

THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

An Interactive Digital Game on Phonics for Nursery Education in Nigeria

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Abstract:

The integration of interactive digital game in instructional system has the potential of revitalizing Phonics instruction and making reading more relevant to the lives of children growing up in the electronic age. Despite the potentials of digital game in enhancing learning at the early childhood educational level, they are not being fully utilised. This study therefore developed a digital game on phonics (DGOP) and evaluated its effectiveness in enhancing pupils learning. The research is design and development of the model type. The package was tested for effectiveness on 30 pupils. Research question one was qualitatively analysed, research questions two and three were analysed using means, standard deviation and percentages. Findings showed that: pupils reacted positively to the use of the package. Percentage reaction of the pupils to the use of DGOP showed 95.24% of 'Yes' and 4.76% of 'No' reaction also, the mean score out of a maximum of 2 for pupils reaction was 1.87. Pupils generally had an overall higher achievement in PRAT when they were exposed to DGOP. The mean score of pupils' achievement in PRAT is 24.20, while the standard deviation was 2.04 and df was 14. Thus, integrating interactive digital games into teaching and learning of phonics for nursery pupils will enhance their skills in reading and introduce them early to basic ICT skills. It was recommended that contextually, relevant interactive digital-based games be developed for all subjects in early childhood education in Nigeria.

Keywords: Development, evaluation, digital game, interactive, nursery education

1. Introduction

Early childhood encompasses the first eight years in the life of an individual. The education given during these years of a child's life plays an important role and helps in proper development of children. Generally, early childhood education or pre-education in the Nigerian context includes the crèche, the nursery and the kindergarten.

National Policy on Education (FRN, 2009) stated that nursery education should lay the foundation for successful pursuit of general interest and attitudes so that each child might develop to his full stature as a responsible citizen. To achieve this, the Federal Government through the Nigeria Education Research and Development Council (NERDC) has taken an initial step in translating the policy statement into a workable Programme of implementation. Early Childhood Programmes serve as facilitating environments for early learning. In addition to the introduction and development of literacy and numeracy skills and a strong emphasis on gross motor skills, interaction and socialization are key components to a successful Early Childhood Programme (Osanyin, 2002).

The world is constantly changing. Education is gradually being transformed due to the changing world. Thus, Nigeria's educational landscape is gradually moving from being traditional to digital and children are being exposed to computers at an earlier age than ever before. As further observed by Butcher (2003); Siraj-Blatchford & Siraj-Blatchford (2003) information and communication technology (ICT) is a major factor in shaping the new global economy and producing rapid changes in the society. It has tremendous impact on both young and adult learners. Onasanya, Ahmed and Oputa (2012) opined that the pedagogical approach in imparting knowledge to learners has become inadequate to learners' needs. Ellis, Heppell, Kirriemuir, Krotoski and McFarlane (2006) stated that over the past few decades there has been an immense shift in the use of technology, computers in particular. Computers and computer games are ever evolving and simultaneously changing the world. Computers have entered even the classrooms of the youngest children. The trend in technology is to catch them young. The earlier the young ones are introduced to the use of computers, the better they are prepared to cope with the technological demands of a fast growing society.

Olatunji (2004) posited that the early development of the potential of technology in a child would positively affect the development of the well being of a nation. Osanyin (2004) in discussing nursery school education in Nigeria stated that the child needs to be given an

all round development which will make him/her become an enquirer, an explorer, an investigator and possibly a technologist. Osanyin stressed that this all round development of the child, at the nursery or pre-primary level of education, would necessarily bring out the technology potentials in the child at an early stage in life. There is increasing emphasis on computer technology and literacy in today's classrooms, which reflects the importance of computer technology and literacy in society. Lankshear and Knobel (2003) found that across all age ranges of school, student computers are seen as increasing student motivation in schoolwork, allowing students to stay on task, and increasing literacy acquisition and practicing literacy skills. They suggested that computer use by children can increase their involvement in and enjoyment of reading and writing, thereby improving the quality of student produced work.

