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SERIOUS GAME AS AN INCENTIVE FOR LEARNING IN NIGERIA THE CASE OF USING MATHEMATICAL MODELLING

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ABSTRACT: *Developments in technology has caused a sky rocket in the number of gamers all over the world, giving rise to a new product in the form of gaming consoles and computers with the ability to play games from low level graphic like Mine craft to high level and graphic intensive games like Fifa 19, Grand theft auto and other titles. Technological developments in the gaming sector have sped up communication and transactions for both game developers and users. Serious games are one of the technologies which is fast growing all over the world. Early arcade video games were developed from 1972 to 1978. During the 1970s, the first generations of home consoles emerged, when consoles, laptops and handheld devices were three major game equipment and still are. During the last decade, database, information system and other technologies applied gaming techniques at different levels. In gaming industries today, Nigeria posts low values when it comes to gaming compared to the rest of the world. This creates a lot of problem as games are seen as a waste of useful time and people who game are seen as useless and unproductive. The use of gaming as an incentive for learning and mathematical modelling as a case study was fully examined, and means of getting information was through the web, journals and other publications as serious games have not been created in Nigeria yet and the sector is almost not existent. The program designed involved the use of unity and visual studio for both the coding and the User interface. The objects designed in this system are expected to be used to capture the program inputs. The application has two users, Administrator, and user (player). The administrator has access to all the backend of the game such as score, time, questions, and the scripts governing their various functions. The Administrator can add as many questions as possible, set the time as he desires to high or low. The User has access to the game, to answer questions within the time limit and view their scores.*

KEYWORDS: Incentive, Learning, Modelling, Prefab, Serious Games, Video Games

INTRODUCTION

Background of the Study

The historical backdrop of computer games goes as far back as the mid-1950s, when scholastic PC researchers started planning straightforward recreations and re-enactments as a component of their examination. Video gaming did not achieve standard prominence until the 1980s, when video arcade recreations and gaming reassures utilizing joysticks, catches, and different controllers, alongside designs on PC screens and home PC amusements were acquainted with the overall population. Since the 1980s, video gaming has turned into a well-

known type of stimulation and a piece of current pop culture in many parts of the world. One of the early recreations was space war, which was created by PC researchers. Early arcade computer games created from 1972 to 1978. Amid the 1970s, the original of home consoles rose, including the prominent amusement Pong and different "clones". The 1970s was additionally the time of centralized server PC recreations. The brilliant period of arcade computer games was from 1978 to 1982. Video arcades with vast, designs finished coin-worked machines were regular at shopping centres and prominent, reasonable home consoles, for example, the Atari 2600 and Intel vision empowered individuals to play diversions on their home TVs. Amid the 1980s, gaming PCs, early internet gaming and handheld LCD recreations developed; this time was influenced by the computer game crash of 1983. From 1976 to 1992, the second era of video supports rose.

The third era of consoles, which were 8-bit units, rose up out of 1983 to 1995. The fourth era of consoles, which were 16-bit models, rose up out of 1987 to 1999. The 1990s saw the resurgence and decay of arcades, the progress to 3D computer games, enhanced handheld recreations, and PC gaming. The fifth era of consoles, which were 32 and 64-bit units, was from 1993 to 2006. Amid this period, cell phone gaming developed. Amid the 2000s, the 6th era of consoles developed (1998– 2013). Amid this period, internet gaming and portable recreations wound up significant parts of gaming society. The seventh era of consoles was from 2005 to 2012. This period was set apart by enormous improvement spending plans for a few amusements, with some having true to life designs; the dispatch of the best offering Wii reassure, in which the client could control the diversion activities with genuine development of the controller; the ascent of easy going PC recreations advertised to non-gamers; and the rise of distributed computing in computer games.

In 2013, the eighth era of consoles rose, including Nintendo's Wii U and Nintendo 3DS, Microsoft's Xbox One, and Sony's PlayStation 4 and PlayStation Vita. PC gaming has been holding a huge piece of the pie in Asia and Europe for quite a long time and keeps on becoming because of computerized appropriation. Since the improvement and across the board buyer utilization of cell phones, portable gaming has been a driving component for amusements, as they can contact individuals once in the past uninterested in gaming, and those unfit to manage the cost of or bolster devoted equipment, for example, computer game consoles. The PC diversions of the 1950s can for the most part be separated into three classes: preparing and instructional projects, look into programs in fields, for example, man-made brainpower, and exhibition programs planned to awe or engage general society. Since these amusements were to a great extent created on novel equipment in a period while porting between frameworks was troublesome and were regularly disassembled or disposed of in the wake of filling their constrained needs, they didn't for the most part impact advance improvements in the industry. For a similar reason, it is difficult to be sure who built up the primary PC diversion or who initially demonstrated a significant number of the recreations or play mechanics presented amid the decade, as there are likely a few diversions from this period that were never exposed and are consequently obscure today.

Objectives of the Study: This study is to:

I. Look at how the acquaintance of gaming with training can encourage scholastic greatness.

II. Straighten out the backward attitude that games are intended for unserious individuals.

III. Present gaming as an instrument or motivation for edutainment.

Statement of the Problem

In spite of the immense effect of computer games on youth culture, there isn't a great deal of research accessible around there, and few of the current investigations face basic examination. This absence of examination implies that we know almost no about the impacts that computer games may have on youngsters' improvement and socialization. While computer games have numerous positive angles, there are various issues that are related with this exceptionally intelligent type of stimulation. Grown-ups who are worried about the measure of time an adolescent is spending on computer games should remember that it is typical for youngsters to toss themselves energetically into interests. To decide if diversion playing is getting to be exorbitant, consider the impact gaming is having on a high schooler's life: would he say he is or she mingling less with companions? Are his or her evaluations declining? Is his or her rest or general wellbeing being influenced? On the off chance that a tyke or adolescent thinks that it's hard to control amusement playing, grown-ups can help them by setting limits on how much time they can play - and by urging them to be engaged with different exercises.

Significance of the Study

The significance of this study on serious games as an incentive for learning is to create awareness on gaming in today's world and how it can be used as a medium to improve students' interest in academics.

Research Questions

This research focuses on serious games as an incentive for learning, the research will try to find out answers to the following questions.

I. What are the difficulties looked by lecturers in colleges?

II. To what extent can serious games improve students study habit?

III. By what means can genuine diversions make learning fun and fascinating?

LITERATURE REVIEW

Serious Games (video games for learning) are the tool of the future for training. Through them, students "do" as they learn; practice is then part of the learning process from start to finish. : 'Serious games are digital games, simulations, virtual environments and mixed reality/ media that provide opportunities to engage in activities through responsive

narrative/story, gameplay or encounters to inform, influence, for well-being, and/or experience to convey meaning.'(Marsh, 2011). The main distinction between a SG and a VG lies in their proposed reason: convenience for the previous, stimulation for the last mentioned. In other words, SGs are VGs with a helpful reason.

