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CONVERTING THE RAYMICK EDUCATIONAL TOY-GAME CONCEPT INTO AN INTERACTIVE DIGITAL MODEL FOR ENHANCING OBJECT RECOGNITION AMONG NURSERY PUPILS IN ZARIA

[1]Shadrack Abayomi, Adeshina, [2]Chike Chinazom Obeagu, [3]Sunday Ogunwole, [4]lucky James, [5]kyonne Jakonda

[1]&[2] Department of Visual and Creative Arts, Federal University Lafia, Nasarawa State
[3] Department of Industrial Design, University of Maiduguri, Borno State, [4]Department of Fine and Applied Arts, College of Education, Akwanga, [5]Department of Industrial Design, Ahmadu Bello University, Zaria

Corresponding Email: raymick192@yahoo.com

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Abstract

This article is premised upon the Raymick toy-game model concept designed and fabricated by Shadrack Abayomi Adeshina as an M.A. Industrial Design project in 2015, aimed at enhancing learning among nursery school pupils in Zaria. The toys were created as physical models using cardboard paper, reinforced with strawboard and mounted on an iron rod stand, affixed to a wooden pedestal. It displayed 26 different photographs of selected objects with their corresponding names and strategically arranged on a cuboid like a giant dice. The toys were used in teaching object recognition to 33 pupils, who were randomly selected from classes 1 to 3 and ages 3 to 5-year-old at the Home Economics Laboratory Nursery School, Faculty of Education, Ahmadu Bello University in Zaria. They were given the Raymick toys to play and interact with for a period of 3 weeks, the essence being to measure the impact of the Raymick toys on their academic performance. Interestingly, the result revealed that 85% of the respondents passed the picture recognition and naming tests. In effect, a new research direction has been initiated that attempts to create a digital game application using the Raymick toygame concept, with a view towards producing a game-based platform for children to complement the traditional classroom process.The research adopts the Digital GameBased Learning (DGBL) instructional model, which incorporates educational contents and learning principles into video games. The significance of digitization of Raymick concept on the pupils is to make the digital game more interesting and flexible. This is in addition to enhancing multi-sensory learning, alongside the provision of instant feedback. This was done with the view that it would help in improving pupils' academic performance in picture recognition.

Keywords: Raymick, Educational Toys & Games, Digital Interactivity and Learning Model

Background

The Raymick toy-game model concept was designed and fabricated by Shadrack Abayomi Adeshina as an M.A. Industrial Design project in 2015, aimed at enhancing learning among nursery school pupils in Zaria. The design concept was aimed at giving local children a feeling of games stemming from the already familiar Raymick model. It was built on the premise that when games are integrated into the learning environment, children tend to assimilate faster and possibly perform better in their academics. Daniels and Pyle (2018) assert that developmentally appropriate practices like playbased learning are valuable for strengthening many areas of development and learning, it can help support young children's learning of social-emotional skills, general cognitive development and self-regulation abilities. With the use of the Raymick toygame model children learnt through repeated drills and practice, being one of the major characteristics of the educational game environment.

The Raymick toys were created as physical models using cardboard paper, reinforced with strawboard and mounted on an iron rod stand, affixed to a wooden pedestal. The toys displayed

26 different photographs of selected objects with their corresponding names and were strategically arranged on a cuboid, akin to a rotating giant dice. The project was designed, developed and simplified to suit the needs of the learners of ages 3-5 years. The Dictionary of Contemporary English (2000) defines a toy as an artifact designed to be played with. While Azi (2014) describes a toy as a plaything purposely designed for the entertainment and sometimes the education of the child. According to Haljakka (2006), a toy is a play object, yet it can also be used for skill building and creativity. A toy is an object for a child to play with, typically a model or miniature replica of something (https://en.wikipedia.org/wiki/Toy).

Toys and games are indispensable in the education of the child. They form an integral part of their day-to-day life. Onder (2012) explains that children play with toys to experience, understand and learn the things they cannot do in real life. Moreover, they construct the building blocks of language and concept development through playing. Children seem to try different social roles by playing different forms of games. For instance, using a pillow and dramatizing with it as their baby, the child is seen talking to it and also curdling and singing for it. This suggests that they learn motherly roles by copying the activities they see their mothers carrying out at home.

