



## Development and Validation of e-Content in Teaching and Learning of Automobile Lighting System in Technical Colleges in Niger State, Nigeria

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**Abstract**—The purpose of this study was to develop and validate study e-content in teaching and learning of automobile lighting system in technical colleges in Niger State, Nigeria. The study adopted Research and Development (R & D) design. The researchers modified the 10 steps of R & D model to 5 steps cycle which fits the present study. The five modified phases include the development of e-content: phase I: determination of the contents of e-content teaching and learning package, determination of the important e-content skills, knowledge and attitude needed by students in automobile lighting system, development of a draft e-content teaching and learning package based on the findings from phase II, validation of e-content and revision of the draft e-content teaching and learning package based on feedback from phase IV. The e-content package was produced on HTML5. The development and validation of the package was conducted using requirement specification as the basis of reference. The validation activities involved Alpha and Beta tests. The reliability coefficient of the instrument yielded 0.86 using Cronbach alpha technique; two research questions were analyzed using mean values and standard deviation. At the end of the validation, e-content teaching and learning package was found to perform all the tasks listed in the requirement specification.

**Keywords**—*automobile lighting system; e-content; teaching and learning*

### I. INTRODUCTION

The standpoint for the vocational institutions in Nigeria is the Technical Colleges (TC). At the TC, the training in Motor Vehicle Mechanic (MVM) is carried out from TC I to TC III. The cardinal objective of the MVM at the TC is to prepare students to acquire appropriate skills and knowledge for employment in the world work. In accordance with the stated objective, the curriculum place emphasis on among others field studies, guided discovery. At the TC, Auto-mechanics is divided into the following departments; engine maintenance and refurbishing, and auto-electricity. The auto-electricity is further divided into the following sensors, battery, ignition, charging, starting and the lighting system. The automobile lighting system syllabus consists of the headlights, filament lamps, headlight alignment, lighting circuits, direction indicators (flashing lights), lighting faults and their remedies.

This study is intended to provide the MVM course to meet the needs of the society through relevance and functionality in its content, application, process and method of teaching.

The method employed for successful teaching and learning is an issue of concern to educators, because, the methods of teaching play an important role in thrilling the students' creative and critical thinking by persuading students' teamwork in viewing an event or problem from many standpoints [1]. These can only be reached when a proper instructional method that would enable MVM practitioners to get hold of both cognitive and psychomotor competencies in the automobiles.

Today, the complexity in the automobile industry is growing exponentially in response to the necessity for technologies to pull off low pollutant discharge and to match and maintain the trail of its development via the Information and Communication Technology (ICT). ICT is a term that consisting of Information Technology (IT) and Communication Technology (CT). [2] defined the terms IT and CT respectively, as a tool to process, manipulate and manage information while the latter is everything linked with the utilization of tools to process and convey data from one gadget to another. [3] stated that the application of ICTs in education is divided into two broad categories, namely ICTs in education and ICTs for education. the former deals with the implementation of the general components of ICTs in the teaching-learning process while the latter involves the development of ICT for teaching-learning purposes [2].

The introduction of ICT into the automobile technology has brought a noteworthy revolution in automobiles students' in the organization of instructions, tests and exams. As such, the applications of ICTs in the school depend on the teacher [4]. On the other hand, mastering and utilizing ICT skills towards creating an improved teaching and learning environment is of utmost importance to teachers in creating new learning culture [5]. As a result, [6] stated that to address the inadequacy of curriculum aligned contents for students and teachers in secondary schools and tertiary institutions in Nigeria to be resourceful, stimulated and creative with the better need for self-learning than relying on handbook and syllabi, the e-content platform is needed.

e-content means content in the electronic form. [7] defined e-content as digital images and text premeditated for put on view on web pages. Similarly, [8] viewed it as any digitalized content that can smooth the progress of learning process and/or outcome. [9] viewed it as a blending of animation with audio, video, images and text. Four different channels are needed for the possession of these contents; these include the procurement of materials, use of freely available content on the internet, invention of material and swap of available contents in a network with other institutions of higher education [7]. According to [10], e-content learning materials focused on cognitive, emotional behavioural and contextual perspective of both the teacher and student. The future teacher will understand that he or she is changing from a provider of facts to one that facilitates a learning environment and the student will be placed in the centre instead of the educator. As advocated by [11], information does not become knowledge automatically until learners have been actively involved in its processing. In developing a knowledge society, integrating ICT (e-content) at all levels of education is essential