This thought isn't shared by (Marsh, 2011), who contended that a VG utilized for a helpful target can likewise be thought to be a SG. We don't acknowledge this perspective all things considered a contention could lead us to view each VG as a SG since it can simply be asserted that the target of preparing with a VG is to enhance representation or dialect aptitudes (if playing the VG requires the perusing of specific writings). We in this way keep up that the utility of reason must be available from the beginning (appropriate from the plain initial phase in the plan of the SG) and not added to the amusement along these lines. Important to mention the existence of a huge variety of SGs that differ both in terms of the type of game (strategy game, brain training, adventure game, etc.) and the type of skill trained (health, military, academic knowledge, etc.). It should also be noted that some VGs or SGs can be categorized into more than one type. This enormous variety of VGs and SGs does not simplify the task of analysing their effectiveness in learning (Girard *et.al.*, 2010). A number of studies have attempted to prove that the digital devices used in teaching in recent years have a positive effect. First, many of these studies have examined the effectiveness of CAL and, overall, have concluded that these applications make it possible to enhance learning compared with traditional methods of teaching such as face-to-face lessons or pencil-and-paper studying. Blok *et.al*. (2002) analysed 42 published quantitative studies in English and Dutch on the effectiveness of using computers to teach beginning reading to children aged 5–12. Blok et al.'s meta-analysis found a small positive effect of computer-assisted beginning reading instruction compared with traditional instruction. However, it is not clear from the article exactly what types of application were considered (CAL, VG, SG or others). Additionally, this study has been criticized for having reviewed a large number of unpublished studies (Sitzmann 2011). More recently, Mikropoulos and Natsis (2010) examined educational virtual environments (EVEs) and produced a review of empirical research into these applications undertaken over the previous 10 years. They showed that EVEs are effective teaching tools because they promote constructivist learning. However, to date there are no summary reviews of SGs and their effectiveness.

A number of researchers have published reviews of specific SGs, such as Baranowski*et.al*. (2008) in the field of health-related behaviour change and Goh *et.al*. (2008) who studied psychotherapeutic gaming interventions. Girard *et.al*. (2010) examined the game-based training of children and adolescents with autistic spectrum disorders, anxiety disorders or language learning impairments. They concluded that training can be effective in the field of mental health treatment and discussed the game design characteristics and human factors (age, gender, socio-economic status, and level of cognitive and emotional development) that can affect the educational effectiveness of games. Their overall finding is that the use of SGs to promote health-related behaviour change has a positive effect (except in one study). The researchers identified important criteria that enhance the effectiveness of SGs (story genre, immersion, fantasy, design and gameplay) and stressed the need to perform further research in the field of SGs targeting health-related behaviour change. The main limitation of the study inGoh *et.al*. (2008) lies in its lack of precision concerning the way the examined games were selected, which means that we do not know whether they consisted of VGs, SGs, EVEs or CAL. The presentation of the inclusion and exclusion criteria is not sufficiently clear and

no accurate description of the games is given. Moreover, the experimental studies examined in the review seem to be too old (from 1998 to 2005) to include SGs. The second limitation of this review is that only games relating to a specific field (psychotherapeutic gaming interventions) were considered. This also constitutes a significant limitation to the study of Baranowski*et. al.* (2008), which compounds the considerable variability of the examined studies and the confusion between VGs and SGs.

Historical Background of Serious Games

As of late, numerous better approaches for educating scholastic also, proficient abilities to kids and grown-ups have been tried utilizing sight and sound advances as programming items, instructive PC diversions or computer games (VGs) (Kebritchi*et.al.*, 2010; Lorant Royer *et.al.*, 2010). In spite of the fact that amusements are powerful learning instruments isn't new (Annetta *et.al.*, 2009), the inquiry has just as of late turned into a subject of exploratory research. A few scientists assert that recreations allow valuable, arranged and experiential realizing, which is upgraded by dynamic experimentation furthermore, drenching in the diversion (Squire, 2008; Haineye*t.al.*, 2011). Their received viewpoint features the immense favourable position of recreations contrasted and conventional strategies for example, eye to eye or pencil-and-paper instructing. In expansion, the customary direct way to deal with learning is by all accounts irrational to numerous instructors and recreations could enable them to escape from the imperatives it forces (Tanes and Cemalcilar, 2010). The fast development of sight and sound advances over the most recent 20 years implies that the present kids and youthful grown-ups were conceived in a mechanized world and are utilized to taking care of a wide range of programming items and diversions. They are known as the 'advanced local' or 'Net Generation' (Prensky, 2001; Westera*et.al.*, 2008; Annetta*et.al.*, 2009; Bekebrede*et.al.*, 2011). It in this manner appears to be characteristic to feel that this populace will be exceptionally open to PC based learning. Undoubtedly, all the youthful individuals in the Net Generation extraordinarily appreciate utilizing PCs furthermore, invest quite a bit of their energy perusing or playing PC recreations. Computerized learning will be improved by the vast measure of time spent exploring in the product and additionally by the abnormal state of inspiration and contribution in the movement showed by students (Boot *et.al.*, 2008; Tanes and Cemalcilar, 2010; Wrzesien and Raya 2010). Also, it appears to be vital to keep up an acknowledged level of congruity and consistency between the instruments utilized as a part of instruction and clients' ordinary home exercises (Burnett, 2009).

Creators have recorded numerous contentions in help of the viability of automated devices in learning: simplicity of availability, simplicity of refreshing substance, minimal effort per individual served, abnormal state of intuitiveness, abnormal state of client particular customization, capacity to utilize alluring designs, and agreeableness of the diversion by clients as a drawing in and engaging movement (Beale *et.al.*, 2007; Boot *et.al.*, 2008; Westera*et.al.*, 2008; Burnett, 2009; Kebritchi*et.al.*, 2010; Tanes and Cemalcilar, 2010; Wrzesien and Raya, 2010; Haineye*t.al.*, 2011).As of late, new automated devices known as 'genuine diversions' (SGs) have showed up in the instructive recreations advertise. By joining gaming and learning, SGs speak to another territory of enthusiasm for the instructive field. SGs are 'diversions principally centred around instruction as opposed to diversion' (Miller *et.al.*, 2011). All the more particularly, SGs are VGs with a helpful reason, e.g. for preparing, instruction, learning procurement, abilities improvement, and so on. We will examine this point at more prominent length in segment 'SGs versus VGs' the place we give an exact meaning of SGs and spotlight on how they vary from VGs. To demonstrate the value of SGs,

analysts require to demonstrate that their particular qualities (i.e. that from the outline organize, they are proposed to serve a valuable reason) make it conceivable to improve learning in players. Albeit numerous creators appear to be persuaded of the viability of SGs (Johnson *et.al.*, 2005; Kiili, 2005; de Freitas and Oliver, 2006; Szilas and Sutter Widmer, 2009), the trial prove for this position is pitiful. In the instructive field, as in pharmaceutical, the logical evaluation of preparing or learning impacts as a rule appears as randomized controlled preliminaries (Schulz *et.al.*, 2010). In fact, this trial configuration is thought to be the best quality level for the assessment of both restorative treatment and instructive mediations. As Sibbald and Roland (1998) clarify, 'randomized controlled preliminaries are the most thorough method for deciding if a cause effect connection exists amongst treatment and result also, to assess the cost viability of a treatment' (Radillo, 2009). Our point in the present paper was to audit all test randomized controlled preliminary investigations that have utilized VGs or potentially SGs for learning with a specific end goal to look at the adequacy of these two kinds of advanced application.

