



The Validity of Using Fixed Infographic Media Pattern to Teach Technical Subject in Mobile Training Environment on Academic Achievement and Attitude for Advanced Technical School Students

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ABSTRACT

This study admeasures the quality of adopting fixed infographic media pattern on academic achievement and attitude towards learning for advanced technical students. The sample size consist thirty advanced technical students at Isa Kaita College of Education Dutsinma; twenty items each Google forms multiple choice questions (MCQ) achievement test and five point likert type attitude questionnaire were the research tools; paired sample t-test at 0.05 significance level was used to compute the pre- test and post-test data generated. E-portfolio was used as the digital learning medium. The post-test results illuminated that using infographic media has a positive effect on attitude towards learning, increases motivation and reduce course anxiety especially in technical subjects; it further divulged higher academic achievement of the experimental subjects after drill. Its' therefore recommended that Technology and Science education teachers may adopt infographic media as part of their instructional resources for effective teaching.

Keywords: Validity, fixed infographic media, academic achievement, attitude

INTRODUCTION

Focus of teachers has now been shifted from creation of a single media pattern that appeal to only one sense to a multimedia pattern which combine multiple data that cut across various senses of diverse learning personalities.

Words verbal or written remain the major technique of communication in schools for several decades, which ultimately yield low achievement and retention of information processed by the learners, hence the saying "I hear, I forget" as such Communication pattern in the arena of teaching and learning should be diverse in such a way that it will close all existing gaps left behind by a single media mode of data application.

Communication has some vital components that make it effective, these ranges from the source of the information, the channel through which the information pass, the message itself and the destination.

In education the source of information is the teacher, the channels are the techniques of the instruction, the message is the instructional experiences, and the destination is the recipient of the experiences that is the learner.

The most important component here is the learner, learners differs in their learning personalities, therefore the techniques of communication with them must reflect those existing learning diversities.

Teaching efficiency largely depend on the quality of teachers' communication, instructional design, selection of good and appropriate instructional techniques, selection of or creation of qualitative instructional resources as well as the teachers and learners quality of the classroom interaction.

The instructional efficiency elements stated above should be design and presented in such a way that it reflects the diverse nature of the class in terms of learners' personalities, interests, cognitive rigor and competences, which could be achieved through presentation of instructional experiences in a format that combines texts and images.

Problem statement

This research study emanated from several recommendations found in various educational researches, which stressed the rationale for finding a new trend in technological methods and resources that will aid teachers to facilitate instruction, improve academic achievement and attitude. In view of the above, this research study generally aimed at answering the question below:

What is the validity of using fixed infographic media pattern to teach technical subject in mobile training environment on academic achievement and attitude for advanced technical school students?

Objectives of the study

The general objective of this study is to investigate the validity of using static infographic media pattern on academic achievement and attitude for advanced technical students: The specific objectives are:

- 1) To determine the validity of using fixed infographic media pattern to teach technical subjects on academic achievement among advanced technical school students
- 2) To determine the validity of using fixed infographic media pattern to teach technical subjects on developing positive attitude towards learning among advanced technical schools students

Research hypotheses

This study was guided by the following hypotheses

- 1) There is a statistically significant difference at the level ($p < 0.05$) between the mean scores of the experimental group in the pre and post application of achievement test in favor of post application
- 2) There is no statistical significant difference at the level ($p \leq 0.05$) between the mean scores of the experimental group in the pre and post application of attitude towards learning questionnaire

LITERATURE REVIEW

Learning acquisition, reasoning, and thinking is part of the actions of the human mind (Cognitivism), therefore learners are considered as information processors. The main objective of using infographic multimedia is to communicate vital data to the learners in a more understandable and fashionable manner, (Scott, Fawker, Oliver & Murray, 2017).

Infographic is widely used today in many spheres of life, it's used in newspapers, magazines, local and digital medias, social network services like whatsapp, Face book, instagram, twitter, YouTube, as well as in educational teaching and learning processes. (Hope & Cheta, 2018).

The idea of infographic multimedia stemmed up from cognitive theory of multimedia learning (CTML), infographic is a dual coding media technique for presentation of educational experiences using various sensory modes like texts and pictures, verbal, acoustics and animations concurrently, (Tayo & Oluwakemi, 2015). Its assumed that learners learn and retain information faster when learning contents are presented to them in more than one mode (dual coding) such as words and pictures (Morrison, Clemens & Ribble, 2015).

