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EDITORIAL

Journal of Science Education and Research (JSER) is a peer-reviewed published Bimonthly. It aimed at advancing knowledge and professionalism in all aspects of educational research, including but not limited to innovations in science education, educational technology, guidance and counselling psychology, childhood studies and early years, curriculum studies, evaluation, vocational training, planning, policy, pedagogy, human kinetics, health education and so on. JSER publish different types of research outputs including monographs, field articles, brief notes, comments on published articles and book reviews.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Patrick C. Igbojinwaekwu

Editor-in-Chief

TABLE OF CONTENTS

Freewill and Determinism: Implications for Learning in Nigerian Secondary Schools Destiny I. Kehinde, (Ph.D)	1
Development and Validation of Physics Teachers' Teaching Effectiveness Scale in Anambra State Ibeagha, Chibueze Udochukwu, Prof. Okigbo, Ebere Chinelo	19
Learning Styles as Predictors of Secondary School Students' Achievement in Mathematics in Owerri Education Zone of Imo State Enyinna, Victoria U., Okigbo E. C.	48
Contemporary Practice in Record Keeping for Effective Management and Administration of Public Secondary Schoolin Educational Zones Ondo State Ovri Bukes Florence, Nweke Phina Amaka, Iwuozor Pedro U.	67
Influence of Learning Environment on Mathematics Achievement of Secondary School Students in Enugu Education Zone Umakalu, C. P.	85

**INFLUENCE OF LEARNING ENVIRONMENT ON MATHEMATICS
ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN ENUGU
EDUCATION ZONE**

Umakalu, C. P.

Precious.umakalu@esut.edu.ng
Department of Mathematics and Computer Science Education,
Enugu State University of Technology (ESUT)

Abstract

The study examined the influence of learning environment on mathematics achievement of secondary school students in Enugu Education Zone of Enugu State. Three research questions and three null hypotheses formulated and tested at .05 level of significant guided the study. A correlational survey research design was adopted for the study. A simple random sampling procedure was used in selecting four hundred and sixty-two (462), Senior Secondary II (SS II) Mathematics students from eighteen selected schools in the Zone. Mathematics achievement scores were extracted from their school records and Mathematics Learning Environment Questionnaire” (MLEQ) were used for data collection. The MLEQ was adapted from Shamaki (2015) The instruments MLEQ was validated by three experts and tested for reliability using Cronbach’s alpha with the reliability indices of 0.83, 0.72, and 0.77 respectively. Data were analyzed using path analysis for the research questions and to test the proposed hypotheses. The findings of the study amongst others showed that physical environment, psychosocial environment and use of educational simulation games positively influenced the academic achievement of secondary school mathematics students. Based on these findings, it was recommended that teachers should be encouraged to embark on in-service training that will glare the facet of ICT enhanced education, thereby fostering achievement in mathematics.

Keywords: Learning environment, Mathematics Achievement,

Introduction

The irreplaceable contribution of education to the development of nations cannot be overemphasized. The wealth of any country is not only determined by the natural resources available and physical capital but also the human resources which is being developed through education that is geared towards the needs of the individual and the society. Human resources could be said to be an active agent of production which accumulates capital, explore other relevant resources, build and develop social and economic institutions (Ale & Musa (2024). Education sector is saddled with the task of achieving national development goals and for the educational goals to be achieved, teachers are expected to be committed and play a significant role in addressing students' achievement gaps.

The realization of the importance of mathematics to man and the society probably account for its' inclusion in the school curriculum as a compulsory subject so as to enable individual to face challenges of life and to enhance national development. Mathematics is a prerequisite subject for many fields of learning that contributes immensely to the technological growth of the nation (Ale & Musa (2024). This includes medicines, pharmacy, nursing, agriculture, forestry, biotechnology, nanotechnology, and many other areas (Oni 2020). Darlington (2021) opined that mathematics is bedrock and an indispensable tool for scientific, technological and economic advancement of any nation. Mathematics plays a pivotal role in shaping the intellectual and logical reasoning of students and remains a core subject in secondary education.

Despite the fact that mathematics is one of the major and hinge of science subject in Nigeria schools, it is quite unfortunate that the subject is being dreaded by many students today. The WAEC chief examiners report (2022) has shown that student's

achievement in the subject is not satisfactory. Survey carried out in Enugu Education Zone showed that 35% of students who sat for WAEC examination in 2025 had credit and above which is sufficient to earn them admission in the institution of higher learning (Survey, 2025). This indicated that 65% of the students had grades below the acceptable admittance level in the institution of higher learning. This condition has remained a worrisome situation in education. According to Anbalangan (2017) factors that are responsible for students' poor achievement in mathematics are as follows: negative attitudes of students towards mathematics, poor instructional strategies, abstract nature of the subject, difficulty paying attention, lack of practice, teaching and learning environment schools among others (Oni & Isola, 2019).