The hypothesis of game-based learning (GBL) includes another method for preparing the representatives of organizations. We are discussing the utilization of amusements for learning. The offer for gamified content is expanding and getting increasingly fluctuated, with computer games intended for about all intended interest groups and segments. At corporate level, this procedure is encountering an irrefutable blast. These are the standards whereupon preparing through diversions is laid. Amusement construct learning is based upon a constructivist sort of learning. What does this mean? Constructivism places the need to give understudies the essential instruments so they can fabricate their own particular methods to take care of an issue. This suggests a participatory procedure by understudies, who connect with their condition to tackle the circumstance that is being embarked to them.

Safe practice, experiential learning and communication are the columns whereupon the hypothesis of amusement-based learning stands. Learning through diversions enables understudies to test in non-debilitating situations and get information through training and social connection both with nature and their companions. One of the qualities of diversion-based learning is its perceived ability to catch the consideration of understudies and guarantee their full association: their commitment. The inspiring methodology of these diversions transforms the learning procedure into something dynamic and intriguing, whose interest is kept up as understudies advance to accomplish destinations. Other than inspiration and a fun-loving methodology, GBL spreads out circumstances that require reflection and basic leadership with respect to understudies keeping in mind the end goal to take care of an issue. Along these lines, the member gains learning and assimilates ideas while creating psychological capacities got from basic reasoning, investigation of the real world and compromise. Not at all like more conventional showing techniques, amusement-based learning permits the individual being prepared to have control of their own learning.

Utilizing genuine diversions, understudies can get moment and customized criticism about their insight and everybody knows about what they realize and what they should work harder at. Obviously, the input and the control over learning isn't something just the understudy can check. Other than the scoring framework and the progressive change made by beating levels or the preparation itself, everything gets recorded into the program. Along these lines, those in charge of the preparation exercises can think about the decisions made by the understudy, their good and bad answers, and the choices that have been made in transit. This framework gives a lot of data in order to evaluate the level of comprehension of members, their

shortcomings and qualities and, in particular, it guarantees that the individual really obtains the information and aptitudes on which they have been working.

The hypothesis of diversion-based learning can't disregard the advantage to imagination gave by the better approaches for learning. The amusement energizes inventiveness and inspiration by posturing difficulties and issues that understudies must tackle utilizing their creative ability. In the event that diversion-based learning is utilized for the improvement of social abilities and delicate aptitudes, cooperation and coordinated effort among members are underscored. The down to earth work centres around perspectives, for example, enthusiastic insight, initiative, correspondence, poise, arrangement and compromise aptitudes, and so on. Every one of them abilities difficult to learn without training, which amusement-based learning test systems particularly give. However, another preferred standpoint of diversion-based learning is the open door it presents to clients to enhance their PC aptitudes and get comfortable with the utilization of computerized gadgets, basic in individual and expert improvement in the XXI century. A GBL learning program executed in a professional workplace will probably prevail than a "work of art" e-learning program, be it conventional or remove learning. Information maintenance is substantially higher through gamification, which ensures a discovering that is successful and dynamic. Cost reserve funds is another colossal preferred standpoint because of its adaptability in time and space.

Types of Serious Games

Even though the term ‘serious game’ or ‘applied game’ stands for a fairly small percentage of the available computer games in our time, this doesn’t mean that this term cannot be divided further. There are quite a few different ‘types’ that the category serious games can be divided into. While it is in fact easy to divide serious games into more than 10 types or purposes they are used for; most of these types will fall once again under at least one of three overlaying purposes. These three purposes that most digital serious games are aimed for are: Education, Persuasion and Health.

Overview of Serious Games

Playing a game dates to the old past and is viewed as an essential piece everything being equal. For example, Dice seems, by all accounts, to be among the soonest recreations utilized by people, the most established known case is a multi-year-old diversion set in south Iran. A portion of these amusements as of now served a "genuine" reason; for instance, Mancala (a diversion planned around 1400 BC) was utilized as a bookkeeping instrument for exchanging creatures also, sustenance. In any case, most recreations depended on the idea that the amusement contains and uncovers learning that is generally avoided the player.

In late history, a few points of interest have denoted the advancement of genuine recreations as abridged in Table 1 and depicted in this area and can likely be considered breakthroughs in the historical backdrop of genuine amusements. The idea of genuine diversions was first authored by Abt and portrayed as tails: "We are worried about genuine recreations as in these diversions have an express and precisely thoroughly considered instructive reason and are not expected to be played fundamentally for delight." He utilized creative gaming ways to deal with enhance instruction for the physical and sociologies, word related decision and preparing, and arranging and critical thinking in government and industry. Besides, interfaces between the military and gaming are a long way from new: amid World War II, the US armed

force general staff were the first to utilize "wargames" and utilized them to enhance their picture with the populace. The publicizing of one of the world's first business home computer game consoles, the Odyssey by Magnavox (propelled in the USA in 1972), stressed the gadget's potential as an instructive apparatus, and consequently it may be viewed as one of the principal genuine computer games. Later on, in 1973, instructive recreations, for example, The Oregon Trail and Lemonade Stand were created by the Minnesota Educational Computing Consortium (MECC). Lemonade Stand, which was made in 1973, concentrated on business administration, while The Oregon Trail, delivered in 1974, planned to show clients about American settlers and was exceptionally prevalent is as yet famous today through cell phones and Facebook. It remains as a case of an effective genuine diversion. In 1981, a reproduction device known as The Bradley Trainer was produced for the American armed force to prepare new enrols in how to work a Bradley tank. This application was produced by a group from Atari and depended on the Battlezone arcade diversion, which is accepted to be the main virtual reality arcade amusement. The years 1982 and 1983 saw the arrival of a few arcade recreations, for example, Pole Position,

Table 1: Milestones in the History of Serious Games.

Year	Serious game	Application
1970	Serious game book by C. abt	Academic book
1972	Magnavox Odyssey	Education
1973	The Oregon Trail	Education
1980	BattleZone	Training
1981	The Bradley Trainer	Training
1982/83	*Pole Position/Atari VCS 2600 console*	Training
1996	Marine Doom	Military
2002	America's Army	Military
2003	DARWARS	Training
2005	VBS1	Military
2006	Bilat	Interpersonal Communication
2009	VBS2/ Game after Ambush	Military
2012	X-Plane 10	Training

As well as games for the Atari VCS 2600 console, such as Pepsi Invaders, which included elements of advertising (a type of application that today is known as an "advergame"). In 1996, the Marine Doom game was used to train members of the US Marine Corps. A first-person shooter game, named America's Army, was developed by the US army and distributed free of charge over the Internet in 2002. The game simulates military training exercises and combat missions, with the goal of promoting the American army and as a recruitment tool for young people between the ages of 16 and 24. Sawyer considered America's Army "the first successful and well executed serious game that gained total public awareness". Other breakthrough games were DARWARS introduced in 2003 and the VBS1 in 2005. In the last decade, serious games grew exponentially. A recent market study showed that the worldwide serious games market is worth 1.5 billion dollars in 2010, with a growth rate, over the last two years, nearly 100% per year. For example, BiLAT, introduced and marketed in 2006, is an immersive learning environment that teaches the preparation, execution, and understanding of bilateral meetings in a cultural context. The second

generation of VBS1 was introduced in 2009, with capabilities for training, simulation, and development. In March 2012, a new version of the flight simulator game X-Plane (X-Plane 10) was introduced to support various mobile platforms such as Android and webOS.

