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Assessing Psychological Appeals in Digital Media Animation for Education of School-Age Children in Selected States of North Central Nigeria

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Abstract

The current study aimed to assess the psychological appeals (EPA) in digital media animation (LED) for education of school-age children in select states of North Central Nigeria. Hinged on the medium theory, the objective of the study was to determine the types of EPA for learning embedded in LED for school-age children in the FCT and Kwara state (the select North-Central states) chosen as the study area. Furthermore, the study also enquired into the level of exposure of school-age children to the LED, the platforms through which content is delivered, the effectiveness of the content, and the challenges encountered by children in responding to the appeals. Through the use of survey, and a carefully determined process of sampling, the FCT-Abuja and Kwara state were selected as the focal states which comprised the study area. Two population segments were considered for this study, that is, teachers and parents of school-age children comprising the study population. Utilizing the Taro Yamane and an online sample calculation solution, the researchers arrived at 381 and 400 samples for the primary and secondary population segments, respectively. The personnel-administered questionnaire was utilized as an instrument for data collection. The findings derived from survey revealed that exaggeration and posturing, humor appeals, persuasive appeals, and problem appeals were some of the EPA employed for animation content to teach youngsters. Among the platforms, the survey identified as being used in the school under investigation for content distribution were projectors, whiteboards, and mobile devices/Among the platforms, the survey identified that projectors, whiteboards, and mobile devices were used for content distribution in the school under investigation. Moreover, the study concluded that some appeals were ingrained in the LED utilized in the study area by the school and that their acceptance rate for instruction was fairly high. Furthermore, the study also explored that the materials were beneficial since they helped children develop problem-solving abilities and provided

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clear explanations of concepts. The results also indicated that the adoption of LED for learning in the study area was reasonable. Additionally, the report suggested that educational institutions prioritize to produce and utilize digital animation materials in order to educate school-age children.

***Keywords*:** animation, appeals, cartoon, education, exaggeration

Introduction

Mankind's ability to communicate has been greatly enhanced, due to the introduction of computers and other digital media. This ability is also evident in teacher-student communication in the classroom. It appears that the classroom of the 21st century has undergone a number of stages of evolution and development before arriving at the current highly advanced stage. The breadth and capacity of the "classroom" has been expanded due to innovations in information and communication technology and new media opportunities. The ease of acquisition is one of the many benefits of the Internet's transformation into a superhighway of knowledge due to the use of computers.

Computer-mediated communication (CMC) is becoming more and more common in the classroom presently (Shreesha & Tyagi, 2016). According to Newton and Scalia (2023), all types of communication involving the use of computers are referred to as CMC. CMC pertains to using a computer in order to establish a connection and facilitate communication between two or more people. This suggests that a computer acts as a mediating agent to facilitate or improve these kinds of individual or group (depending on the situation) communication attempts. When these people use computers to communicate, communication occurs; resultantly, the computer system mediates the situation.

Digital learning technologies and related tools fill in the gaps left by traditional classroom training, which include the lack of an instant learning environment, quick assessments, and strong engagement (Haleem et al., 2022). Traditional teaching and learning approaches cannot match the enabling environment and efficiencies provided by these technologies. Currently, people are using computers, cellphones, and related wireless technology devices in conjunction with the Internet more and more. Moreover, education institutions (EIs) are increasingly adopting and accepting these gadgets as well. According to Haleem et al. (2022), the younger generation finds learning more enticing due to the versatility and

non-intrusive nature of new technological instruments. This opens up the possibility of streamlined and flexible processes in addition to personalized learning.

One component of these technologies employed in the present day is animation, which is not merely used in the traditional classroom environment, however, also on various platforms to make learning easier and better. It is crucial to both e-learning and the traditional classroom setting (Movchan, 2024; Neale, 2021). The term "e-learning animation" refers to the technique of arranging drawings and pictures in a certain order to give them the impression of movement. It is widely used in modern times to teach any subject in an EI and has many benefits (Joshi, 2021). E-learning animation offers various advantages, one of which is that it fosters student engagement by generating an interactive and impactful learning environment.