A conducive learning environment encompasses the physical environment, psychosocial environment and instructional materials in which learning takes place. This includes the quality of classroom infrastructure, teacher-student relationships, lighting, ventilation, seating arrangements and general school ambience. A well-structured and stimulating environment can foster motivation, engagement and effective learning, where as a poor environment may hinder academic performance (Meremikwu, & Ibok 2020). Learning environment refers to all the human and materials resources available in the school which a child can see, hear, touch, smell, taste, feel and respond to. Examples are teachers, school children, school buildings classrooms school compound, sporting equipment, learning materials among others. The appropriateness of a learning environment is a key both to safety and to effective learning and development (Meremikwu, & Ibok 2020). The environment in which students learn can significantly influence the academic performance and well-being of the learners. The architecture, layout, and facilities of the school play a vital role in

shaping the learning environment and promotion of effective teaching and learning. Again, Ale and Musa (2024) argued that the learning environment can serve as a tool for influencing behaviour and as an aid to the teacher in the management tasks. Ale and Musa (2024) identified components of learning environment as appearance and physical plants; faculty relations; leadership and decision making; environment that is welcoming and conducive for learning; environment that promotes communication and interactions; environment that promotes a sense of belonging and self-esteem and the environment that promotes learning and self fulfillment. Friendly school environment provides necessary stimulus for learning experience since students spend their most of their time in the school (Oni, 2019). Apart from learning environment, availability of learning resources in teaching mathematics goes a long way in enhancing students' performance in mathematics. Such learning resources are: text books, writing materials, charts, construction/ drawing instruments, graph board, mathematical set among others. All these learning resources do contribute remarkably to students' performance in mathematics. Shamaki (2015) asserted that learning environment could be an essential key determinant to the students' achievement in mathematics. The major purpose of teaching and learning process is to bring about in the learner desirable change in behaviour through critical thinking. This process however, does not take place in vacuum but in an environment structured to facilitate learning. Gilavand (2016) described learning environment as a physical space that supports multiple and diverse teaching learning programmes including current technologies, one that demonstrates optimal, promotes effective performance and operation over time; one that respects and is in harmony with the environment; and one that encourages social participation, provide a healthy, comfortable, safe, secure and stimulating setting for

its occupants. Learning environment has also been emphasized as an essential requirement for smooth teaching and learning process to take place. This is because students study habits are to a large extent tied to it. A good learning environment presents learning as a lifelong enterprise and enables students to discover appropriate value system that can be their compass for self-awareness and national consciousness. The facilities that are needed to facilitate effective teaching and learning in an educational institution include the classrooms, offices, laboratories, conveniences and other buildings as well as furniture items and sporting equipment. Comfortable classroom temperature and smaller classes enhance teachers' effectiveness and provide opportunities for students to receive more individual attention, ask more questions, participate more fully in discussions, reduce discipline problems and perform better than students in schools with substandard buildings by several percentage points. Learning environment promotes students learning and positive learning environment greatly influence students' motivation to learn. Positive learning environment promotes cooperative learning, group cohesion, respect and mutual trust. Omemu (2018) submitted in their various studies that conducive learning environment can have positive effect on both attitudes and achievement of students. Researchers such as Ale and Musa (2024) revealed that quality of learning facilities available within the learning environment has positive relationship with the quality of teaching and learning activities which in turn influence students' academic performance. The primary purpose of the teaching and learning process is to bring about in the learner desirable change in behaviour through critical thinking. This process does not take place in a vacuum but rather in an environment structured to facilitate learning. Oragwu and Nwabueze (2016) described the environment of an organization as all elements relevant

