

Commercial HVAC Maintenance Instructional Video

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Abstract: Commercial HVAC maintenance is a subject studied by refrigeration and air conditioning students. The goal of this research was to create an instructional video for commercial HVAC maintenance. The ADDIE Model will be used in this study, as well as the questionnaire instrument approach. Microsoft Excel was used to analyse data obtained from expert validation. Three lecturers from the Faculty of Technical and Vocational Education (FPTV) was chosen as experts. The study's findings revealed that experts gave positive evaluations of instructional videos on all items of the questionnaire in the design, content, and language sections, but when it came to functionality, item two in the questionnaire, 'Tools to change students' attitudes,' one respondent answered "No," leading the study to conclude that this instructional video needs to be improved so that it can be used to change students' attitudes. The study researcher made some recommendations for future research at the conclusion of the study.

Keywords: Instructional Video, HVAC, Multimedia, Teaching Aid, ADDIE

1. Introduction

Digital material and multimedia technology, which integrates a variety of media such as text, graphics, animation, video, and audio, are commonly used by students and teachers in this century (Ismail, 2017), however, their use in Malaysia is still limited in comparison to industrialized countries.

Teachers should employ Teaching Aids (ABBM) in T&L sessions this measure guarantees the information relating to the subjects taught is delivered more clearly and systematically, and that students can follow along better (Ja'apar, 2017). It is important to ensure that students master a particular skill or skills before moving on to learn more skills (Phillips, Schumacher & Arif, 2016) Video is one of the multimedia technologies that teachers and students have begun to employ as Teaching Aids (ABBM) in T&L sessions. HVAC systems are more commonly employed on many sorts of buildings, according to Seyam (2018), including industrial, commercial, residential, and institutional structures. Commercial HVAC systems are mostly employed in industry since they have a higher cooling capacity than home HVAC systems.

1.1 Problem Background

The weakness of Teaching Aids (ABBM) in helping the T & L process during class time is because teachers still practice the traditional approach that emphasizes lecture and demonstration methods compared to using Teaching Aids (ABBM) in the T & L process and this statement is supported by Yusoff (2017) who highlighted that there are lecturers who solely use lecture methods in the teaching process. In addition, the lack of innovative Teaching Aids (ABBM) development occurs because teachers feel it is not obligatory to expand the teaching materials used (Hardjo, Permanasari & Permana, (2020) to be more innovative. In addition, the lack of innovative Teaching Aids (ABBM) development is due to the factors encountered. insufficient materials, time constraints, unskilled in building or developing Teaching Aids (ABBM) on their own, and financial factors (Ja'apar, 2017).

Furthermore, there are also teaching methods being used by teachers who focus only on themselves better known as teacher-centred teaching methods, the adverse effects of teacher-centred teaching alone are students seen as passive students, or relatively only recipients of information and the idea of a teacher (Olasunkanmi, 2016) as well as it adversely affects students who are slow learners because these slow learners have low intellectual learning capacity have personal factors such as pain and absenteeism (Vasudevan, 2017) therefore, teacher-centred teaching methods will cause them to lag behind in acquiring knowledge. Finally, students lose focus and interest in learning because of teachers' attitudes and this happens because, during P&P sessions, teachers use less innovative and creative technology to be able to attract students to follow learning is supported by a statement by Shah (2014) said teachers need more creative and innovative in ensuring that the delivery system is effective, interesting, fun and can stimulate students' interest in learning.

1.2 Problem Statement

There are four issues that led to the implementation of this study, first, the issue of weakness of Teaching Aids (ABBM) in helping the R & D process, the second issue is the lack of innovative Teaching Aids(ABBM) development, the third issue is teacher-centred teaching and fourth issue of students losing focus in learning because of teachers. Based on these four issues, the researcher found, that teachers often use lecture and demonstration methods compared to using Teaching Aids (ABBM) and that is the cause of Teaching Aids (ABBM) weakness to help the T&L process. According to Ordu (2021), some teachers believe that Teaching Aids (ABBM) are not required to be developed and that there are several factors that impede the development of Teaching Aids (ABBM), including lack of materials, time constraints, lack of skill to build or develop on their own, and financial constraints.

