Multidisciplinary International Journal of Research and Development
Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

Appraisal of MATFOSC Game Model on Mathematics for Science Achievement Among Higher Education Science Students

ISYAKU Amina[1], AROWOLO Jacob Gbemiga[2], ALAGBE Simeon[3], & AWOYALE Olusegun[4]

[1,2]Integrated Science and [3,4]Mathematics

[1,2,3,4]Federal University of Education, PMB 39, Kontagora, Niger State Nigeria

Email: arowologbemiga1@gmail.com

Abstract— The introduction of noble and plausible bustle which people love to do into the learning environment is believed, can strengthen critical thinking, intellectual self-assurance and manpower development. This underpropped the appraisal of MATFOSC Game model for enhancing higher education students' learning outcomes on a science course. 300 new intakes of 100 level students' randomly selected from Integrated science department in 3 Colleges of Education participated. Two instruments CSRQ and SRS developed and validated with reliability indices of .77 and .83 respectively were used for data collection. 2 research questions and 1 hypothesis were answered and tested respectively with Chi-square and t-test statistical tools. Results showed that MATFOSC Game model did stimulate instructional strategy as well as help overcome mass failure and goal fulfilling. It was therefore recommended among others that the use of MATFOSC Game should be applied for self-assurance by science students' in all courses in tertiary institutions as well as playing MATFOSC Game should follow an arrangement that enhances extrinsic and intrinsic motivation.

Keywords— Attitude, Game, Learning environment, Players, Self-assurance.

INTRODUCTION

Students of diverse age brackets participation in science courses is increasing internationally. Research findings about students' beliefs on scientific knowledge revealed a multiplicity of individual differences. While some students have a realistic view of science and recognize the relationship between scientific knowledge as well as the complex scientific problems, others believe that the best way to learn science was to memorize rather than to understand (Bamiro, 2006). Equity and effectiveness go hand in hand in science courses. To teach science effectively therefore to students in institutions of higher learning, courses ought to:

- emphasize understanding, not memorization.
- respect for students' ideas rather than labeling them as misconceptions and
- impart a view of science as dynamic rather than static.

Thus the need to extend learning opportunities over the whole life span and the need for new skills become crucial but pose challenges that are not easily met by conventional structures and institutions. This assumption culminated into redefining teachers' role from being the sole source of knowledge to being facilitators of knowledge instead; and the active students' involvement in activities that attract their attention as well as motivate them. Global innovations in technology had pop-up attentions that prompted the need to place premium responsiveness on the use of Information Communication Technology (ICT) in instruction as a relevant and functional way of providing education to learners that could assist in implanting in them the required capacity for the world of work. This has been observed most often nowadays to have made students become lackadaisical in their study due to much reliance on artificial intelligence embedded in ICT.

The skill of instruction on either pure or applied sciences emphasizes a humanistic, experiential and constructivist approach to teaching and learning, and integrates a wide variety of pedagogical tools. It is imperative therefore to encourage students especially at the tertiary level to construct ideas about science teaching and learning through their interactions with peers, mentors, and instructors, and through hands-on or minds-on or even hearts-on activities designed to foster a collaborative and thoughtful learning environment. The foregoing among others invariably revealed established and convincing evidences that called for critical re-examination of the processes involved in the teaching and learning of Integrated Science courses as done in other fields of science with the application of games in tertiary institutions in Nigeria.

Like any medium, games act as channels of communication with varying effects with respect to the content of the game. The British Journal Nature that reported researchers' findings in 1998 captioned document which emphasized absolutely that the brain releases dopamine which is a pleasure chemical during video game play. It is ever known that games are not without mental or physical context when played according to rules. Games are usually played for fun, but they can also provide admirations, excitements, challenges, relaxations, satisfactions and tolerance. Different games can help individuals who play them to develop mental, physical and social skills.