Prensky (2012) maintained that in order for teachers to adapt their instruction to meet the needs of students, they can implement computer or digital-based games as learning tools in the classroom. These games can be used in various subject areas and in a variety of ways. Prensky attributed educator's inability to successfully educate the children to the fact that educators are educating a new generation in old ways, using ineffective tools. As a result, a widening gap has formed between the knowledge and skills students are acquiring in schools, and the knowledge and skills needed to succeed in the increasingly global, technology infused 21st century workplace (Partnership for 21st Century Skills, 2005 b). Abimbade (2006) opined that educational games interest pupils and motivate them while also making positive contribution to their learning by giving practice, fostering social activity, good sportsmanship and creative ideas. Abimbade further maintained that games help pupils to think clearly and logically rather than follow memorised procedurals. Games can extend and enrich the work of fast learners and can give the slow learn learners practice in a different form.

The Nigerian National Policy on education (2009) has prescribed that the main method of teaching at the early childhood education level shall be through play, to retain children's interest. Significantly, this stage according to Osanyin (2002) is typically guided by the principles of child-centeredness, and learning by doing. Long-Breipoh (2004); Gee (2003), pointed to the fact that learning through computer is creative play that supports the foundation of later lateral thinking and a creative approach to scientific and cultural concepts. Children thrive when they are actively engaged in fun and meaningful activities. This is why play occupies a central role in the early learning environment.

The United Nations Children's Fund (UNICEF) (2000), opined that the only way to ensure that every child has the chance to reach their full potential is to invest in their first three years and one of these key investments involves setting the foundation for lifelong reading skills. Reading is the ability to substitute letters and group of letters for spoken sounds and to receive ideas from the written word. It is the process of understanding speech written down and the goal is to gain access to meaning (Ziegler & Goswami, 2005). The challenge is borne out of the fact that in reading, the letters take up different sounds by way of pronunciation. This makes it difficult for many undiscerning pupils to master effective reading early. Ashiet (2011) found that inability to read is one of the major barriers to the attainment of the dream of many Nigerian children to earn a decent living or a university degree. Ashiet identified inadequate teaching methods of teaching them at foundation as one of the reasons for poor literacy attainment amongst public Primary schools in Nigeria.. Phonics is a powerful tool in improving spelling because it emphasizes spelling patterns, which become familiar from reading. No wonder, Jagun referred to letter sounds as the golden keys to reading (Jagun, 2004). McGuinness, (2004) opined that Phonics instruction helps emergent readers to get across the alphabetic principle (that the letters of the alphabet stand for sounds) by teaching the relationship between letters and the sounds they represent.

Surveys of adolescents and young adults with criminal records show that about half have reading difficulties. Similarly, about half of youths with a history of substance abuse have reading problems. It is not an exaggeration to say that early reading failure places a child's life at risk (Whitehurst, 2009). Early childhood education has received more attention every year because of the results of research which continuously report that a child will be a more successful student throughout his school years and in college if he has been positively affected in the primary grades. Thus, the experiences and the learning of a child in early years using appropriate approach/method can support them in their entire life. This means that a solid foundation provided in the early years will enable the children to play constructive roles later in their task of nation building. Since research (Prensky, 2012; Seymour, 2006; Tapscott 2008; Lankshear & Nobel, 2000) has indicated that using computer games in education increases motivation, enhances students' cognitive skills, is a source of fun for learners, improves students' abilities in terms of using mouse and keyboard and it is an effective tool in teamwork. It means that developing and incorporating digital games into the instructional process is inevitable especially at the nursery level.

Therefore, this study developed and evaluated an interactive digital game on phonics using mixed-method approach in analyzing the data collected. Proponents of digital game-based learning contend that it provides learning opportunities that engage students in interactive instruction and helps prepare them to participate in the globalized, technological society of the 21st Century.

