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Three Dimension (3D) Animation Video Development on Dental Care for Children

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Abstract: This study aims to develop 3D animated videos about dental care for children. This 3D animated video will give a proper understanding and consciousness toward children ages of five and six of brushing teeth to prevent infection that can increase the risk of infection or other illnesses. What is the right course of action that they need to take to prevent the infection. It uses Waterfall development model in process of designing and developing 3D animated. The model consists of. six phases which are planning phase, analysis phase, design phase, development phase, implementation and testing phase and the last phase is maintenance phase. In this study, there were five (5) specialists consisting of two (2) dental professionals, two (2) lecturers with experience and expertise in creative multimedia and one (1) three-dimensional (3D) animation field. The instrument use for the research is the questionnaire and the research method use are survey method. The analyzed data found that the experts agreed on the content and interface of 3D animation of dental care for children. This 3D animated video can increase children's interest because of the realistic shape of the 2D animations on television. This 3D animated video helps the child learn about dental care and to provide awareness for this dental care. This 3D animated video also gives a positive effect on communicating information more effectively and easily.

Keywords: Dental Care, Three Dimension (3D)

1. Introduction

Nowadays, world with advanced technology, learning materials are not only limited to textbooks, stationary and traditional teaching but its already have technology such as computers, the internet, LCDs, compact discs, digital camera and others. Computer technology, communication and information technology is something that is of great interest to young people. The technology can improve the quality of teaching and can improves the diversification to deliver the knowledge and teaching through the

internet, multimedia as well as existing diversification. Interactive multimedia is developed using visual, text, music, video and animation visual that help to build students' understanding of the concept. The usage of instructional animations defined as forms of presentation using dynamic illustrations is more dynamic than disseminating information in lectures (Mayer & Moreno, 2002). Besides that, it can give a positive impact in delivering the information which are more attractive and understandable. Nowadays, the society did not take seriously about dental care because they lack awareness about it (Bahri, 2018). Children need to adapt the proper dental care at their age because it is important and can maintain the healthy teeth. It causes excess sugar and can prevent it by reducing sugar intake and keeping your mouth healthy. There are sugars in foods and beverages are a source of food for bacteria in plaque producing acid that attacks your teeth. As a result, there a lot of people are not aware and do not know the consequences of poor dental care can affect the quality life of someone.

Unorganized teeth make it so difficult to clean it. The leftover food that stuck between tooth will be hard over time and this will cause problems to tooth such as gum disease, gum swelling and bleeding. According to Abu Bakar in a report through the official website of Utusan Malaysia (2017), for some children, they find that these dental practices do not need to be learned and have a lax attitude in children as a responsible person can maintain dental health which is, their parents without even thinking about the effects of the disease that is tooth infection. Children who are lazy to brush their teeth properly before and after eating can develop a variety of diseases which are heart disease, respiratory disorders and oral cancer. After that, it is difficult to teach kids to take care of their teeth because some children always get bored of dental care, it takes a long time to brush their teeth properly. Therefore, an effective step should be taken to give the children an awareness of proper dental care which is three dimension (3D) animated video on dental care for children.

2. Problem Statement

Based on the background of the problems mentioned, this information technology has indirectly led to the development of children through adolescence and has been influenced by their exposure to the source of technology present in their lives and environments. The advent of technology in the 21st century has forced children to grow up in an environment where unlimited access to information (Miftachul, 2017). Thus, students can practice a variety of methods or fields by using today's technology to convey information and improve the quality and understanding of students' learning and teaching processes.

The usage of animated video is a process or medium that conveys information to humans. By using this approach, it is possible to convey a clear and understandable information. In addition, it can attract attention of the children while delivering the information through this approach. The usage of animated videos is a medium for disseminating information that is more effective than disseminating lectures (Mayer & Moreno, 2002). It is very important that the usage of multimedia presentations such as animations in the process of communicating information to children is easier to understand and has an impact on each child. This study will develop a 3D animated video on dental care to make it easier for children to understand. The application and knowledge of pediatric dentistry is very important in giving children an awareness of the right steps to maintain dental care.

In addition, children often overlook dental care because of their lack of exposure and awareness of health care. This warns children that it would be dangerous to them if knowledge of dental health was not practiced from the beginning. As such, initiatives or steps to create a medium that can provide proper awareness of dental care should be complex elements that are more appealing to children and easier to use as examples through animated videos.

3. Objective

There are three objectives identified in developing a 3D three-dimensional animated video on dental care for children. The objectives are:
- Design a three-dimensional (3D) animated learning video about dental care for children.
- Develop a three-dimensional (3D) animated learning video about dental care for children.
- Evaluating the functionality of a three-dimensional (3D) animated video on dental care for children.