Aligning the significant demands and preferences of students for higher learning achievement of teachers and students in teaching and learning of automobile lighting system in Niger State technical colleges, developing and validating the methodology for teaching and learning of automobile lighting system in technical colleges in Niger State will entail a re-think in the methodology used in teaching automobile trade. Such a methodology should incorporate the use of e-content.

In teaching automobile lighting system via the e-content, the processes of giving and taking, talking and listening, describing and witnessing, help expand horizons and foster common understanding among the students to gain knowledge when appropriate information is presented and processed.

## II. STATEMENT OF THE PROBLEM

Despite the fundamental function played by Technical Vocational, Education and Training (TVET), the method of teaching it is to a certain extent not highly effective in most of the technical colleges in Nigeria to give the student-teachers the prospect to think autonomously and conceptualize the strong point of mind of the subject matter due to inadequate and high excellence instructional strategy in the classroom. For this reason, the method used by teachers in sharing information with students is an aspect influencing learning at all levels of the education system [12]; [13]. This is because today's society is becoming dependent on digitalized devices and as such become inevitable for students who will live and work in the digital world [12].

As a result of the above-mentioned problems, [14] grieved over that the traditional structures and methods of teaching/learning come into sight, less responsive to the challenges of the turbulent times because the instructional delivery system fails to effectively keep pace with the rapid skills obsolesce especially in the automobile industry. Hence, this necessitates a change in the instructional methods used in teaching and learning automobile lighting system in technical colleges in Niger State so as to enable the products of these colleges to

obtain an incorporated knowledge of affective, cognitive and psychomotor skills required in the work.

## III. AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to develop and validate e-content for teaching and learning of automobile lighting system in technical colleges in Niger State.

Distinctively, the study seeks to identify the contents of the e-content and the requirement specifications of e-content for teaching and learning of automobile lighting system.

## IV. METHODOLOGY

The study adopted the Research and Development (R & D) research design method. This was considered suitable because the study deals with the interaction between research and the production as well as evaluation of a new product, which are systematically field-tested, evaluated, and refined until they meet specified criteria of effectiveness, quality, or similar standards [15]. The researchers modified the 10 steps of R & D model to five steps cycle. The five modified phases include Phase I: Determination of the contents of e-content teaching and learning package to be developed; this involved the collection of information such as determination of objectives, content, delivery system and evaluation activities. Phase II: Determination of the important e-content skills, knowledge and attitude needed by students in automobile lighting system. Phase III: Development of a draft e-content teaching and learning package based on the findings from Phase II. Phase IV: Validation of e-content and Phase V: Revision of the draft e-content teaching and learning package based on feedback from Phase IV. The study was conducted in the technical colleges in Niger State. A Structured Questionnaire (SQ) was developed by the researcher in line with the research design and objectives of the study. Each set of an item contained a response scale as follows:

- Highly Required (HR) / Great extent (GE): 3.50-4.00
- Averagely Required (AR)/ To an extent (TAE): 2.50-3.49
- Slightly Required (SR)/ A little extent (ALE): 1.50-2.49
- Not Required (NR)/ Not at all (NAA): 1.00-1.49

Three validates validated the developed package in terms of animations, functionality, graphical interface, language, navigation, packaging and typography and emphasis on key concepts, simplicity and its suitability for instruction. Their suggestions and recommendations were used for modifying the package. For example, the recommendations made were to add an administrative page as well as comment box. This was carefully considered very vital in preparing the final draft of the instrument. To establish the reliability of the instrument, Cronbach Alpha was used to determine the internal consistency of the e-content and the reliability coefficient was found to be 0.86. The e-content was developed by the researcher using the Hypertext Markup Language (HTML 5). HTML 5 was considered appropriate because it creates more platform independent applications which can run across browsers eliminating the need for testing on multiple browsers [16].