to its operation and they include direct and indirect action elements. School facilities, constitute the major components of both direct and indirect action elements in the environment of learning. Several studies have shown that a close relationship exists between the physical environment and the academic performance of students. Omemu (2018) maintained that the quality of education that children receive bears direct relevance to the availability or lack thereof of physical facilities and overall atmosphere in which learning takes place. The school facilities consist of all types of buildings for academic and non-academic activities, equipment for academic and non-academic activities, areas for sports and games, landscape, farms and gardens including trees, roads and paths. Others include furniture and toilet facilities, lighting, acoustics, storage facilities and packing lot, security, transportation, ICT, cleaning materials, food services, and special facilities for the physically challenged persons. These facilities play pivotal role in the actualization of the educational goals and objectives by satisfying the physical and emotional needs of the staff and students of the school. Oragwu and Nwabueze (2016) emphasized that the physical needs are met through provision of safe structure, adequate sanitary facilities, a balanced visual environment, appropriate thermal environment, and sufficient shelter space for his work and play. His emotional needs are met by creating pleasant surrounding, a friendly atmosphere, and an inspiring psychosocial environment (Dhanapala 2021). The educational system has undergone tremendous changes in the form of its philosophy, broadened goals and objectives, new approaches to service delivery and architectural design, quantum leap in school enrolment, multiplicity of curricula programmes and extra-curricula activities, introduction of Information and Communication Technology (ICT) with simulation and games and expanded academic support services such as guidance

services to students, teachers and the community, integration of the school and community (Anamezie, Onah & Aniekwu 2023). Omemu (2018) noted that the resultant effect of all these changes is the need for creative and innovative steps in the management of school facilities. The research showed that students learn better when a combination of methods and materials are employed during teaching. Furthermore, emphasis has shifted towards giving individual attention to students as against teaching large classes which presupposes that all students in a class have the ability to learn at the same pace. The implication of the foregoing is that in designing school plant, provision should be made for individual and small group interaction and for large groups for academic and social activities. Factors that influence students' performance in mathematics have been well studied but this subject area remains a research priority especially in countries like Nigeria where students' failure rates in the subject remain high. In order to find out this, it has become necessary to investigate how various components of the learning environment influence students' achievement in mathematics in secondary schools, with a focus on physical environmental, psychosocial environment and simulation and games instructional approach.

Statement of the problem

Students' academic achievement in mathematics in secondary school has become worrisome for education stakeholders in the recent time. Intelligent is not the only determinant of academic achievement of students. West African Examination Council (WAEC) Chief Examiner's report (2017-2025) stated that the persistent poor achievement of students in Mathematics at Senior Secondary Schools Certificate Examination leaves one in doubt about the effectiveness of Instructional materials,

learning environment and instructional delivery approaches popularly used by the mathematics teacher (Oni 2020). Oni asserted that a comfortable and caring learning environment enhance students' academic performance. In order to find out this, it has become necessary to investigate the influence of teaching and environment on mathematics achievement of secondary school students.

Purpose of the Study

The primary purpose of this study is to examine the influence of learning environment on mathematics achievement of secondary school students in Enugu Education Zone of Enugu State. Specifically, the study seeks to determine the:

1. Beta weight between the path of the physical environment and students' achievement in mathematics.
2. Beta weight between the path of psychosocial environment and students' achievement in mathematics.
3. Beta weight between the path of the use of educational simulations and games and students' achievement in mathematics.

Research Questions

1. What is the beta weight between the path of physical environment and students' achievement in mathematics in secondary schools?
2. What is the beta weight between the path of psychosocial environment and students' achievement in mathematics in secondary schools?
3. What is the beta weight between the path of educational simulations and games and students' achievement in mathematics in secondary schools?

Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

HO₁: There is no significant influence of the physical environment and students' achievement in mathematics in secondary schools.

HO₂: There is no significant influence of psychosocial environment and students' achievement in mathematics in secondary schools.

HO₃: The influence of educational simulations and games and students' achievement in mathematics in secondary schools is not significant.

Methodology

The study adopted a correlational survey research design. A correlational survey according to Nworgu (2018), is the relationship between two or more variables without manipulation. It allows the researchers to examine associations among naturally occurring variables through structured data collection methods. The design was appropriate for this study as it enabled the researchers to investigate into how variables such as the physical environment, psychosocial environment, and simulation and games relate to students' achievement in mathematics in secondary schools. The study was carried out in Enugu Education Zone, located East of Enugu State, Nigeria. Enugu State has six Education Zones which include: Enugu, Awgu, Agbani, Nsukka, Obollo-Afor and Udi. Enugu Education Zone consists of three local government areas; namely: Enugu North, Enugu East and Isi-Uzo local government area. The area is predominantly urban, semi-urban and rural in nature with basic amenities such as good roads, hospitals, electricity, schools and markets. Most people living in the zone were