4. Conceptual Framework

Conceptual Framework is a form of conceptual framework that briefly describes the form of study, study direction, study format and the stages or phases of the study. It can also be based on any existing theory or formulated based on previous studies. Here are some conceptual frameworks for the entire process of developing Dental Care Animated video for children. Figure 1 is the process used by the developer based on the Waterfall design model.
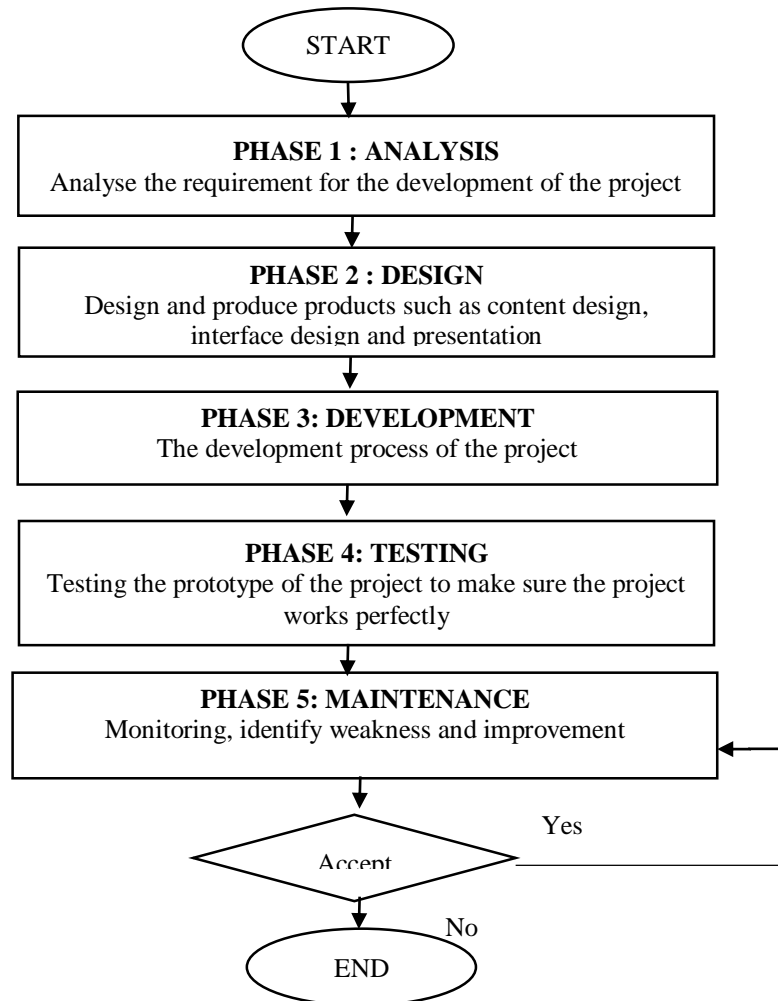

Figure 1: Flowchart of the process based on Waterfall model for development of the 3D animation video on dental care for children

In addition, the conceptual framework for content design is a set of content that has been included in the development of 3D animated videos. The order made is organized, concise and compact because it aims to ensure the effectiveness of delivering the information. The design of the content is the order of content according to the goals that children want to convey and disseminate. There are four main subtopics which are Objectives, Introduction to Dental Care, Importance of Dental Care, Toothbrush Techniques and Dental Care Measures. The objective is what to achieve after using this animated video.

The conceptual framework for interaction design is a medium for presentation and interaction that connects users to the content provided. In design phase, the presentation of interface design contains information that developers want to convey to the user. In addition, the interaction interface design is also a medium of presentation that serves as the initial evaluation or perception of a product. Developers have set the pace of the development process of interacting interface and presentation of multimedia elements to ensure smooth implementation of this development of animated video. The text used also varies in size to distinguish the title and description. The types of text used in the development are the 'Cooper Std' and 'Gilroy-Heavy' types. In addition, other media such as graphics, audio and video are used for the development in order to strengthen and disseminate information to children.

5. Literature Review

Developing a three-dimensional (3D) dental care video for children using several multimedia elements such as text, graphics, audio, animation and 3D animated videos. The most important element is text because it plays a role in delivering information to users. The text will become more interesting when combined with other multimedia elements to develop this 3D animated video. According to Jamalludin (2001) graphics are a step forward in the transmission of information through visualization, writing, drawing and image in either 2D or 3D. Graphics are a key element in multimedia for the visual presentation of information. For instance, the usage of graphics in the development of 3D animated video on Dental Care for Children can make faster and more accurate in delivering the information.

