

MULTI-DISCIPLINARY APPROACHES TO LEARNING AND TEACHING IN KENYA: USE OF VIDEO GAMES IN EDUCATION

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Abstract

Education is one sector that tries to be consistent despite facing several changes. Various factors and emerging trends have affected the sector both positively and negatively. The scope of the digital divide is more pronounced in the developing countries and the COVID-19 pandemic exacerbated the technological struggles in Africa more than before. Technology is an enabler in education but not in all contexts because it also causes other challenges that increase the vulnerability of learners and educators in diverse circumstances. The proliferation of digital devices, especially mobile and smart devices, has brought in new changes and innovative ideas that have impacted the sectors input, output, and outcome. Learners have demonstrated various degrees of adoption and absorption of new devices, and simultaneously educators have integrated and adapted to new pedagogies that resonate with the situation. As a continent, Africa has experienced an emerging trend with digital and non-digital devices interconnected for educational purposes on demand whenever needed. In developing countries like Kenya, more innovative ways of learning have been harnessed for learning and teaching purposes. With the penetration of the World Wide Web, the internet of things, availability of electronic devices, and improvement in information communication and technology infrastructure. Video games, which can be played on many platforms and electronic devices, can easily be leveraged for teaching and learning purposes. This study was conducted among learners and educators in an urban setting in Nairobi County, Kenya. The study investigated the potential of video games in education as used by learners and teachers. The findings indicated that most learners targeted had personal mobile devices. This gave them easy access to video games, which led to the popularity of these games. The findings also indicated that the learners were not allowed to use digital devices like mobile phones in the classroom at school but had limited access to video games through desktops and laptops available in their institutions. The findings also showed that the majority of teachers were not keen on using video games for teaching and learning purposes, and this scenario presented a disparity in and a barrier to using multi-disciplinary approaches and integrating technology in teaching and learning. The study recommended that, with more electronic devices available for learners and other education stakeholders, it is necessary to harness video games for learning and teaching purposes to allow for innovation, discovery, critical thinking, and experiential learning among learners.

Keywords

Africa, access, education, learners, video games

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Introduction

The generation born roughly between 1980 and 1994 is characterized as ‘digital natives’ (Prensky, 2001a) or the ‘Net Generation’ (Tapscott, 1998) because of their familiarity with and reliance on ‘Information Communication Technology (ICT) for various functionalities. They are described as living lives immersed in technology surrounded by and using computers, video games, digital music players, video cams, cell phones, and all the other toys and tools of the digital age’ (Prensky, 2001a: 1). Social researchers Howe and Strauss (2000, 2003), labeled this generation the ‘Millennials’, ascribing to their distinct characteristics that set them apart from previous generations. Bayne and Ross (n.d) noted that these young individuals have grown up with computers and the internet. The argument is that they are naturally proficient with new digital technologies and spaces, while the older generation will always be a step behind in their digital proficiency. Additionally, young learners’ immersion in digital technologies creates in them a radically different approach to learning, one which is concerned with speed of access and instant gratification.

In developing countries, these generations are leaders in thinking through issues dealing with technology because their lives revolve around technological devices. For them, education and technology are one and the same as they get all the information and guidance they need online. This study will look at the aspect of leveraging various learning models using technology. The study will specifically investigate the use of video games for learning purposes. In essence, video games are digitally-based games typically played on personal computers or dedicated gaming devices, such as game consoles (Xbox, PlayStation) or handheld game devices (3DS, Vita). Gee (2004) posited that video games offer players ample opportunity to practice and even automatize their skills at various levels, and they integrate opportunities for learners to learn new concepts outside of their context thereby Aseev (2020) noted that remote learning is capable of fostering private and meaningful learning experiences connected to learners’ home environments, interests and local identities while using available devices at their homes.