civil servants, students, traders and many farmers. The researchers chose Enugu Education Zone due to the fact that most of the secondary schools have qualified mathematics teachers, laboratories and instructional materials and yet students experience difficulties in answering questions in mathematics especially linear algebra in their external examinations which was evident in their final achievement scores and grades in WAEC results hence the need for the study in the area. Therefore, this research will inform the teachers, education stakeholders and government agencies on the fundamental factors that fosters students' achievement in mathematics which will in turn enhance good learning outcomes and productivity in the subject. The population for the study was 4,689 SS2 Mathematics students from 33 public secondary schools in the zone. Four hundred and sixty-two (462) SS2 mathematics students (242 males, & 220 females) drawn through simple random sampling procedure from twelve secondary schools in Zone, six schools were randomly sampled from each stratum. The three local government areas were purposively sampled to capture the area under study. Purposive sampling was used to select eighteen secondary schools in the zone with six schools from each of the local government areas based on the existence of well-equipped mathematics resources, laboratories and experienced mathematics teachers with teaching qualification in the school. Simple random sampling technique (precisely balloting) was next used to select 462 students. The instruments used for data collection were two the mathematics achievement scores that were extracted from the students records of 2024/2025 academic session and Researchers structured questionnaire titled "Mathematics Learning Environment Questionnaire" (MLEQ). MLEQ was adapted from Shamaki, (2015). MLEQ comprises 15 items adapted from a 16-item Mathematics Learning Environment Inventory. The scales were originally for students'

general learning environment inventory for students but the researchers modified the instrument specifically for mathematics students. MLEQ is a four-point scale, ranging from 1 = strongly disagree to 4 = strongly agree, which was used for all items in this instrument. 3 items were positively cued and scored in order. 2 question items had negative cue in the instrument, precisely 1 and 5. These negatively cued items were reverse-scored. MLEQ consisted of 15 items from 3 clusters. Each of the clusters assessed the opinions of students on the relevance of the cluster. The instrument employed four-point scale, ranging from 1 = strongly disagree to 4 = strongly agree, with positive and negative constructs alike. MLEQ were face validated by three experts from Enugu State University of Science and Technology (ESUT) and tested for reliability using Cronbach alpha which yielded a coefficient of 0.83, 0.72, and 0.77 indices respectively. The instrument was distributed to the respondents upon selection through the help of the research assistants who doubled to be their mathematics teachers in their respective schools. This method enabled the researchers to have 457 questionnaires properly filled (98.91%) return of the filled instruments. The proposed research questions and hypotheses, a path analysis in AMOS version 22 was employed, and all estimates were calculated using the maximum likelihood with bootstrapping (5000 resampling at 95% bias-corrected confidence intervals (CI95%).

Results

Research Question 1: What is the beta weight between the path of physical environment and students' achievement in mathematics in secondary schools in the area?

Table 1: The coefficient of linear regression between the path: physical environment and students' mathematics achievement in secondary schools in the combined model

Linear Regression Path	Beta-Weight
Physical environment and students' achievement in mathematics	.074

Table 1 shows that physical environment contributed approximately 7.4% determination of mathematics students' achievement. On the other hand, 92.6% factors that influence mathematics students' achievement is counted for other factors other than physical environment.

Research Question 2: What is the beta weight between the path of psychosocial environment and students' achievement in mathematics in secondary schools?

Table 2: The coefficient of linear regression between the path: psychosocial environment and students' mathematics achievement in secondary schools in the combined model

Linear Regression Path	Beta-Weight
Psychosocial environment and students' achievement in mathematics	.378

Table 2 shows that psychosocial environment contributed approximately 37.8 to the influence of mathematics students' achievement. On the other hand, 62.2% factors that

determines mathematics students' achievement is counted for other factors other than psychosocial environment.

Research Question 3: What is the beta weight between the paths of educational simulation and games and students' achievement in mathematics in secondary schools?

Table 3: The coefficient of linear regression between the path: educational simulation and games and students' achievement in mathematics in secondary schools in the combined model

Linear Regression Path	Beta-Weight
simulation and games and students' achievement in mathematics	.429

Table 3 shows that educational simulation and games contributed approximately 42.9% determination of mathematics students' achievement. On the other hand, 57.1% factors that determined mathematics students' achievement was counted for other factors other than educational simulation and games.

H0₁: There is no significant influence of physical environment on the students' achievement in mathematics in secondary schools.