Studies have revealed persistent manifestation of pupils' anxiety throughout Mathematics class and tests (Nonyelu & Anikweze, 2013), which has led to annual increase in the number of students failing the subject on a large scale (Musa, Mamudo, Mohammed & Audu, 2022). The usual back-up explication has been the incapacitation of mathematics teachers to employ appropriate instructional facilities when imparting knowledge based on the curriculum contents. As part of effort to providing a succor for teachers, the potential of Codice video game for mathematics education in Nigerian classrooms was explored by Ogundele (2021). Mathematics, been an essential and prerequisite language of science subjects demands that learners develop a genuine background for the comprehension and application of its ideas and skills to succeed in the present day rapidly evolving technological environment. This provided a report on the efficacy of ludo game by Sam-Kayode and Salman (2015). To play a game, player may need a good memory, physical ability or an understanding of probabilities – a Mathematical brain-raking phenomenon. Games may also require skills at guessing what engaging players think or an ability to visualize changing patterns of fragments on a board.

GAME THEORY

Game theory is a branch of mathematics that studies strategic decision-making in areas like: economics, international relations, moral philosophy, political science, social philosophy, sociology and biology. By incorporating game-theoretic concepts, such as strategic games and puzzles, teachers can create a competitive and cooperative learning environment (Kelly, 2013); the classic "Prisoner's dilemma" highlights and summarizes a conflict between individual and group interests that lies at the heart of many important real-life situations.

Decisions about paying or evading taxes, protecting the environment or acquiring nuclear or destruction of chemical weapons generally or embellishment in suicide bombing as with Boko haram as well as human trafficking or its kidnapping menace equivalent by bandits in Nigeria particularly may reflect the tension between what is good for the decision maker and what is good for the group.

Game theory promotes problem-solving skills, essential for mathematical development as portrayed by "Traveler's Dilemma" game which requires students to apply mathematical concepts, such as probability and optimization, to win the game (Basu, 2007). By solving game-theoretic problems, students eventually develop critical thinking, analysis, and decision-making skills, transferable to various mathematical contexts. Game theory encourages collaboration and communication among students, fostering a sense of community in the classroom. Cooperative games, like the "Ultimatum Game," promote negotiation and mutual understanding, while competitive games, like "Rock-Paper-Scissors," encourage strategic thinking and adaptation (Poundstone, 1992). By working together to solve game-theoretic problems, students attain the capability to develop essential teamwork and communication skills. "Auction Game" illustrates the concept of bidding strategies, relevant to economics and finance (Krishna, 2010). By exploring game-theoretic applications, students can connect mathematical concepts to practical scenarios, enhancing their understanding and appreciation of the subject.

The main features of a game in educational delivery are: presence of fixed number of players, goal achievement and rule compliance. Abdulsalam and Arowolo (2010) identified among others the following as the role of games as instructional devices in learning environment:

- Games have powerful motivating effect that fulfills a function that may be missing in the classroom.
- Games give the classroom a different feel of atmosphere.
- Games allow students (young and old) to learn by themselves.
- Games help to free the teacher from the task of disciplinarian judgment of students' performance.

In the light of the foretasted, a MATFOSC game was designed, applied and efforts were made to appraise its effectiveness in the teaching and learning of some concepts in a course by students who were enrolled into Integrated science department in selected Colleges of Education in the North central zone of Nigeria.

THE PROBLEM

Studies that analyzed the efficacy of didactic models have highlighted the necessity of active students work in different disciplines. Didactical games in mathematics, interactive computer programmes learning and videogames among others have been proposed in addition to specific methodologies. Innovative though these approaches seem to be, they result in violence, hostility, aggressive behaviour, addiction as well as immorality in some way.

This study conceding yet the crucial role of games in active participation of students in any learning environment, the design as well application of a MATFOSC game and the appraisal of its efficacy in learning outcomes enhancement of Integrated science students in Colleges of Education was carried out in Colleges of Education in the North central of Nigeria.

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

COURSE DESCRIPTION

The principal objectives for preparing college science students in Nigeria among others are to enable students gain insight into the concept of the fundamental unity of science, instilling in them a commonality of approach to problems of a scientific nature, developing in them (teacher-to-be) the ability to impart and encourage in their pupils the spirit of inquiry into living and non-living things in the environment, developing the ability and motivation in students to work and think in an independent manner as well as enabling students carry out scientific investigations, by emphasizing cooperation, development of appropriate written as well as oral communication skills.