In contrast to existing classifications as discussed previously, in this work, we propose a multidimensional classification that examines serious games more closely by looking into the characteristics that are important in their design and that have the potential to make a significant difference in the success of a serious game. These criteria are based on conclusions drawn from the study of different serious games articles and applications, by analysing their characteristics including the interaction style they offer to the player, the activity, the modalities, the environment, and the application area, as will be explained in a later section. Hence, we believe that the new classification we are proposing will allow a more detailed categorization and analysis of serious games.

Growth of Serious Games

Serious games are digital applications designed for education with fun. The primary function of serious games is to provide knowledge, train, inform, memorize, and teach end users, rather than mere entertainment. It enables advertisers to optimize brand awareness by increasing receptiveness of message, target more audience, and generate additional traffic to their websites. It also helps students to learn with fun as it bridges gap between theory and practical. Serious games are also used in inspection, technical training, competency evaluation, fault finding & rectification, and other applications.

The global serious games market was valued at $2,731 million in 2016, and is expected to reach $9,167 million by 2023, growing at a CAGR of 19.2% from 2017 to 2023. The major factors that drive the market growth are increased need for user engagement across enterprises, growth in usage of mobile-based educational games, and improvement in learning outcomes. Improper game design and lack of awareness about serious games hinder the growth of the market. Large-scale digitization and emergence of social networks pave new opportunities in the market.

The key players operating in the global serious games industry include Breakaway, Ltd., Designing Digitally, Inc., DIGINEXT, IBM Corporation, Intuition, Learning Nexus Ltd, Nintendo Co., Ltd., Promotion Software GmbH, Revelian, and Tata Interactive Systems. These players have expanded their market presence by adopting various business strategies such as acquisition, geographical expansion, product development, strategic alliance, and collaboration.

The serious games market is segmented based on user type, application, industry vertical, and geography. Based on user type, it is bifurcated into enterprises and consumers. As per application, the market is classified into advertising & marketing, simulation training, research & planning, human resources, and others. Based on industry vertical, the global serious games market is studied across healthcare, aerospace & defence, government, education, retail, media & entertainment, and others. Based on region, the market is divided into North America, Europe, Asia-Pacific.

Taxonomy of Serious Games

In an attempt to classify serious games, we try to define here the characteristics that are important in their design and that have the potential to make a significant difference in the success of a serious game. We thus suggest the following criteria that are based on information derived from the study of different articles and applications related to serious games.

Activity: The first characteristic that we define here is the type of activity performed by the player as required by the game. This is the function performed by the player as a response and/or input to the game. Activity types can be physical exertion, for example, in games for well-being such as in games for health to fight childhood obesity. The activity type can also be physiological such as in games for rehabilitation or for the detection of some health conditions. It can also be mental, for example, in games for education, training, or interpersonal communication.

Modality: Another criterion that is of importance is the modality, which is here the channel by which information is communicated from the computer to the human(s) participating in the game. This characterizes the sensory modalities the player experiences in the game. The most common modalities include visual, auditory, and haptic. There are also some smell attempts that were contributed such as an application of using the sense of smell in therapy. It is important to use modalities to the advantage of the game's purpose.

Interaction Style: The interaction style defines whether the interaction of the player with the game is done using traditional interfaces such as keyboard, mouse, or Joystick or using some intelligent interfaces such as a brain interface, eye gaze, movement tracking, and tangible interfaces. Choosing the right interface during the serious game design may have an impact on the success of the game. For example, for some games, it is important to use intelligent interfaces instead of traditional interfaces. Such games include movement tracking such as the one provided by Microsoft Kinect or the use of a remote such as the Nintendo Wii remote which allows the player to feel more freedom and realism while playing the game. An example showing that using the right interface can be a determining factor in the success of serious games was explored using a system called Sensor Network for Active Play (SNAP). SNAP aims at getting players physically active and uses a set of sensors attached to the players limbs, which allow the system to make sure that the players are moving their body as required by the game. This allows overcoming shortcomings in systems such as the Wii Fit where players can sit on a couch and move the Wii remote and still be able to get through the game without getting the desired physical exercise.

Environment: This criterion defines the environment of the digital game and can be a combination of several criteria. 2D/3D: the environment of the serious game can be either 2D (two-dimensional) or 3D (three dimensional) or a combination of the two.

- Virtual or mixed reality environment: virtual reality refers to a completely synthetic world. It is a computer-generated immersive environment that can either represent the real world or be purely imaginative. Virtual reality is widely used in serious games. A mixed reality, includes both augmented reality and augmented virtuality. It refers to an environment that merges real and digital worlds, allowing objects from each world to interact in real time.

- Location awareness: it depends on whether or not the game allows the determination of the player's current location.
- Mobility: it determines whether the game is mobile or not.
- Online: it determines if the game can be played over a computer network, usually the Internet.
- Social presence: it depends on whether the game is single or multiplayer. This can be an important criterion to be taken into consideration, where some research was conducted specifically for exercise games and concluded that multiplayer collaborative exercise games are more motivating and engaging than single-player exercise games.

Application Area. The application area refers to the different applications domains relevant to serious games.

Serious Games Versus Video Games

'Serious games are digital games, simulations, virtual environments and mixed reality/ media that provide opportunities to engage in activities through responsive narrative/story, gameplay or encounters to inform, influence, for well-being, and/or experience to convey meaning.'(Marsh, 2011).For us, the only difference between a SG and a VG lies in their intended purpose: usefulness for the former, entertainment for the latter. That is to say, SGs are VGs with a useful purpose. This idea is not shared by Marsh (2011), who argued that a VG used for a useful objective can also be considered to be a SG. We do not accept this view point as such an argument could lead us to consider every VG to be a SG because it can always be claimed that the objective of training with a VG is to improve visuospatial or language skills (if playing the VG requires the reading of certain texts). We therefore maintain that the utility of purpose has to be present from the outset (right from the very first step in the design of the SG) and not added to the game subsequently.

It is, moreover, important to mention the existence of a huge variety of SGs that differ both in terms of the type of game (strategy game, brain training, adventure game, etc.) and the type of skill trained (health, military, academic knowledge, etc.). It should also be noted that some VGs or SGs can be categorized into more than one type. This enormous variety of VGs and SGs does not simplify the task of analysing their effectiveness in learning.

Method and Procedures

This chapter discusses how the objectives of this research work would be achieved, how the problems encountered during manual operations would be tackled and also give in details of what the proposed system is going to achieve. Research methodology is the systematic theoretical analysis of the method applied to a field of study it comprises the theoretical analysis of the body of method and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative and qualitative techniques. The art of software development is dependent on humans designing, writing, and documenting the necessary programs.