The digital native generation is often defined in relation to technology. Stoerger (2009) posits that digital natives are individuals born and raised with technology. Yet these young people do not tend to view what adults consider new technologies as high-tech; rather, they see them as tools and devices for making their lives more efficient (Herring, 2008; Howe and Strauss, 2003). These are indications that young people are enthusiastic technology users. Recently, however, questions about the actual technological savviness of this generation of students have surfaced. According to Herring (2008), our images of youth, new media, and their experiences are described through an adult lens, which may not reflect the reality of the situation.

Video games and learning

Video games are quite engaging, and they are designed mainly for entertainment purposes and to fulfil some education principles. Gee (2004: 67) stated that video games can fulfil the following education principles:

- Psychosocial moratorium principle where learners can take risks in a space where real-world consequences are lowered
- Committed learning principle where learners participate in an external engagement as an extension of their real-world identifies in relation to a virtual identity to which they feel some commitment, and a virtual world that they find compelling
- Amplification of the input principle, which notes that for a little input, learners get a lot of output
- Achievement principle for learners of all skill levels with intrinsic rewards from the beginning, customized to each learner's level, effort and growing mastery, and signaling the learner's ongoing achievements with other principles.

There are indications that some video games, if used effectively, can aid the education systems in developing countries on issues of self-study and access to resources where the learners are exposed, video games can be accessed in any location.

Christopher et al. (2019) noted that circumstances in which students live affect their academic engagement, academic progress, and educational attainment in important ways. This scenario was noted in the Continental Education Strategy for Africa, CESA 16-25 2016–2025 Report, which stated that many African children go to primary school unprepared, resulting in prevalent discontinuities between the home and classroom environments. Africa is one of the continents where the language of instruction mostly in lower levels is mother tongue or a specific country's national language. From upper primary school to university, Researchers have noted that, more often than not, a foreign language makes it difficult for children to cope with a new language and structured approaches to teaching and learning. Early Childhood Care and Education (ECCE) is therefore the next frontier if Africa is to realize sustained quality education and training (CESA 16-25 2016–2025 Report). Learner's readiness to learn in school and the school's readiness to accept and accommodate learners with different abilities and capabilities are essential ingredients for a successful educational outcome. The Kenya Institute of Education (KIE, 2012: 147) report indicated that pupils' ideas and thoughts are in their mother tongue and will continue to be so, long after they have learned to speak in English.

Canhoto and Murphy (2016) stated that any serious games offer an experience-based learning environment focused on exploration, discovery, or problem solving that is devoid of instructional guidance. Motivation in game and is also driven by reward systems, which may include scores, permissions, property, Vlachopoulos and Agoritsa (2017) noted that rapidly evolving

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technological applications, games, and simulations are already widely integrated in the traditional educational process. Ostenson (2013: 77) posited the following:

May games that the students were familiar with (others falling into the first-person shooter category) were examples of games on rails, games they perceived fairly linearly regardless of a player’s action. Students compete in games like this to master books they have read and they noted that the attraction of these games was being able to solve puzzles requiring good timing and hand-eye coordination.

Literature Review

Learning models and devices in the digital age

Sustainable Development Goal (SDG) 4 is on quality education. One of its indicators is to build and upgrade education facilities that are child-, disability-, and gender-sensitive, providing safe, non-violent, inclusive and effective learning environments for everyone (SDGs). Digital games are quite common among younger generations with a small percentage of adults playing games. According to G4LI research, they are recognized for their potential as environments for supporting learning. With their vast popularity and singular ability to engage young people, digital games have been hailed as tools that may enable a new paradigm for education in the world (G4LI).

Figure 1 revises Bloom’s Taxonomy relating to the domains of learning that can use used to understand video games.