The course considered in this study is known by a code as ISC 121 and title being "Mathematics for Science II". It is a 1 credit compulsory course. It is all about the application of graphs to summarize any given scientific findings.

It covers such concepts as graphs and forms, variables and scales for graph plotting, slope and intercept on a linear graph, standard linear form, forms of common plots, slope of a tangent to a curve, geometry and trigonometry, rate of change, area under the curve as related to integration, and histograph plots.

The course was expected as others to be activity-based for which students ought to be able to handle materials, design experiment to generate data by using variety of materials, busy engaged in translating data to graphs and estimating by calculation a variety of values of importance, discussing their work with one another and the teacher as well as ensure deciding out for themselves what to do, from step to step and not relying on others to be told what to do.

As part of the cardinal requirements to achieving success in the course, the teaching and learning processes were assumed to be tailored towards making the learners take the miniature in suggestive manner what to do and how to set out resolution(s) about it. They were expected to try out ideas to see what could be the result.

They could as well try different ways of approaching a problem or use specific instruments for aiding observation as well as measurement in addition to devising and applying tests to find out what things will do and to crown it all, have workshop experience and practice.

These requirements bring to mind the significance of Vygotsky social learning theory as enumerated by Arowolo (2012) in his study on the "use of two conceptual change strategies on students learning outcomes" that learning is viewed as an active process where learners develop the ability to discover principles, concepts and facts for themselves, hence the importance of encouraging guesswork and intuitive thinking in learners.

The theory highlights the convergence of the social and practical elements in learning by stressing that the most significant moment in the course of intellectual development occurs when speech and practical activity, two previously completely independent lines of development, converge.

Through practical activity a student constructs meaning in an intrapersonal level, while speech connects this meaning with the interpersonal world shared by the students and the culture of the immediate environment.

MIJRD Multidisciplinary International Journal of Research and Development
Multidisciplinary International Journal of Research and Development
Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

METHOD

A pretest posttest quasi-experimental design was adopted. Basically 100 level Integrated science students who offered ISC 121 from the 10 colleges of education in the North central of Nigeria formed the target population. 2 Federal and 1 State Colleges of Education that adopted the minimum academic standard content on mathematics for science courses were randomly selected (Dunn, 2001) and assigned into MATFOSC Game model and the lecturing method as control respectively.