Four types of animations stand out as educational animations. These include stop motion, whiteboard, storytelling, and explanatory (Ezeibekwe, 2023). Using animation techniques, children are the primary audience for simple, frequently unrealistic drawings that show hilarious situations (Rankin, 2024). These drawings may also be seen in short films or on television. It is said that cartoon animation plays a crucial role in education, both within and outside of the classroom (Neale, 2021). This is due to the fact that parents expose their children to comparable content on television in their homes for educational and recreational purposes. Children are frequently exposed to such stuff in schools to make a lasting impact. While there are many different kinds of animations, the current study specifically focused on those used for teaching purposes. Furthermore, the study primary focused on those animations that are utilized in teaching and learning. This is because they have the potential to be appealing to children and influence their behavior.

Appeal is a fundamental animation principle that refines a design's character (Tetali n.d.). In advertising, appeals are frequently used to persuade a potential client or buyer (Orr & Shinn, 2022). However, the process begins with getting the attention of that particular person. Similarly, appeals are employed in animations to draw in and hold the interest of the intended viewers (also known as the content consumer). Similar to advertisements, several appeals are made for animated entertainment to educate young viewers. These could take the form of humor or an aesthetic

appeal (Mondal, 2023; Siwach & Chauhan, 2020). Additionally, emotional appeal plays on the feelings of the intended audience. Orr and Shinn (2022) claimed that fear, reason, and music are additional significant attractions. These pleas are frequently found in animated content, such as cartoons for a range of age groups.

Psychological appeals (EPA) refer to the appeals embedded in any form of content targeted at evoking certain reactions from the individuals exposed to them. These appeals are triggers created to highlight specific aspects of an object that may be attractive or interesting (Kidenda, 2018) to a member of the audience. In reality, an appealing content triggers an individual to give out a reaction that depicts interest. Put in another way, an individual interested in a particular content would react in a way that is suggestive to the creators' intentions.

Consuming cartoon content helps kids focus and retain information in a better way. Furthermore, it also improves language proficiency, understanding, moral education, artistic foundation, cognitive function, vocabulary, and many other areas (Pius, 2022). Animation provides significant benefits for children's development across various competence aspects, as the cerebral cortex is believed to thicken with increased use. Additionally, exposure to images and audio-visuals fosters a child's imagination and provides nourishment (Simple Show, 2018). Cartoons and other types of animated content may improve a child's ability to think critically and analytically as well as to solve problems and be creative. In this study, the terms cartoons and animations have been used interchangeably. Resultantly, one term may be used to signify the other, indicating that they have the same meaning when utilized in this study.

Students are the main focus of education, referred to as school-age children in this study. Therefore, in order to support teachers' instructions and school-age children's learning, it is the responsibility of educators and administrators to implement the required technology tools and learning assistant tools/materials. These encounters are frequently reciprocal and there needs to be a point at which the interests of teachers and students collide. Some cartoons are developed specifically to educate the minds of children and young people, just as some are made to amuse and instruct children and young people. They are frequently developed for additional instructional purposes. For this kind of learning in an academic setting, cartoons and other motion picture animations are helpful. This suggests that

when it comes to learning, children and other young people of school-age relate well to animations (Attard & Cremona, 2019; Vargo, 2017).

Children are the most impressionable of all the student demographics and ages (Gwon & Jeong, 2018). Stated differently, youthful minds are susceptible to the impact of others due to their immaturity. In general, instructional aides have a significant impact on students' learning experiences (Sudhakar, 2017). However, the effects seem to be multifaceted when the most advanced animations are used in the classroom. Since they have come to understand the value and influence of these resources, educators around the globe have fully integrated them into the teaching of all learning levels, from elementary to basic to advanced. Every level and category have its own special resources and teaching tools that are appropriate for particular teaching and learning scenarios.

According to data made public by Family Health International, in order to secure the future of millions of children in Nigeria, a great deal of effort has to be done in the field of education. One approach is to deliver high-quality instruction by utilizing the appropriate resources including technologies and techniques, such as animation. Resultantly, this study examined animation appeals and their advantages for Nigerian school-age children.