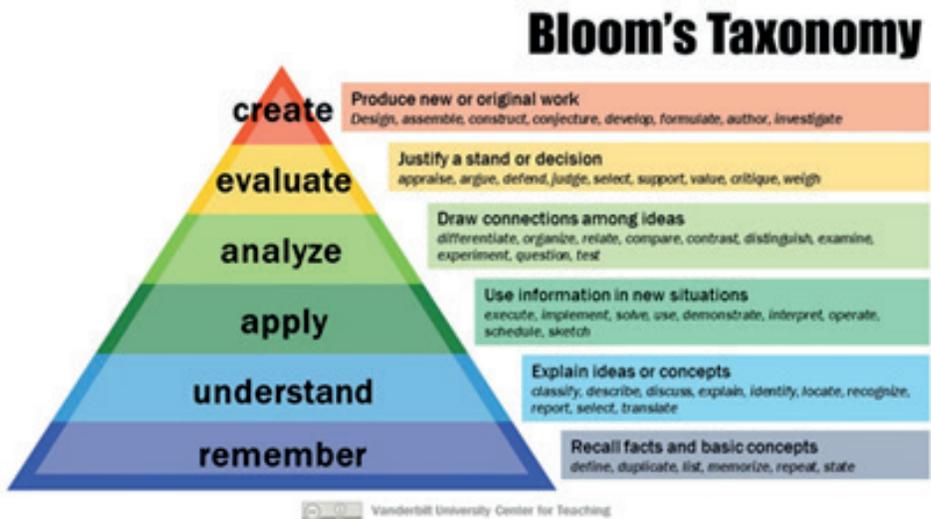


Figure 1. Bloom’s taxonomy (Vanderbilt University Centre for Teaching) and Anderson and Krathwohl’s 2001 revised of Bloom’s Taxonomy

Video games are capable of enabling learners to achieve all stages of Bloom's taxonomy if well utilized. Bloom's six stages are in line with the Technology Integration Matrix (TIM), provides a framework for describing and targeting the use of technology to enhance learning in various settings. TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. In total, there are the five characteristics of meaningful learning environments and five levels of technology integration (Instructional Technology (FCIT) 2005, third edition (2019). Ostenson (2013: 71) suggested that there is a unique reason for bringing video games into the English classroom because they represent some of the most important storytelling in the 21st century. This new medium is not only connected to our students' lives and interests but also represents our society's efforts to push the boundaries of storytelling in meaning ways.

Recent research into how young people in tertiary higher education access and use technology however, the research offers a more diverse view of the role of technology in the lives of young people. For example, a survey of 4,374 students across 13 institutions in the United States (Kvavik, Caruso & Morgan, 2004) found that the majority of respondents owned personal computers (93.4%) and mobile phones (82%), but a much smaller proportion owned mobile devices (11.9%). The most common technology uses were word processing (99.5%), emailing (99.5%), and surfing the internet for pleasure (99.5%). In Africa, the penetration of digital devices has been rapid but those could be related to adults acquiring the gadgets at a higher percentage compared to youth. This study also found that about 80% of the respondents owned mobile phones.

Hideg (2020a) conducted research among primary school students in Hungary, in which she examined sports habits and the role of modern telecommunication devices. The survey asked respondents how important their phone was to them and 71% of respondents thought it was important or very important. Nevertheless, in her hypothesis, she argued that despite technology, family and social life still play an important role in the respondents' lives. Summarizing the results of the research, the author argued that using cell phones has become one of the most obvious means of relaxation and communication. This study and other related studies are in line with Bloom's taxonomy and its six main categories. The six categories resonate well with video games in a school context as all the domains (create, evaluate, analyse, apply, understand, and remember) can apply to both learners and educators.

Digital games like video games are an innovative way of learning just like other games allows learners independent time to practice and collaborate with others. Online sites such Quiz Shows and Big allow students to compete individually or in groups on a national level with other students in a weekly "amehow" format similar to how the pub trivia game Buzz Time is currently played. Having access to computers with internet access is all that is required to play. A variety of game show quiz formats could be used including, Jeopardy, Who Wants to Be a Millionaire, and

Wheel of Fortune. Questions can be easily obtained from standards-based tests like the New York State Regents Exams in multiple subjects. This can help the learners practice asking and answering questions in real-time classrooms.