2. Statement of Problem

Learning through digital games can be classified as a personalised form of learning and a form of learning with technology that enhances reasoning and problem solving abilities. Children at early childhood level learn better by engaging in activities of interest and enjoyment provided in form of play/game. Most Nigerian pre-schools are not aware of the effective ways of maximising children's learning through play. Drills and memorisation is the commonest feature of the pre-school classes in Nigeria. Previous studies (Ashiet 2011; Lawal, 1994; Okebukola, 2000) has revealed that children's performance in reading is generally poor. This has been traced, among other things, to poor techniques of teaching reading to children who are just beginning to learn to read. One of the problems identified at this stage of beginning reading is that of methodological confusion in the choice of methods and approach to teaching beginning reading in Nigeria. Also, the difficulty experienced by children in reading has a result of L1 and L2 interference as been revealed by various studies (e. g Ashiet, 2011; Ikwuka, 2010).

Research. (Hansen, 2008; Kulik, 2003; Mitchell & Fox 2001) has also shown that more reading benefits occur from incorporating technology into the classroom because technology has the potential of revitalizing reading instruction and making reading more relevant to the lives of children growing up in the Electronic Age. The present research focused on the development and evaluation of an interactive digital game on phonics.

3. Purpose of the Study

This study deals with the development and evaluation of an interactive digital game for teaching phonics in early childhood education. Specifically this study:

- developed a digital game on phonics (DGOP)
- evaluated the DGOP using Kirkpatrick model (levels 1 & 2) by determining:

The reaction of the pupils towards the use of DGOP and

- The effectiveness of the DGOP in enhancing pupils' learning.

4. Research Questions

The following research questions were generated to guide the conduct of this study:

- i. What are the steps involved in the development of the Digital Game on Phonics (DGOP) programme?
- ii. What is the reaction of Pupils to the use of DGOP?
- iii. Is the DGOP effective in enhancing pupils' learning

5. Hypothesis

The following hypothesis was generated from the research questions three

H01: There is no significant difference between the achievement of pupils taught phonics using DGOP and those taught using conventional classroom instruction.

6. Research Design

This is a Design and Development Research of the Model Type. It involved the Development and Evaluation of an interactive Digital Game on Phonics (DGOP). The research design that was adapted for this study is Hays (ISD- ADDIE) model of systematic approach to the development and use of instructional game (2006). The model falls under Product - Oriented models as characterised by Gustafson and Branch (2001). The DGOP was evaluated using levels one and two of Kirkpatrick's Model (2006). Mixed method approach was adapted for the study (qualitative and quantitative approach). The instrument was qualitatively and quantitatively analysed by Pupils, for effectiveness, using Pupils response questionnaire and pupils achievement test.

7. Validation of the Digital Game on Phonics (DGOP)

Five instruments were used in validating the DGOP during its developmental stage. These instruments were all rated on adapted 5 point response Likert scale of: strongly agreed, agreed, strongly disagreed, disagreed and undecided: the subject content validation questionnaire; educational technologists validation questionnaire; computer experts validation questionnaire; early childhood educator validation questionnaire and nursery teachers validation questionnaire. The reliability of the questionnaires was determined using Cronbach Alpha. A reliability co-efficient of .93, .74, .85, .89, and .93 was obtained respectively.

8. Results

Research Question 1. What are the steps involved in the development of DGOP?

The DGOP is a research programme used as phonics instructional game designed for use in early childhood education (nursery section) to address the reading problems faced at this level. The instructional content was created and organized to support programme requirements (the age of the pupils, their class, content, approach). The content was then integrated into a game design that utilized key game characteristics that includes educationally supported learning principles. The merging of the instructional objectives and game design resulted in the DGOP programme.

The production of the DGOP Programme was in phases:

- i. Writing out the instructional content: the instructional content (PICM) was created using the National Curriculum for Early Childhood Education as well as some phonics books as a guide. The instructional content was written out by the researcher and was typed into the computer.
- ii. The instructional content was designed and integrated into a game design under four levels thus: level one: matching of letter sounds with pictures (picture match game); level two: matching of letters sounds with pictures and text (letter sound game); level three: forming words by spying on the letters written on the screen, listening to the sound as being pronounced by the instructor, and clicking on the appropriate letter sound to form words (I spy game) and level four: completing sentences making use of text, numbers as well as pictures to track the answers (Crack the Code/Game of visual tracking)
- iii. Recording of the phonic sounds that was used for the games: the phonic sounds that was used for the Programme was recorded by the researcher using a tape recorder
- iv. Writing of scripts that guided the programming of the DGOP.

v. Programming of the DGOP: the Phonics instructional content was developed into a computer instructional Programme for classroom instruction with the assistance of a computer scientist. The computer expert was instructed on how to present the programme.