Statement of the Problem

Education and learning are two sides of the same coin. While education cannot be obtained without learning, learning is the means by which education is accomplished. Although, these two statements seem identical, they actually mean the same thing. The remarks are merely intended to highlight how the two ideas relate to each another. It has been demonstrated that the use of educational resources and aids produces superior results for the development of brain (Han & Toh, 2019; Liu & Elms, 2019). Technology provides students the opportunity to learn more quickly, easily access knowledge, and engage in different activities that apply what they have learned (American University School of Education, 2020). This emphasizes how vital technology is for the overall educational environment, including instruction.

It is crucial to emphasize that the use of technology in education has been a topic of discussion for more than 20 years because of the need to merge time and space, establish a conducive learning environment, and

grant unrestricted access to education in our global society. Some studies (Haleem et al., 2022) concentrated on the roles that digital technology plays in education. Whereas, others (Memon et al., 2022) examined the effects of technology on students' academic performances, functional performances, and satisfaction. Still, others only examined the effects of such technologies on students' academic performances (Al-Hariri & Al-Hattami, 2017; Harris et al., 2016).

Additionally, studies were conducted on the use of animation to support children and adolescents' learning (Masitah et al., 2020). Furthermore, studies have also looked at how these resources are used to impact kids' behavior outside of their classroom and advance knowledge (Alidosti et al., 2022). Unfortunately, a few studies have specifically examined the EPA that animation has on school-age children in Nigeria. As a result, this is the crucial gap in literature that the current study aimed to fill. In light of the aforementioned views, this study concentrated on the EPA of animation for school-age children in select states of North Central Nigeria.

Research Objectives

The two objectives of this study are mentioned as follows:

1. To identify the types of EPA for learning in digital media animation (LED) for school-age children in select states of North Central Nigeria
2. To determine the effectiveness of the EPA for learning in LED for school-age children in the select states of North Central Nigeria

Research Hypothesis

EPA in LED significantly enhance learning outcomes (LOC) among school-age children in select states of North-central Nigeria.

Literature Review

Numerous academics and writers have produced voluminous works on the subject of child education and the use of cartoons and animations to that end. A wide range of texts would be taken into consideration as part of the review of related material for the current study. This is due to the design of the study, which included factors, such as school-age children, education, animation, and appeals. Gonzalez (2016) asserted that education is viewed as a critical component that influences societal and individual advancement. Education is viewed as an important factor that promotes culture, values,

and all that is related to humans in addition to imparting information and learning. For this reason, nations prioritize education and view it as a crucial duty that must be realized.

As is normal in any civilized society, children's education is viewed as the cornerstone around which other things grow. According to Lane (2022), education is one of the most important things that kids could have. Moreover, education helps kids become responsible individuals and doors of opportunities frequently open for them. Children's education is an investment made by their parents and the country for their future (Currie & Goodman, 2020; World Bank Live, 2022). It has also been observed that any country with a strong desire to advance education is only making the proper investments. Education for children is frequently prioritized, regardless of the difficult circumstances that any country may be facing (Ajayi, 2018).

Consequently, the acquisition of formal education through the school system refers to one of the several methods through which education can be obtained (Abulencia, 2023; Long-Crowell & Levitas, 2021). Teachers interacting with children at schools aim to ensure that they are imparted with appropriate knowledge. Moreover, teachers need a variety of materials to impart knowledge to students that they need to become responsible individuals. Using resources and tools to provide instruction is one of those materials. Animation content is now regarded as one of these teaching aids that teachers use both inside and outside of the classroom. It can be used in an in-person classroom or on the Internet.

Animation is viewed as a significant component of learning for children. Animated content can be used in the classroom to help students visualize complex concepts and processes (Sibley, 2024). Visualization is an important notion since animated materials make difficult or complex ideas and processes easier for students to understand in the classroom, especially school-age children with impressionable minds. Similarly, the depiction and reduction of difficult concepts make learning more engaging (Mondal, 2023). This has enormous implications to educate the next generation of leaders, that is, today's kids who would grow up to be adults. For children, their teachers, tutors, or instructors, learning with technology and contemporary tools and resources is a unique experience.