It is a time consuming and costly exercise and requiring prudence and application of appropriate techniques, which depends on the nature and complexity of the particular area of application. In areas where the problems to be solved are mostly technical in nature and emphasis is on expressing known algorithm in some programming language. However, these tools (flowchart and pseudo code) are highly deficient when it comes to complex applications, where the problem to be solved mostly concerns everyday life such as airline reservation, payroll systems, to mention just but a few. The work of software designer is viewed as being close to that of an architect; what an architect is to a builder is what a software designer is to programmer. When building a house, the builder does not start with piling up bricks; rather, the requirement and responsibilities of the client are first analysed, taking into account such factors as family structures, hobbies, finances and the like. The architect takes this into consideration when designing the house. Only after the design has been agreed upon is the actual construction stated. That is why in developing a serious game as an incentive for learning we want to employ the use of water fall model which is simple and flexible for developing such a system.

METHODOLOGY

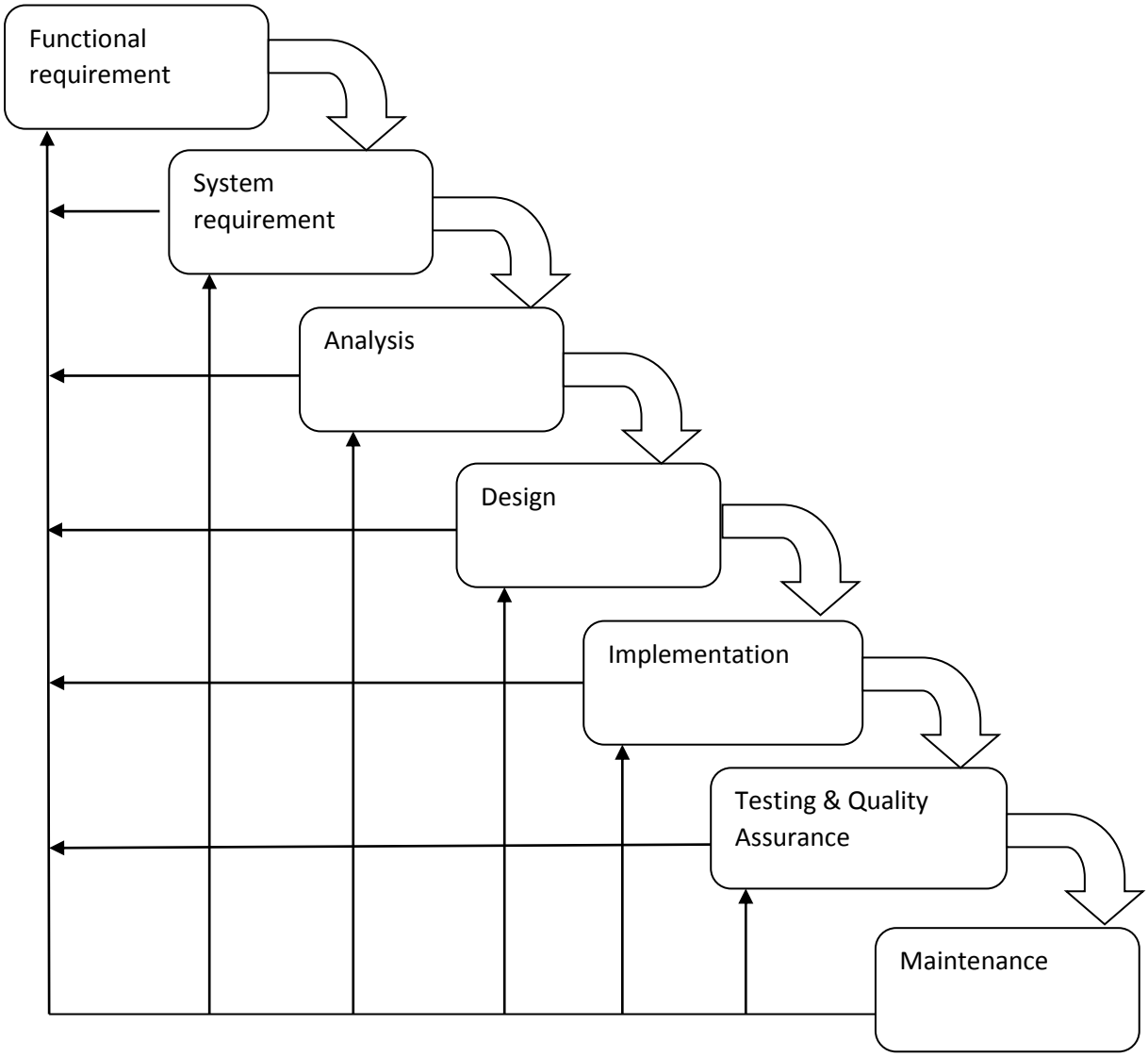
Theoretical and Empirical model; These are developed using physical and chemical laws of conservation such as mass balance component balance, moment balance while empirical models are obtained by fitting experimental data.

Software Development Model

In other to develop the system, waterfall model has been selected as the model to be used. Water fall model is a classical software development model (initiated by Winston Royce in 1970). The model is characterized by linear and sequential execution of the various phases of the software life-cycle. This model is useful when developing small/medium software products. The model can be broken down into several phases such as;

i. Functional requirement
ii. System requirement
iii. Analysis
iv. Design
v. Implementation
vi. Testing
vii. Maintenance

Waterfall Model



Requirements Specification

In order to design and implement an efficient system, there are basic requirements that should be considered; the requirements of this system are as follows:

a) The system should have security access control that enforces users to sign in before accessing any feature of the system.
b) For any member to access the system he/she should be registered as a user on this platform.
c) The system should have a staff management page through which the system admin can administrate the entire system.
d) The system should have a list of all users on its database.
e) The system should provide an easy search window for easy reporting of crime case.

Software Specification

This system will be a web-based application and will be implemented on:

i. Visual Studio and WPS

ii. Bootstrap: A CSS framework

System Design

The implementation stage of software development is the process of converting a system specification into an executable system. It always involves processes of software design and programming but, if an incremental approach to development is used, it may also involve refinement of the software specification. A software design is a description of the structure of the software to be implemented, the data models and structures used by the system, the interfaces between system components and the algorithms used.