Besides that, audio is also one of the most effective attractions to attract user. According to Fuad (2018), sound will shine in multimedia presentation when the text display only contains graphics and text to capture the attention of the user. Proper audio is used to attract the user to focus from the beginning of the presentation until the end. Animation is the act or process of making something look like alive. According to Md Sharif. N (2012), the word 'animation' comes from the Latin meaning 'alive', which refers to the process of producing a dead, motionless object that looks like alive. Therefore, these animations can also capture a person's attention or interest and can have a positive impact in delivering the information more effectively.

According to Mayer & Moreno (2002), it states that the usage of animated video can be a source for reference outside the classroom because the three-dimensional animation video is flexible that it can be used from various platforms such as computers, mobile phones and others at anytime and anywhere and it can be replayed through various learning methods using animated video. Thus, it is clear that the usage of video animation greatly helps the child learning process to provide awareness of this dental care. Besides that, dental care is an important part of determining the health status of children, especially school-aged children they are easily to be exposed to dental and oral problem. The incidence of oral health problems in Malaysia of school-aged children may influence the decline in health status of school-aged children. Therefore, the most common dental and oral health problem for school-aged children is

dental caries. Almost 90 percent of school-aged children worldwide suffer from caries (Bagramian, 2009). Therefore, it is clear that the issue of dental care within children is very important and should be expose to them in order to protect their teeth from causing tooth decay.

6. Methodology

The Waterfall model was chosen as a work-in-progress strategy in the development of animated video on dental care for children because it is clear and easy to understand. Waterfall model is a design process that follows the flow downstream like waterfall. The official description of this Waterfall model has been described by Jamaludin (2013). Based on Figure 2, there are five phases of the Waterfall model selected by the researchers to develop this animated video.
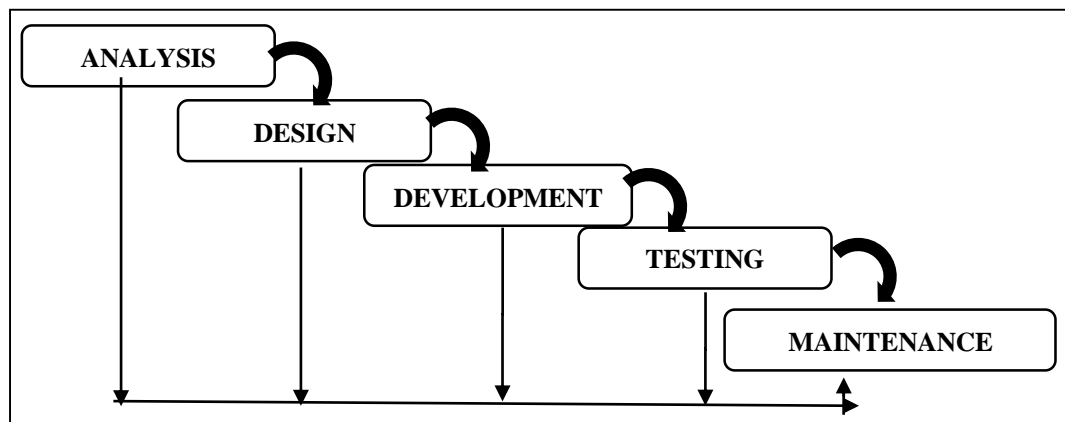

Figure 2: **Waterfall Model Framework**

6.1 Analysis Phase

In the first phase which is analysis phase, it is imperative that the developer can determine the needs and focus of the study. Through this phase, it involves many aspects including user analysis, objective analysis and environmental and learning analysis. The main users of this animated video are children who need information on proper tooth brushing. The design of this animated video is developed through three-dimensional animation so it can be realistically developed for the target audience which are children. Developers need to do analysis about user because as developers, they need to identify users that using this animated video and it will involve children in Tun Hussein Onn Malaysia Kindergarten of five (5) children among age five (5) to six (6) years old. Hardware and software are necessary in developing the 3D animated video. The hardware used by the developer is a personal computer (PC). The software to be used are Autodesk 3Ds Max 2018, Adobe Photoshop CS6, Adobe Illustrator CS6, Adobe Flash CS6 and Adobe Premiere Pro CS6.