Toyosi (2018) went on to say that teacher-centred teaching makes the teacher the centre of knowledge and that it is through teachers that students obtain knowledge and that teachers are also responsible for their students' learning. Teacher-centered teaching makes their students passive or relatively only recipients of the teacher's information and ideas in lessons Another gap discovered and also reported by Cicekci & Sadik (2019) and Kruk & Zawodniak (2018) is that students were bored and lost attention in learning since they followed the learning system while listening to teacher explanations without the teachers using teaching aids, this has a negative impact on slow learners. There is also a lack of innovative and creative technologies used by teachers to draw students to enjoy their learning, and these teachers should be more creative and imaginative to attract pupils.

2. Methodology

The methodology is a “contextual framework” for research, which is coherent and logical based on the attitudes, beliefs, and values that drive the choices of researchers or other users (Kara, 2015).

2.1 Research design

The design of this study is in the form of instructional video development with the help of ADDIE development model. Then the survey method is used in obtaining product functionality data

through the distribution of questionnaires. Key features are taken into account in the development of Commercial HVAC Maintenance Instructional Videos to assist teachers and students in the process of teaching and learning in the classroom. Below is figure 2.1 of the ADDIE model flow charts modified for this study.

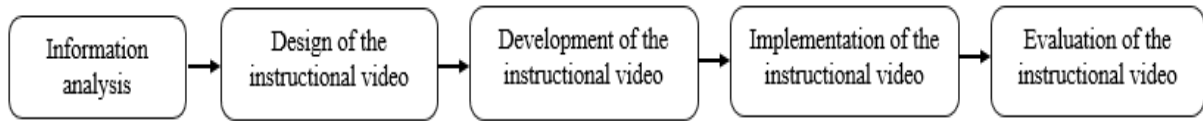


Figure 2.1: ADDIE model flow chart

The first step is information analysis. Past research in technical and vocational education was examined with the aim of determining the best video design to use in the development of instructional videos. In addition, a review of appropriate materials and equipment to be used in the development of the instructional film on the internet domain was also carried out. The instructional video's design is the next step, this was facilitated through the data obtained and analysed, a plan which includes a storyboard and a storytelling screenplay, to begin the process of creating the instructional film was devised.

The creation of an instructional video is the third phase. A venue for filming the instructional content was identified. The video was created based on the sequences in the storyboard and the script for the story. The video was edited after the development phase was completed. The entire video was dubbed, and subtitles were added to represent the instructional film's dialogue. The video was then uploaded to the YouTube site. The fourth stage is to put instructional videos into action. The study displayed the generated instructional film to an expert to determine any defects. Before sending the film to the second group of specialists to be evaluated, improvements were made to the identified defects.

The evaluation of the instructional videos is the sixth phase. At this point, the instructional videos that were developed were examined by a panel of experts. Three specialists were selected from FPTV, and UTHM lecturers. These lecturers have a wealth of experience teaching multimedia as well as refrigeration and air conditioning. During the evaluation stage, the specialists were given questionnaires to fill out to get feedback and suggestions for changes.

2.2 Research sample

Three lecturers from the Faculty of Technical and Vocational Education were chosen as the sample for the study, all of whom had taught refrigeration and air conditioning as well as multimedia subjects at the faculty. The lecturer who teaches multimedia subjects has 19 years of teaching experience, while the lecturer who teaches refrigeration and air conditioning has only one year of experience. The aim of selecting the sample for this study is to ensure that the study's objectives are met and that the instructional films developed are of high quality. The study sample was involved in the instructional video's evaluation stage to provide an evaluation of the instructional video.

2.3 Research instrument

A Guttman scale questionnaire was employed to collect data for this study. The response on each topic in the questionnaire is given on a nominal scale, which has two answer options: 'Yes' or 'No.' This is done to evaluate the functionality of the instructional film generated.

