation, (2) Design/Outline, (3) Development/Build Up, (4) Implementation/Execution, and (5) Evaluation/Assessment are carried out. Every stage has a result that sustains the subsequent stage in the series. This methodology ensures that the ToolBook provides activities that are needed for preparing the teaching and learners materials and the final

outcome. Fig. 1 shows the research framework of the HHAFI courseware based on the ADDIE methodology.

The analysis stage characterizes and creates 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 human heart courseware. 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 courseware. It is based on this that adjustments are made prior to progressing to the next stage.

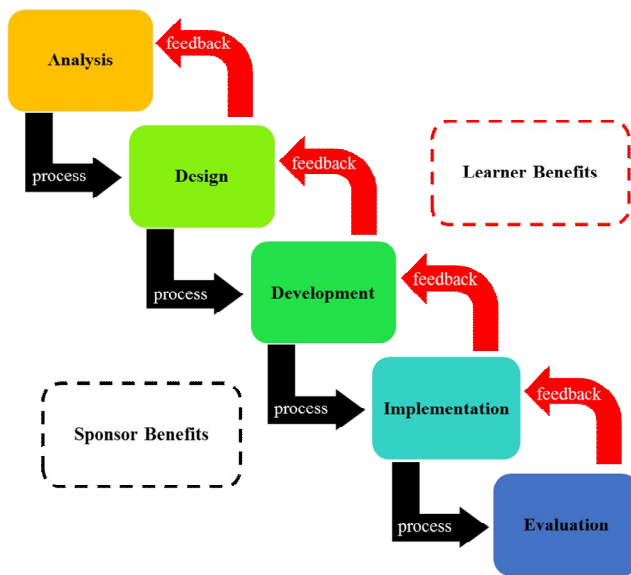


Figure 1: The research framework

3.4.1 Analysis

During the analysis stage, our group identifies the learning issue, the aims and target of the courseware, the crowd's requirements, current information, and some other significant attributes. During analysis, the learning condition, the conveyance alternatives, and the course of events for the undertaking are additionally taken into consideration. Project milestone and Gantt chart makes the developer always follow their schedule to ensure the consistency of the overall project. Fig. 2 shows the ADDIE framework application in the HHAFI courseware development phases.

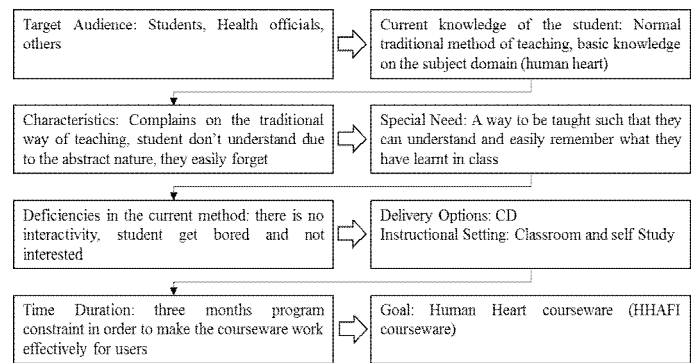


Figure 2: The Diagrammatic representation of the analysis phase

3.4.2 Design

A methodological procedure of specified learning aims is made. Itemized storyboards/illustrations and models are frequently done, and the appearance, visual computerization, UI and substance are specified. Fig. 3 shows the storyboard of the HHAFI courseware. It consists of five procedures which are Introduction, Heart Mechanism, Heart Disease, Treatment and Healthy Lifestyle. It also includes a test to measure the understandability of the users to the given course.

