Influence of Gamification on Students' Motivation, Attitude, Knowledge and Engagement in Sexual Health Education among undergraduate Adolescents in Awka, Anambra State

*[1]Sabina Nwakego Igwilo, [2]Nonye Ann Ujuagu, [3]Chioma Precious Alozie, [4]Ebele Nneka Anyaeji, [5]Christiana Ada Okoye

[1-5]Health Promotion and Public Health Education Department, Faculty of Education, Nnamdi Azikiwe University, Awka
*Corresponding author: sn.igwilo@unizik.edu.ng

Abstract

Modern learning strategies encourage students' engagement similar to what games can do, to improve their particular skills and optimize their learning. To address the demands of technology in the 21st century, sexual health education needs an effective, innovative pedagogy. This study investigated influence of gamification on students' motivation, attitude, knowledge, and engagement (MAKE) in sexual health education among undergraduates in Awka, Anambra state. The study employed quasi-experimental study design. The researchers experimented for three months with 40 100 level undergraduate students on gamification and another 40 undergraduates on traditional teaching strategy as control. 100 level undergraduate students of health promotion and public health education department of Nnamdi Azikiwe university at the time of this study were 80 in number, so the whole class were used. Three months of instruction on sexual health issues lasted for 60 minutes each week. Data analysis was done using mean and standard deviation for research questions and Analysis of Covariance (ANCOVA) for the hypotheses at 0.05 level of significance. There was a significant difference between the mean sexual health on motivation, attitude, knowledge, and engagement (MAKE) scores of adolescents in Anambra state exposed to gamification intervention and the control. $F_{(1,137)} = 480.215$, $p = .000 < 0.05$. The null hypothesis of no significant difference between the two groups was therefore rejected. The pre-test was used to establish the baseline students' motivation, attitude, knowledge, and engagement on sexual health education before the treatment. The post-test was used to determine the influence of gamification strategy after the treatment. Deduction from the entire findings proved that gamification has potential to boost motivation, generate skills required for positive attitudinal change, influencing the acquisition of the knowledge and raises awareness for engagement towards sexual health education. Health Education policy makers are therefore recommended to incorporated gamification strategy as a new teaching strategy for our adolescents since it increases engagement by incorporating game elements into an educational environment.

Keywords: Gamification, Sexual health, Motivation, Attitude, Knowledge, Engagement.

Introduction

Adolescents' unhealthy sexual behaviour is becoming alarming globally, and African nations are not left out (Hussein et al. 2018). Indeed, this has gained attention from academics in global public health that are looking for creative ways to encourage improved, healthier sexual outcomes. Adolescents experience physical, mental, and emotional changes during adolescence as a result of increased hormonal function. These biochemical changes make adolescents more vulnerable and enhance curiosity in sexual behavior (Walcott et al 2008).

Many young individuals are prone to dangerous sexual behaviors include having unprotected sex, polyamory, having underage sex, and going into situations where they could be sexually assaulted (Mlyakado, 2020).

Adolescent substance use, which influences unhealthy sexual behaviour, has been reported to be widespread and rising (Zimmerman et al., 2017). These behaviours have a negative impact on their long-term health, increasing their risk of developing Sexual Transmitted Infections (STIs) like HIV/AIDS, dropping out of school due to unplanned pregnancies, and developing the human papillomavirus (HPV), which increases the risk of developing cervical cancer (Makuza et al., 2015; Mlyakado 2020). According World Health Organization (WHO, 2010), adolescent is a person aged 10 - 19 years. They are commonly referred to as the "next" or "future generation" and they require protection and care, services, opportunities, support, and recognition (United Nations International Children's Emergency Fund [UNICEF], 2011). At this stage, curiosity about sexuality increases, they start showing sexual interest in opposite sex.

Adolescents can acquire the knowledge and skills they need to make safe sex-related decisions through sexuality education (Vanwesenbeeck et al., 2016). It can lessen the spread of false information while boosting critical thinking, communication, and self-assurance. These will influence young people to make wiser decisions regarding their romantic relationships. The year 2010 saw the development of comprehensive sexual health education and implementation techniques, according to World Health Organization (WHO, 2010). The acquired knowledge aids teens in lowering their propensity for unsafe sexual conduct.