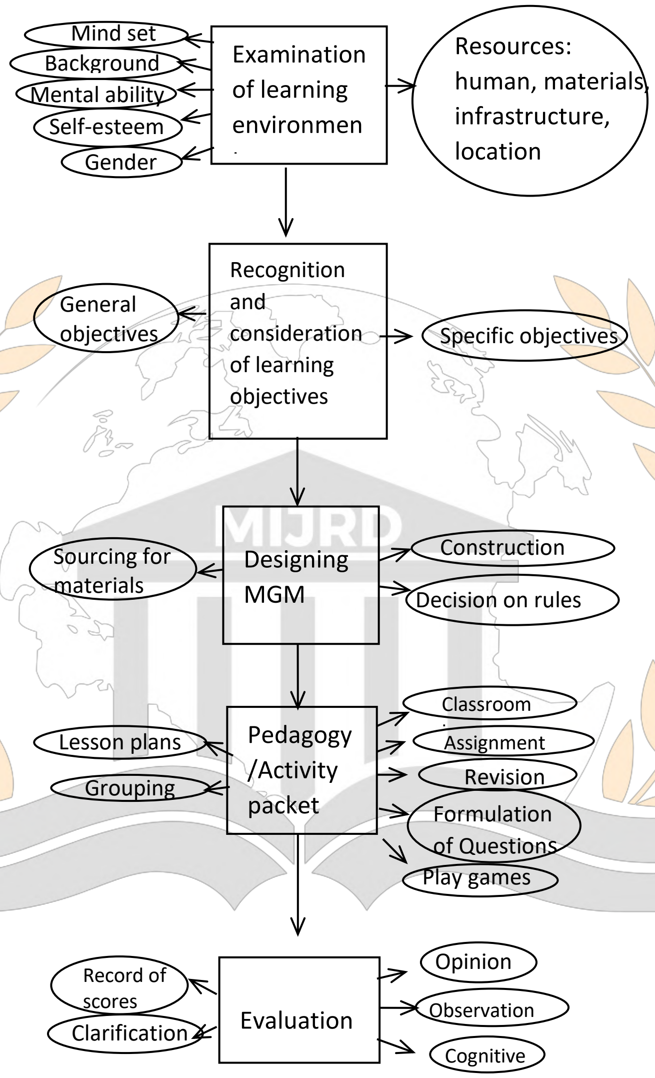

Fig.1: Chronology of procedure for MGM Application

MATFOSC GAME MODEL

Experiences have shown that the translation of one's views into practice is a predictor of a variety of contextual and personal factors (such as classroom management, constraints of the curriculum, time, concerns for students' motivation and ability) on the one hand and the teaching experience on the other. Scientific knowledge is tentative or subject to change and revision. This is what MATFOSC Game Model (MGM) stands to establish. The 5 stages of activities involved in MGM were meant to help students build better scientific view of science concepts as indicated in figure 1.

MIJRD Multidisciplinary International Journal of Research and Development

Multidisciplinary International Journal of Research and Development

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

The perceptions thereof however, could not alone provide an empirical evidence for the adequacy of the model. As a result, the researchers prepared two different instruments due to time constraints to test the anticipated effectiveness of the model.

PROCEDURE

A lecture scheduled on each concept is taught by the lecturer and students form groups comprising of 6 members each formed through balloting by picking a number ranging from 1 to 6, 5 minutes to the end of the lesson.

All students are given assignment that would cause them to do some revisions individually. Members of any group who pick numbers 1 to 4 automatically become the first set of players while the other two with 5 and 6 are the umpires (U) 1 and 2.

All members of a group must have prepared at least 20 tasks from their individual revisions of the concept(s) on the course on a sheet of paper.

One of the first set of players starts by throwing the dices on the board to necessitate the movement of the first tally out of home through the cells.

Once a player is able to move all her/his three tallies into their destination that marks the end of the round.

The first two members who play the role of the umpires would automatically be numbers 1 and 2 at the next round of play while numbers 3 and 4 assume the role of the umpires. This same rule applies for the third round in which case members with numbers 1 and 2 take over the umpire functions.

The umpires use the tasks on them alternately when a tally from a player lands on a number in the cells on the board one after the other in order of numbering.

Each of the players picks a home and takes turn to play by throwing the dices on the plane surface of the MATFOSC Game board.

A player can only move one of the tallies out from home by rule when at least one of the dices shows 1 dot face-up and moves from there forward with surplus dots on the other dices.

In the course of moving, if a tally lands on a number, the umpire in possession of the questions takes turn to ask the question.

The player is expected to respond verbally to the question. When this is scored correctly, it is recorded as credit to the player that gets it right.

If the question is on red cell and the player gets it right, she/he scores 5 marks; if on blue, the player scores 3 marks; if on green, 2 marks and on cells with number without colour, 1 mark. If, however the player could not give a correct response to a question, and her/his tally lands on red, she/he returns the tally home as penalty; if on blue and unable to answer the question correctly, the tally is moved 5 steps backward; if on green and the response is wrong, the tally is moved 2 steps backward and if on no coloured cell but with number and no correct response is made, the tally is moved 1 step backward.

MIJRD Multidisciplinary International Journal of Research and Development

Multidisciplinary International Journal of Research and Development

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

If the backward movement of the tally necessitates its landing on a number, the procedure applies (ie a question is asked and a correct response is anticipated alongside the reward or otherwise if scored or otherwise respectively).

Once a question has been answered correctly, it is not repeated again. The scores of each player are recorded on a piece of paper by the umpires and are summed at the end to determine their placements. This record is taken to the class.