To buttress the effect of infographic Morrison et al (2015) presented three ways by which human mind receives and process infographic as a multimodal form of data processing, accordingly learners receives data in a dual affinity (combination of visual and acoustics), the capacity limit, finite capacity of processing and storage of new knowledge and the active process of generation, analysis, synthesis, organization and integration of new knowledge.

Thus infographic emphasizes on the validity of multimodal pattern of delivering instructional resources in order to aid instruction and improve performance, retention and remembrance. Richard Mayer asserts that attention memory comprises two sets of components that accepts and process learning resources in parallel, the acoustics through the sense of hearing (ears) and visuals, by the sense of seeing (eyes) thus inform of images and sounds, and for effective learning to occur, the two sets should work concurrently (Tayo & Oluwakemi 2015).

Instructional resources, (electronic and print types) are associated with some inherent difficulties that relate to the nature and complexity of the material presented, these deter the action of the working memory in processing the information (intrinsic cognitive load).

However to tackle the above phenomenon and facilitate deeper processing and understanding, the information should be integrated with some elements of priori knowledge and other actions and processes that aids learning (germane cognitive load) such as charts, diagrams, acoustics, written words with verbal course hence infographic media vitality in education (Shibli & West, 2018).

The concept of infographic is a combination of two words, information and graphics combine together to form infographic as a multimedia pattern of education which combines both verbal and visual information that are presented simultaneously with a sole purpose of limiting the actions of human mind in processing and interpreting information presented in a single mode.

Instructional designers often use lines, charts, illustrations, pictures, animations, as infographic to present a visualization of educational information that assists learners to understands and remember the knowledge gained easily.

Infographic has been introduced as a mechanic of education meant to assist instructors to facilitate their teaching activities with a view to enhance learners' learning especially in the higher education;

Infographic is therefore seen as images inform of pictures combine with words to aid the spread of information to the gallery by an individual or group of teachers.(Amin, Khalisah, Liyana, Hoo, Shaffe, Narimah & Fauzi, 2017).

Today's infographic static and motion are viewed as an act of explanation of an event, data or resources in a combine process that involves words and sounds concurrently. (Taspolat, Kaya, Sapanaca, Behshti & Ozdamli, 2017).

To strengthen the above statement Taspolat et al (2017) opined that infographic media pattern value in education cannot be overemphasized, as such “ a picture speak worth than a thousand words”, they are on the view that infographic assists teachers in the following areas:-

- 1) Properly describe the course work and topic flow in a simpler and understandable manner
- 2) Augment learners learning experiences when the data presented is supported with visuals and sounds simultaneously so as to further depict the main ideas associated with the concepts and knowledge presented
- 3) Enable learners to develop more critical thinking skills and creativity
- 4) Enhance learners ability to receive, process, store and retrieve information better

The design of infographic

Gestalt principles suggest that infographic multimedia design format should be in such a way that the designed media appeals to the cognitive processes of the human mind and should be able to attract the attention of the eyes of viewers.

To that effect the processes and steps of design vary among the designers so also the product as well as the consumers. In view of that Scott, Fawkner, Oliver and Murry, (2017), described the word graphic as an acronym that represented seven guiding principles and steps of infographic design adopted by the designers in order to design a meaningful and attractive infographic as follows:-

- 1) G – Get to identify the gallery
- 2) R – Restriction on color application
- 3) A – Alignment and sequencing of the design elements
- 4) P – Prioritize grouping of items and contents
- 5) I – Invest in imagery

- 6) H – Highlight, bolds and color the headings to attract viewers’ attention
- 7) C – Choose appropriate charts to represents the contents

These are further described in the figure below:



Figure 1. Design and share of an engaging infographic by Scott et al (2017),Basco (2020)

Similarly Siricharoen and Nattamun, (2015) suggests that teachers who need to create infographic for specific need should adhere to the guidelines below:-

- 1) Acquire data from diverse refuges
- 2) Set the target accordingly
- 3) Plan the flow of the propose infographic media
- 4) Adopt online tools to layout your design
- 5) Select the best visuals to represent your contents like charts, diagrams, illustrations
- 6) Review and assess the process
- 7) Edit the product after validation
- 8) Cite the source of your information

Infographic media pattern are grouped into audio media infographic, visual media silence infographic, motion visual media infographic, audio visual media silence infographic and motion audio visual media infographic which could be accessed electronically via social network and other professional forums like, facebook, twitter, LinkedIn, whatsapp and as a print physical copy in different journals, conferences and seminars, (Hussain & Parveen, 2021).