3. Research findings & Discussion

As previously stated, a questionnaire was distributed to collect data from three experts in the fields of refrigeration and air conditioning, as well as multimedia. The questionnaire has five sections, namely Section A, Section B, Section C, Section D, and Section E. The titles of the five sections are:

- Section A: Respondent Demographic Information
- Section B: Instructional Video Evaluation Information: Design

- Section C: Instructional Video Assessment Information: Contents
- Section D: Instructional Video Assessment Information: Language
- Section E: Instructional Video Assessment Information: Functionality

Based on the study's data analysis, the findings will be discussed.

3.1 Result

Section B contains ten newly developed items relating to instructional video design. This section contains questions about color elements in the background and foreground, the interface, the display screen, text, audio, and graphics. The results of part B of the questionnaire revealed that all items have the same frequency and percentage of respondents choosing "Yes," as seen by the results. This result was used to answer two research questions. The research questions are: 'What is the design of Commercial HVAC Maintenance Instructional Video appropriate and attractive?' and 'Does this developed Commercial HVAC Maintenance Instructional Video work well visually, auditory and kinesthetic?'. However, for section B as it relates to this design the impact will only be seen in visual terms. The research questions are: 'How appropriate and appealing is the design of Commercial HVAC Maintenance Instructional Video?' 'Is this created Commercial HVAC Maintenance Instructional Video aesthetically, auditorily, and kinesthetically effective?' However, the visual impact of section B as it relates to this design will be limited. The research questions were answered by the results because three respondents (100%) answered 'Yes' to each item on the questionnaire, indicating that this instructional film is acceptable and interesting, and its visual function is in good working order. Below is table 3.1: Data Analysis of Section B Questionnaire.

Table 3.1: Data Analysis of Part B Questionnaire

Question: Instructional video design using					
No.	Item	Yes		No	
		Frequency	%	Frequency	%
1	The selection of background and foreground colors is appropriate	3	100%	3	100%
2	Attractive background and foreground colors	3	100%	3	100%
3	Attractive interface	3	100%	3	100%
4	Attractive display screen	3	100%	3	100%
5	Clear text arrangement	3	100%	3	100%
6	Appropriate text size	3	100%	3	100%
7	Appropriate text type	3	100%	3	100%
8	Appropriate text color	3	100%	3	100%
9	Appropriate audio sound	3	100%	3	100%
10	Interesting use of graphics	3	100%	3	100%

Section C includes 8 items related to the instructional video content that has been developed. This item contains questions related to the elements of learning content, objectives, content, facts, learning style, notes, and activities. The results of questionnaire part C show that all items have the same frequency and percentage of respondents in choosing 'Yes' as many as 3 people (100%) on each item and from the results of these results also the researcher wants to see if it answers the researcher's research question that is 'Is this Commercial HVAC Maintenance Instructional Video developed able to work well in terms of visual, auditory, and kinesthetic?' However, for part C related to this content the researcher will look in terms of kinesthetics only. As a result, it has answered the research questions set by the researcher because each item obtained a 'Yes' answer from 3 respondents (100%) and this indicates that this instructional video works in terms of kinesthetics. Below is table 3.2: Data Analysis of Part C Questionnaire.

Table 3.2: Data Analysis of Questionnaire Part C

Question: The content of the instructional video conveys					
No.	Item	Yes		No	
		Frequency	%	Frequency	%
1	Easy -to -follow learning content	3	100%	3	100%
2	Clear objectives	3	100%	3	100%
3	Clear content	3	100%	3	100%
4	Organized arrangement of content	3	100%	3	100%
5	Reliable facts	3	100%	3	100%
6	Diversity of learning styles	3	100%	3	100%
7	Notes that aid teaching and learning	3	100%	3	100%
8	Activities suitable for the teaching and learning process	3	100%	3	100%

Section D includes 5 items related to the language of instructional videos that have been developed. This item contains questions related to elements such as language, terminology, speech, and description. The nominal scale is used to perform an evaluation of the language of the instructional video that has been developed. The results of the questionnaire Section D show that all items have the same frequency and percentage of respondents in choosing 'Yes' as many as 3 people (100%) on each item and from the results of this result also the researcher wants to see if it answers the researcher's research question that is 'Will this developed Commercial HVAC Maintenance Instructional Video works well in terms of visual, auditory, and kinesthetic?' However, for Section D related to this language the researcher will look in terms of auditory-only. As a result, it has answered the research question that has been set by the researcher because each item obtained a 'Yes' answer from 3 respondents (100%) and this indicates that this instructional video works in terms of auditory. Below is table 3.3: Data Analysis of Section D Questionnaire.