To the best of the researchers' knowledge, there is still controversy around the delivery and use of sexual health education in settings with minimal resources. According to Vanwesenbeeck et al. (2016), developing nations, including Nigeria, are witnessing an increase in adolescents' irresponsible sexual behavior and its harmful health implications. Teenagers are more likely to engage in unhealthy sexual behaviour because they lack comprehensive sexual well-being information and abilities.

Most adolescents in sub-Saharan Africa (SSA) lack basic knowledge on sexual and reproductive health (Sani et al., 2021). For instance, the report on HIV AIDS in SSA from 2015 revealed that 37 per cent of new infections were among teenagers between the ages of 15 and 19 (Joint United Nations Programme on HIV/AIDS [UNAIDS]; 2016). Due to these worrying numbers, calls have been made for public health interventions to address the rising incidence of STIs (including HIV/AIDS) and other risky sexual behaviours as well as to enhance and execute initiatives for sexual health education (Sommer et al., 2015).

The suspected ineffective implementation of sexual health education in schools may be due to some factors, including instructors' reluctance to educate about sexual health issues and societal and cultural attitudes that forbid free conversation (Sani et al., 2021). The teacher controls a large portion of the intellectual work in this traditional classroom setting. The majority of the learning is pre-packaged by the teacher, who also plans the scope and method (Owusu, 2015).

Additionally, the commonly used traditional teaching methods now in use do not promote the efficient delivery of sexual health education (Haruna et al., 2018). Adolescent protection may be aided by sexual health education that is practicable. This study is developed to influence Students' motivation, attitude, knowledge and engagement on sexuality education where adolescent sexual behaviour issues are on the rise and are linked to teen pregnancies and extremely dangerous chronic illnesses. Motivation describes why a person does something. It is a driving force behind human actions. An attitude in this research work means a manner of acting, feeling, or thinking that shows one's disposition, opinion, etc. Knowledge is fact information, and skills acquired through experience or education; theoretical or practical

understanding of subject. Engagement in this context means when one becomes involved with someone or something in order to understand them.

It has been discovered that modern educational tactics are among the invention that effectively facilitates behavioural transformation and knowledge acquisition. Thus, the development of interventions / strategies involving the use of "educative games" could help sexual health education as information technology (IT) in health advances (Eleftheriou et al, 2017).

The attractiveness, confidentiality, and convenience of various games in sexuality health education have been noted as being desirable to adolescents, who can escape the awkwardness or monotony of talking about the topics with teachers or health promotion specialists (Carswell et al., 2012). Researchers have identified eight qualities to take into account when creating games that effectively teach sexual health: Personalized content, goal-setting, a narrative or storyline, audio-visual effects, and interactivity are just a few examples. According to Arnab and Clarke (2017), using games to learn about sexual health can also boost cognitive growth, raise awareness, and incite behavioural change. Playing games to learn is private by nature, thus encouraging teenagers to openly address sexual health issues (DeSmet et al., 2014). As a result, it is appropriate even in societies such as Africa where discussing sex in public is frowned. Adolescents are able to quickly receive, transfer, and retain the targeted knowledge when sexual health education is presented through games (Jiang et al., 2021). The learner is required to participate in a variety of demanding learning activities (thinking exercises, tests, competitions) that promote cognitive growth of skills including reasoning, problem-solving, decision-making, recall, and evaluation.

In game-based learning (GBL), learning activities use game elements and principles. It is the use of any game-based strategy created with learning rather than amusement as its primary goal (Noem & Máximo, 2014). The GBL is one approach that is simple to apply in a classroom setting. Empirical researches have demonstrated the potential of GBL for adolescent sexual health education (Hieftje et al., 2013). The use of digital game technology to teach today's digitally savvy teenagers about health has enormous promise. Digital health games improve participation and create a more engaging learning environment. Additionally, they provide useful skills through experiential education that may be applied in the actual world (Hieftje et al., 2016). They are great for learning because they are repetitious. The games give the learner rapid feedback, which is quite helpful (Hieftje et al., 2013). A growing number of people are interested in creating digital health games for sexual health education and analyzing their results (Baranowski et al., 2015). Adolescents' sexual behaviour has been proven to change in response to digital health game interventions.

