

Video Production and Validation for Teaching Transmission and Utilisation of Electricity Concept at the Nigerian Upper Basic Education Level

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Abstract—This study aimed at producing and validating a video instructional package (VIP) for teaching transmission and utilization of electricity concept in Basic Technology at junior secondary school level of education (Upper Basic). The study adopted research and developmental design. The study was conducted in Bauchi State, North east Nigeria. This study consists of 852 Basic technology experts, out of this, 15 Basic Technology experts, 3 instructional technologists, 2 video experts were purposely selected to participate in this study. ADDIE model of instructional system development was adapted in the production of the video instructional package (VIP). The findings of this study indicated that design procedures based on ADDIE model were followed in the production of this video instructional package (VIP); suitable topics were identified from the curriculum content of the subject matter and were all included into the VIP production. This study recommended that Basic Technology teachers should be stimulated and motivated to use video instructional package in teaching and also recommended that Video Instructional Package (VIP) should be produced for other topics of Basic Technology curriculum.

Keywords— Upper Basic, Video Production, Validation, Transmission and Utilization of Electricity

I. INTRODUCTION

Upper Basic level of education formally known as Junior Secondary Schools is regarded as a basic education which is essential to human and societal educational development of Nigeria. Hence, it is regarded as the groundwork upon which other levels of education are built and therefore forms a requirement for growth and national development. Basic technology is one of the compulsory prevocational subjects taught at upper basic level of education (junior secondary schools) [1]. It was designed to create basic technological awareness about industrial development for the learners to appreciate the impact of technology for the based interest of national development [2]. Basic technology is one of the compulsory prevocational subject taught at the upper basic level of education (junior secondary school level of education in Nigeria), basic technology is presently in 9-3-4 upper basic education curriculum which is uprightly to provide the learner at the basic level with foundation technology knowledge and skills irrespective of learners' discipline career progression area[1]. Certainly, basic technology deals with both cognitive and psychomotor aspects of learning. The production of video instructional package for teaching and learning is an instructional design process [3]. Video production is the process by which procedures are followed to create new videos for instructional purposes

[4]. ADDIE Model was adapted to guide the production of video instructional package for teaching transmission and utilization of electricity concept in basic technology because, it comprises the components of all other design models and it is a relatively simple model [5].

Over the years, the development of information and communication technology (ICT) have comes with various forms of technologies that are used in teaching and learning. For example, the use of video technology was found promising in supporting teaching and learning [6]. Technology of video instruction helps teachers to bring out-of-class instructional activities into their classroom environments to support their jobs [7].

Transmission and utilization of electricity concept of basic technology requires taking the students to field work and it involves some certain levels of risk. For instance exposing students to dangerous electricity gadgets, abduction of students, over-populated classes and so on have discouraged teachers to embrace the field-trip instructional approach. Issues concerning students' population, time factor and transportation problems is affecting many schools not to involve their student in field-trip work [8]. Lack of using field trip approach in teaching of basic technology has made the teaching of basic technology incomplete without adequate and rich practical exposure

[9]. Instructional areas such as transmission and utilization of electricity concept of basic technology can be one of the topics that can be taught using produced video technology instruction to bring out-of-class instructional activities into their classroom environments.

Research Objectives

The main purpose of this study was to produce and validate a video instructional package for teaching transmission and utilization of electricity concept at upper basic in Bauchi State. Specifically, the study sought to:

- i. Identify the content topics suitable for inclusion into a video package for teaching Transmission and Utilization of Electricity Concept in Basic Technology.
- ii. Determine suitable features for producing video package for teaching Transmission and Utilization of Electricity Concept in Basic Technology.
- iii. Identify procedures appropriate for producing a video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology.
- iv. Validate a video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology.

Research Questions

The following research questions are formulated to guide the conduct of this study: -

- i. What are the content topics suitable for inclusion into the video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology?
- ii. What are the features suitable for producing video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology?
- iii. What are the suitable procedures for producing a video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology?
- v. What is the validity of the video instructional package for teaching Transmission and Utilization of Electricity Concept in Basic Technology?