In addition to allowing learners to cut across space and time, video games also help learners to be exposed to different subjects in games like Dungeons and Discourse. The game's goal is to defeat the Aesiphron who have invaded the regions of Sophos, with each region representing a major branch of philosophy. To do this, students travel throughout Sophos, completing quests, participating in the market place of ideas, pursuing membership in various guilds, and building their skills of consistency, rigor, research, rhetoric, precision, and skepticism. In the game Learn to Earn, students earn points in order to advance and receive rewards. Points can be earned by getting a good grade on a test, completing a computer math game, or participating in using the classroom's SMART Board.

Video games and critical thinking among learners

According to Gee (2004), video games encourage players to explore and reflect on their identities in clear and powerful ways. This concept is very applicable to school classrooms where learning is based on individual learner identities with students working in different ways and using different strategies and approaches to perform academically. Prensky (2001) noted that the digital world itself is split between natives and incoming immigrants. The migrants are further illustrated by Gee (2009b) who stated that a new generation of video-gamers emerged as being more sophisticated and better prepared for capitalistic societies than individuals going through traditional schools. Immersion in this technology-rich culture is said to influence the skills and interests of digital natives in ways significant for education. The digital migrant's narrative is further illustrated by the net generation, which has defined the setting in relation to technology. This generation does not tend to view what adults consider new technologies as high-tech; rather, they see them as tools and devices for making their lives more efficient (Herring, 2008; Howe & Strauss, 2003).

Gee (2004a, b) elaborates that those with access to new technology are separated from an emerging underclass of those who do not have access (Tapscott, 1998); the digital world itself is split between natives and migrants (Prensky, 2001). Games bring up the issue of identities, virtual reality and virtual characters in a virtual world (Jan L. Plass et al., 2012). The other identity in a game is real world identity the gamer's identity, which is the actual person in real life (RL). And, identity also stresses the interface of interactions between the real world and the virtual character, which in a classroom environment may not be well understood by the learners because they are in real in world situations.

In a video game, forming, modifying and playing the assigned character and developing one throughout the game allows the video game maker a certain degree of freedom and choice in forming one's personality traits. One's character in the virtual world of the video game and the real world is likely to be different because in the real world a person can fail to use the game controls in an effective way, thereby caus-

ing the actor to fail in one way or the other in the game. A person's values in the real world can also inhibit his or her character in the virtual world from performing tasks or visiting places in the game, which the real self may not allow. For example, in the game Arcunum, Gee (2004) says that his real self – especially his Catholic virtues – will not permit the female character in the game to visit the brothel, but game instincts can also lead one to go one's way. These limitations in the real world have to be overcome so that one becomes a good player. Gee (2004) also notes that one limitation of video games is that they do not reward but punish some of the most cherished ways of thinking.

The tripartite interaction of identities – a virtual identity, a real world identity, and a projected identity in the relationship of “player as a virtual character” – is quite powerful (Gee, 2004). The player transcends identification with characters in novels or movies, actively does things, and is reflective while making choices about the virtual character. Tapscott (1998) posited the following, arguing that for the first time in history the young youth are way again of their elders in shaping the use of a new technology.

Research has consistently shown that playing computer games produces quicker reaction times and improved hand-eye co-ordination and self-esteem. Driven by an embodied view of human cognition, educational technologists and learning scientists are striving to design learning experiences that promote multisensory processing, using technology as well as tangibles and manipulatives. A large spectrum of technologies based on novel interaction modalities ranging from multi-touch to virtual reality have been developed to enrich these learning experiences. These technologies aim to promote sensory engagement by offering new opportunities for physically interacting with objects and digital representations, highlighting the role of the body in interaction and learning (Marianna Ioannou and Andri Ioannou, 2020).