Infographic media is design to improve so many skills and achievements in the teaching and learning process, among these skills is visual literacy skills. Visual literacy are those skills for visual competencies that learners of the 21st century are expected to develop by integrating various sensory experiences that are fundamental to human learning activities, (Schoen & Molly, 2015, Johnson, 2021).

Moreover a visually literate persona could easily describe, differentiate and interpret data that appears inform of images, symbols and illustrations, that are naturally or artificially produced and he associated with in his physical environment.

Empirical evidences proved the vitality of infographic in various sectors of life, education in particular. Sabry, Foutouna and Gouda, (2021), observed a positive effect of infographic on different learning styles trained in an adaptive training environment to enhance their programming skills and efficiency.

However in a cross sectional analysis of infographic results indicated that most of infographic media patterns does not sufficiently depict information that will enable users to understand the study findings, characteristics and results, hence there is need for more initiatives to enhance the presentation of a clear infographic, (Ferreira, Elkins, Jones, Okeeffe, Gashin, Becerra, Gamble & Zadro, 2022).

Furthermore Egan, Acharaya, Sunderajah, Xu, Mottershaw, Phillips, Ashrafian and Darzi, (2021), observed that infographic enhances guidance and recall, as well as reduces cognitive load while interpreting information displayed, their findings revealed further that infographic guidance is more explicated than text only, and however the dual coding media guidance does not reduce anxiety of the users.

Infographic has also been proved to be effective on the academic success and can influence learners' retention capacity in Maths, Turkish language, Social Studies, and Science and technology courses (Ozdamli & Ozdamli. 2017).

Using infographic is very vital in increasing students, academic performance, alters attitude towards learning in media systems, and also that female perform below their male counterparts while using infographic as a result of strong affinity and interest of male learners compared to female learners, (Hope & Cheta, 2018).

Infographic were thought to be among the best instructional resources that makes learning permanent and has also been found to be more preferred to be used by learners at basic level of education than the other levels of education, (Yildirim, 2016).

Meanwhile mobile training environment refers to the learning environment available in all the mobile devices, such as android phones, smart phones, tablets, personnel digital assistants (PDAs) that serve as channels through which infographics media are disseminated to the learners.

These channels include social network and professional forums, and platforms available in all 3G and 4G network devices, platforms like YouTube, facebook, twitter, whatsapp, LinkedIn, learning management systems used by learners to gain access to learning resources anytime anywhere, are examples of such (Kabir and Kadage ,2017).

One of the technical subjects is electrical trade offered as a course and as a discipline at both high grade and advanced technical institutions of learning in Nigeria. For advance technical students, the course is offered as a core course at preparatory level (TED 013, 023) and the first and second semesters of the first two sessions (TED 113, 123, 213, & 223) four (4) semesters in the programme, and finally a final year student may choose it as a specialization that runs for another one semester, (FRN, NCCE, 2012). Basic electricity has been selected as the treatment course for this research.

Research design

An extended one group pre test and post test quasi experimental design was adopted; this was in order to explore some of the impact of using fixed infographic media pattern on the academic achievement and attitude for advanced technical school students in one of the technical trade subjects

Area of the study

The study was limited to the treatment of some selected advanced technical school students in Katsina State, Nigeria in the 2022/2023 academic year, on the design and application of fixed infographic media pattern in the teaching of Basic electricity subject.