MATFOSC GAME BOARD

Fig 2: MATFOSC Game Board with complete Accessories for playing (Field work, 2024)

INSTRUMENT

The learning prerequisite for the group that played game was for the students to gather materials and construct a board under the guidance of the course lecturers, then study the rules and form groups for them to participate in playing the game leisurely having learnt a concept. Two instruments: College Students' Response Questionnaire (CSRQ) and Success Rewarding Evaluation (SRE) were drafted. CSRQ was a 20-item statements with four different opinion options: a, b, c and d from which participants were to choose the most appropriate; it measured participants' attitude towards the teaching and learning of a science course.

Success Rewarding Scale (SRS) contained 8 short structured questions drafted by the researchers based on the course contents with mixed up fill-in-the-gaps as well as alternative to practical test for 30 marks; tested the overall understanding of the course contents with respect to students' acquired ability in description, calculation, application, recall, understanding, analysis and drawing. The instruments were administered at the beginning and at the end of the course lecture hours in the second semester of the 2023/2024 academic session.

VALIDATION OF INSTRUMENTS

CSRQ made up of 30 items was presented to experts: one science lecturer in a University in the South West of the country, a Psychologists on item construction and aa expert I the field of Game for face, content and construct

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

validity and its suitability. Their remarks necessitated the reduction of the items to 20. The inter-rater scores obtained from them were tested for the reliability of the draft through Scott's π which yielded 0.83.

SRS also made up of 25 items was made available to two University dons for moderation relative to the content and construct validity and based on their comments, 20 items formed the final refined draft which was trial tested on 20 Science Education students selected from among those who offered a General Study in Education (GSE) Mathematics course. The data obtained from the trial test were process for its difficulty index which gave 0.48 while the reliability coefficient was 0.77 using KR 20. Both instruments were administered at the beginning and at the end of lecture hours on the course (ISC 121) for both the group that applied MATFOSC Game and thought by lecture method only as control.

RESULTS AND DISCUSSIONS

Research question 1: To what extent does students' participation in MATFOSC Game stimulates instructional strategies?

Table 1: Frequency of students Participation in MATFOSC Game to stimulate strategy

Participants	**Week**												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Female	5	8	22	36	43	70	77	90	92	90	92	93	92
Male	11	20	35	44	59	72	78	87	90	94	96	95	95

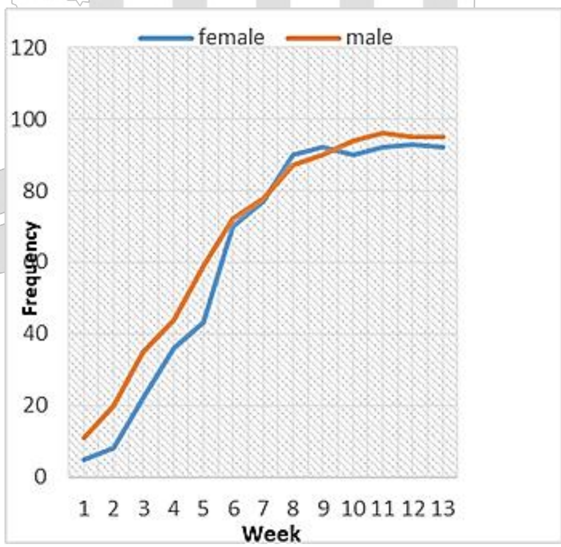

Fig. 3: Weekly Participation of students in playing MATFOSC Game.

Table 1 reveals the level of participation of the students in MATFOSC Game for the semester. Plotting the frequency of participation against weeks in the semester, the ogive (fig. 3) reveals that the male students participated more in playing the game early in the semester up to the seventh week after which a disordinal interaction was noticed at which level the female students displayed a competitive interest in the game. The level of participation in MATFOSC Game between both sexes reached the climax as the semester matured. This level of participation was

MIJRD Multidisciplinary International Journal of Research and Development
Multidisciplinary International
Journal of Research and Development
Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

sustained till the end of the semester. It is the characteristic of every logistic growth curve as the type depicted by the graph in figure 3 to slow after a phase of rapid increase and flattens as the carrying capacity is reached. This is the beauty in variations observed in the interactions among the students in the course of playing MATFOSC Game in ISC 121.

