IMPACT OF CHATBOTS INSTRUCTIONAL AID ON THE ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN GEOMETRY IN ENUGU STATE

BY

DR. SAMUEL ONYINYECHI NNEJI

Onyinyechi.nneji@esut.edu.ng

Department of Mathematics and Computer Science Education Enugu State University of Science and Technology, (ESUT) Enugu

Abstract

The purpose of this study was to investigate the Impact of Chatbots Instructional Aid on the Academic Achievement of Secondary School Students in Geometry in Enugu State. Design adopted for the study was quasi-experimental design. Three research questions and five hypotheses guided the study. Area of the study was Enugu state. Population for the study consisted of 302,954 Secondary School students in Enugu State as at the time of this study. The sample consisted of 492 Secondary School students (205 public schools' students and 287 private schools' students). The sample also was made up of 314 and 178 students from schools located in urban and rural areas respectively. Purposive and simple random sampling techniques were used to draw the sample from intact classes. A 40-item structured Geometry Academic Achievement Test (GAAT) was used for data collection. The GAAT was validated by three research experts. Kuder-Richardson's formula 20 (KR-20) was used to determine a reliability coefficient (internal consistency) of .93 for GAAT since its items were dichotomously scored. Mean and standard deviation were used to answer the research questions while Multiple Analysis of Covariance (MANCOVA) was used to test the hypotheses at .05 significant level. Major findings of this study revealed that students taught using chatbots elicited higher achievement than their counterparts taught without chatbots. It was recommended among other things that mathematics teachers should integrate chatbots into regular classroom instruction to support personalized learning, instant feedback, and improve students' academic achievement of Geometric concepts.

Introduction

A Chatbot is a computer program designed to simulate conversation with human users, either through text or voice interactions. These programs (chatbots) utilize artificial intelligence (AI) and natural language processing (NLP) to understand user input and generate appropriate responses. Chatbots are used in various applications, including customer services, virtual assistants and information retrieval. Nneji (2023) investigated the use of Chatbots for teaching secondary mathematics, while this researcher intends to investigate the effect of use of Chatbots on students' academic achievement in Geometry. Beech (2023) defined achievement as the process of bringing out or accomplishing something through effort, skill or course. Bell and Thompson (2019) averred that academic achievement generally suggests an achievement relating to education and scholarship. Tenty and Awe (2021) added that academic achievement depicts student's performance on a standard of measurement such as performance test, skill test, analytical thinking test, etc.

Academic achievement can therefore be described as the gain in knowledge of students as a result of taking part in a learning activity or programme. According to Kuntu and Pedro (2020) academic achievement is a result-oriented construct that encapsulates the extent of performance of a specified task. More specifically, academic achievement in this study refers to achievement in secondary school Geometry. This achievement will be measured using Geometry Academic Achievement Test (GAAT). The GAAT will be used to measure the students' gain in knowledge as a result of having being taught Geometry. Another variable of interest in this study is the influence of school type on the effects of use of Chatbots on secondary school students' academic achievement in Geometry. In recent times, school type or proprietorship has generated a lot of concern to educators and researchers. The Federal Republic of Nigeria, FRN (2013) in the National

Policy on Education states that Government welcomes the participation of voluntary agencies, communities and private individuals in the establishment and management of secondary schools.

State governments shall prescribe conditions to be met by the communities and others wishing to establish secondary schools. School ownership/proprietorship in this work is categorized into two viz; public and private schools. The public schools, also known as state, federal or government schools refer to schools owned, funded and overseen by the state or federal government. The dreaded monster, corruption which has eaten deep into every sector of the Nigerian society has not spared the education sector. Nigerians' general attitudes towards government property suggest that both the grassroots and elite erroneously believe that what belongs to the government belongs to nobody, (Eze, 2020). Hence Nigerian public schools today are characterized by neglect and abandonment, dilapidated infrastructures, vandalization/looting of facilities and obsolete instructional aids. Teachers in public schools continue to allege ill-motivation, denial of incentives and poor condition of service. As the teachers resort to hassle for survival, absenteeism and truancy become the order of the day, (Ayuba, 2022).