Table 4: Summary of regression weights of the observed variables

Observed Variables	Estimate	S.E.	C.R.	P	Remarks
Achievement <--- Simulation Game	.457	.060	7.679	***	S
Achievement <--- Physical Environment	.075	.030	2.517	.012	S
Achievement <--- Psychosocial Environment	.382	.056	6.827	***	S

Table 4 shows that the probability of getting a critical ratio as large as 2.517 in absolute value is less than 0.012. The result figured out that physical environment determined the achievement of secondary school mathematics students' ($\beta = .075$, $t(457) = 2.517$, $P < 0.05[.012]$). In other words, the null hypothesis is rejected. Thus: the regression weight for **physical environment** in the influence of **students' achievement in mathematics in secondary schools** is significantly different from zero at the .010 level (two-tailed).

H0₂: There is no significant influence of psychosocial environment on students' achievement in mathematics practical in secondary schools.

Table 4 shows that the probability of getting a critical ratio as large as 6.827 in absolute value is less than 0.000. The result figured out that the influence of psychosocial environment determined the measured achievement of secondary school mathematics students' ($\beta = .382$, $t(257) = 6.827$, $P < 0.05[.000]$). In other words, the null hypothesis is rejected. Thus: the regression weight for **psychosocial environment** in the influence

of **students' achievement in mathematics in secondary schools** is significantly different from zero at the .000 level (two-tailed).

H0₃: The influence of educational simulation and games on students' achievement in mathematics is not significant.

Table 4 shows that the probability of getting a critical ratio as large as 7.679 in absolute value is less than 0.000. The result figured out that the influence of educational simulation and games determined the measured achievement of mathematics students' ($\beta = .457$ t (457) = 7.679, $P < 0.05$ [.000]). In other words, the null hypothesis is rejected. Thus: the regression weight for **educational simulation and games** in the influence of **students' achievement in mathematics in secondary schools** is significantly different from zero at the .000 level (two-tailed).

Discussions

The finding of the study revealed that physical environment contributed a modest 7.4% to improvement of mathematics students' achievement. This finding was supported by Shamaki, (2015), Obong (2017), Ale and Musa (2024) who in their respective studies reported that schools with well-equipped laboratories and conducive environment had students who demonstrated higher enthusiasm and competence in mathematics with improved learning outcomes and measurable achievement. Secondly, the study found that psychosocial environment which entails teacher student relationship, student-student relationship together with student parent relationship significantly determined 38% of students' achievement in mathematics. This is consistent with Shamaki (2015), Mohammed, Ado, and Ibrahim (2023) who noted that student's relationship with the teacher, parents and fellow students is a factor of achievement in mathematics. This

poisted that positive contribution of these factors on achievement was engendered by the strategies like inquiry-based learning and guided discovery were more effective in maintaining students' interest. Effective teachers not only facilitate learning but also create an engaging environment through the use of structured demonstrations and interactive questioning, which aligns with Kolb's Experiential Learning Theory. Again, the finding was observed that educational simulations and game-based learning accounted for a high 45.7% contribution to student achievement in mathematics. This agreed with Oni (2020) who concluded that digital tools and interactive simulations significantly enhance students' engagement and understanding in sciences. The integration of digital resources, especially in mathematics, fosters visual learning and experimentation even in the absence of physical labs. This is in consonance with Adebayo and Onwuegbuzie (2022), who observed that digital tools enhance students learning outcome. The strong beta weight confirms simulations as a potent determinant. The overall findings confirm that while physical environment and infrastructure is essential, instructional quality and modern teaching aids such as simulations and games play a more substantial role in fostering student interest. This reaffirms the importance of capacity-building for teachers, investment in technology, and active teaching strategies as sustainable measures for improving student engagement in mathematics.

Conclusion

The study concluded that student achievement in mathematics has good determining factors of educational simulations, teacher-student psychosocial relationship, and adequacy of physical environment and infrastructures significantly influenced students' engagement and learning outcome. For achievement in mathematics to be

improved and sustained, a multifaceted approach involving infrastructure improvement, teacher development, and use of modern instructional tools is essential.

Recommendation

Based on the findings of the study, the study recommends the following;

1. Parents and the stakeholders through P.T.A. should work to see that the learning environment conform to UNESCO standard. Government and education stakeholders should equip schools with infrastructures that will foster global trend.
2. Teachers should be encouraged to embark on in-service training that will glare the facet of ICT enhanced education. School authorities should engage the services of ICT personnels o train her teachers on the use of simulation enhanced education.
3. More so, mathematics teachers should arrange learning activities in such a way that it will help students to be self-regulated in their learning; which will help them apply all the interest for both situational; personal and academic interest in the learning of mathematics. Since school environment comprises of human and materials resources, teacher should make atmosphere of the classroom environment friendly enough for students to learn.

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