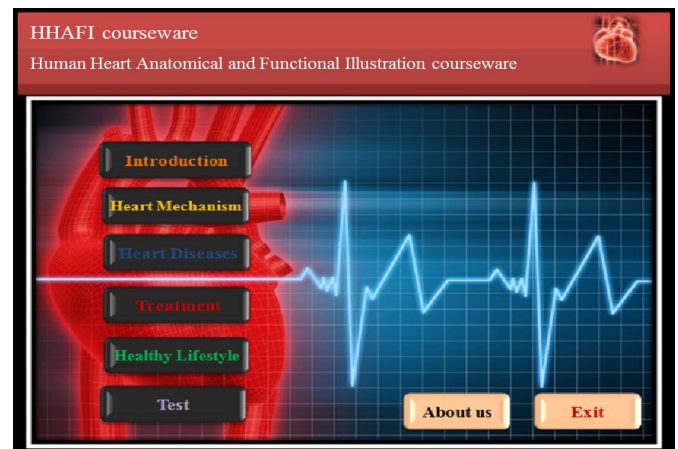


Figure 3: The storyboard of the HHAFI courseware

3.4.3 Development

During development/build-up, the exact making (building) of the substance and learning aids are formed depending on the design/outline stage. The knowledgebase contains systematic knowledge and news facts about the common human heart. The systematic knowledge provides information on the rules and procedures of the method that are used in the identification of the project particulars. The courseware has five procedures that cover the following topics: (1) General overview of the human heart; (2) Mechanism of the human heart; (3) Heart diseases; (4) Treatments of heart diseases; and (5) Living a healthy lifestyle. The reference of the procedures and their sub-pages have been compiled and

classified based on the functionality and contents of each procedure. It is important to develop an effective methodology that can enhance learning about these procedures. It includes the following activities.

Activity 1: The major information about the human heart are gathered in textual forms, videos, pictures and audios.

Activity 2: The courseware is divided into parts i.e. introduction, mechanism, diseases, treatment etc.

Activity 3: Each part has its separate page where detailed explanations are made in the form of audio, text, pictures and videos.

Activity 4: All textual elements are converted to the audio format and tested.

Activity 5: The pages are linked together for easy navigation by users.

Activity 6: Other data like questionnaires are added to evaluate if the student understands the course.

Activity 7: The HHAFI courseware is prepared for implementation and testing.

3.4.4 Implementation

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. During the implementation phase, the process for preparing the students is conducted. The teachers' instructing should encompass the course educational programs, learning outcomes, a method for transfer, and testing methodology. Preparing the students comprises of educating them on novel tools (soft/hardware) and understudy enrollment. This is additionally where we ensured that the books, hands-on gear, devices, CD-ROMs and programming are set up in the correct spot and that the training application is practical. Since the courseware will be on the CD-ROM, we made sure it is well packaged. Much of this will be covered in the next chapter. A debugging procedure is performed and the courseware is investigated and updated based on the gotten reactions. Fig. 4 shows an IMM overview of the human heart. This window contains text, image, sound and video to clearly explain to the student's human heart.

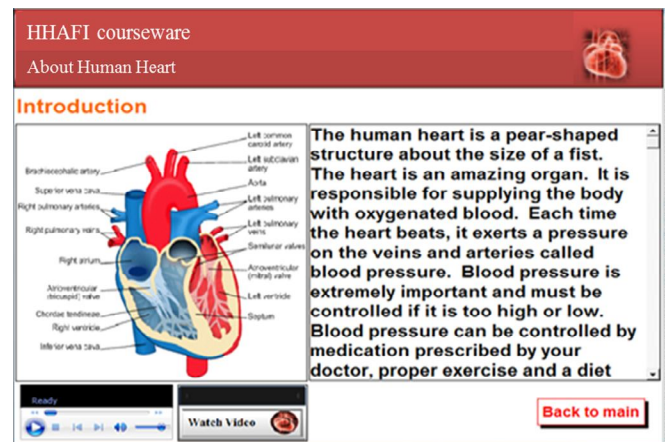


Figure 4: The HHAFI implementation

3.4.5 Evaluation

The ADDIE approach is an efficient and consecutive flow way to deal with courseware application advancement which starts at the examination level and advances through various stages. The assessment stage comprises of (1) developmental and (2) summative assessment. Developmental assessment is available in each stage of the ADDIE procedure. The proposed courseware 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. Summative assessment comprises of tests intended for yardstick-connected cited things and giving chances for reactions from the clients. Corrections are made as fundamental according to the assessment necessities of this task.

The learning model of this courseware is acquiring 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 users to understand that different individuals have special ways of obtaining information. This way, the users are able to use different training techniques to learn what is taught. Fig. 5 shows the four test options that users perform to evaluate the learning model of the courseware. Evaluation score is provided at the end of each segment and the overall results also provided along with the correct answers at the end of the test.