Multiple platforms are used for animation in educational settings. The most important of them is YouTube, since it has a number of channels which are used for broadcasting content in diverse formats (Phuc, 2022). Furthermore, another method to project the animated content into the classroom is using whiteboards. It has been characterized as a successful method of instruction (Wadhwa, 2024). Researchers led by the psychologist Richard Wiseman found that people who watch whiteboard animation, in which images are created digitally using a virtual whiteboard, may recall 15% more information than people who watch talking head footage (Kanariov, 2025). Basic projectors are another option. Apart from these platforms, there are other online tools and platforms that facilitate the production and dissemination of animated content in educational settings (Cox, 2023; Kulkarni, 2023). These include iKitMovie, Synfig, Pencil 2D, Opentoonz, Harmony, Clip Studio, VideoScribe, Renderforest, Animaker, PowToon, Moovly, and Vyong (GoAnimate).

Children's mental and psychological development may benefit particularly from being exposed to animated content in their classrooms. Animated content broadcasted on television has multiple benefits for children. This is because it helps raising their cognitive level, encourages them to use all of their senses, and assists them become better problem solvers. Furthermore, it brings out their innate artistic abilities and promotes critical and analytical thinking (Krishnaja, 2022). Exposing a child to animated content leaves several positive effects on their academic development.

Children are taught animated content in their classrooms to help them master a variety of skills and talents. Furthermore, the use of animation in the educational processes stimulates children’s thinking and lightens their workload (Thomas & Israel, 2014). Use of animated materials in educational institutions has been very successful. Studies have indicated that they close significant gaps in knowledge by providing instructional resources that allows children's knowledge and comprehension to effectively improve (Brophy, 2020). This suggests that animated educational materials can effectively foster children's knowledge and comprehension growth as they progress through the educational process.

On the other hand, a study discovered a number of difficulties linked to exposing children to animated content, one of which is a decline in task persistence (Kotaman, 2017). Furthermore, Krishnaja (2022) pointed out

that there is a plethora of detrimental effects from watching animated content including obscenity and overstimulation. The use of animated content in education presents a number of difficulties including the potential to divert students from their studies, higher purchase costs, bandwidth requirements, and a potential lack of beginner-friendliness (Bui, 2021). It is probable that unnecessary elements, which are frequently included in animations, could divert pupils' attention from important lessons. Another issue is that it could be expensive since the kind of technological equipment needed to put up custom educational movies makes them quite expensive to produce. The fact that most animations are large files which may take a while to load is another drawback. This suggests that students need a fast/reliable internet connection to access files, as a slow internet connection can be more distracting than a loading screen.

Theoretical Framework related to Medium Theory

The central focus of medium theory is that both messages and mediums play a critical role in the communication process. The channels of communication are also as important as the message; hence, the term "medium". Developed by Marshall McLuhan and Harold Innis in the 1960s, medium theory is particular about the medium or approaches that can be used to convey meanings to the target audience. It contends that the medium is simply the message, which implies that the medium used to convey content plays a significant role in the way such content is perceived by the recipient or audience (Gross, 2011). This proves to be the case with the Internet and associated technologies, such as social media in modern times, especially how news reach people through these platforms.

Since medium theory is concerned with the effects of a medium, it is also applicable to education. It has been noted and emphasized that "medium theory is concerned with the effects that a medium, whether a pen, article of clothing or computer circuit, have on us as individuals and communities" (Renolds, 2017, p. 21). Therefore, the use of learning materials or tools in school curriculum may be explained with the aid of medium theory. In particular, the use of technologies in the classroom including animation and related tools rest on this theoretical foundation. Reading has never been easy and technology being the medium is the reason for the simplified process.

According to Renolds (2017), computers, images, videos, texts, and electronic communication were not introduced with the advent of the Internet since all of these previously existed. However, among the more significant effects of the Internet were "social media, "online education", and "digital economy". Social interactions, business communication, and the way humans learn have all changed. This has all been possible due to the Internet as the technology has brought about facilitation, communication, and transactions across the borders in manners that were hitherto impossible. The great scholar McLuhan has referred to the Internet as the 'global village'. The Internet happens to be a re-invention of the global village conceived by McLuhan into the virtual world of the digital age.

The medium theory is relevant to the current study since it explained the importance of the mediums in the communication process. Furthermore, this study discussed the use of animations and EPA generated as these topics relate to the education of school-age children in Nigeria. In this case, the animations and the platforms used to teach these children included the mediums and channels, while the content was message. The medium theory provides that mediums of communication play an important role due to the lasting impact they may have on the recipient.