Some have concentrated on preventing the spread of HIV/AIDS (Hieftje et al., 2016), others on preventing the spread of Chlamydia and other STIs, others on promoting human papillomavirus (HPV) vaccinations, and still others have aimed to do away with coercion and pressure in adolescent relationships (Arnab et al., 2023). Although GBL has demonstrated significant potential for sexual health education, little is known regarding its use and efficacy in the setting of the study (developing countries, which have limited resources). Much is still needed to improve participation and create a more engaging learning environment.

Gamification is the process of applying game mechanics and digital game design strategies to real-world issues with a social impact. In order to engage students, motivate activities, improve learning, and solve problems, it involves applying digital game concepts in a non-gaming situation (Kapp, 2020). For instance, game mechanics are easily accessible on the Moodle learning platform, which is not a gaming environment. Points systems, leaderboard positions, badges, trophies, achievements, competitions, and levels are typical game mechanics (Dicheva et al., 2015). In the context of learning, gamification could be used for

the following purposes: storylines that change the context of a particular activity; the creation of social competition; and the supply of incentives, such as badges and rewards, that stimulate behavioural change (Hanus & Fox, 2015).

It is the application of digital game mechanics in a non-gaming context for the purpose of engaging learners, motivating activities, enhancing learning, and solving problems (Kapp, 2012). Gamification has potential for educating adolescents about their health (Edwards, et al, 2016). It might be successful in promoting student involvement, which is crucial for influencing the acquisition of the knowledge and skills required for attitude and behavioral transformation. It provides chances for pupils to be motivated, interested, and having fun while studying (Behnke, 2015). A cutting-edge learning strategy called gamification has the potential to improve the effectiveness of sexual health education. For instance, a 2013 study by Schoech et al. found that game mechanisms can significantly reduce teen sexual and romantic violence. Another empirical study (Zhang, et al., 2017) showed that gaming's components have a major impact on STIs and an HIV campaign that reached a sizable community of young adults. Although gamification has demonstrated significant promise for sexual health education, little is known regarding its use and efficacy among adolescents in Anambra State, Nigeria. The suspected ineffective implementation of sexual health education in schools is still a problem to adolescents' sexual health behaviour. This research tries to fill that gap.

Purpose of the Study

The purpose of the study was to investigate the effectiveness of Gamification on Sexuality Health Education for In-School Adolescents in Anambra State. Specifically, the study determined the:

1. mean engagement scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group;
2. mean motivation scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group;
3. mean knowledge of adolescent sexual health education before and after exposure to gamification intervention and those in the control group; and
4. mean attitude scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group.

Research Questions

1. What is mean engagement scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group?
2. What is mean motivation scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group?
3. What is mean knowledge of adolescent sexual health education before and after exposure to gamification intervention and those in the control group?
4. What is mean attitude scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group?

Hypothesis

One null hypothesis guided the study and was tested at .05 level of significance.

1. There is no significant difference in the mean motivation, attitude, knowledge, and engagement scores of adolescents' sexual health education in Anambra State before and after exposure to gamification intervention and the traditional method.

Methods

Study setting, design and population

The population of this study consisted of eighty undergraduate adolescent (male and female) of health promotion and public health education department, Nnamdi Azikiwe University, Awka, 100 level students precisely. The total population was used as the sample size for the study, an intact class. Forty students were exposed to gamification and forty for control group.

The study employed a pre-test post-test quasi-experimental design, comprising of one experimental group and one control group to investigate the influence of gamification on Sexual Health Education of undergraduate Adolescents in Anambra State. Undergraduate sstudents in the two groups (experimental and control groups) were exposed to the same topics of sexual education but in different ways, game-based method and traditional teaching method. This lasted for a period of six weeks. Traditional method here is the usual lecture method of teaching and learning.