II. RELATED WORK

Researches were conducted on production and validation of video instructional package in numbers for many decades such as a research carried out to produce and validated a multimedia package for teaching applied electrical and electronic concept of basic technology. The major objectives of the study were to develop an instructional package for teaching electricity/electronics component of basic technology and also validate the instructional video for teaching the concept. This study will very much address the inadequacies of Nigeria's peculiar situations of overcrowded classrooms, obsolete and outdated equipment, erratic power supplies, and absence of state of the art teaching/learning resources. The

study revealed the effectiveness of the instructional package for teaching electricity/electronics component of basic technology. The study is similar to the current studies in design because both the two studies adopted developmental research. The study is different from current studies because the research was conducted at Kano state while the current studies was conducted at Bauchi state [10]. Also a research carried out on development and validation of video lesson package for flipped mastery classroom in computer science teaching for higher secondary school students. The main purpose was to develop and validated an instructional video for flipped classroom in computer science teaching for higher secondary students. In a flipped classroom, direct access to the knowledge was provided for students unlike the traditional method of teaching were teacher stands between students and knowledge. The study revealed that a video instructional package has positive impact on the students' achievement in Computer Science [11]. Another study was conducted title "Designing and developing video lessons for online learning". The study aimed at designing and developing video lessons for an online graduate course. The study recommended that the design and development of the video lessons followed the seven design principles [4]. Another research title "Adoption of Instructional Videos for Teaching and Learning Safety Precautions in Vocational Schools for Achieving Sustainable Educational Development Goals in Nigeria" was conducted to examined the benefits and concept of a video package. The research recommended that there is need to provide classrooms with videos as an instructional tool to improve learning of safety precaution. Finally, it was suggested that, there is urgent need to provide gadgets and equipment needed for playing and watching instructional videos in schools [12]. In a study, Instructional Mathematics Videos and the Flipped Classroom investigated video instructional package design format and its characteristics. The result of this study recommended that, a video instructional package design framework was suggested as well as characteristics of a good video instructional package. The study also concludes with recommendations to the Technological Pedagogical Content Knowledge framework applied in this study and provides guidelines for instructional video development [13].

III. METHODOLOGY

The design and development processes consist of design and production of a video instructional package. Developmental research design was adopted in this study. Developmental research is an organized study deals with planning, producing, and evaluating instructional programs for effective teaching and learning [10]. The most common types of developmental research involve product development process which is further analyzed and described. The final product is evaluated to determine its effectiveness [14].

Production of Video Instructional Package

The production of video instructional package adapted ADDIE models. The ADDIE model comprises of five phases. The stages of ADDIE Model consist of Analysis, Design, Development, Implementation and Evaluation. The stages of ADDIE Model were sequentially followed in the development of Video Instructional Package as follow.

Analysis: The analysis phase was done by assessing the needs of the curriculum contents and identifying suitable topics for inclusion in to the video instructional package production.

Design: The design phase includes writing a lesson plan and converting it to script. The designed script was followed in the production of video instructional package.

Development: The development phase was done by producing a video instructional package using a script. The script was followed sequentially. A camera was used to record video, voice recorder was used to record audio, as well as computer software Adobe Premiere (video editing program, integrate animation, pictures, voice narration and additions) was used to edit the video instructional package.

Implementation: The implementation phase was conducted with media ratings of VIP by 4 educational technology experts and a pilot test was conducted in Government Junior Secondary School Babale, Jos North Local Government, Plateau State. The reason for the choice of the School is that, the students have similar characteristics with those in the main study; however, the school is not in any way involved in the main study. An instrument used in the implementation phase is a questionnaire with Likert scale, four level rating scales. The produced video instructional package will be given to five (5) professionals, 3 from NTA and BATB, one from ATAP and one from ATBU. The questionnaire was completed to provide information for face, content, appropriate and relevance of the video package.

The area of the study was Bauchi state, North Eastern Nigeria. The target population for the study was 852 Basic technology teachers from 852 upper basic schools in Bauchi State. For this study, 15 Basic Technology teachers, 3 Educational technologists, 2 video experts were purposely selected for the evaluation of Video Instructional Package based on instrument assessment.