The story seems not to be in any way better in the private schools. Private schools are schools owned by non-governmental organizations or individuals. Private schools are known for high cost, yet the proprietors seem to shy away from money demanding ventures such as employment of qualified teachers, provision of instructional materials and other infrastructures good for conducive teaching and learning. So many private schools allegedly use secondary school leavers to teach secondary school students, (Adejumo, 2022). Many examination malpractice centers "Miracle centers" have been traced to be private schools, usually such schools make a lot of noise in the media, deceiving people who rush and pay heavily to put their children and wards into such places (Ojim, 2021). This has created more and more unmanageable social problems

that should worry well-meaning educators and researchers. Many researchers that investigated public and private students' achievement in Geometry reported conflicting findings. Kofi (2019) Ojim (2021) and Adejumo (2022) reported that public school students achieved higher in Geometry than their counterparts in private schools. Contrarily, Kim (2021), Ayuba (2022), Uyi (2023) all reported that private school students out-performed their public school counterparts under the same instructional strategy.

This study therefore seeks to determine the effects of use of Chatbots on students' academic achievement in Geometry with respect to their schools' type. This is with a view to bridge the gap of conflicting findings as stated above. Location of schools is another topical issue that worries educators and researchers. Location in this context would be categorized into two namely; urban and rural. Undoubtedly, urbanization and rural development still pose great challenges to the government of the third world countries such as Nigeria. In the urban areas, barely all the basic infrastructures are inadequate in supply, hence, the struggle for and consequent over stretching of the available few. Therefore, in the school system, the story has remained that of over-crowded classrooms, insufficient and obsolete equipment, absenteeism occasioned by the use of school children for street trading even during the school hours, truancy on the part of the teachers as they hassle to survive the high cost of living, etc, (Tenty and Awe, 2021). The emergence of urban congestion has worsened things and created more unmanageable devastating problems. The problems of urbanization are many and they constitute a big threat to teaching and learning in our schools.

This is because learning must take place in very conducive environments. On the other hand, the situation in the rural areas is not in any way better. Although the rural locations may never be known for over-population, they have definitely suffered neglect and abandonment.

Hence, schools in the rural areas are marked by dilapidated buildings, where they even exist at all and lack of necessary equipment's to enhance teaching and learning. Many rural schools have been deserted by teachers who usually seek transfers to urban areas. All these largely tell on the learners who are the most vulnerable. Very disturbing to this researcher is the fact that researchers vary in their findings and opinions as to whether location affects students' achievement, in secondary school Geometry or not. Kelvin (2019) reported that urban school's students taught Geometry with chatbots achieved higher than their rural schools' counterparts. Melky (2020) found in another study that students in rural schools achieved higher than those in urban schools when taught Geometry with chatbots strategy.

School location according to Zest (2021) and Larry (2023) did not have significant influence on students' achievement in Geometry when taught with chatbots approach. This no definitive conclusion regarding the influence of school location on students' academic achievement when taught Geometry with chatbots may constitute a great barrier to attainment of the laudable objectives of secondary education if left unchecked. Thus, a study of this nature is most timely as it seeks to investigate whether location can affect the teaching and learning of Geometry with chatbots strategy with a view to resolving the crises of no definitive conclusion.

Purpose of the Study

The purpose of this study was to investigate the Impact of Chatbots Instructional Aid on the Academic Achievement of Secondary School Students in Geometry in Enugu State. Specifically, the study aimed at determining the:

i. mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in Enugu state secondary schools

ii. mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in public and private secondary schools in Enugu state

iii. mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in urban and rural secondary schools in Enugu state

Research Questions

The following research questions guided the study.

1. What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in Enugu state secondary schools?
2. What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in public and private secondary schools in Enugu state?
3. What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in urban and rural secondary schools in Enugu state?

Hypotheses

The following hypotheses were tested at .05 level of significance;

1. There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in Enugu state secondary schools.

2. There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in public and private secondary schools in Enugu state.
3. There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in urban and rural secondary schools in Enugu state.
4. There is no significant interaction between use of instructional aids and school type with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools.
5. There is no significant interaction between use of instructional aid and school location with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools.