At this point we should mention the work of Hideg (2015; 2017, 2018, 2019a, 2019b, 2020b), who, with the spread of modern telecommunication devices and the increase in physical inactivity. The interesting thing about the study is that the opinions of young European, Kenyan, and Malaysian individuals on fair play are compared, and we also get a clearer picture of their interest in sports. The results from Kenya are highlighted in the study. She measured the behaviour of Kenyan youth in a variety of

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competitive situations. Based on her results, we can see that primary school students are more prone to fraud, and they behave more selfishly than students in higher education. This also indicates that video games could be good for students, but they must be handled with caution to reduce the negative side effects.

Digital games and the penetration of electronic mobile devices

Citizens of Sub-Saharan Africa have access to mobile services, accounting for 45% of the population (Sub Saharan Africa 2020 GSMA Report). The 2020 GSMA report further noted that the mobile market in the region will reach several important milestones over the next five years: half a billion mobile subscribers in 2021 and 1 billion by 2024, with 50% of the population having access to mobile services by 2025. This is an indication that videos games are still viable in the region and can be used for learning purposes

The Mobile Economy: Sub Saharan Africa 2020 GSMA Report (2019) indicated that 44% of the population has access to the internet in Africa. The report further noted that, the media and entertainment (M&E) industry in Sub-Saharan Africa is showing signs of digital disruption, prompted by rising mobile internet and smartphone adoption, a youthful population, and the increasing availability of local entertainment content. Over the last two years, a number of mobile operators have launched M&E services or partnered with third-party content providers to deliver online streaming content. Airtel Kenya launched a free video and music streaming app called Airtel TV in August 2020, while in July 2020 the video-on-demand (VoD) streaming service CineMagic partnered with Vodacom and MTN to deliver content on the operators’ mobile content platforms (Vodacom Video Play and MTN Play). Meanwhile, MTN is expanding its instant messaging service Ayoba to include gaming and media channels, and its streaming app MusicTime is now live in seven MTN markets across the region.

Young More Likely to Use Cell Phones for Texting, Taking Pictures or Video

Adult cell phone owners who used a cell phone in the past 12 months to ...

	Send text messages			Take pictures or video		
	18-34	35+	Diff	18-34	35+	Diff
	%	%		%	%	
Ghana	65	34	+31	62	33	+29
Senegal	84	56	+28	61	39	+22
Nigeria	89	67	+22	68	42	+26
Uganda	66	52	+14	51	20	+31
Tanzania	97	84	+13	62	41	+21
Kenya	93	83	+10	62	44	+18
South Africa	98	92	+6	69	51	+18

Note: All age differences are statistically significant.
 Source: Spring 2014 Global Attitudes survey. Q74a-b.

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Table 1. Use of mobile phone in Africa

Study Methods

Using a descriptive survey, the study targeted 30 primary school pupils, 40 high school students between 11-18 years old, and 20 trained teachers teaching in government schools in Nairobi County, Kenya. The primary school pupils attended school in Westlands Sub-County, Nairobi. The high schools students attended high school during the research and they were residents of Westlands Sub County for at least a period of three years before the study.

The study took place in July 2018 to August 2020. The teachers were trained teachers working in primary schools in Westlands Sub-County, Nairobi Kenya during the study period. The secondary school teachers were omitted from the study because of the diversity of their students.

The other condition for participating in the study was that each participant had to own a mobile phone or have access to a parent's or guardian's phone, iPad, laptop, or desktop to enable access to video games. The other electronic device which was acceptable for this study was a gaming console such as PlayStation. The other condition was that students had to still be in school to participate in the study, as dropouts were not allowed to participate. Data was collected using structured questionnaires for high school learners, focus group for primary students, interviews for teachers, and observations of both students and teachers. The various data collection methods ensured that necessary data was collected accurately and consistently.

The study also used content analysis of materials written in various times supporting the research, and researchers used descriptive statistics to analyze the collected data.

Study Findings

There was a response rate of 100% from the respondents. 95% of the respondents for both primary and high school learners met the requirement of having to own or have access to a family electronic device to participate in the study.

The study realized 80% respondents in both primary schools and high schools owned mobile phones for which are in their respective households. The primary school students indicated that they had access to their parents' or guardians' phones and other electronic devices available at home. The secondary school students indicated that they had access to their parents' or guardians' phones. The teachers indicated that they owned mobile phones and 20% had access to laptops and computers.