The audience

The audience consist one hundred and thirty four advanced technical students in Katsina State. The selected sample were thirty advanced technical students in the department of technical education, school of secondary education vocational and technical, Isa Kaita College of Education Dutsinma; the sampling technique was purposive, only students with android version mobile devices were selected. The detail attribute statistics of the sampled audience are presented in table 1 below:

PRESENTATION OF FINDINGS

Table 1; Attribute statistics of the sampled audience:

Attribute	Category	Frequencies	Percentages
Gender	M	30	100%
Level	300	30	100%
Age	18 – 20 years	11	36%
	21 - above years	19	64%
Department	Voc & tech educ.	30	100%

From table 1 above, the sample size consisted thirty male students, indicating that 100% of the audience were male, out of which eleven representing 36% were between the ages 18 – 20 years and nineteen representing 64% were 21 years and above. All the participants were level three students of vocational and technical education department.

Research tools

Twenty items multiple choice questions (MCQ) achievement test and twenty items five point likert type attitude questionnaire produced by the researchers were employed to elicit information from the sample.

Validity and reliability of the tools

After items development for the two instruments, they were taken for external and internal arbitration to ensure construct and content validity, all critiques from arbitrators were strictly implemented which made the tools credible for the purpose. Thereafter, two weeks pilot study was conducted with twenty technical students who were among the target but not within the selected sample to ascertain reliability of the tools; their degrees were taken after drill and Cronbach alpha coefficient was computed using SPSS software version 23 where .83 and .89 was observed for each of the two instruments, indicated their high level of internal consistency.

The mobile training environment

The mobile training environment adopted was trainer’s e-portfolio (Sani Ahmed infographic portfolio), the rationale for the assent was that, the site is free and available in Google drive of most android version mobile phones which might not pose any difficulty to the masquerades.

The drill and practice

The audience drill and practice was orchestrated for two weeks with the thirty sampled students, prior to treatments, pre-test with achievement test containing twenty items in basic electricity course and twenty items attitude towards learning questionnaire was applied to determine the cognitive level and affective feelings of the whole sample. The computed result indicated that all the sample were at the same cognitive and affective level. Thereafter drill and practice commences with Basic electricity treatment course materials (BETCM) using diametric forms of infographic media patterns related to course electrical circuit; these infographics were generated from slideshare, Canva, scribd and Google sites and were uploaded to Sani Ahmed infographic e-portfolio, signing ID was shared to the trainees via

whatsApp. The training was also full of higher order thinking skills activities inform of discussion, online quizzes, comments and observations using e-portfolio as a medium.

Table 2: Plan for the training events: Duration: Two weeks, begins from 1st - 14th February, 2024

Week	Treatment/ activity	Assessment
Week one (1) 1st – 7th February 2024	<ul style="list-style-type: none"> - General guidelines and objectives of the training 1. Introduction of the first module: introduction to electrical circuit (concept, characteristics, components,). - Activities. 2. The second module: types of electrical circuits, Series circuit, parallel circuit and series parallel circuit - Activities. 	Formative assessment and feedback
Week (2) 8th – 15th february,2024	<ul style="list-style-type: none"> 1. The third module: components of electrical circuit (current, voltage and resistance) - Activities. 2. The fourth module: Ohm’s law (Relationship between current, voltage and resistance in a circuit) - Activities. 	Formative assessment and feedback.

At the expiration of drill and practice period, the two research instruments were reapplied as post-test and the final data generated were analyzed by descriptive statistics and paired sample t-test to determine the effect of predictor variable to the sample; the predicted changes are presented below

RESULTS AND DISCUSSION

The arrays of illustrations of results and findings are given below

Findings in respect of pre – test and post – test achievement test

To examine the impact of infographic on developing knowledge acquisition skills, pre –test and post – test were authorized, and outcomes collected, average scores were extracted to determine if there is any important variation between them by means of paired sampled t – test. Table 3 below envisaged the results.

Table 3: Mean, standard deviation, paired sampled t – test and correlation coefficients in respect of pre – test and post – test success scores concerning Basic electricity achievement test.

Experimental group	Test type	No of items	Mean	Mean Difference	Standard deviation	Correlation coefficients	2 tailed sig.	Remark
	Pre test	20	5.15	-4.8	3.514	.447	0.00	Sig.
	Post test	20	9.95		3.086			

Table 3 above, unfolded a significant paradigm in the average scores between pre- test and post –test in the cognitive skills of learning Basic electricity course with infographic as revealed by the achievement test scores, the post test average score was 4.8 higher than the pre – test, 5.15 (SD, 3.514 and 9. 95 (SD, 3.086) pre and post – test respectively, Also .447 correlation coefficient was observed, which indicated a very low relationship between the scores.