Methodology

The current research was quantitative in nature and employed a survey-based method to collect data for calculation and analysis. Parents and teachers of school-age children from the North Central geopolitical zone of Nigeria constituted the population using quantitative, survey-based methodology. North Central region comprises 6 states plus the Federal Capital Territory. This region was chosen for the current study's purposeful selection of particular geopolitical zones due to its growth in terms of education. Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau are among the North Central states.

The FCT-Abuja and Kwara were chosen randomly from the two states within the geopolitical zones to conduct the current study. According to the National Bureau of Statistics, the FCT (3,067,500) and Kwara (3,551,000) are the estimated population statistics of these states. This suggests that the population under investigation and the primary focus of the study was 6,618,500. Additional population data indicates that there are 24,116

primary schools in the chosen states. Furthermore, Taro Yamane's formula was applied to determine the secondary population (made up of parents of school-age children while the primary population is made up of teachers) sample:

$n \approx 400$

The final sample that completed the survey was selected using the multistage sampling procedure. Resultantly, the North Central zone was chosen in the first step using purposive sampling of the states from Nigeria's six geopolitical zones. Secondly, the FCT and Kwara in the North Central were chosen by the researcher after employing a straightforward random sampling technique to identify two states in the geopolitical zone.

Kwara Central Senatorial Zone and Ilorin South LGA in Ilorin Municipality were selected to conduct the study. Abuja Municipality, which includes areas, such as Nyanya, Maitama, Garki, and Apo, was chosen as the primary focus due to its central location. The FCT has only one senatorial zone. Two schools from each of the LGAs in the two states comprising the study region were selected using the stratified random sampling technique in the fourth stage of the sampling process. As a result, four schools were part of the survey study frame. These schools were selected due to their central location and the number of students and teachers they had so as to ensure a fair representation of the study population. In Ilorin, school 1 was a mixture of primary and secondary schools and comprised a total population of 1205 students and 306 staff members. Of this population, 290 were teaching staff (50 headteachers, 10 supervisors and 3 heads of school) distributed in 3 arms of the school located across South Ilorin. School 2 was also a primary/secondary school and had a total population of 595 students and 160 staff members made up of 147 teaching staff (20 head teachers, 6 supervisors and 2 heads of school). In Abuja, school 1 was a primary and junior secondary school comprising 256 students and 102 staff members of which 85 were teaching staff (15 head teachers, 5 supervisors, and 2 heads). While school 2 was also a primary/secondary school comprising 103 students and 30 staff members including 19 teaching staff (7 head teachers, 3 supervisors, and 2 heads of school). Data from survey was analyzed using descriptive statistical tools, frequency distribution, and percentages. Scientific tables were also used in the analysis and are presented below for the ease of comprehension.

Model Specification

The model can be represented as:

$LOC = \beta_0 + \beta_1 \text{LED}_1 + \beta_2 \text{EPA}_2 + \epsilon$

where:

LOC= Learning outcomes (dependent variable)

$\beta_0 = \ln\ tercept$ (Constant term)

β1=Coefficient representing the effect of level of exposure to digital media animation

β2 = Coefficient representing the effect of psychological appeals on learning outcomes

LED = Level of exposure to digital media animation (independent variable)

EPA =Effectiveness of psychological appeals (independent variable)

€ = Error term (captures unobserved factors affecting learning outcomes)

Results

The Primary population for this study comprised school teachers. A total of 368 questionnaires were returned (96% response rate) with complete data by the respondents. Similarly, the field survey result of the instruments distributed to the secondary population (parents of school-age children) showed 90% response rate with 360 returned copies of questionnaires declared valid. /A greater number of male participants participated in the survey due to the fact that men were better qualified to become teachers than women in the study area. While 39% were in the FCT-Abuja, 61% were the residents of Kwara state. Relatedly, as seen in the secondary population segment; with 54% more women took the survey, while 66% possess BSc/HND, a proof that they are educated enough to take the survey from an informed perspective. Data from the survey is presented in a tabular form as follows:

Table 1

Descriptive Statistics

	M	*SD*	*N*
LED	4.5565	.46579	368
EPA	4.4821	.49554	368

	M	*SD*	*N*
LOC	4.5402	.44380	368

Note. level of exposure to digital media animation (LED), effectiveness of psychological appeals (EPA) and learning outcomes (LOC)

The descriptive statistics in Table 1 provide an overview of three key variables. These include level of exposure to LED, EPA, and LOC in the context of school-age children's education in select states of North Central Nigeria. The mean scores for LED (4.56), EPA (4.48), and LOC (4.54) were all above 4 on a 5-point scale, indicating high levels of exposure to LED, EPA, and positive LOC. The SD values for all variables were relatively low (ranging from 0.44 to 0.50), suggesting that responses were closely clustered around the mean. This indicated a general consensus among the 368 respondents regarding the positive role of LED and EPA in enhancing LOC for school-age children.

Table 2

Correlations

		LED	EPA	LOC
LED	Pearson Correlation	1	.785**	.646**
	Sig. (2-tailed)		.000	.000
	N	368	368	368
EPA	Pearson Correlation	.785**	1	.766**
	Sig. (2-tailed)	.000		.000
	N	368	368	368
LOC	Pearson Correlation	.646**	.766**	1
	Sig. (2-tailed)	.000	.000	
	N	368	368	368

The correlation results in Table 2 indicate significant positive relationships between the variables examined in the study. The level of exposure to LED was strongly correlated with the EPA, showing a Pearson correlation coefficient of .785, which was significant at 0.01 level (p = .000). Similarly, LED was positively correlated with LOC with a Pearson correlation of .646 (p = .000). Furthermore, the correlation between EPA and LOC was also strong, with a coefficient of .766 (p = .000). These findings suggest that higher exposure to LED and EPA was associated with improved LOC for school-age children.

Table 3
Model Summary

R	R^2	Adjusted R^2	Std. Error	Durbin-Watson
.769[a]	.592	.589	.28437	2.186

Note. Predictors: (Constant), EPA, LED. Dependent Variable: LOC

The model summary in Table 3 indicates that the predictors, level of exposure to LED, and EPA explained 59.2% of the variance in LOC, as shown by the *R* Square value of .592. After adjusting for the number of predictors, the adjusted *R* Square value slightly decreased to .589, demonstrating a strong fit of the model. The standard error of the estimate was .28437, suggesting a moderate level of variability in predicting LOC. The Durbin-Watson statistic of 2.186 suggested that there was no significant autocorrelation in the residuals of the model.

Table 4
ANOVA

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Regression	42.768	2	21.384		
Residual	29.517	365	.081	264.426	.000
Total	72.285	367			

Note. Predictors: (Constant), EPA, LED. Dependent Variable: LOC

The ANOVA results in Table 4 demonstrate that the regression model was statistically significant. The regression sum of squares was 42.768, with 2 degrees of freedom, and a mean square of 21.384. The residual sum of squares was 29.517, with 365 degrees of freedom, leading to a total sum of squares of 72.285. The *F*-statistic of 264.426 was highly significant (p = .000), indicating that the predictors, level of exposure to LED, and EPA significantly contributed to explaining the variation in LOC for school-age children.

Table 5
Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
	B	Std. Error	Beta		
(Constant)	1.327	.150		8.869	.000

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
	B	Std. Error	Beta		
LED	.112	.051	.117	2.172	.031
EPA	.603	.048	.674	12.487	.000

The coefficients table provided insights into the contribution of each predictor variable to the LOC. The constant (intercept) had an unstandardized coefficient of 1.327 with a *t*-value of 8.869 (p = .000), indicating it was statistically significant. The level of exposure to LED had an unstandardized coefficient of 0.112 and a standardized Beta of 0.117, which was also significant (t = 2.172, p = .031). This suggested that LED had a modest positive impact on LOC. The EPA had a significantly larger effect, with an unstandardized coefficient of 0.603 and a standardized Beta of 0.674, which was highly significant (t = 12.487, p < 0.001). This indicated that EPA had a strong positive influence on LOC for school-age children.