- Research Question 2: What is the reaction of Pupils to the use of DGOP?

The pupils' reaction to the package was both qualitatively and quantitatively analysed. The qualitative aspect of the pupils' reaction could be seen in their response and attitude to the programme. The researcher observed during the implementation of the DGOP that the children were eager and excited interacting with the package. The experimental group found the game quite interesting. To show that the package really catered for individual differences, some of the very good ones amongst the pupils had to skip level one and some level two to go to level three and four, while some still went through all the levels. These were the responses gotten from some of the pupils: "it was fun", "it was good", "it was sweet", "I enjoyed it", "Are we going to be doing this every day?, it's interesting", "I like it", "I like the lesson", "I love playing the game", "I love the game and I want us to play it every day".

Table 1 as well as figure 1, showed the quantitative aspect of Pupils reaction to the package

S/N	Statements	Yes	No	Weighted \bar{x} Score
1	The instruction using the Programme is very interesting.	15	0	1.93
2	I really enjoyed the lesson	15	0	1.80
3	The lesson was well understood	10	5	1.80
4	I prefer digital games to teachers presented lesson	15	0	2.00
5	The pictures are colourful	15	0	2.00
6	Do you like the colours of the picture?	14	1	2.00
7	I was able to play the games on my own	15	0	1.93
8	Would you like to play this type of computer game again?	14	1	1.93
9	I can now read simple three letter words	14	1	1.87
10	I can form simple three letter words	14	1	1.87
11	I can blend sounds and consonant in a word	13	2	1.87

Table 1: The result of Pupils response to the use of DGOP

From the coding, '2' is assigned to 'Yes' response to indicate positive reaction while '1' is assigned to 'No' response to indicate a negative reaction. After the pupils had been through the DGOP, the result obtained from their responses to PRQ was analysed as follows: when the weighted mean of any of the item is 1.50 and above, it indicates positive reaction but when the mean is less than 1.40 and below it reflects a negative reaction. The result on Table 1 showed that the minimum or lowest weighted mean score was 1.80 while the highest weighted mean score was 2.00. The result as shown on the table is an indication that pupils reacted positively to the use of the package. Percentage reaction of the pupils to the use of DGOP was further revealed on Figure 1.