Table 3.3: Data Analysis of Section D Questionnaire

Question: Video instruction using language					
No.	Item	Yes		No	
		Frequency	%	Frequency	%
1	Easy to understand	3	100%	3	100%
2	Easy-to-understand bilingual	3	100%	3	100%
3	The right term	3	100%	3	100%
4	Easy-to-follow speech	3	100%	3	100%
5	Clear and orderly description	3	100%	3	100%

Section E includes 10 items related to the functionality of the instructional videos that have been developed. This item contains questions related to the functional elements of this instructional video as a tool. The results from the questionnaire in section E showed that only item two had respondents choosing 'No' compared to the other items, all respondents chose 'Yes' on each item. For item two, 'Tools to change students' attitudes', the frequency and percentage obtained for 'Yes' was 2 people (66.66%) while for 'No' it was 1 person (33.33%). The researcher concluded that this instructional video needs to be improved so that it can be a tool to change students' attitudes. Below is table 3.4: Data Analysis of Section E Questionnaire.

Table 3.4: Data Analysis of Section E Questionnaire

Question: Instructional videos can serve as					
No.	Item	Yes		No	
		Frequency	%	Frequency	%
1	A tool for discussion between students and lecturers	3	100%	0	0%
2	Tools to change student attitudes	2	66.66%	1	33.33%
3	Tools to cultivate student interest	3	100%	0	0%
4	Tools to enhance student curiosity	3	100%	0	0%
5	Tools that simplify the teaching and learning process	3	100%	0	0%
6	A tool that saves time in the preparation of teaching and learning resources	3	100%	0	0%
7	Energy -saving tools for the provision of teaching and learning resources	3	100%	0	0%
8	Tools that reduce spending on teaching and learning resources	3	100%	0	0%
9	Tools that change consumers 'perceptions of technology in education	3	100%	0	0%
10	Tools for self -directed learning process	3	100%	0	0%

3.2 Discussion

The discussion is done based on the findings of the study and it is also referred to the objectives of the study that have been set out. Discussions were conducted to see if each of the objectives set in the development of this instructional video was successfully achieved or otherwise.

First Objective: Design a Commercial HVAC Maintenance Instructional Video

The design of this instructional video form is guided by the ADDIE Model. The study began the design of this instructional video by referring to the analysis of information that has been obtained through reviewing past studies and websites. The process of designing and producing storyboards and storytelling scripts were used as a guide in developing these instructional videos. The storyboard and storytelling script produced are in accordance with the method guidelines for video content development by Voronkin (2019). The study applied several measures under the proposed aspect, like scenario and video duration under methodology and also speech speed and cognitive load under the psychological aspect and finally apply purpose and learning outcomes under the didactic aspect.

Second Objective: Develop a Commercial HVAC Maintenance Instructional Video

The development of this instructional video is guided by the ADDIE Model. This instructional video was developed for students of the Refrigeration and Air Conditioning Technology course and for students of the Technical and Vocational Education (Refrigeration and Air Conditioning) course as well as for lecturers of the Refrigeration and Air Conditioning course at Universiti Tun Hussein Onn Malaysia. The researcher started by referring to the video design done and did a video recording to be included in the content scene. After that, the researcher carried out the instructional video development stage. The researcher followed the method development guidelines for video content development by Voronkin (2019) where the researcher applied several things under the considered aspect, namely first, things such as synchronization in time and dynamics under the methodological aspect. Second, things like emotional speech under the psychological aspect. Third, things like animation techniques, subtitles, and interactivity under the ergonomic aspect. Fourth, things like aspect ratio, frame rate, sound, and noise as well as lighting under the technical aspect.