The 2 tailed significant values were .00 below the 0.05 threshold, signifying that, null hypotheses has been rejected since the 2 tailed values is less than the 0.05

P value which implied that fixed infographic media is effective in improving the academic performance of the subjects under review.

To clarify the finding above, Morison, Clement and Ribble (2015) opined that when learning messages are presented in variant modes such as words and images (dual coding) it energizes faster learning and recall. Moreover Tayo and Oluwakemi (2015) assume that static infographic media patterns such as texts, pictures, verbal and acoustics when used concurrently positively enhances learning output of the subjects. Furthermore Shibli and West (2018) noted that instructional experiences has some implicit travails that dissuade action of the working memory (intrinsic cognitive load), to abode the bizarre germane cognitive load inform of static infographics like charts and diagrams should be incorporated in the design and development of instructional resources

Findings in respect of pre – test and post – test concerning the experimental group’s credence towards learning

To expose the epitome of fixed infographic media pattern on developing positive enthusiasm towards learning, pre – test and post –test results were compared by paired sampled t – test and the results are presented in table 4 below:

Table 4: Mean, standard deviation, paired sample t-test and correlation coefficients in respect of pre –test and post –test concerning attitude questionnaire

Experimental group	Test type	No of items	Mean	Mean Difference	Standard deviation	Correlation coefficients	2 tailed sig.	Remark
	Pre test	20	5.90	-	3.024	.459	.000	Sig.
	Post test	20	9.95	4.05	2.964			

Table 4 above, the mean scores in respect of pre- test and post test were 5.90 (SD, 3.024), 9.95 (SD, 2.964) which revealed that pre –test average scores were 4.05 lower than post – test average scores, also .459 correlation coefficients indicated a medium correlation between the scores, the 2 tailed significance value were .000 at $p \leq 0.05$ significance. This result led to the rejection of null hypotheses, since the 2 tailed values are less than 0.05 confidence level. It implied that fixed infographic media pattern has significant influence on developing positive attitude of the trainees.

Gestalt principles advocates that media design format should replicate the cognitive process of individuals and that be able to arouse interest and attract the attention of the viewers Scott, etals (2017). To project the above, Chetah (2018) revealed that exploiting infographic in the areas of teaching and learning increases academic performance and positive attitude towards learning. Egan etals (2021) described infographic media as a resource that if applied appropriately in classroom will enhance learners recall ability and reduces course anxiety and improve motivation and self confidence of the learners to learn and present their ideas effectively.

More revelation from attitude questionnaire indicated that using infographic media pattern in the teaching of Basic electricity courses increase learners’ learning excitement, arouse and withhold their attention and accrue more enthusiasm to learn. Moreover the findings affirmed that infographic media were perfect 21st century learning drive that stag academic activities; thus when infographic are optimally utilized in the teaching of Science and technical subjects can be an effective plot to deepen learners understanding of the learning messages via a nomadic technology and contents, (Basco, 2020, Naparin & Sa’ad, 2017).

CONCLUSION AND RECOMMENDATIONS

In line with findings of the study, its deduced that post-test outcome of the achievement test outweigh the pre-test result indicating that infographic media pattern is very influential in scaling up the academic

performance of the learners in technical subjects, to expatiate further infographic media enhances some relevant skills of learning, literacy and career of the learners these includes collaboration and team work, critical thinking skill and the ability to use dual coding media to learn technical subjects. Besides that, in the area of affective aspect of the learners it can be cogitated that, infographic improve learners' motivation, self confidence and reduces learning anxiety.

In view of the above, it's suggested that teachers in technology and science education may adopt infographic media pattern and mobile training space as a teaching resources and medium to teach their subjects.

ACKNOWLEDGEMENTS

On behalf of the authors, I wish to express our gratitude to the Federal government of Nigeria, the tertiary education trust fund (Tetfund) for sponsoring this research work, we are also indebted to Isa Kaita College of education Dutsinma, the Tetfund office of the college and the directorate of academic research and planning for facilitating all the issues related to this research work from the beginning up to the end, may Allah reward you all.

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