The Sigmoidal-growth curve depicted by the data used for plotting the graph (fig 3) is an indication that the students came to realize that playing MATFOSC Game could influence their socialization and provides a convenient medium of interacting with colleagues to ensure easy means of boosting individual understandings freely without fear of intimidation or molestation. It equally revealed the fact that the game strengthened the means through which the students could recall basic concepts in the course. The scenario could have been enhanced unconsciously through collaboration latently intervening in the course of playing the game and which compelled the students to collectively acquire communicative learning skills.

Research question 2. To what extent could MATFOSC Game Model assist in overcoming mass failure in learning Integrated science?

Table 2: Chi-Square of overcoming Mass Failure through MATFOSC Game Model

MATFOSC Game vs Overcoming Mass Failure	**Value**	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	153.774a	265	.020
Likelihood Ratio	129.463	265	.262
Linear-by-Linear Association	.014	1	.906
N of Valid Cases	200		

Chi-Square Tests				
MATFOSC Game vs Overcoming Mass Failure	Value	Df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	153.774a	265	.020	
Likelihood Ratio	129.463	265	.262	
Linear-by-Linear Association	.014	1	.906	
N of Valid Cases	200			
Symmetric Measures				
		Value	Approx. Sig.	
Nominal by Nominal	Phi	1.240	.020	
	Cramer's V	.620	.020	
N of Valid Cases		200		

Table 2 reveals a higher X2 value about students' capability to overcoming mass failure in learning concepts in ISC 121 due to playing MATFOSC Game ($x2 = 153.744$; $df = 165$ at $\alpha = .020$). This gave a test for goodness-of-fit that the observed data did departed from the expectation of no difference across the categories. The Phi coefficient of

MIJRD Multidisciplinary International Journal of Research and Development

Multidisciplinary International Journal of Research and Development

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

1.240 which is higher in value than 1 indicates a greater degree of association between the variables, in this case MATFOSC impacted much on students' capability to overcoming mass failure in ISC 121.

Hypothesis One: MATFOSC Game can fulfill goal and less frustrating

Table 3: t-test on MATFOSC Game Goal Fulfilling and Less Frustrating Nature

Event	N	$\bar{x}$	SD	t (P)	df	Sig	Remark
MATFOSC GAME	**200**	**67.72**	**.876**	**21.312**	**298**	**.003**	**S**
CONTROL	**100**	**32.42**	**.233**				

The result on table 3 also reveals a significant mean difference on the goal fulfillment and non-frustrating nature of MATFOSC Game compared to the activity-based approach on students ameliorated achievement (t = 21.312; df = 398 at P > .05). The anticipated came to the fore with this result such that it is possible to arrogate this improvement to the effectiveness of MATFOSC game. Furthermore, considering Skinner's postulate on the many principles of a powerful learning paradigm called operant condition, Neumann and Morgenstern, (1980) taken credence from Energization Theory of Motivation and Emotion (ETME) opined that game could predicts effort and provides energy mobilization to be greatest for a difficult, but possible task where success is rewarded. MATFOSC Game, as revealed in this study became an interactive medium on various units of the course that provided an excellent model for learning.

The use of MATFOSC Game is an excellent instance of what ETME purports to be the most highly motivating tasks. Students, participation increased their knowledge acquisition culminating in their make easy strategy for understanding the likely fearful concepts in the course.

CONCLUSION

Different from other researchers that investigated video games (computer-based), this study confined itself to the impact of MATFOSC Game on students' attitude towards and knowledge of concepts in ISC 121 (a course in Integrated science in Colleges of Education in Nigeria). It could be deduced from the findings of this study that MATFOSC Game entrenched a significant attitudinal changes and improvement in knowledge of concepts in the course considered on the part of the adult students'.