This type of design allows the principal and co-investigators to control the assignment to the treatment. The instruments for data collection were self-structured instruments known as motivation, attitude, knowledge, and engagement (MAKE) questionnaire. The MAKE questionnaire consisted of 20 multiple choice questions with options A-E with only one correct answer, which was used to assess sexual health of the students. The face and content validity of the instruments were established through the judgments of three experts. To ascertain the reliability of the instrument, a test re-test was conducted for internal consistency of the instrument using 10percent of the projected sample size (10 students) from Anambra State university, Uli. The data from the test-retest was statistically analyzed using the Kuder-Richardson, K-R-21 and the value obtained was 0.82.

The research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The pre-test was used to establish the baseline on students' motivation, attitude, knowledge, and engagement on sexual health education before the treatment. The post-test was used to determine the influence of the gamification teaching method after the treatment.

Description of the design of the study

Groups	Baseline data (2 weeks)	Intervention (12 weeks of sessions)	Measurement Post-Test intervention	Impact evaluation (3 months)
Control group	O	O	O	O
Experimental group	O	X	O	O

Where O = Observed
        X = Experiment

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Results

Table 1: Pre-test and Post-test mean engagement scores of the adolescents' sexual health education before and after exposure to gamification intervention and those in the control group

Source of Variation	N	Pretest $\overline{X}$	SD	Posttest $\overline{X}$	SD	$\overline{X}$ Difference
Gamification Strategy	65	59.77	14.02	95.26	3.87	35.49
Control Group	75	64.00	11.72	68.21	11.89	4.21

Table 1 reveals the pre-test and post-test of the engagement influence mean scores of the undergraduate adolescents' sexual exposed to gamification method to be 59.77 and 95.26 with a gained mean of 35.49 and SD of 3.87, while those in the control group had 64.00, 68.21, 4.21and 11.89 as mean pre-test, post-test, gained mean and SD scores respectively. Both the post-test mean scores and gained mean scores of adolescents exposed to gamification were greater than that of those in the control group.

Table 2: Pre-test and Post-test mean motivation scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group

Source of Variation	N	Pretest $\overline{X}$	SD	Posttest $\overline{X}$	SD	$\overline{X}$ Difference
Gamification Strategy	41	57.56	13.53	94.83	4.02	37.27
Control Group	49	33.55	9.94	67.27	10.54	3.72

Table 2 shows the pre-test and post-test motivation influence mean scores of 57.56 and 94.83 for undergraduate adolescents' exposed to gamification strategy. On the other hand, the motivation impact mean scores at control group are 33.55, 67.27 and 10.54 as their pre-test, post-test, gained mean and SD scores respectively. This shows that the gained mean scores of adolescents exposed to gamification were greater than those of their counterpart in the control group.

Table 3: Pre-test and Post-test mean knowledge of adolescent sexual health education before and after exposure to gamification intervention and those in the control group

Source of Variation	N	Pretest $\overline{X}$	SD	Posttest $\overline{X}$	SD	$\overline{X}$ Difference
Gamification Strategy	39	62.77	13.24	95.69	4.14	32.92
Control Group	53	35.36	11.60	39.58	3.38	4.22

In Table 3, the analysis shows the pre-test and post-test knowledge mean scores of the undergraduate adolescents' sexual health education before and after being exposed to

gamification intervention as 62.77 and 95.69 and SD of 4.14 while the control group had 35.36 and SD of 3.38 as their pre-test, post-test, gained mean and SD scores.

Table 4: Pre-test and Post-test mean attitude scores of the adolescent sexual health education before and after exposure to gamification intervention and those in the control group

Source of Variation	N	Pretest $\overline{X}$	SD	Posttest $\overline{X}$	SD	$\overline{X}$ Difference
Gamification Strategy	65	58.72	8.28	68.83	8.04	10.11
Control Group	75	58.99	6.69	66.32	6.26	7.33

Table 4 reveals the pre-test and post-test attitudinal influence mean scores of undergraduate adolescents' sexual health education before being exposed to gamification intervention to be 58.72 and 66.83 with a gained mean of 10.11 and SD of 8.04 while those in the control group had 58.99, 66.32, 7.33 and 6.26 as mean pre-test, post-test, gained mean and SD scores respectively. Both the mean post-test score and gained mean score of adolescents exposed to gamification were greater than their counterparts in the control group.