6.2 Design Phase

Through this phase, storytelling is used as an approach or framework for the development of pre-designed animated videos. The planning information obtained from the analysis phase will developed to form a new medium construction process. This storyboard provides insight into the overall designs, structures,

contents, media types and technologies that will be used for the development of 3D animated video. The developers can set or design the animated video by using multimedia elements such as text, color, audio and video. Text can make the users easy to read and make it easy to understand. In addition, the developer can use color to make the 3D animated video more interesting in order to gain attention from the user. Besides that, the developers can use audio for the background, and it must be appropriate audio to help the user understand the content and gets the delivered information. Finally, developers can use a three-dimensional animated video as the main video that guides users to understand the video more effectively. Figure 3 to Figure 12 shows the interface of the video.

Figure 3: Interface for the Main page

Figure 4: Interface for Contents page

Figure 5: Interface for Introduction page

Figure 6: Interface for Importance page

Figure 7: Interface for Objective page

Figure 8: Interface for Brush Technique page

Figure 9: Interface for First Brush Technique

Figure 10: Interface for Second Brush Technique

Figure 11.0: Interface for Third Brush Technique

Figure 12.0: Interface for Forth Brush Technique

6.3 Development Phase

During this phase, all the key elements that were designed in the previous phase are explained in more practical form at the beginning of the development animated video process as planned. The result of the storyboard design will be used to produce a real-time development prototype using pre-designed hardware and software. This phase aims to develop a complete prototype to test its effectiveness and it works smoothly on 3D animation video development is also carried out in accordance with the specifications of the planned requirements.

6.4 Testing Phase

The testing phase is the fourth phase used in this study where in this phase, the target user or the actual user was selected as the respondent involved in the evaluation of the developed animation video. It is intended to ensure that the software is functional, effective and fulfills the objectives of the study. This phase also

focusses on the multimedia elements used in the content of the animated video and learning about proper tooth brushing. The testing and evaluation of this product is evaluated by experts in two different aspects which are through content and the design of the interface. The content is evaluated by three (3) dental professionals from UTHM University Health Center (PKU), while the design of the animated video interface will be evaluated by three (3) creative multimedia lecturers from the UTHM Faculty of Technical and Vocational Education. Subsequently, as a result of the interview process that has been created, the researcher makes the process of improving or restoring the quality of 3D animated video developed and fulfilling the user's wishes and objectives can be achieved.

6.5 Development Phase

During this phase, the completed develop product will be presented informally to the evaluator. The purpose is to test the functionality and see any problems that arise without being aware of during the design and development phase. Any deficiencies and weaknesses will be identified, rectified and tested to succeed. Developers can upgrade products developed according to the user's requirements.

7. Findings

Expert testing and evaluation are validation of the functionality of products that have been developed in their respective areas of expertise. Five experts have evaluated the level of functionality of 3D animated video on dental care for children. The experts are among of three (3) creative multimedia lecturers from UTHM's Faculty of Technical and Vocational Education who will test the Interface Design section and two (2) experts from a dental specialist from Pasir Puteh Dental Clinic, Kelantan will evaluate the content of the animation video.   Analyzing the interface design and presentation is **part B** of the expert evaluation form. Twenty-nine (29) items were developed to analyze the design level of the interface and 3D animated video presentation on dental care for children. The analyzed data will then be presented in the form of frequency and percentage values as shown in Table 1 and Table 2 shows the items, frequency and percentage of expert acceptance to test the design and presentation design aspects.

Table 1: Table of Expert Data Analysis for Interface Design

No.	Item	Frequent Yes	No	Percentage (%)
1.	Type of text used is suitable.		3	0
2.	The usage of color used is suitable.	1	2	33.3
3.	Text size used is suitable.	3		100
4.	Type of text used is consistent.	2	1	66.7
5.	2D graphic used is attractive.	3		100
6.	2D graphic used is clear.	3		100
7.	2D graphic used is easy to understand.	3		100
8.	The usage color of the graphic used is suitable.	3		100
9.	The graphic used have high resolution and clear.	3		100
10.	Audio used is suitable.	2	1	66.7
11.	Audio used is does not disturbing the user.	3		100
12.	Audio used can be hear loud and clear.	2	1	66.7
13.	Audio used is suitable with the content.	3		100
14.	Background music used in the 3D animation video is suitable.	3		100
15.	Video quality of 3D animation is satisfying.	3		100
16.	User can control the video.	3		100
17.	The duration of the video is suitable.	3		100
18.	3D animation video is clear.	3		100

19.	3D animation video is easy to understand.	3	100
20.	Animation video is easy to follow up.	3	100
21.	3D animation created is suitable.	3	100
22.	3D animation created is interesting	3	100
23.	3D animation created is clear.	3	100
24.	Interaction button work perfectly.	3	100
25.	The position of the interaction button is consistent.	3	100
26.	The icon used for the interaction button is suitable.	3	100
27.	The text used for the interaction button is suitable.	3	100
28.	The function of interaction button for every page is clear and understandable.	3	100
29.	The design of the interaction button is suitable for the user.	3	100

Besides that, this design content analysis section is part B of the expert evaluation form. There are nine (9) items built to test the functionality of 3D animated video on dental care. The analyzed data are then presented in the form of frequency and percentage values as shown in Table 2.0. Table 2 shows the items, frequency and percentage of expert acceptance to test the content design aspects of the two experts involved.