Experimental Procedures

Briefing of Resource Persons

The regular Mathematics teachers of the sampled schools served as resource persons for this study. Hence, the researcher briefed them (the regular Mathematics teachers in the sampled secondary schools) on the use of Chatbots for teaching Geometry for a period of one week.

Experiment Proper

Foremost, GAAT was administered to all the subjects of the study as pretest. This gave the pretest achievement scores. Thereafter, the treatment was administered for a period of four weeks. Experimental groups were taught the selected Geometry topics using Chatbots while the control groups were taught same topics without use of Chatbots. At the expiration of the treatment period, the GAAT was re-arranged and administered to all the subjects as posttest to obtain posttest

achievement scores. All the tests administered were scored by the researcher using already made marking scheme.

Result

Research Question 1

What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in Enugu state secondary schools?

Table 1: Mean acamedic achievement scores of experimental and control groups in pretest and posttest.

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Experimental	259	22.31	11.0413	71.25	5.0019
Control	233	21.84	10.5201	52.80	8.4522

From table 1 above, the pretest mean score of experimental group was 22.31 while that of control group was 21.84. These suggest that both groups were almost of equal ability at the beginning of the experiment. In the posttest experimental group had a mean of 71.25 while the control group had a mean of 52.80. Apparently, the two groups achieved higher in the posttest than the pretest indicating that learning took place. However, the posttest mean score of the experimental was higher than that of the control group. Moreso, a lower standard deviation value of 5.0019 in the posttest for experimental group indicates that there were fewer extreme scores in the experimental group than the control.

Research Question 2

What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in public and private secondary schools in Enugu state?

Table 2: Mean academic Achievement scores of public and private schools' students in pretest and posttest.

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Public (Experimental)	170	20.11	10.1141	71.14	4.2201
Private (Experimental)	89	19.82	12.0413	70.93	5.0203
Public (Control)	35	19.71	11.1123	50.76	8.4991
Private (Control)	198	21.03	10.0233	51.35	7.9005

From table 2, the posttest mean score of the public (Experimental) was 71.14 while that of private (Experimental) was 70.93. Similarly, the posttest mean score of the public (control) was 50.76 while that of private (Control) was 51.35. This result suggests that both experimental and control groups (public and private) achieved equally.

Research Question 3

What are the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in both pretest and posttest in urban and rural secondary schools in Enugu state?

Table 3: Mean academic Achievement scores of urban and rural schools' students in pretest and posttest.

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Urban (Experimental)	144	41.83	10.11	69.24	0.2210
Rural (Experimental)	95	42.01	12.04	67.99	0.0237

Urban (Control)	170	41.22	11.11	48.55	8.4901
Rural (Control)	83	42.04	10.02	49.01	7.9017

From table 3, the posttest mean score of the urban (Experimental) was 69.24 while that of rural (Experimental) was 67.999. Similarly, the posttest mean score of the urban (control) was 48.55 while that of rural (Control) was 49.01. This result suggests that both experimental groups (urban and rural) achieved equally and both control groups (urban and rural) achieved equally.

Hypothesis 1

There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in Enugu state secondary schools.

Hypothesis 2

There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in public and private secondary schools in Enugu state.

Hypothesis 3

There is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in urban and rural secondary schools in Enugu state.

Hypothesis 4

There is no significant interaction between use of instructional aids and school type with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools.

Hypothesis 5

There is no significant interaction between use of instructional aids and school location with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools.

Table 4: MANCOVA analyses of students' Academic Achievement scores.

Source	**Type III sum of squares**	**Df**	**Mean square**	**F**	**Sig**	**Decision**
Corrected model						Significant
Hypothesis	898494.425	1	898494.425	4687.3976	.009	Reject Hypothesis
Error	191.683	1	191.683			
Instructional aids						Significant
Hypothesis	712445.5659	1	712445.5659	5408.008	.001	
Error	64683.849	491	131.739			Reject Hypothesis
School Type						Not Significant
Hypothesis	272.844	1	272.844	1.613	.125	
Error	83056.578	491	169.158			Do not Reject Hypothesis
School Location						Not Significant
Hypothesis	614.151	1	614.151	7.856	.218	
Error	38385.398	491	78.178			Do not Reject Hypothesis
Instructional aid * School Type	169.158	1	169.158	1.23005	.116	Not Significant
Hypothesis	137.521	1	137.521			
Error						Do not Reject Hypothesis
Instructional aid *School Location	278.173	1	278.173	2.4617	.108	Not Significant
Hypothesis	113.001	1	113.001			
Error						Do not Reject Hypothesis