THE NOTION OF "PLAY" IN EDUCATION

According to Azi (2011), games are of critical importance in child education and using them effectively can enhance performance. He maintains that increasing the number and variety of toys will make children's learning even much easier. Danniels and Pyle (2018) in supporting the significance of play in education, affirm that since the early 2000s, there has been a shift towards recommending the use of play-based learning in early education curricula across several different countries, including: Canada, Sweden, China etc. Most of the photographic images used in developing the Raymick educational toys were generated from the internet, while in terms of the textual contents the researcher used a simple typographic font style called Century Gothic for the name of each of the images shown on each phase of the toy-game. The learning contents of the educational toys reflect the objects in the children's environment. In effect, this helped the child to easily recognize the objects presented.

Plate 1: Raymick Toy and Game Wireframe Design. *Source: Adeshina (2014)*

Plate 2: The Raymick Educational Toys and Games 3D Model. *Source: Adeshina (2014)*

The findings of this study agree with Azi (2006) and Alemaka (2009) who assert that children learn better when their reading books are illustrated with relevant imagery, as well as showcasing rich imagery with flamboyant colours. The responses of the participants to the newly developed toys and games revealed that indeed children love colours. The test carried out among the 33 Nursery pupils using the newly developed Educational toys and games show that the percentage of participants who were able to identify the pictures and texts of the educational toys and games were higher than those who were unable to identify the pictures and texts of the educational toys and games. The instruments were administered for the period of three (3) weeks. This enabled the researcher to give a quality time to each of the participants.

The researcher relied more on the designed and developed educational toys and games, questionnaire, interviews, and observations. Through questionnaire the data can be quickly analyzed and useful generalization made. One set of questionnaires was designed and administered to the target population under study, with the view to reinforce the researcher's discussion with the respondents. There were four Research Assistants who helped in the following areas:

i. Coordinating of the children during the experiment

ii. Recording the respondents' verbal responses via the questionnaire

iii. Recording still images of the scene to depict the activities among the respondents and the researcher respectively.

iv. Entering of the respondents' verbal responses into the spaces provided on the questionnaires.

Each question required a 'Yes' or 'No' response by the respondents. A correct answer is ticked in the 'right' box created on the questionnaire. On the contrary, an incorrect answer is ticked 'wrong'. All the answers given to the questions were carefully recorded in the spaces provided in the questionnaire. During the interview, chairs and tables were provided to make the procedure formal. Everybody involved in the research procedure were seated in a relaxed way except for the photographer. A Tripod stand was used to support the video camera, while the scenes were videotaped. And each of the respondents were interviewed one after the other for not more than seven minutes. Also, the target population was observed for a period of six weeks to test their reactions to the newly developed educational toy, alongside to ascertain the durability and effectiveness of the new educational toy presented.

This study also reveals that well designed and developed educational toys and games can excite, stimulate, and engage young learners in meaningful play and effective learning, even though couched with fun. Additionally, this study reveals the important role educational toys and games play among young learners when it comes to learning of letters of the Alphabet, identification of objects, identification of small and capital letters, formation of simple words, and so forth. This finding confirms the assertion of Goldsmith (1984), who holds that children have fondness for illustrations, most especially in word learning task.

FINDINGS OF THE EARLIER RAYMICK MODEL

The Raymick educational toy-game is 3ft high and has four segments which contain all the 26 letters of the English alphabets distributed across all the segments, with a corresponding object attached to each of the letters of the alphabets. The children who were 33 in number, played with the toy-game for a period of six weeks. In assessing its educational impact, the following outcomes were observed:

(i) **Acceptability of the Raymick Toy-game** - The children accepted the toy and they were willing to play with it, given its attractive design and embellishment with very colourful and unique look and textural feel, as against their regular toys.

(ii) **Object Recognition Task** - During the period of play with the toy, it took only a few minutes for the children to recognize the 26 images displayed on the Raymick toy-game prototype with about 95% accuracy;

(iii) **Articulation of Objects by Name** - The children also displayed high ability in the articulation of objects by their names and picture. This they did by loudly pronouncing the names when each picture was shown.

Plate 3: During the Raymick Educational Toy-game Pilot Test. *Source: Adeshina (2014)*

CONVERTING THE RAYMICK CONCEPT INTO DIGITAL PLATFORM

This aspect of the research showcases the designs of the Raymick digital interactive game concept. It is aimed to further enhance the development of the children's cognitive skills, by simulating the manually driven Raymick educational toy-game component into a digital game-based learning approach. According to Keesee (2012) digital games are of different types. They include:

(i) Board games (for example, pure strategy and/or rolling dice).
(ii) Card games (playing cards); and8
(iii) Video games (involving human interaction with a user interface to generate visual feedback on a video device.