This is an indication that most learners and the teachers targeted were able to access video games on phones or other devices available to them. This was in line with the Pew Research Center a nonpartisan American think tank based in Washington report in (PEW, 2014), that posited that most of the young population in Kenya own mobile phones. The GSMA Report 2020 indicated that there are many partnerships between mobile phone providers and customers to provide the necessary resources for use of technology in education. Another noticeable partnership with mobile supplier and education was noted in July 2020 that involved the video-on-demand (VoD) streaming service CineMagic partnered with Vodacom and MTN to deliver

content on the operators' mobile content platforms (Vodacom, Video Play and MTN Play). All these partnerships have proved beneficial to the education sector.

Learning relies on three domains of education according to Bloom's taxonomy, including cognitive, affective and psychomotor domains. Teacher respondents realized that video games enable students to achieve all the three domains of learning. Video games, according to this study and teachers' responses, are capable of fitting in all the three domains and as other researches have indicated, video games assist young learners in developing social skills by providing a continuous interest in the games, which can be compared to sustained learning in school classrooms. This is in line with the findings of Gee (2004) on learning principles built into video games and Bloom's taxonomy.

The student respondents in both primary and secondary schools indicated that video games make talking and playing much easier, and they said using video games for learning purposes is an interesting concept to them that should be applied more in schools and homes because it gives them the opportunity to learn and interact out of the traditional classroom. In special needs education, teachers noted that some special needs learners enjoy video games just like mainstream students. Researchers have noted that learners with special needs require a variety of learning models, strategies, and devices to enjoy learning. In other scenarios, video games have been used to train people with multiple handicaps, such as severely limited vocal speech acquisition, by using scanning and selection responses. Other researchers have used video games to help learning disabled children develop their spatial abilities.

The teachers indicated that they have no issue with using video games for pedagogical purposes. This is corroborated with other findings that support the use of other devices including smart devices in learning. Kearney et al. (2018) had this to say about smart learning which relates to learning using electronic devices:

The promise of smart learning is that it returns control of learning to the student regardless of the context they are learning in. It increases their independence and enables them to feel more empowered which has not been evident in any of the previous technology paradigms (Kearney et al., 2018)

This study report indicated that, 74% of teachers with less than four years of teaching experience reported using videos as part of their classroom lessons and other class activities compared to 65% of teachers with 16 or more years of experience. Other studies have also indicated a greater percentage of use of video games by students in elementary grades. Marín-Díaz et al. (2019) in a study at the University of Córdoba, Spain carried out among pre-service teachers undertaking a degree in Primary Education noted that a number of factors determine the relationship of children, teenagers and young people with video games, one of them being the time dedicated to the game and participants also stated that the use of video games in the primary classroom can enhance behavior modification hence creating school coexistence.

The study found that students in kindergarten, first grade and second grade report even higher levels of game play (77). Students in high school are more likely to research and use video games that they find online themselves. Amongst those high school students, girls' search and use of video games (44) outpaces their male counterparts; only about one-third of boys (34 %) say that this is a regular activity they engage in. This data supports Bennet's (2008) findings that game play has no gender differentiation across all grade level, contrary to conventional wisdom.

Majority of respondent who were smart phone owners were in high school. This could be an indication that as school children mature they start owning phones, which they indicated they use for various purposes. Playing video games on their phones was one of the popular uses. About 55% of the high school respondent indicated that videos games in their phones are good for entertaining themselves and sharing learning materials. Primary school students use video games for entertainment, to kill boredom, and to learn new concepts. Teachers would give them a video game assignment to complete and they would write stories or give presentations to class on the game.

This reflects the situation on the ground as mobile phone market penetration in Africa is quite high. According to GSMA (2015), the mobile industry in Sub-Saharan Africa continues to grow rapidly, reaching 367 million subscribers in mid-2015. The study found that 30% of the teacher respondents did not understand the purpose and use of video games on their phones and didn't link the games to learning, but others understood the role of video games and made use of them in their teaching routines.