Validation of the Video Instructional Package was done at various stages in order to improve the video package before and after its production. The first stage which is the preliminary validation was done after the video scripts of the video package was produced and printed in a Microsoft document format, the copies was given to experts in the field of Basic Technology to validate it. The second stage is the prototype of the produced video instructional package was given to 3 Educational Technologist to find out whether the Video Instructional Package conforms to acceptable standards of instructional development using four rating scale instrument. Reliability of the instruments was tested using test-retest method. It was administered to three experts, after an interval of two weeks; the result of the two administrations was analyzed using the Pearson Products Moment Correlation Coefficient formula.

The returned instruments bring into focus the various opinions of the respective experts concerning the modifications required. These observations include the pictures, sounds and voice; video slides transition, contrast and colour as well as the general textual arrangement of the package. All the observed and suggested modifications were carefully executed before the final production of VIP.

IV. RESULT AND DISCUSSION

Research Question One: What are the content topics suitable for inclusion in to the video instructional package for teaching transmission and utilization of electricity concept at Upper Basic?

Table 1: Mean responses of basic technology experts on suitable topics for inclusion in to the produced video package for teaching Transmission and Utilization of Electricity Concept at Upper Basic.

S/N	Items	Mean	Std. Deviation	Remark
1.	Principles of transmission of electric power	4.60	.548	Suitable
2.	Transmission of electric power at low frequency	1.20	.447	Not Suitable
3.	Transmission of electric power at high frequency	1.40	.548	Not Suitable
4.	Classification of radio waves	1.20	.447	Not Suitable
5.	Basic power transmission equipment	4.80	.447	Suitable
6.	Visiting transmission station to see how transmission is done	4.80	.447	Suitable
7.	How electricity is supplied to domestic houses	1.20	.447	Not Suitable
8.	Control equipment for supplying electricity to a building	1.40	.548	Not Suitable
9	Types of electric consumers	1.40	.548	Not Suitable

Source: Field survey 2022

Key: Very Highly Suitable = VHS, Highly Suitable = HS, Suitable = S, Low Suitable = LS, Not Suitable = NS.

Table 1 indicated that 3 items had their mean values from 4.60 to 4.80 above the cutoff point of 3.00 which indicated that all the 3 items were suitable for inclusion into the video instructional package for teaching transmission and utilization of electricity concept in basic technology.

Whereas items number 2,3,4,7,8 and 9 with mean ranging from 1.20 and 1.40 were below the cutoff point of 3.00 indicating that the 6 items were not suitable for inclusion into the video package for teaching transmission and utilization of electricity concept in basic technology.

The result of the analysis in table 1 for research question 1 on the suitable contents topics for inclusion into the production of video instructional package for teaching transmission and utilization of electricity concept in basic technology. It was indicated that basic technology experts identify the needs for inclusion of 4 topics into the production of video instructional package for teaching

transmission and utilization of electricity concept in basic technology [10] and [15].

Research Question Two: What are the features suitable for producing video instructional package for teaching Transmission and Utilization of Electricity Concept at Upper Basic?

Table 2: Mean responses of video experts on features suitable for producing video package for teaching Transmission and Utilization of Electricity Concept at Upper Basic.

S/N	Items	Mean	Std. Deviation	Remark
1.	Lesson planning	4.80	.447	Suitable
2.	Scripting	4.80	.447	Suitable
3.	Audio recording	3.60	.548	Suitable
4.	Video coverage	4.40	.894	Suitable
5.	Capturing of pictures	4.40	.894	Suitable
6.	Forming of animation	3.60	.548	Suitable
7.	Designing	1.40	.548	Not Suitable
8.	Directing	4.00	.707	Suitable
9	Rehearsal	1.20	.447	Not Suitable
10	Testing	1.20	.447	Not Suitable

Source: Field survey 2022

Key: Very Highly Suitable = VHS, Highly Suitable = HS, Suitable = S, Low Suitable = LS, Not Suitable = NS.