Table 6

Psychological Appeals Seen in Animation

Option	Frequency	Percentages [%]
Exaggeration and posing	40	11
Humor appeals	48	13
Persuasive appeals	70	19
Problem-solving appeals	100	27
All of the above	110	30
Total	368	100

Table 6 suggests that responders were aware of the particular appeals to which the youngsters were exposed. Appeals, such as exaggeration and posing, humor, persuasiveness, and problem-solving were seen in the animation with which the teachers teach school-age children in the zone. This is based on the position of 30% of the respondents that went for all of the above psychological appeals.

Table 7

Likelihood of a Relationship between Appeals and Willingness to Learn

Option	Frequency	Percentages [%]
Definitely	29	8

Option	Frequency	Percentages [%]
Very probably	55	15
Probably	196	53
Probably not	88	24
Total	368	100

Table 7 implies that respondents were of the opinion that there probably exists a relationship between appeals embedded in LED content and students' willingness to learn in early childhood education. The foregoing is based on the notion of 53% respondents who stated that it is probable that appeals are embedded in the animation to which children are exposed.

Table 8

Platforms used for the Delivery of the Materials to the Learners

Option	Frequency	Percentages [%]
Whiteboards	136	37
Projectors/Big screens	190	51
School-provided mobile devices	14	4
Not sure	28	8
Total	368	100

Table 3 shows that the platforms used to provide animated content to students in the select schools include whiteboards, projectors/big screens, and gadgets and all were provided by the school. Approximately, 51% of the respondents believed that projectors/big screens were some of the points of delivery of the animated materials used to teach school children within the region.

Table 9

Connection of the Tools to the Internet

Option	Frequency	Percentages [%]
Definitely	240	65
Hardly connect	51	14
Cannot tell	49	13
Not sure	28	8
Total	368	100

Table 9 above implies that respondents usually ensured a connection of specific tools or platforms to the Internet. As seen in Table, 65% of the

respondents said that they had the tools connected to the Internet. According to 65% of the respondents, they connected tools to the Internet.

Table 10
Level of Exposure to the Content

Option	Frequency	Percentages [%]
Large extent	46	13
Reasonable	264	72
Minimal	30	8
Not at all	28	7
Total	368	100

The majority of respondents (72%) believed that school-age children were reasonably exposed to digital media content in their learning institutes, which were the schools in the selected states of Nigeria. The implication of the foregoing is that children are, indeed, exposed to animation contents in their classrooms.

Table 11
Type of Effects of the Content and Psychological Appeals on Children

Option	Frequency	Percentages [%]
Positive effect	159	44
Negative effect	21	6
Both	173	48
Not sure	7	2
Total	360	100

Table 11 reflects the opinion of parents (secondary population segment). It implies that the effect of the content and psychological appeals on school-age children could be both positive and negative as 48% favored the notion in this regard. This also means that though the appeals embedded in the content may have positive effect, they also can affect children in negative dimensions.

Table 12
Positive Effects

Option	Frequency	Percentages [%]
Improve problem-solving skills	148	41
Ability to deconstruct difficult task	90	25

Positively modeled behavioral pattern	22	6
All of the above	100	28
Total	360	100

Table 12 illustrates the advantages of digital animation content as well as the psychological appeals incorporated within it. Among the positive effects included the improvement to the children's problem-solving skills, ability to deconstruct difficult tasks, and positively-modeled behavioral patterns. Therefore, the children are positively impacted through exposure to animated contents in schools.

Table 13

Negative Effects

Option	Frequency	Percentages [%]
Violent behaviour	22	6
Mimicking the character	238	66
All of the above	58	16
None of the above	42	12
Total	360	100

Table 13 implies that there were negative effects associated with digital animation content and the embedded psychological appeals. Accordingly, data in the above table revealed that violent behaviour and mimicking the character were some of the negative consequences of their exposure to animated content in schools.

Table 14

Agreement with the Notion on the Effectiveness of Ensuring Better Learning Outcomes and Academic Performance

Option	Frequency	Percentages [%]
Definitely	216	60
Probably	112	31
Probably not	22	6
Definitely not	10	3
Total	360	100

Table 14 suggests that those surveyed agreed that using animation to teach school-age children may result in better LOC and increased academic performances. According to the table, 60% of the parents were affirmative

that better LOC and academic performances may be inked to children's exposure to animated content.