Instructional aid * School Type* School Location	437.521	1	437.521	1.429	.036	Not Significant
Hypothesis	612.333	2	306.167			Do not Reject Hypothesis
Error						

Use of Instructional Aids (experimental/control) as main effect gave an f value of 5408.008 and this is significant at .001. Since .001 is less than .05 (significant level set for this study), this means that at .05 significant level, the f value of 5408.008 is significant. Therefore hypothesis 1 is rejected as stated because there is significant difference between the mean academic achievement scores of students taught Geometry using chatbots instructional aids (experimental groups) and their counterparts taught Geometry without chatbots instructional aid (control group) in favour of the experimental group. This indicates that the observed difference was due to the treatment administered to the groups. School Type (Public/Private) as main effect gave an f value of 1.613 and this is significant at .125. Since .125 is greater than .05 (significant level set for this study), this means that at .05 significant level, the f value of 1.613 is not significant. Therefore hypothesis 2 is not rejected as stated, indicating that there is no significant difference between the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in public and private secondary schools in Enugu state. Hence, School Type (Public/Private) had no significant influence on the students' academic achievement in Geometry when taught using chatbots instructional aids.

School Location (Urban/Rural) as main effect gave an f value of 7.856 and this is significant at .128. Since .218 is greater than .05 (significant level set for this study), this means that at .05 significant level, the f value of 7.856 is not significant. Therefore hypothesis 3 is not rejected as stated, indicating that there is no significant difference between the mean Geometry

academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in urban and rural secondary schools in Enugu state. Thus, School Location (Urban/Rural) had no significant influence on the students' academic achievement in Geometry when taught using chatbots instructional aids. The interaction effect between Use of Instructional Aids and School Type gave an f value of 1. 23005 which is significant at .116. Since .116 is greater than .05 (significant level set for this study), this means that at .05 level of significance, the f value of 1.23005 is not significant. Therefore, hypothesis 4 is not rejected as stated, indicating that there is no significant interaction between use of instructional aids and school type with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools. The interaction effect between Use of Instructional Aids and School Location gave an f value of 2. 4617 which is significant at .108. Since .108 is greater than .05 (significant level set for this study), this means that at .05 level of significance, the f value of 1.23005 is not significant. Therefore, hypothesis 5 is not rejected as stated, indicating that there is no significant interaction between use of instructional aids and school location with respect to students' mean Geometry academic achievement scores in Enugu state secondary schools.

Summary of result

The results presented above can be summarized thus:

1. Secondary School Students taught Geometry using chatbots instructional aid achieved higher than their counterparts who were taught Geometry without using chatbots instructional aid.
2. School Type (Public/Private) had no significant influence on secondary school students' academic achievement in Geometry when taught using chatbots instructional aid.

3. School Location (Urban/Rural) had no significant influence on secondary school students' academic achievement in Geometry when taught using chatbots instructional aid.
4. There is no significant interaction between use of instructional aids and school type with respect to secondary school students' mean Geometry academic achievement scores.
5. There is no significant interaction between use of instructional aids and school location with respect to secondary school students' mean Geometry academic achievement scores.

Discussion

Research question one sought to determine the mean Geometry academic achievement scores of students taught using chatbots instructional aid (experimental group) and their counterparts taught without chatbots instructional aid (control group) in Enugu state secondary schools. Findings of the study in this regard reviewed that the difference between the mean academic achievement scores of the groups was significant with the experimental group, (taught using chatbots) achieving higher than their counterpart in the control group, taught without chatbots. This finding further validates those of Royal (2018), and Harry (2022). These researchers in their independent studies found that students taught Geometry using chatbots achieved higher than their counterparts taught without chatbots. On the other hand, Melky (2020) reported in another study that students taught Geometry without chatbots achieved higher than their counterparts taught with Chatbot. Whereas Zest (2021) found that students taught Geometry with chatbots achieved equally with their counterparts who were taught without chatbots. The disagreement in the findings of these researchers may likely be traced to experimenters' ability in controlling extraneous variables.