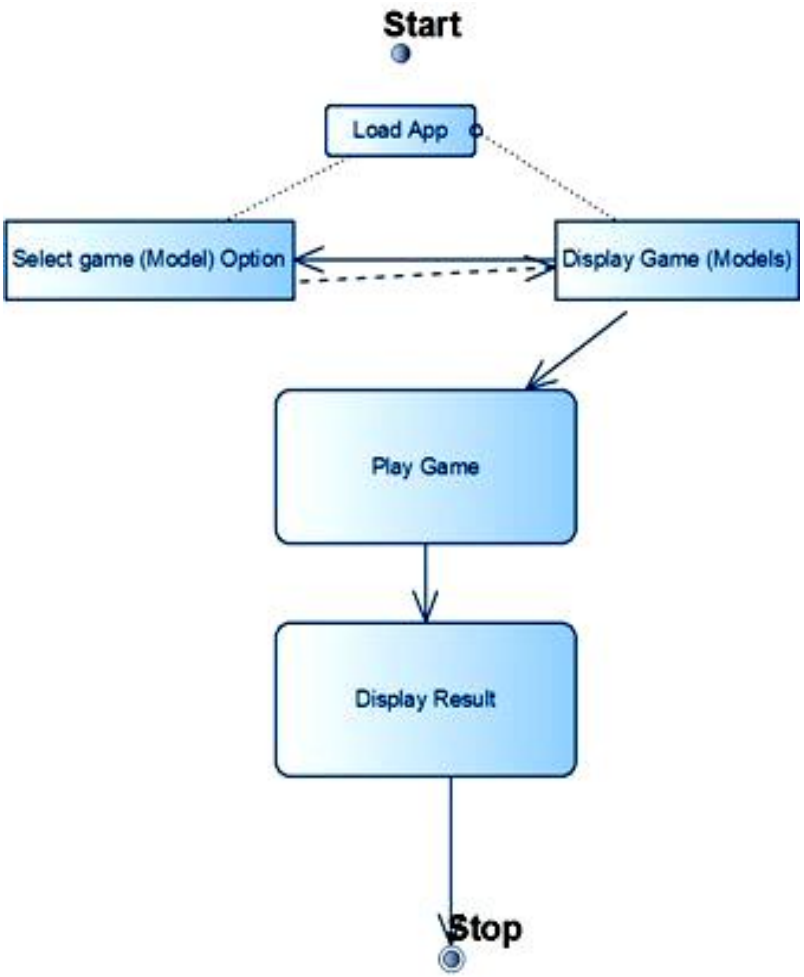


Figure 1: Use Case diagram

The use case diagram in figure 3.2 above shows how the game interacts with the player. Once the application loads, it loads the game with a start button which when clicked takes you into the game proper and results are developed for both score and time after the round is over.

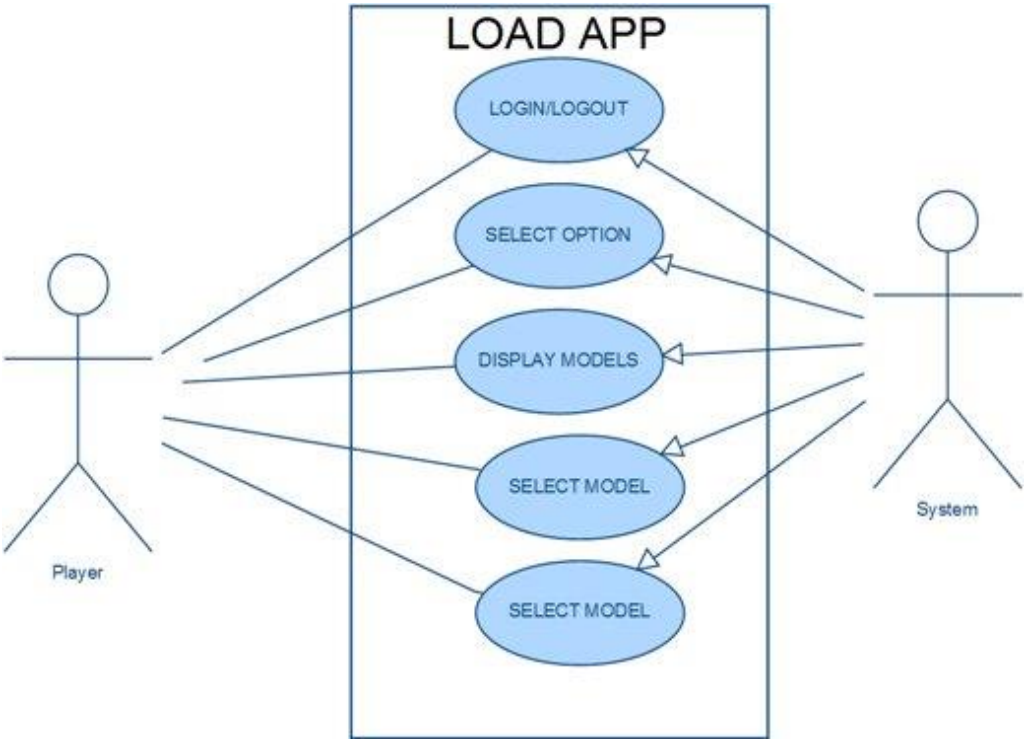


Figure 2: Activity Diagram for the System

Thus, upon opening displays models for the user to select the one of their choice and proceed.

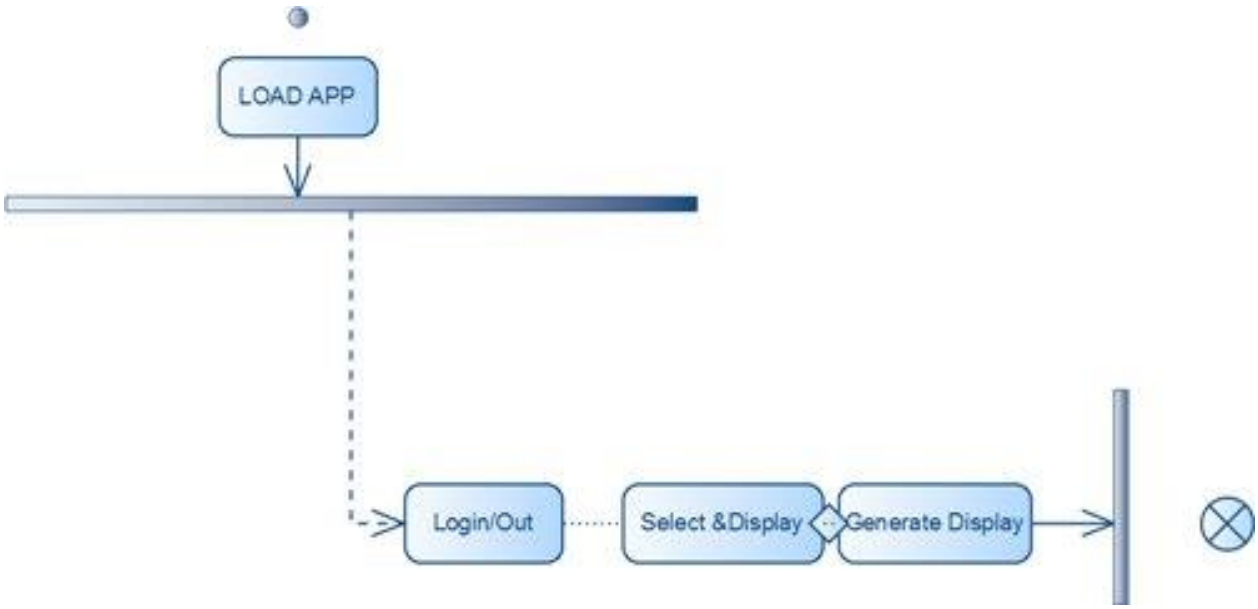


Figure 3.4: Data flow diagram for User

The game loads and select start game which generates the question user interface for users to answer

Database Structure

The structure of relational database shows the different tables that make up the database and the relationships among the fields. The database consists of the following tables:

Field	Description
Player–id	Player id
Player–name	Player name
Game-logo	Game Model System logo

Table 2. Game Model System

Field	Description
Display-id	Display id action auto-increment
Display-name	Player
Display-Game type	Display game selected
Model-type	Model type to use
Report	Display players result
Display-date& time	Display time and date played

Table 3. Display Table

Field	Description
Id	Game Id (auto increment)
Name	Game's name
Position	Game's position
Model-type	Game's role

Implementation

After a complete development of the system, this chapter presents the result of the work. The design specification in chapter three was used to develop the system. The system developed was tested, ran Offline on windows and screen shorts of the results were presented.