The procedures adopted during the development of automobile lighting system e-content teaching and learning instructional package are:

- *Need Analysis:* This involves the collection of facts to search information on the contents of e-content such as determination of objectives, content, delivery system and evaluation activities.
- *Importance of the Product:* After the need analysis, the next step is to determine the importance of the product that will be developed. In this step, the researcher interviewed experts of curriculum areas, teacher of motor vehicle mechanic subject and students in the technical colleges.
- *Developing Preliminary Product:* At this stage, a draft e-content teaching and learning package was developed after the initial planning has been completed. Developing the e-content instructional package, the researcher made this media offline and started the installation of XAMPP as localhost server and then preceded the installation.
- *Validation of the e-Content:* At this stage, the e-content teaching and learning package was validated by experts in automobile technology, educational technology and ICT in terms of its clarity, appropriateness, utility, objective, originality and adequacy of content for use in teaching and learning of automobile lighting system. Their comments and suggestions were incorporated in the final copy of the e-content. The purpose of this validation is to obtain an initial qualitative evaluation of the new educational product.
- *Evaluation of the e-Content:* The purpose of this stage is to determine whether the product under development meets its performance objectives.

## V. RESULTS

### A. Research Question 1:

What are the contents of the e-content in teaching and learning of automobile lighting system?

The result in Table I revealed that five items conformed to highly required (HR); eleven items conformed with to an averagely required (AR); while no item conformed to slightly required (SR) and not required (NR). Thus, this gives the impetus to conclude that the contents of the e-content in teaching and learning of automobile lighting system are averagely required (AR).

### B. Research Question 2:

What are the required specifications of e-content for teaching and learning of automobile lighting system?

The result in Table II revealed that seven items conformed to a great extent (GE); twelve items conformed to an extent (TAE); while only one item conformed to a little extent (ALE) and no item conformed to not at all (NAA). Therefore, this gives the impetus to conclude that to an extent, the requirement specifications of e-content for teaching and learning of automobile lighting system is satisfactory.

TABLE I. MEAN RESPONSE OF THE RESPONDENTS ON THE CONTENTS OF E-CONTENT IN TEACHING AND LEARNING OF AUTOMOBILE LIGHTING SYSTEM

N= 5				
S/N	Item	$\bar{X}$	SD	Decision
1	Home	3.56	0.70	HR
2	Objectives	3.76	0.51	HR
3	Subject mapping	2.52	0.82	AR
4	Summary	3.53	0.64	HR
5	Text	3.60	0.55	HR
6	Audio	3.34	0.85	AR
7	Video	3.29	0.79	AR
8	Assignment	3.27	0.71	AR
9	Quiz	3.05	0.70	AR
10	Tutorials	2.75	0.73	AR
11	Exams	3.19	0.77	AR
12	References	2.96	0.86	AR
13	Glossary	2.38	1.12	AR
14	Hyperlink	2.52	0.82	AR
15	Download	3.76	0.51	HR
16	Contact	2.96	0.86	AR
$\bar{X}_g$		3.15		AR

Keys: N= Number of respondents,  $\bar{X}$ = Average mean, SD= Standard deviation, Highly Required (HR), Averagely Required (AR), Slightly Required (SR) and Not required (NR),  $\bar{X}_g$ = Grand average mean

## VI. DISCUSSION OF FINDINGS

The data presented in Table 1 provided answers to research question number 1. It revealed that the sixteen (16) contents of the e-content in teaching and learning of automobile lighting system were averagely required. This finding concurs with [17] result which revealed that comments received from experts confirmed that the content, authoring tools, colour used, navigation mode, structure and interactivity used in the development and validation of web-based instructional package for teaching purpose were relevant and it was of good quality for intended users. In addition [18] revealed that web-based learning environment model enhanced cognitive skills for students.

The results from Table 2 indicated that all the Auto-Mechanic teachers at the technical colleges that were used as research assistants on which the Alpha and Beta test were conducted equally agreed that the e-content performed all the tasks contained in the requirement specifications in the actual classroom. This finding agrees with [19] that the use of e-content in teaching and learning simplifies the entire testing cycle including among others archiving, evaluation, generation and presentation of learning experience.