Also important is experimenters' ingenuity in manipulating the instructional aid in their various studies to suit possible peculiarities among subjects of their different studies. Academic

achievement generally suggests an achievement relating to education and scholarship. Academic achievement can therefore be described as the gain in knowledge of students as a result of taking part in a learning activity or programme. According to Kuntu and Pedro (2020) academic achievement is a result-oriented construct that encapsulates the extent of performance of a specified task. Going by these descriptions of academic achievement, we can say, with certainty, that the achievement of the students in this study was as a result of the treatment administered to them. Moreso, extraneous variables were properly controlled. This implies therefore, that use of Chatbot promoted higher academic achievement in this study. Undoubtedly, this is heartwarming. It also shows that proper use of chatbots and indeed other AI instructional aids can help in bringing about the much desired high academic achievement among secondary school students.

Research question two addressed the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in public and private secondary schools in Enugu state. It was found in this study that the mean Geometry academic achievement scores of public and private schools' students did not differ significantly when taught using chatbots instructional aid. Contrary to the findings of this study, Kofi (2019), Ojim (2021) and Adejumo (2022) in their separate studies reported that public school students achieved higher in Geometry than their counterparts in private schools when taught using chatbots instructional aids. However, the findings of this study with regards to the influence of school type reaffirms the findings of Zest (2021) and Larry (2023) who in their separate studies found that there was no significant difference between the academic achievement of public and private secondary school students when taught Geometry using chatbots instructional aid. In recent times, school type has generated a lot of concern to educators and researchers.

Since it was found in this study that there was no significant difference between the mean academic achievement scores of public and private schools' students in both experimental and control groups, it implies that there was no significant interaction between school type and use of instructional aids on the students' academic achievement in Geometry. From the findings of this study which affirmed that students from public and private schools achieved equally in Geometry, it is important for researchers to see the need to apply caution in the use of various instructional aids so as to accommodate every learner irrespective of their school type (public/private). Infact, the findings of this study in this regard show that chatbots instructional aid is friendly to all students irrespective of their school type. Research question five sort to establish the mean Geometry academic achievement scores of students taught using chatbots (experimental group) and those taught without chatbots (control group) in urban and rural secondary schools in Enugu state. It was found in this study that the mean Geometry academic achievement scores of urban and rural schools' students did not differ significantly.

This finding is in line with the findings of Zest (2021) and Larry (2023) who in their separate studies found that school location did not have significant influence on students' academic achievement in Geometry when taught using chatbots instructional aid. On the other hand, the findings of this study in this regard are in sharp disagreement with those of Kelvin (2019) and Melky (2020). Kelvin (2019) reported that urban school's students taught Geometry with chatbots achieved higher than their rural schools' counterparts. While Melky (2020) found in another study that students in rural schools achieved higher than those in urban schools when taught Geometry using chatbots instructional aid. Once again, it is evident that the conflicting findings may, most likely, be attributed to individual differences among the researchers. It is either that the researchers differ in their individual skills or that the research environments differ. This is because use of

instructional aids cannot be done effectively in isolation from other factors that facilitate learning. In trying to defend this view, Larry (2023) argued that a bad workman will perform badly even when given the best tools, whereas, a skilled workman will do well even when provided with locally improvised tools.

Conclusions

Consequent upon the findings of this study, the following conclusions were made;

1. Secondary school students attain higher academic achievement in Geometry when taught using chatbots instructional aid.
2. Secondary school students' academic achievement scores in Geometry when taught using chatbots instructional aid do not depend on their school type, (public/private).
3. Location of schools (Urban/Rural) has no significant influence on secondary school students' academic achievement in Geometry when taught using chatbots instructional aid.

Recommendations

Based on the findings of this study, the following recommendations were deemed adequate.