Tools Used for Game Development

1. **UNITY**

   Unity is a cross-platform real-time engine developed by Unity Technologies, The engine can be used to create both three-dimensional and two-dimensional games as well as simulations for its many platforms. Several major versions of Unity have been released since its launch, with the latest stable version being Unity 2019.1.0. The version used to create this mathematics model quiz game is Unity 5.4.0f3 (64-bit) 2017 enterprise. Unity gives users the ability to create games and interactive experiences in both 2D and 3D, and

the engine offers a primary scripting API in C#, for both the Unity editor in the form of plugins, and games themselves, as well as drag and drop functionality. Prior to C# being the primary programming language used for the engine, it previously supported Boo, which was removed in the Unity 5 release, and a version of JavaScript called *Unity Script*, which was deprecated in August 2017 after the release of Unity 2017.1 in favour of C#.

Fig 4. Unity

2. VISUAL STUDIO

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code. Visual Studio includes a code editor supporting IntelliSense (the code completion component) as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a code profiler, forms designer for building GUI applications, web designer, class designer, and database schema designer. Visual Studio supports 36 different programming languages and allows the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. But for this game we used c# only.

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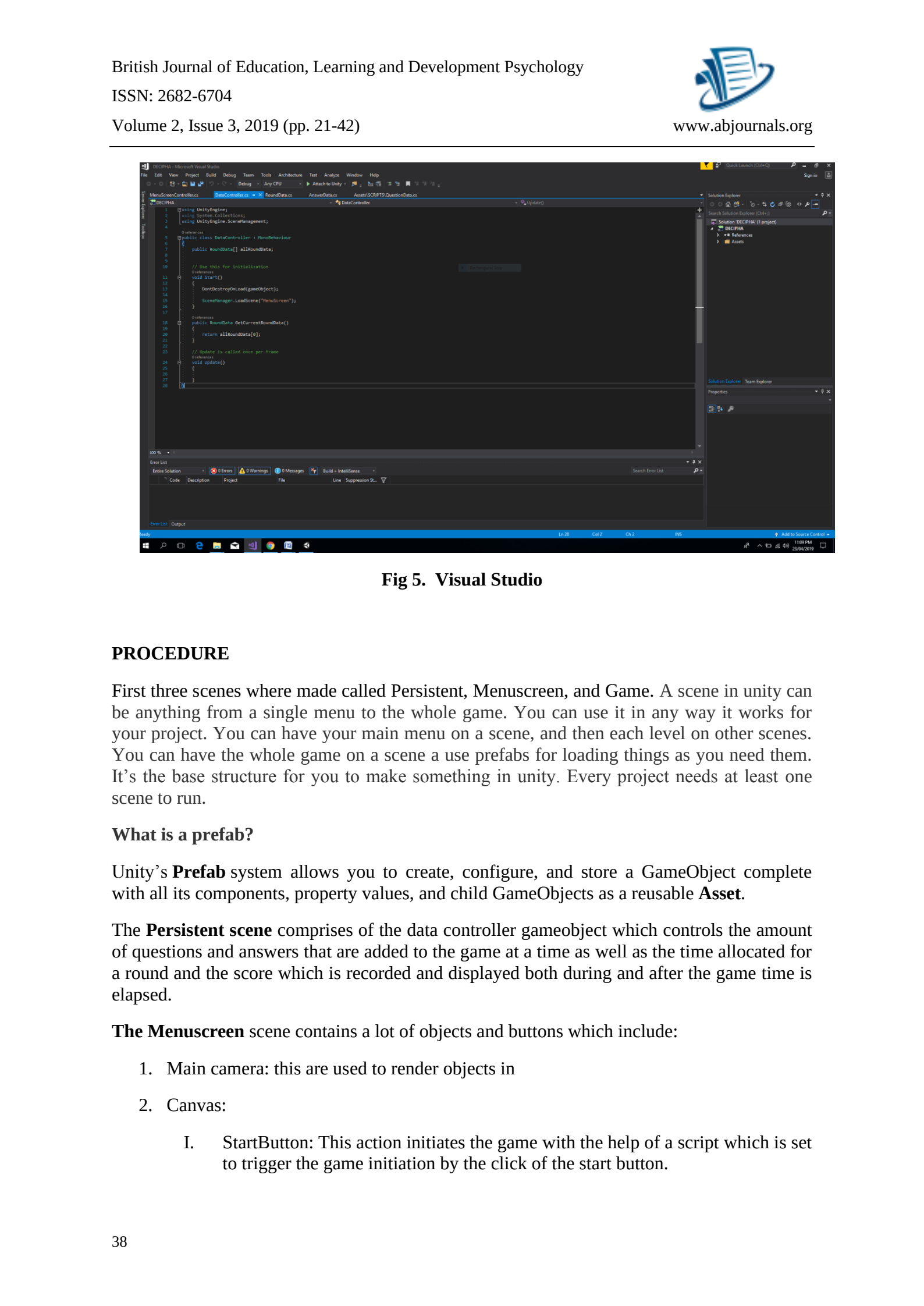

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Fig 5. Visual Studio

PROCEDURE

First three scenes where made called Persistent, Menuscreen, and Game. A scene in unity can be anything from a single menu to the whole game. You can use it in any way it works for your project. You can have your main menu on a scene, and then each level on other scenes. You can have the whole game on a scene a use prefabs for loading things as you need them. It's the base structure for you to make something in unity. Every project needs at least one scene to run.

What is a prefab?

Unity's **Prefab** system allows you to create, configure, and store a GameObject complete with all its components, property values, and child GameObjects as a reusable **Asset**.

The **Persistent scene** comprises of the data controller gameobject which controls the amount of questions and answers that are added to the game at a time as well as the time allocated for a round and the score which is recorded and displayed both during and after the game time is elapsed.

The Menuscreen scene contains a lot of objects and buttons which include:

1. Main camera: this are used to render objects in
2. Canvas:
    I. StartButton: This action initiates the game with the help of a script which is set to trigger the game initiation by the click of the start button.

II. Text elements: These are functions which enable the user to write text on buttons, canvasses or background objects.

3. EventSystem: A script in Unity is not like the traditional idea of a program where the code runs continuously in a loop until it completes its task. Instead, Unity passes control to a script intermittently by calling certain functions that are declared within it. Once a function has finished executing, control is passed back to Unity. These functions are known as event functions since they are activated by Unity in response to events that occur during game play. Unity uses a naming scheme to identify which function to call for a particular event.

4. MenuScreenController: This script controls how objects on the MenuScreen interact with each other when the game is initiated.

The Game scene contains the actual objects that make the game such as:

1. **The Question panel**: where the questions are displayed when the game starts.

2. **The Answers panel**: which contains the options to the questions

3. **The Roundover panel**: this is the panel that displays whether the time has run out or the player has successfully answered all the questions in the time allotted.