Table 5: ANCOVA Summary of the influence of Gamification intervention and those in control group on motivation, attitude, knowledge, and engagement (MAKE) Mean Sexual Health Knowledge Scores of Adolescents Exposed to Gamification intervention and that of Control Group

Source	SS	Df	MS	F	P
Corrected Model	28929.983	2	14464.991		
Intercept	18917.096	1	18917.096		
Pretest	3454.438	1	3454.438		
Group	27911.030	1	27911.030	480.215	.000
Error	7962.703	137	58.122		
Total	950256.000	140			

Table 6 shows that there was a significant difference between the mean sexual health on motivation, attitude, knowledge, and engagement (MAKE) scores of adolescents in Anambra state exposed to gamification intervention and the control group. F, $(1,137) = 480.215$, p = .000 < $P<0.05$. The null hypothesis of no significant difference between the two groups was therefore rejected.

Discussion

The finding in table two reveal that the engagement influence mean scores of the adolescent sexual health education exposed to gamification method were greater than those exposed to control group (traditional method), 35.49 and 4.21 respectively . This is because the adolescents of these day spends more time with their mobile telephone playing one game or the other and so they are more engaged with phone. Therefore, anything that tilt toward playing game will keep them busy as well. This is in line with the work of Hieftje, et al., 2013 which have demonstrated the potential of GBL engagement for teenage sexual health education. Concisely, engaging in health education through game will definitely increase their knowledge and in turn develop a positive behaviour towards sexual health.

Table 3 reveals the test motivation influence. Motivation influence mean scores of adolescents exposed to gamification were greater than those of their counterpart in the control group with mean differences of 37.27 and 3.72 respectively. This is to say that learning through playing game will motivate them to learn more, therefore exposing them to sexual health knowledge for better sexual healt behaviour. This is in line with the work of Arnab and Clarke (2017), using games to learn about sexual health can also boost motivation, cognitive growth, raise awareness, and incite behavioural change.

In Table 4, the analysis shows the knowledge mean scores of the adolescent sexuality health promotion before and after exposure to gamification intervention as 62.77 and 95.69. While the control group had 35.36 and SD of 3.38 as their pre-test, post-test, gained mean and SD scores respectively. This is line with work of Jiang, et al, 2021 that opined that adolescents are able to quickly receive, transfer, and retain the targeted knowledge when sexual health education is presented through games.

Finally, Table 5 reveals that the attitudinal influence mean scores of adolescents sexuality health promotion before being exposed to gamification intervention to be 58.72 and 66.83 with a gained mean of 10.11 and SD of 8.04 while those in the control group had 58.99, 66.32, 7.33 and 6.26 as mean pre-test, post-test, gained mean and SD scores respectively. Both the mean post-test score and gained mean score of adolescents exposed to gamification were greater than those of their counterparts in the control group. This imply that indecent attitudes toward sexual behaviours as well as STIs will drastically reduce because of positive attitudinal changes in sexual health of adolescents.

The overall findings showed that the participants who used the gamified environment had a higher mean gain scores than their counterparts in the control group. This is in line with the work of Kapp, 2020 which said that in order to engage students' motivate activities, improve learning, and solve problems, it involves applying digital game concepts in a non-gaming situation.

Implications of the Study

The study implies that gamification provides chances for pupils to be motivated, interested, and having fun while studying (Behnke, 2015). Undergraduate adolescents are therefore advised to be using gamification teaching approach as their tools to interact with sexual health learning content in a way that will fosters habits that prevent imprudent sexual behaviour (the outcome).

Conclusion

Deduction from the entire findings proved that gamification has potential to boost motivation, generate skills required for positive attitudinal change, influencing the acquisition of the knowledge and raises awareness for engagement towards sexual health education. It might be successful in promoting student involvement, which is crucial for influencing the acquisition

of the knowledge and skills required for attitude and behavioural transformation towards sexual health education.

Recommendations

Health Education policy makers are therefore recommended to incorporated gamification strategy as a new teaching strategy for our adolescents since it increases engagement by incorporating game elements into an educational environment. This is to generate levels of involvement equal to what games can usually produce.

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