Table 2.: Table of Expert Data Analysis for Design Content

No.	Item	Frequent		Percentage (%)
		Yes	No	
1.	Animation video on dental care give clear vision about steps for proper brushing the teeth.	2		100
2.	The content about dental care in animation video is suitable.	2		100
3.	Animation video on dental care is clear.	2		100
4.	Animation video on dental care is easy to understand.	2		100
5.	The content about dental care described correctly.	2		100
7.	Children easy to understand about the animation video on dental care.	2		100
8.	Animation video on dental care can follow up clearly.	2		100
9.	Animation video about steps of brushing the teeth is precise and suitable.	2		100

i.	First Step	2		100
ii.	Second Step	2		100
iii.	Third Step	2		100
iv.	Fourth Step	2		100
v.	Fifth Step	1	1	50
vi.	Sixth Step	2		100

8. Discussion

8.1 Design a three-dimensional (3D) animated learning video about dental care for children.

The design of 3D animation video on dental care for children has been planned in a systematic and structured design phase. All three (3) interface design and presentation experts agreed on a 3D animation video design on dental care for children based on a survey conducted. Software used to develop this 3D animation video is 3DS Max software. This software was chosen because developers have vast knowledge and skills in this software because they learned it during the teaching and learning process. Furthermore, 3D objects developed in 3D animation video on dental care for children are designed using 3DS Max. Once 3D objects are developed in 3DS Max, it will be integrated into Adobe Premiere software to make the video. Interesting and understandable objects which are button and graphics are develop through Adobe Photoshop and CS6 Flash software.

8.2 Develop a three-dimensional (3D) animated learning video about dental care for children.

The second is about developing a three-dimensional (3D) animation video on dental care for children. It is developed by using several multimedia elements such as texts, graphics, audios, animations and 3D animation videos. Text is the most important element because it plays a role to deliver the information to users. As such, the text will become more interesting when combined with other multimedia elements to develop this 3D animated video. Graphics are a key element in multimedia for the visual presentation of information. The usage of graphics in the 3D animation video on dental care for allows for faster and more accurate delivery of information.

In addition, audio is the best attractions to attract customers. Proper audio is used to attract the audience and make them focus more on the presentation from the beginning until the end. Animation is the act or process of making something look alive. Therefore, these animations can catch a person's attention or interest and can have a positive impact in delivering the information more effectively. Therefore, the usage of video greatly helps the children learn and provide awareness of dental care. Besides that, dental care is an important part of determining the health status of children, especially school-aged children because they are easily to be exposed to dental and oral problem. The incidence of oral and oral health problems in Malaysia of school age children may influence the decline in health status of school-aged children. Therefore, the issue of dental care in children is very important and should be exposed with these dental cares in order to protect their teeth.

8.3 Evaluating the functionality of a three-dimensional (3D) animated video on dental care for children
The level of functionality of this 3D animated video can be measured through the questionnaire that develop by the developer based on the ready and finished product. The questionnaire was conducted into

two categories. Firstly, the interface design expert and presentation and the content. The percentage of experts accepting the project being developed is 100%. The audio used by the developers in the product is clear and helps users to understand the content. Additionally, the text used for this 3D animation video is appropriate and has been approved by the expert. After that, experts also agreed that the purpose of the development of this 3D animation video is to make it easier for users to understand the information they are about to convey. The development of this 3D animation video clearly demonstrates that it can convey information more effective, fast and impactful way to viewers. Animation used in the 3D animation videos on dental care for children is an element that can help convey messages to users for greater clarity and appeal. Using animations in the 3D animation video on dental care for children can deliver the information quickly and in the interest of children.

9. Conclusion

Overall, the development of 3D animation video on dental care for children has been developed in accordance with established goals. As a result of the research and analysis conducted, developers have found 3D animation videos on dental care for children help experts involved in deliver the information about dental care for children to hear and focus learning about it inside the content of the 3D animation video that had been developed.

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