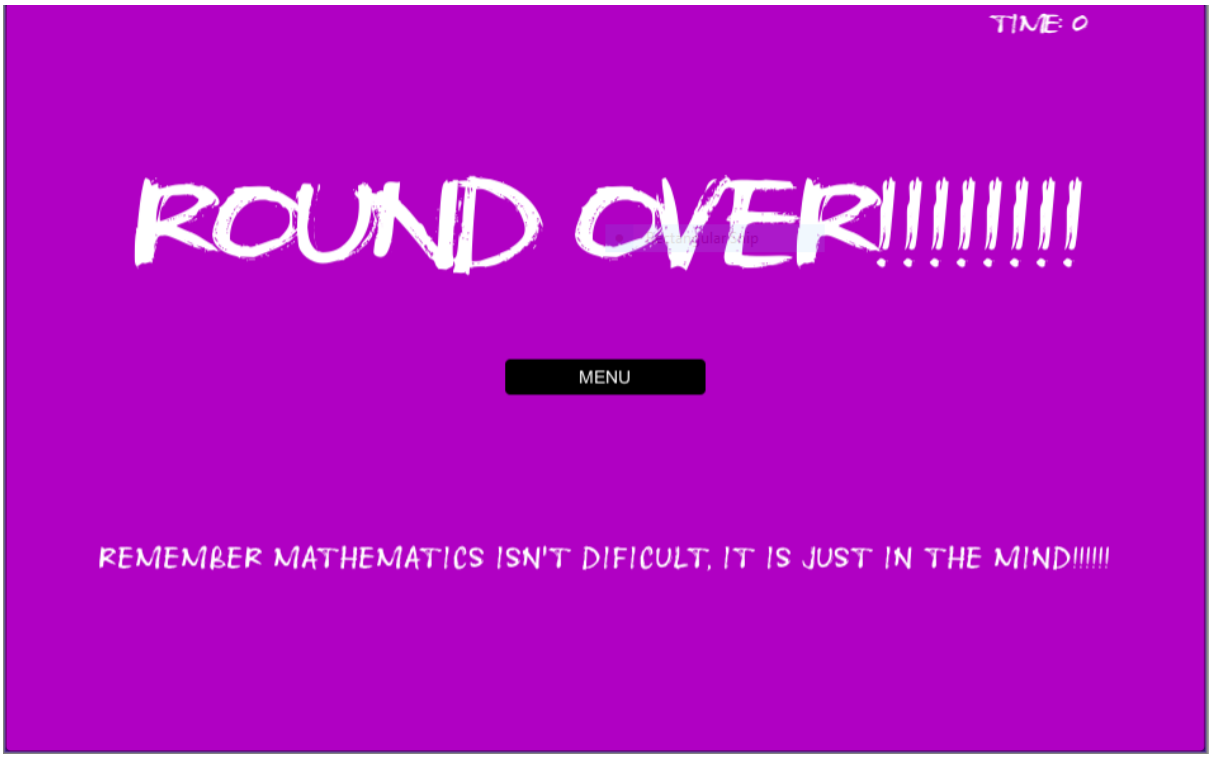

Fig 6. Roundover Screen

4. The User interfaces

   I. Score: This displays with accuracy the cumulative score the player attains during the game.

   II. Time: This displays the time the player has left during the game.

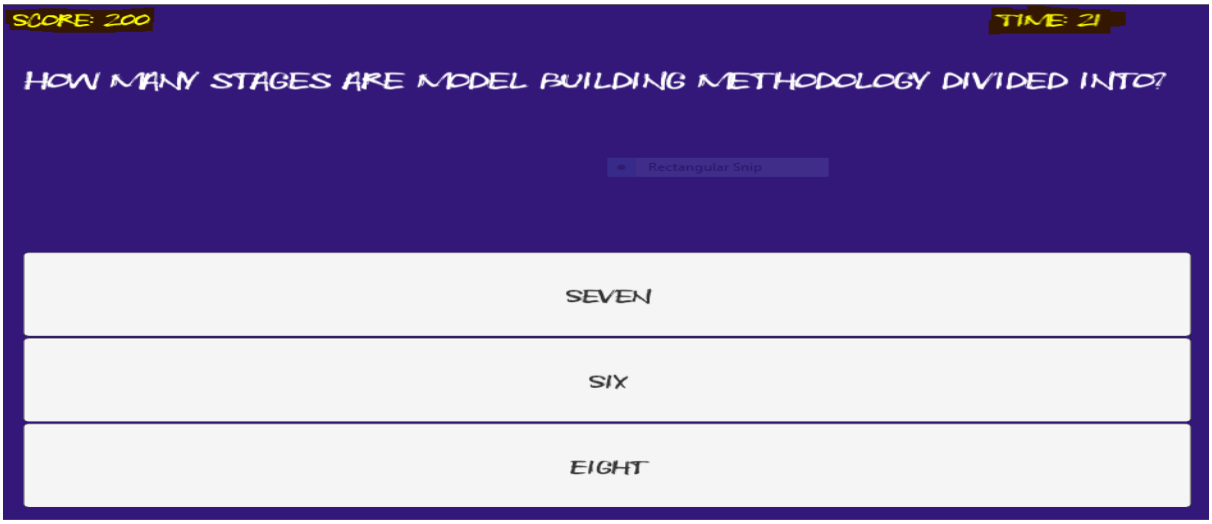

Fig 7. Score and time interface

CONCLUSION

The main objective of this paper was to portray games as Look at how the acquaintance of gaming with training can encourage scholastic greatness. The second objective was Straighten out the backward attitude that games are intended for unserious individuals. These objectives were achieved. The third objective was to present gaming as an instrument or motivation for edutainment, which was also achieved. The system response time was quick and interactive. The system is an offline application; this method therefore possesses the merits and demerits associated with an offline system. One of the weaknesses of this system is that the admin cannot view the location in which the report was sent from because the system is an offline system. When a good relationship is developed between users and games developed for edutainment, it would lead to a successful implementation of gaming systems in various academic fields and also other sectors of the Nigerian economy. With the global counterfeit problem on the rise, the system is designed to be beneficial to all users using games to create an environment conducive for learning. Based on the results produced, the system has shown to be effective and reliable. The existing type of games were discussed and it was narrowed down to a system which enables users to learn using gaming for edutainment which is the main aim of this paper.

The resulting software would be of benefit to students who want to augment their learning process by trying the game on the system. The software has been able to meet its objectives

and will make gaming for edutainment more successful in Nigeria. When a good relationship is developed between game programmers, and the consumers, it would lead to a successful implementation of gaming systems for learning. With the Nigerian market yet to readily accept tested serious games due to various limitations of which publicity is a major one, the system is designed to be beneficial to all students therefore the need for it to be tested at university level and then be spread to other sectors as time goes on. Utilizing serious games as another avenue for learning by tapping into the world as a global village where technology is gradually taking over; will aid not just the educational sector but can also be utilized in other sectors such as agriculture, the military and even the food industry in Nigeria. Because a virtual environment will enable users gain valuable knowledge of different scenarios without actually being in those locations at that specific time.

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