1. mathematics teachers should integrate chatbots into regular classroom instruction to support personalized learning, instant feedback, and improve students' academic achievement of Geometric concepts.
2. Policymakers should invest in educational technologies that support AI-driven learning, ensuring that both urban and rural as well as public and private schools have equitable access.
3. Secondary school proprietors should be conducting regular conferences, seminars, workshops and other forms of in-service trainings for mathematics teachers to keep them abreast with trends and innovations in AI supported learning.

REFERENCES

Adejumo, G. (2022) Effect of Chatbots Instructional aid on secondary school student's achievement in Shagamu, Ogun state adopted a quasi-experimental study. *Journal of Educational Sciences.* http://www.edu.org.com. Retrieved 15/01/2023

Ayuba, P.F. (2022) effect of Chatbots Instructional aid on students' achievement and interest in Geometry in Cape Town. www.mathscorner/tcl.com.

Bench, G (2023) Efficacy of computer aided instruction in enhancing secondary school students, achievement. *www.edusupport.net/newsletter. 448010322/ABSTRACT.*

Eze, C.O. (2020) Effect of Chatbots on Students' Achievement and Interest in mathematics in Agwu Education Zone of Enugu state. *Association for Promotion of Creative Education (APCE) Journal,* 2(1), 12-23.

Federal Republic of Nigeria. (2013) *National Policy on Education*. Abuja: NERDC Press.

Harry, A.T (2022) Pedagogical value of Chatbots in secondary school Geometry academic achievement in Cape Town South Africa. *Journal of Technology Education 14(2) 10-22* http://www.scholar/ib.vt.edui/ejour/ijev/1472/haynie/html. Retrieved 22/03/2022

Kelvin, N. (2019) Chatbots usage and its effect on students' achievement in secondary Level Geometry in Southern California United States of America. *http://www.interscience,wiley.com/cgibin/abstract/783268288/ABSTRACT*.

Kim, M. (2021) Effect of use of Chatbots on students' academic achievement in high schools in Ohio, USA. *Journal of educational research 3(11), 112-129.* www.jer.edu.org.

Kofi, C.A. (2019) Effect of use of Chatbots on students' academic achievement in Geometry in public and private colleges in Katima, Namibia. *Association for Promotion of Creative Education Journal, 1*(4). 2001-2119

Larry, Z. (2023) Effect of Chatbots-Assisted learning on students' academic achievement in sciences in Lagos state Nigeria. *http://www.African quarters.org/journal 2(1). 200-214.*

Melky, W. (2020) Role of AI Chatbots in shaping academic performance in secondary Geometry in urban and rural schools in central Austrian district. *Association for Promotion of Creative Education Journal, 2*(1). 90- 111

Nneji, S.O (2023). Effect of computer Aided Instruction on Secondary School Student's Achievement in Mathematics in Enugu State. *Nigerian Journal of Educational Leadership and Management (NJELM).* 338-349

Kuntu B. & Pedro, B (2020) Effect of School Ownership Type on Students' Interest, Achievement in Geometry. http://www.edu. org.com. Retrieved 16/11/2021

Ojim, R. (2021). Effect of use of Chatbots on students' academic achievement in Geometry in Obudu local government Area of Cross River state. *Journal of educational research 3(11), 300-331*. www.jer.edu.org.

Royal, K.O (2018). Effect of Chatbots on high school students' achievement in Geometry in Central Mexico. www.Llickconnect.com

Tenty, M. & Awe, O. (2021). The "Significantly worse" phenomenan: A study of student achievement in different current Areas by school ownership. *Education and Modern Society, 31 (2), 127-138.*

Thompson, H.J (2019) Improving Students' Achievement Interest in Sciences through Chatbot. *http://www.maths.org.com. Retrieved 12/11/2021.*

Uyi, C.N. (2023) Effect of use of Chatbots on students' academic achievement in public and private schools in Auchi, Edo State.

http://www.interscience,wiley.com/cgibin/abstract/7832608288/ABSTRACT.

Zest, H. (2021) Effect of use of Chatbots on the interest and achievement of high school students in Geometry. *Association for Promotion of Creative Education Journal, 3* (1). 152-178