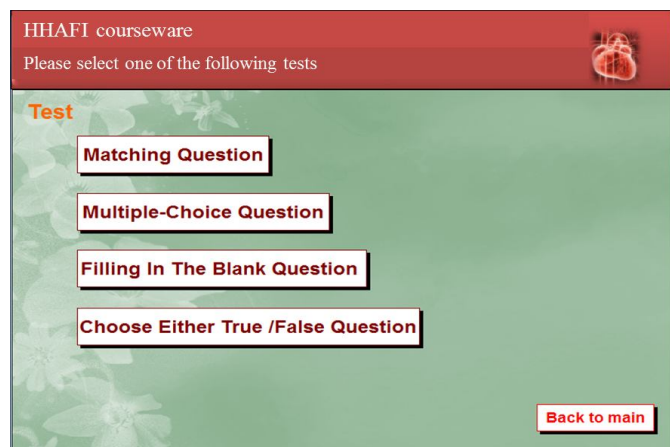


Figure 5: The main graphical interface of the tests

4. TESTING AND RESULT

The HHAFI courseware is tested with the student to identify the improvement in their knowledge and measure the level of interest in the topic. The HHAFI courseware provides learning and interactive training functions for interested individuals. The students are able to understand the roles of the heart by studying the structure and to trace how the blood

flows within the heart. They are able to identify the major vessels of the heart. The HHAFI courseware allows students to observe the parts of the heart. It increases the students understanding of the structures associated with the heart and the circulatory system. Finally, it gives the students and the users an overview of causes of heart diseases, methods of prevention of cardiovascular diseases, and the available methods of treatment.

As mentioned earlier, 4 kinds of questions (A, B, C & D) are given to the users in order to evaluate learning ability of the users and their understanding to the provided HHAFI courseware. A final evaluation of the HHAFI is done by comparing the students' improvement in performance before (when they learned with the common method of teaching) and after using HHMC courseware to learn is completed. A number of 12 students in each group participate in the test. The students belong to the same class and have the same education level to minimize the bias of the test. A score of each test segment and the overall results of the tests are shown in table 1 in which the t denotes traditional method and c denotes HHAFI courseware.

Table 1: The results of the two tests

student	A-t (%)	B-t (%)	C-t (%)	D-t (%)	A-c (%)	B-c (%)	C-c (%)	D-c (%)
1	51	81	47	83	80	79	71	92
2	86	49	64	54	60	74	66	61
3	73	77	59	70	65	93	56	86
4	46	80	59	65	80	80	77	69
5	63	73	81	80	98	100	83	95
6	49	72	40	76	71	67	58	97
7	71	77	79	84	95	95	79	80
8	50	42	64	47	79	92	81	64
9	51	78	67	42	90	63	91	85
10	90	79	49	79	60	57	69	87
11	43	92	94	43	88	85	83	100
12	71	55	78	71	84	76	61	97

Figure 6 shows the analysis of the results for both tests in which the t denotes the traditional PowerPoint method and c denotes the HHAFI courseware. It is clear from Figure 6 that there is a noticeable improvement in students' learning ability when using the HHAFI courseware comparing with the traditional method. Lately, different smart algorithms are proposed for dynamic decision-making including [27-30] which can be deployed in the HHAFI courseware for including automated human heart diagnostic operation.

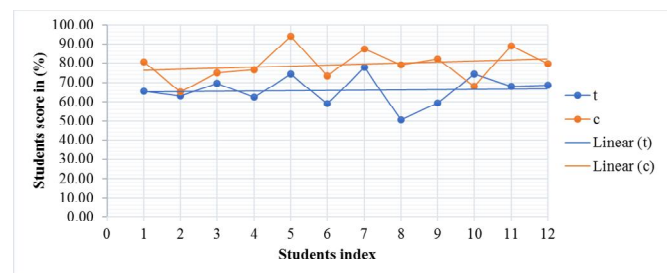


Figure 6: The results of the two test groups

5. CONCLUSION

This paper explains in details the development of a Human Heart Anatomical and Functional Illustration (HHAFI) courseware. The HHAFI courseware is implemented based on the ADDIE methodology and by Toolbook Instructor and presented on Windows platform. ToolBook is a straightforward tool that encourages the method for course configuration with much emphasis being placed on the utilization of innovation to enhance the process of learning. Instructors only require little efforts to make relevant inferences about the efficiency of the structure of the learning framework. The HHAFI courseware includes an introduction that describes the heart and recall such as mechanisms of the heart, heart diseases, healthy tips and living a healthy lifestyle. The HHAFI courseware is tested with the student to identify the improvement in their knowledge and measure the level of interest in the topic. The HHAFI courseware provides learning and interactive training functions for interested individuals. There are many parties that can benefit from this research, including students, health officials and everyone interested in having a healthy heart. The future work considers improving the HHAFI courseware and studying the possibility of changing it to an android application in order to improve the possibility of access and usage.

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