This result has provided an experimental support for the use of MATFOSC Game as necessary model that facilitates students' learning processes. The game is worth it, in that it exposed students to fact differentiation as well as recall, analysis and comparison, understanding and problem-solving, affection and free will among others. With these results MATFOSC Game is advocated as an instructional model that improves student's high-order thinking and favourable interactions of human and material resources under fun-fare condition.

RECOMMENDATIONS

The use of MATFOSC Game should be applied to all courses in tertiary institutions for learners since it can help them to continue to bring to memory important facts about a concept even outside the classroom.

Multidisciplinary International Journal of Research and Development
Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

A close-to-optimal combination of massed versus distributed practice should be carried out by students with MATFOSC Game, this is necessary because their active involvement would influence positive attitude and enhancement of knowledge of the course.

The playing of MATFOSC Game should be arranged such that it enhances extrinsic and intrinsic motivation on the part of the players, this will as have revealed in this study help to portray the teacher as a facilitator who guides from behind and not command from front.

Players should set clear objectives with adaptable difficulty levels in line with the rules of playing as they apply to the course contents in order to help them focus on specific and relevant concepts at a time which could increase their level of understanding.

REFERENCES

[1] Abdulsalam, O. M. & Arowolo, J. G. (2010): Improvisation and usage of instructional materials for Primary/Junior secondary school teachers'. Capacity building training workshop by Niger State Universal Basic Education, Kontagora Consult Limited, (31 Jan-6th Feb, 2010).

[2] Arowolo, J. G. (2012): Two conceptual change strategies and junior secondary school students' learning outcomes in Basic science concepts in Kwara State, Nigeria. Unpublished Doctoral Thesis, Faculty of Education, University of Ibadan, Nigeria.

[3] Bamiro, O. A. (2006): Teaching and technologies for human development. Educational Technology, 14(5), 46-51.

[4] Basu, K. (2007). The traveler's dilemma: A game-theoretic approach. Journal of Economic Psychology, 28(1), 33-41.

[5] Dunn, D. S. (2001): Statistics and data analysis for the behavioural sciences, New York: McGraw-Hill.

[6] Kelly, F. (2013). Game theory and education: A review of the literature. Teaching Mathematics and its Applications, 32(1), 1-13.

[7] Krishna, V. (2010). Auction theory. Academic Press.

[8] Lachlan, K. A., Smith, S. L. & Tamborini, R. (2005): Models for aggressive behaviour: The attributes of violent characters in popular video games. Communication Studies, 393, 266-268.

[9] Musa, S., Mamudo, W. S., Mohammed, B. B. & Audu, J. H. (2022). Correlation between Students' Attitude and Mathematics Learning Achievement of High School Students in Yobe, Nigeria. Indonesian Journal of Science and Mathematics Education, 5(2), 147-155.

[10] Neumann, J. V. & Morgenstern, O. (1980): Theory of Games and Economic Behaviour: Princeton University Press.

[11] Nonyelu, R. N., & Anikweze, C. M. (2013). Assessment of the Anxiety levels of Mathematics Performance in Probability. The Journal of the Mathematical Association of Nigeria. 40(1), 83-91.

[12] Ogundele, A. T. (2021). Effects of game-based video instructional strategy on senior school students' performance in Matjematics in Omu-Aran Kwara State, Nigeria. Unpublished thesis, Faculty of Education, University of Ilorin, Nigeria.

Volume: 04 / Issue: 01 / 2024 - Open Access - Website: www.mijrd.com - ISSN: 2583-0406

[13] Poundstone, W. (1992). Prisoner's dilemma: John von Neumann, game theory, and the puzzle of the bomb. Doubleday.

[14] Sam-Kayode, C. O. & Salman, M. F. (2015). Effect of Ludo Game on Senior School Students' Performance in Probability. The Journal of the Mathematical Association of Nigeria. 40(1), 83-91.

[15] Walsh, D. A. (2006): Violent and Explicit Video Games: Informing Parents and Protecting Children, Testimony given before the US House of Representatives Subcommittee on Commerce, Trade and Consumer Protection.