## VII. CONCLUSION

The findings of the study revealed that each stage of e-content is recognized to have a high degree of validity for the package in the automobile lighting system. The result also indicated that the e-content performed all the tasks contained in the requirement specifications to fulfill the requirement at and outside the developer's site when the proposed groups of students were made to use it.

TABLE II. MEAN RESPONSE OF THE RESPONDENTS ON THE REQUIRED SPECIFICATIONS OF E-CONTENT FOR TEACHING AND LEARNING OF AUTOMOBILE LIGHTING SYSTEM

N= 5

S/N	ITEM	$\bar{X}$	SD	Decision
1	Does the automobile lighting system e-content run on a Personal Computer Platform?	3.53	0.64	GE
2	Will the automobile lighting system e-content simulate one-on-one instruction for the students?	3.34	0.85	TAE
3	Will the automobile lighting system e-content track down the behaviour of students?	3.70	0.75	GE
4	Will the automobile lighting system e-content force students to follow a learning sequence?	2.59	0.29	TAE
5	Will the automobile lighting system e-content provide the opportunity for the student to control his own pace of study?	3.27	0.71	TAE
6	Will automobile lighting system e-content create a multimedia presentation?	2.21	1.06	ALE
7	Will automobile lighting system e-content provide suggestions on how to proceed or helps when needed?	3.56	0.70	GE
8	Will automobile lighting system e-content provide timely feedback?	3.76	0.51	GE
9	Will automobile lighting system e-content controlled entrance into the examination contents through the students' Identity (ID) No. and password and a password to be supplied by the teacher?	3.29	0.79	TAE
10	Will automobile lighting system e-content control and record the actual time spent in writing the examination and log out?	3.76	0.51	GE
11	Will automobile lighting system e-content score the student achievement test?	3.53	0.64	GE
12	Will automobile lighting system e-content produce the student's record scores?	3.61	0.56	GE
13	Will automobile lighting system e-content store student scores in the database?	3.30	0.73	TAE
14	Will automobile lighting system e-content display the student scores in the database?	3.23	0.81	TAE
15	Will automobile lighting system e-content display the results at the expiration of the test for the students?	2.92	0.83	TAE
16	Will automobile lighting system e-content catch obvious user mistakes?	2.69	0.68	TAE
17	Will learners understand what is expected of them?	3.18	0.67	TAE
18	The analogies in automobile lighting system e-content relevant to learners need and interest?	3.26	0.69	TAE
19	All terms of the content areas are adequately explained	3.23	0.75	TAE
20	All activities of the automobile lighting system e-content practicable	3.24	0.71	TAE
$\bar{X}_g$		3.36		TAE

Keys: N= Number of respondents,  $\bar{X}$ = Average mean, SD= Standard deviation, Great Extent (GE), To An Extent (TAE), A Little Extent (ALE) and Not At All (NAA),  $\bar{X}_g$ = Grand average mean

The screenshot shows a web interface for an e-content module on automobile lighting systems. On the left is a vertical navigation menu with buttons for 'Home', 'Objectives', 'Introduction', 'Main text', 'Videos', and 'Exercise'. The main content area has a title 'LIGHTING SYSTEM' and a sub-section 'LIGHTING CIRCUIT OBJECTIVES'. Below this, it states the lesson objectives: 'At the end of this lesson, the students should be able to: i. State and explain the features of lighting circuit, ii. Draw the lighting circuit layout, iii. State the wattages of car lamp bulb'. The 'INTRODUCTION' section discusses the importance of vehicle lighting systems for road safety. The 'MAIN TEXT' section begins with 'Statutory regulations specify the number, position and specification of many of the external lights fitted to a vehicle...'.

Figure 1. Home page of the Developed e-Content in Teaching and Learning of Automobile Lighting System

## VIII. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- Teachers teaching TVET subjects should adopt an e-content instructional approach to improve cognitive, emotional, behavioural and contextual perspective of both the teacher and student.
- A similar instructional package should be integrated as part of course of study in the higher institutions

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