Discussion

The findings showed that particular psychological appeals, such as those involving exaggeration and posing, humor, persuasion, and problem-solving skills, were evident in the educational animation that school-age children watch in a few states of Nigeria. This confirms the results of this study that participants knew enough about the psychological benefits of digital animation for learning for school-age children in North Central Nigeria. This closely resembles the findings of a study conducted by Buttussi and Chittaro (2019) on the application of humor and fear appeal in animated pedagogical agents for aviation safety instruction. It was specifically mentioned that the adoption and use of humor and fear appeal in educational institutions may have a favorable effect.

In respect of the effectiveness of the psychological appeals for learning in LED for school-age children in the select states, data from the findings show that content and psychological appeals affect learning just as the positive may be positive and negative. Furthermore, data also shows that improved problem-solving skills, ability to deconstruct difficult tasks, and positively-modeled behaviour patterns are some of the positive effects. The study also determined that the negative effects associated with digital animation and psychological appeals embedded in the content include violent behaviour and the act of mimicking the animated characters by the school-age children. The study also revealed that the use of animation to teach school-age children was effective as it leads towards better LOC and improved academic performance.

Additional study findings indicated that in the chosen states of North Central Nigeria, school-age students were exposed to these animated materials via whiteboards, projectors/big screens, and school-issued mobile devices. This supports the finding that the respondents remembered using certain platforms or channels to present animated content created especially to teach school-age students in the research area. This provides additional support for a previous study conducted by Boubour (2023), which discovered that interactive whiteboards (IWBs) were a mediated teaching aid in Swedish classrooms. Moreover, the study determined that the

country's preschool system's implementation of IWBs had a significant impact on teachers' instructional strategies.

Findings suggested that while exposure to LED positively influenced LOC, it was the effectiveness of EPA embedded in these animations that played the most critical role in improving children's educational performances. This highlights the importance of not only exposing children to digital media content, however, also ensuring that the psychological appeals, such as emotional engagement, relatable characters, and motivational elements are well-designed and effectively integrated into the content. These appeals seem to resonate with school-age children and drive their cognitive and emotional engagement which, in turn, enhances learning outcomes.

High correlations between LED, EPA, and LOC suggested that LED designed with EPA may serve as a powerful tool in educational settings. The strong R Square value in the model underscores the importance of these factors in influencing LOC, making them key areas of focus for educators and content creators aiming to optimize the educational impact of digital media on children.

Conclusion

The current study concluded that there are specific types of psychological appeals embedded in the LED to which school-age children are exposed in the select states in North Central Nigeria. These include exaggeration and posing, humor appeals, persuasive appeals, and problem-solving appeals. As has been established, these appeals are useful to improve the teaching and learning process of school-age children. The emphasis here is on the use of digital animation contents within which certain types of psychological appeals may be embedded. This is towards ensuring quality early childhood education in all parts of the world including Nigeria.

The study demonstrated that both the level of exposure to LED and the EPA significantly contributed to the LOC of school-age children in North Central Nigeria. However, the psychological strategies embedded in the media appeared to have a more substantial effect. This suggested that the elements of design and emotional engagement in educational animations are critical to maximize their educational value. This finding pointed to the need

for more intentional and research-based approaches in the development of digital educational content for children.

Recommendations

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

1. Given the significant impact of EPA on LOC, educational content creators should focus to design engaging and relatable animations that use emotional triggers, motivational elements, and age-appropriate characters to capture and retain children's attention. This may help maximize the educational effectiveness of digital media for school-age children.
2. Since a higher level of exposure to LED was positively associated with LOC, schools and educational institutions in North Central Nigeria should prioritize making digital media animation more accessible. This could involve incorporating digital learning tools into the classroom and providing children with access to educational content outside school hours.
3. Educators should be trained to effectively integrate LED into their teaching practices. Professional development programs may equip teachers with the skills to select and use high-quality digital media content that incorporates EPA to enhance student engagement and LOC.
4. LED producers should collaborate with psychologists to ensure the content is designed with effective psychological strategies. Understanding how children process information and engage emotionally with content may lead to the creation of more effective educational animations that enhance learning.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability Statement

Data supporting the findings of this study will be made available by the corresponding author upon request.

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