Table 2 indicated that 7 items had their mean values from 3.60 to 4.80 above the cutoff point of 3.00 which indicated that all the 7 items were suitable features for producing video instructional package for teaching transmission and utilization of electricity concept in basic technology. Whereas items number 7, 9 and 10 with mean ranging from 1.20 and 1.40 were below the cutoff point of 3.00 indicating that the 3 items were not suitable features for producing video instructional package for teaching transmission and utilization of electricity concept in basic technology.

The result of the analysis in table 2 for research question 2 on suitable features for inclusion into the production of video instructional package for teaching transmission and

utilization of electricity concept in basic technology. It was indicated that multimedia experts identified features appropriate for use in the production of video instructional package for teaching transmission and utilization of electricity concept in basic technology. The video instructional package production entails features and procedures that must be applied to ensure the achievement of specified goals of video production, This is in agreement with [16].

Research Question Three: What are the suitable procedures for producing a video package for teaching Transmission and Utilization of Electricity Concept in Basic Technology?

Table 3: Mean responses of video experts on procedures suitable for producing a video instructional package for teaching Transmission and Utilization of Electricity Concept at Upper Basic.

S/N	Best software for video production	Mean	Std. Deviation	Remark
1.	Windows movie maker	4.60	.548	Suitable
2.	Movavi video suit	4.80	.447	Suitable
3.	Magix movie editor	4.80	.447	Suitable
4.	Adobe premiere pro	4.60	.548	Suitable
5.	Imovie	4.40	.548	Suitable
6.	Lightworks	4.20	.447	Suitable
7.	Openshot	4.40	.548	Suitable
8.	VSDC Free Video Editor	4.80	.447	Suitable
9	Shotcut	4.60	.548	Suitable
10	Swishmax	4.40	.548	Suitable
11	Final cut pro	4.60	.548	Suitable
12	Corel video studio	3.60	.548	Suitable
13	Blender (a 3D animation program)	3.60	.548	Suitable
14	Adobe premiere element	3.40	.548	Suitable
15	Pinnacle studio	3.60	.894	Suitable
16	Filmora	4.20	.837	Suitable
17	Wondershare	4.20	.837	Suitable
18	Nero vision	4.20	.837	Suitable
S/N	Best techniques involved in video production	Mean	Std. Deviation	Remark

1.	Trim and split	4.20	.837	Suitable
2.	Stitch media	4.20	.837	Suitable
3.	Ripple move	4.20	.837	Suitable
4.	Clip speed	3.20	.548	Suitable
5.	Extend frame	4.20	.837	Suitable
6.	Cropping	3.80	.837	Suitable
7.	Adding music	4.20	.837	Suitable
8.	Speed ramping	4.20	.837	Suitable
9.	Animating title text	3.80	.837	Suitable
10.	Cross dissolve	4.00	1.00	Suitable
11.	Jump cut	4.00	1.00	Suitable
12.	Montage	3.40	.548	Suitable
13.	Wipe	3.40	.548	Suitable
14.	Fade in and out	3.60	.894	Suitable
15.	Standard cut	3.40	.548	Suitable
16.	JL Cut	3.80	.837	Suitable
17.	Cutting on Action	4.20	.837	Suitable
18.	Cutaways	4.20	.837	Suitable
19.	Match cut	4.20	.837	Suitable
20.	Smash cut	4.20	.837	Suitable
21.	Invisible cut	4.00	1.00	Suitable

Source: Field survey 2022

Key: Very Highly Suitable = VHS, Highly Suitable = HS, Suitable = S, Low Suitable = LS, Not Suitable = NS.

Table 3 revealed that all 18 items under best software for video production and all 21 items under best techniques for video production had their mean values ranging from 3.20 to 4.80 above the cutoff point of 3.00 which indicated that all the 18 items and 21 items were suitable procedures for producing video instructional package for teaching transmission and utilization of electricity concept in basic technology.

The results in table 3 for research question 3 on suitable procedures for inclusion into the production of video instructional package for teaching transmission and utilization of electricity concept in basic technology. It was

indicated that multimedia experts identified procedures appropriate for use in the production of video instructional package for teaching transmission and utilization of electricity concept in basic technology. The video instructional package production entails features and procedures that must be applied to ensure the achievement of specified goals of video production, this is in agreement with [4].