Advantages of Integrating Technology into Education

The use of technology in the domains of teaching and learning has a great impact on the learners. A number of researches have been carried out across the globe to evaluate the positive impacts of technology in teaching and learning, and to determine the kind of enhanced learning environment that technology gives in the classroom. Studies have shown clearly the benefits that can be gotten by learners, teachers and administrators. Some of which are briefly highlighted as follow:

i.Technology will change the educational landscape forever and in ways that will engender a dramatic increase in the performance of learners (Edison (cited in Saettler, 1990, p 98), Negroponte (1995).

ii.Technology if properly integrated has the potential to enhance the teaching and learning process (Apkan, 2002; Bork, 2003; Dwyer, Ringstaff, and Sandholtz, 1990; Kian-Sam Hong, Abang Ahmad Ridzuan and Ming-Koon Kuek, 2003; Lee and Dziuban, 2002; Thompson, 2003).

iii.Technology-enabled education has the potential to promote the development of students' decision-making and problem-solving skills, data processing skills, and communication capabilities (Whitworth and Berson, 2003).

iv. Integration of technology in education in the classroom environment will provide more conducive and enhanced teaching and learning.

MODELS FOR SOFTWARE DEVELOPMENT

The software development models are the various processes or methodologies that are being selected for the development of the project depending on the project's aims and goals. The models specify the various stages of the process and the order in which they are carried out. There are various Software development models or methodologies. They are as follows (http://tryqa.com/what-are-the-software-development-models/):

(i) Waterfall model
(ii) V model
(iii) Incremental model
(iv) RAD model
(v) Agile model
(vi) Iterative model
(vii) Spiral model
(viii) Prototype model

Software Development Life Cycle (SDLC) is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop,9 maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process.

SOFTWARE DEVELOPMENT LIFE CYCLE

According to tutorials point .com, the following stages are crucial and fundamental in software development. These are:

Stage 1: Planning and Requirement Analysis: It is the most important and fundamental stage in SDLC. It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts in the industry. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas. Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage. The outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

Stage 2: Defining Requirements: Once the requirement analysis is done, the next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts. This is done through an SRS (Software Requirement Specification) document which consists of all the product requirements to be designed and developed during the project life cycle.

Stage 3: Designing the Product Architecture SRS: This is the reference for product architects to come out with the best architecture for the product to be developed. Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented in a DDS - Design Document Specification. This DDS is reviewed by all the important stakeholders and based on various parameters as risk assessment, product robustness, design modularity, budget and time constraints, the best design approach is selected for the product. A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third-party modules (if any). The internal design of all the modules of the proposed architecture should be clearly defined with the minutest of the details in DDS.

Stage 4: Building or Developing the Product: In this stage of SDLC the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle. Developers must follow the coding guidelines defined by their organization and programming tools like compilers, interpreters, debuggers, etc. are used to generate the code. Different high level10 programming languages such as C, C++, Pascal, Java and PHP are used for coding. The programming language is chosen with respect to the type of software being developed.

DIGITAL SIMULATION OF THE RAYMICK GAME MODEL

This paper delves into how Raymick educational toys and game can be simulated using the digital game-based learning (DGBL) instructional model which incorporates educational contents and learning principles into video games. The simulation of the Raymick digital toy-game concept comprises the following processes:

I. Designing interface of the Raymick digital interactive toy-game.
ii. Design of the Raymick digital toy-game storyboard.
iii. Creating the detailed layout.
iv. Creating the interaction components (buttons and navigation components).
v. Creating suitable sound effects (as part of feedback).

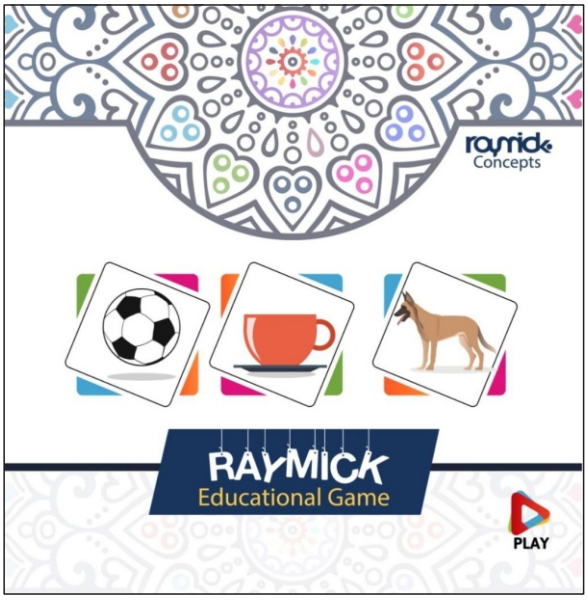

Plate 4: Raymick Digital Game Interface Design.
Source: Adeshina (2019)