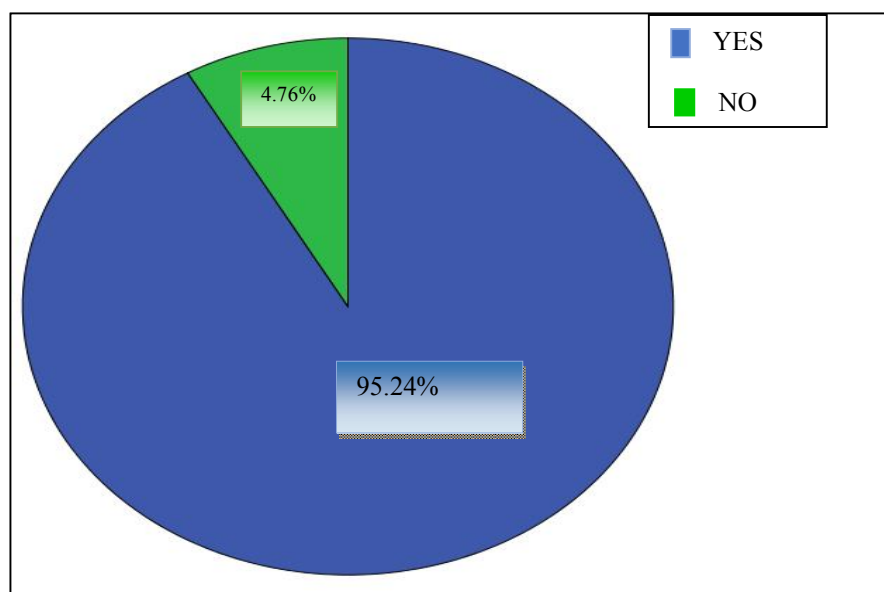


Figure 1: Pie Chart Distribution of Pupil's Reactions to the use of the DGOP

The Pie chart on the reaction of the pupils, showed that the pupils had a positive reaction towards the use of DGOP (95.24% of 'Yes' and 4.76% of 'No' reaction). Thus, the results, as shown on Table 1 as well as Figure 1 are an indication that the pupils had a positive reaction towards learning with the DGOP.

Research question 3: Is the DGOP effective in enhancing pupils' learning?

Group	N	Mean (\bar{x})	SStd.dev.	df
DGOP	15	24.20	2.04	14

Table 2: Pupils' Achievement in PRAT when exposed to DGOP

Table 2, showed clearly that the pupils generally had an overall higher achievement in PRAT when they were exposed to DGOP. The mean score of pupils' achievement in PRAT is 24.20, while the standard deviation was 2.04 and df was 14.

H01: there is no significant difference between the achievement of pupil taught using DGOP and the ones taught using conventional classroom instruction

The t - test analysis of experimental and control groups achievement in PRAT is presented in Table 3. as follow:

Groups	N	\bar{x}	SD	Df	t Crit	t Cal	Sig(2 tailed)
DGOP	15	22.73	1.91	14	1.761	34.354	.000*
Control	15	10.87	3.38				

Table 3: T - test analysis of Pupils' Achievement in PRAT in DGOP and Control Groups

*Significant at $P < .05$

The result of the statistical test was statistically significant. The t - test revealed a statistically significant difference between the DGOP group and the conventional group in terms of performance. The DGOP group had statistically significant higher score (22.73 ± 1.91) or (mean = 22.73, SD = 1.91) at the end of treatment compared to the conventional group (10.87 ± 3.38) or (mean= 10.87, SD = 3.38), $t(14) = 34.354$, $p = .000$ ($p < .05$). Thus, it was observed from the table that a significant mean difference existed between the achievement of the pupils in DGOP and conventional groups respectively. The mean achievement score was higher for pupils taught using the DGOP than those taught using the conventional method. This significant difference necessitated the rejection of the null hypothesis.

9. Summary of Findings

The following are the summary of findings in this study:

- The DGOP package is adjudged by the experts to be very good and capable of delivering its objectives. Despite the cost implication, the package can be developed with reasonable amount of money.
- The frequency counts of Pupils reaction towards the use of DGOP showed that pupils have a positive attitude towards the use of the package.
- The pupils generally had an overall higher achievement in PRAT
- There was a significant difference in the achievement of pupils taught using DGOP and those taught using conventional method.

10. Discussion of the Findings

The development of the DGOP was in accordance with ISD- ADDIE model which provided a step-by-step system of analyzing the pupil's needs, designing and developing of the DGOP and evaluating the programme for effectiveness. This is in agreement with Hays (2006); Gustafson and Branch, (2001) which maintained that instructional design is a systematic process that is employed to develop education and training programmes in a consistent and reliable fashion.

Moreover, the programme was developed using a framework that has to do with issues of learning involved in designing and implementing new technologies. Thus in order to empower and assist the children become competent and relevant in the digital age, DGOP was developed in agreement with Siraj-Blatchford & Siraj-Blatchford (2003) who maintained that children today live in a communication rich environment and the models of communication they encounter in their everyday life include a whole range of electronic and digital methods of communication.

Moreover, learners have different background, experience and learning styles. The programme was developed considering the individual differences by having four levels (picture match, letter sound match, I spy game-fill in the words, game of visual tracking-crack the code and read). Learners could start from any level. The ultimate is for the children to be able to fill in the gaps with the appropriate letter sound and be able to read the phrases or sentences applying the knowledge of letter sounds that they acquire in previous levels. The first and second level of the programme are likened to advance organizer that would prepare the children for greater challenge or task in levels three and four. This is in accordance with Torrente, Moreno-Ger, Martinez-Ortiz and Fernandez-Manjon, (2009).