The findings of this study also indicated that young people spend about 65% of their time on mobile phones chatting, browsing, texting, playing video games, and calling friends

Disadvantages of video games

The respondents in this study indicated that, despite video games being popular among young children and adolescents, there are also some risks associated with them such as addiction, fatigue, fraud, and frustration. Video games can also lead to users wasting time and having conflict with friends if there are imbalances between winners and losers. These findings are supported by Hideg (2015; 2017, 2018, 2019a, 2019b, 2020b). Other studies have also shown that video games cause participants to become excited, which can result in motivation and individual skills. Videogame technology has rapidly changed across time. Therefore, video games are constantly being upgraded, which makes it difficult to evaluate their educational impact across studies.

Video games are also dangerous and 60% of the respondents indicated addiction associated with characters in the games. This is in line with the findings of Gee (2004) who argued that one limitation of video games is that they do not reward positive thinking and behavior but punish such attributes.

Especially among teachers, it was noted that video games could divert students' attention from the curriculum expectations to other spheres of learning. This is what

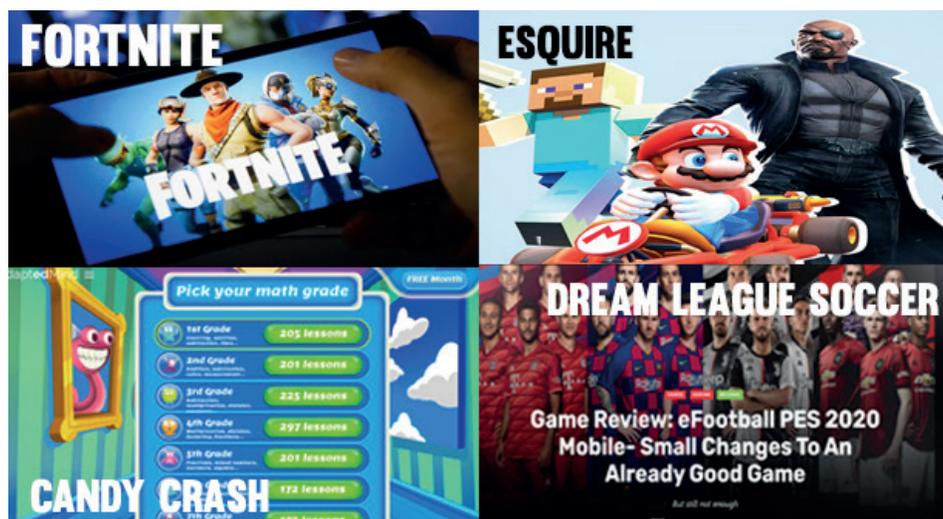
Prensky (2001) meant by the digital world itself being split between natives and incoming migrants. Video game experiences were entertaining, pushing students to become more innovative. Griffiths (2002) noted that video games may also enhance participant's performance and this can skew up results. Most teachers noted that some of the video games could be dangerous and harmful to the learners, leading to aggression.

See Figure 2 for sample of videos games found to be familiar with the student respondents in this study.

Conclusion

For learning to be affective and community-oriented, face-to-face instruction should be blended with digital tools that are available on mobile phones, such as video games. This allows students to learn independently and at their own pace, and to navigate their learning on their own. This helps in freeing up time for teachers to give students more individualized attention and to focus on more complex tasks. Video game proved to be effective in providing students an opportunity to explore the learning process within their own environment and at their own pace.

Some of video games used in this study could be incorporated into most schools subjects and courses, and they would fit into the student-centered Competency-based Curriculum (CBC) that educational leaders may implement in Kenya's education system in the near future. But first it must be determined which video games are most appropriate for educational purposes, and which games are not suitable. ✨



^ Figure 2. Sample of popular video games played among respondents during the research

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