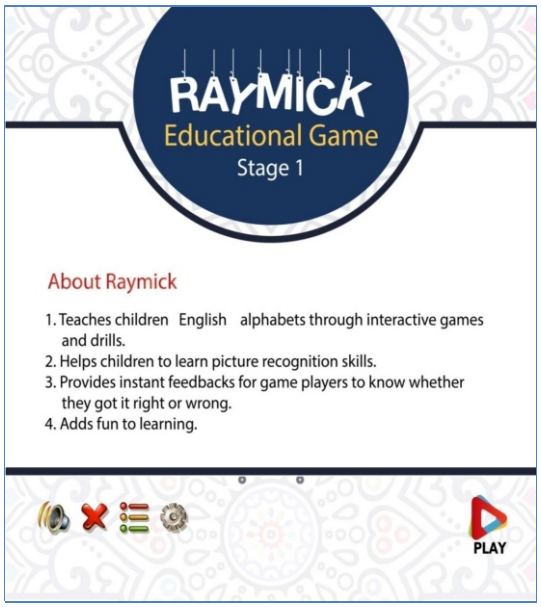

Plate 5: Raymick Digital Game Interface Design
Source: Adeshina (2019)

Plate 6: Raymick Digital Game Interface Design
Source: Adeshina (2019)

SIGNIFICANCE OF DIGITIZATION OF RAYMICK MODEL CONCEPT ON THE LEARNERS

Interactivity is the communication process that takes place between humans and computer software(https://www.techopedia.com/definition/14429/interactivity). The most constant form of interactivity is typically found in games, which need a continuous form of interactivity with the gamer. Database applications and other financial, engineering and trading applications are also typically very interactive.

Dempsey et al. (2002) define a game as an activity involving one or more players, with goals, constraints, payoffs and consequences, which is rule-guided, artificial in some respects and has an element of competition. Similarly, Prensky (2001) describes six structural elements of games: rules, goals, outcomes and feedback, competition or challenge, interaction, and representation or story. deFreitas (2006) defines computerbased learning games as: Applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, outcomes and experiences. Summarily, the Raymick digital game will engage the learner in a meaningful way as he/she uses the game. Some of the benefits13 each child is liable to gain from the Raymick game include the ability to recognize and verbalize the English alphabets. Also, the Raymick game will practically motivate the learners towards learning with their interest sustained.

CONCLUSION

The use of digital game-based learning for early childhood is growing rapidly with technological enhancement, but without the academic research to determine its effectiveness (Peirce, 2013). Game has become so important within formative action that some authors discuss the concept of "ludic epistemology", whose role is that of analyzing the traditional knowledge theory and identifying the way in which it may be given life in education through games (Castell, 2011). Any type of game is the expression of the ludic nature of the human being. From entertainment and recreation, to learning and behaviour change (Connolly et al., 2012), games are necessary and useful. Games meet the fundamental needs of learning by providing us with enjoyment, passionate involvement, structure, motivation, ego gratification, adrenaline, creativity, social interaction and emotion (Prensky, 2001). Educational games are games explicitly designed with an educational purpose, or which have an incidental or secondary educational value, meant to teach people about certain subjects, expand concepts, reinforce development, understand an historical event or culture, or assist learners in acquiring a skill while playing.

Some of the advantages of digital GBL are: the player/learner is at the centre of, and expert in the activity, which enhances his self-esteem; the versatility of digital games: the universe of the game responds to each of the player's actions; everything is possible in a digital game; things are relatively simpler compared to the real world; the games work on a trial-and-error principle, there are no risks; digital games do not force children to learn but provide learning opportunities every second, enhancing learner motivation. Digital game-based learning involves the following four steps: doing (sensing) – being engaged in the activity; reflecting (perceiving) – looking back for discussing impartially; linking (intuition) – linking to ideas and experiences, seeing possibilities; planning (judging) – reviewing and deciding the next steps (Tam and Hui, 2011).

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HOME BACK NEXT PLAY