The principle of multi-Media was equally adopted in developing this programme (DGOP) as opined by Abimbade (2006). Inherent in the digital games were sounds, colourful, pictures, audios, video, texts, instructions as well as animation. All these contributed to making the DGOP fun and interesting to play for the children. This is in support of the multimedia principle which stated that students learn better from words, pictures and sounds than from words alone.

Moreover, the result of the findings on the development of the DGOP shows that children learn better when taught using play-way method. Game, which uses the principle of play, is an approach that was employed in developing the package. This is in agreement with Osanyin (2002); Gee, (2003); Long breipoh (2004), which maintained that play-way method is an instructional approach which involves engaging in activities that bring pleasure or enjoyment to children. Such activities include game playing, acting a play and playing music.

The responses gathered with reference to the instrument used to measure the reaction of pupils to the programme (PRQ) showed that the participants were satisfied with, as well as enjoyed the programme. The response was quite positive. The children were eager and enthusiastic to play the phonics games. Some of the children claimed that they want to continue with the programme because they enjoyed it better than teacher led class. The sounds, colourful pictures and animations enabled the pupils to proceed at their own pace and motivated them to navigate the computer on their own. (Lankshear & Nobel, 2003; Prensky, 2012)

Learning evaluation, which is the process of measuring the knowledge, attitude and skills learned and how effective the programme has accomplished the stated objectives was carried out using PRAT. PRAT was an instrument used to check whether the lesson objectives have been attained or not. There was a significant difference in the achievement of pupils taught using DGOP and those taught using conventional method. The pupils generally had an overall higher achievement in PRAT when they were exposed to DGOP. The outcome of the test was an indication that the DGOP was very effective. The achievement of the experimental group compared with that of the alternative group is an indication that performance could be better off with the use of technology-based approach in teaching and learning Process. This agreed with Hansen (2008); Labbo (2006), who asserted, that when young students interact with technology in the classroom, students develop an increased vocabulary, comprehension, fluency and achievement.

11. Implication of Findings

Based on the findings of this study, the following implications were drawn:

Interactive digital game on phonics can be designed and developed with minimal cost to facilitate instruction as in the developed countries. Computer games that children and adults engage in for pleasure could become a useful and powerful tool in teaching and learning by incorporating well-stated instructional objectives into the games. Teachers can create instructional game that could be programmed into a computer for individualized instruction. Teachers can design and develop digital games package that could assist in the teaching and learning of various subjects. The use of digital games would make the learning of some concepts in English fun and enjoyable for nursery school children. Also, the use of digital game on phonics would motivate pupils towards reading.

12. Conclusions

This study has revealed the effectiveness of digital games in learning at the early childhood educational level. Children at this level enjoy learning and perform better using this approach. The achievement of the experimental group compared with that of the alternative group is an indication that performance could be better off with the use of technology-based approach in teaching and learning Process. Moreover, the finding has shown that computer technology can support phonics/reading skills. Computer programmes with multimedia features tend to be engaging and interactive and could be used by young children to reinforce basic reading/phonics skills instructions. Play is an important and necessary part of children's cognitive development and so the use of this approach would go a long way in sharpening the children's cognitive skills. Educational games are valuable teaching tools in the classroom and can meet pupils' individual differences. Both the slow and the fast learners could benefit maximally from learning through interactive digital games.

13. Recommendations

Based on the conclusions on the effectiveness of interactive digital game in early childhood education, the following recommendations were made:

1. The Federal, States, SUBEBs and the LGEAs should create a professional development opportunities and technical support to help teachers use technology to develop meaningful instructional strategies for pre-school children by making funds available.
2. School administrators should organise workshop for their teachers to enable them utilise digital games approach to teaching
3. Stake holders in early childhood education should assist children in gaining skills necessary to be successful in today's society by providing necessary facilities and funds for utilizing interactive digital games for academic purposes.
4. Interactive digital game should be employed by teachers to support effective learning and teaching of phonics for beginning readers

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