The instructional video developed has notes and activities that can be accessed online to assist instructors and students in the T&L process, and it can be found on the YouTube platform. Notes and

activities included in instructional videos can help in the cognitive and social development of students in problem-solving tasks (Zahn et al., 2010) and this is done to follow the interactivity matter under ergonomic aspects of the method guide for video content development.

Third objective: Test the functionality of Commercial HVAC Instructional Videos

There are four sections that experts would like to evaluate in ensuring the functionality of this instructional video. The four areas emphasized are the design part, the content part, the language part, and the functionality part. This evaluation is important because if this video is proven to be functional it can be utilized in teaching in the classroom as a practical tool to increase the quality of existing conventional methods (Sidek & Hashim, 2016). The evaluation of the first section is the instructional video design section. Based on the results of the questionnaire data was distributed to experts, namely lecturers who have experience teaching refrigeration and air conditioning subjects as well as multimedia subjects. The researcher received a positive response where all the experts answered 'Yes' to all the question items in the questionnaire and this indicates that the design of this instructional video is in good condition. According to Risitano (2011) states that a good design is an effective design in addition to being liked by users. Therefore, the design part of the instructional video proved its functionality from the results of the evaluation that has been done.

The evaluation of the second section is the content part of the instructional video. Based on the results of the questionnaire data distributed to experts, the researcher received a positive response where all experts answered 'Yes' to all question items in the questionnaire and this indicates that the content for this instructional video is in good condition. Good video content can help students 'learning regardless of time and place through the video and this statement is supported by Carmichael (2018) who stated that learning content through video provides opportunities for learning regardless of time and place. Therefore, the content section of the instructional video proved its functionality from the results of the evaluation that has been done. The evaluation of the third section is the language section of the instructional video. Based on the results of the questionnaire data distributed to experts, the researcher received a positive response where all experts answered 'Yes' to all question items in the questionnaire and this indicates that the language used in the instructional video is in good condition. The language used in the video is important to ensure that users can understand what is being conveyed from the video they are watching. According to Khoya, Moohamad & Ardam (2017) stated that the language of delivery used should be easily understood by the public so that the purpose and goals can be achieved. Therefore, the language section of the instructional video proved its functionality from the results of the evaluation that has been done.

The evaluation of the fourth section is the functionality section of the instructional video. Based on the results of the questionnaire data distributed to experts, the researcher found that almost all experts answered, 'Yes' to all question items, this is because expert 2 has chosen 'No' on the second question item which is "tools to change student attitudes". Changes in students' attitudes are necessary because Shah (2014) in his study found that students' attitude factors influence students to lose focus in class during T & L. Based on the selection of the answer 'No' from expert 2 this indicates that improvements need to be made. Therefore, the researcher will re-discuss with the supervisor to get his / her opinion in addressing this matter. The possibility of these improvements can be considered in further study proposals.

Conclusion

In conclusion, the study results showed that almost all respondents chose 'Yes' for each item in the sections in the questionnaire but expert 2 chose 'No' for item 2 which is a tool to change students' attitudes in Section E. This demonstrates the necessity to improve the educational film to make it an effective tool for changing students' attitudes. This instructional video's outcomes can be used to the teaching and learning process. Positive feedback and recommendations for improvement have been received, indicating that this instructional video will improve in the future.

Furthermore, based on the results of the study, this research has potential for improvement if it is to be continued. There are four data analysis research recommendations. The flowings are recommendaions for further research:

- Activities can be varied to be more interesting
- Add English subtitles
- Provide a special platform which in the pafform has a menu of options that can be selected by the user to choose between three video materials produced because it is under one course name.
- Make sure the title position is consistent in one place only and the selection color is selected that can match all interface backgrounds.

In addition, this research makes recommendations for how to improve instructional films. The following is a list of suggestions to consider when developing this study in the future:

- Ensure content is more interesting and quality
- Diversify the types of activities for instructional videos
- Use animation in instructional videos
- Add more topics in instructional videos
- Improving the quality of instructional video recordings
- Making instructional videos can change students' attitudes

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