Research Question Four: What is the validity of the video instructional package produced for teaching Transmission and Utilization of Electricity Concept in Basic Technology?

Table 4: Mean responses of Educational technology experts on the validity of produced video instructional package for teaching Transmission and Utilization of Electricity Concept at Upper Basic.

S/N	Statement item	Mean	Std. Deviation	Remark
1.	The use of text in the produced VIP follows the principles readability.	3.60	.548	Agreed
2.	The appearance of characters in the produced VIP is okay for viewers.	3.60	.548	Agreed
3.	The design of produced VIP uses proper fonts in terms of style and size.	3.20	.837	Agreed
4.	The VIP is structured in a clear and understandable manner.	3.20	.837	Agreed
5.	The presentation of information in the produced VIP can captivate learner's attention.	2.80	.837	Agreed
6.	A high contrast between graphics and background is retained in the produced VIP.	3.20	.837	Agreed
7.	The presentation of information in the produced VIP can stimulate recall.	3.20	.837	Agreed
8.	The in the produced VIP allows learner to work on their own pace.	3.40	.894	Agreed
9.	The introduction of produced VIP facilitates learning by doing.	3.20	.837	Agreed
10.	The produced VIP is structured to allow learner to move around freely in different lessons.	3.20	.837	Agreed
11.	Audibility of the narration in the produced VIP is okay.	3.20	.837	Agreed
12.	Production quality (audio, video, text) of the produced VIP is sufficient to make content tolerably watchable.	2.40	.548	Agreed
13.	The produced VIP has appropriate slide layout.	3.60	.548	Agreed
14.	The produced VIP allows storage (save) in CD-ROM, DVD, cloud computing and other external storage devices.	3.20	.837	Agreed
15.	The interactivity of the produced VIP corresponds to the maturity of the students.	2.80	.837	Agreed
16.	Narrator in the produced VIP inspires confidence by presenting self as knowledgeable and skilled.	3.20	.837	Agreed

17	The produced VIP persuades viewers that they can successfully complete the tasks that are the focus of instruction.	3.00	1.000	Agreed
18	The produced VIP was designed to interest and motivate learners.	3.20	.837	Agreed

Source: Field survey 2022

Key: Strongly Agreed = SA, Agreed = A, Strongly Disagreed = SD, Disagreed = D

Table 4 revealed that all 18 items had their mean values from 2.40 to 3.60 above the cutoff point of 2.00 which indicated that all the 18 items were agreed by the experts. This also indicated the validity of the produced video instructional package for teaching transmission and utilization of electricity concept in basic technology

The results in table 4 for research question 4 on the validity of the produced video instructional package for teaching transmission and utilization of electricity concept in basic technology. It was indicated that basic technology and educational technology experts agreed that the produced video instructional package is valid for teaching transmission and utilization of electricity concept in basic technology. The video instructional package must be validated before testing its effects, This is in agreement with [11].

V. CONCLUSION AND FUTURE SCOPE

The result obtained from data gathered and analyzed in this study indicated that the produced video instructional package for teaching transmission and utilization of electricity concept in basic technology for upper basic secondary school in Bauchi state, Nigeria, is suitable for teaching and learning basic technology in upper basic secondary school if appropriately deployed into the instructional process of basic technology.

Instructional video package and modern technologies should be use by teachers when delivering their instructions to allow learners comprehend and master what was taught to them and also improve their academic achievement. Government should encourage the use of video instructional package by providing required electronics such as projectors, projection screen, laptop computer, standby generator and so on. To facilitate the utilization of video instructional package by upper basics specifically JSS 2 in order to supplement teaching of topics that required field trip method of teaching. Curriculum planners in collaboration with relevant stakeholders should design school curriculum that will encouraged effective use of instructional media gadgets and tools by upper basics in order to achieve learning objectives. Government should organize workshops to train teachers on the use of modern technologies, particularly the use of instructional video package.

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