

school pupils in the study area. However, further studies would be needed as regards this in order to provide an intervention method for the dyslexic children in the lower primary schools.

Recommendations

There must be compulsory training at the entry level for all teachers especially on special education. This exercise should be an ongoing process with regular trainings or workshops for teachers at the primary level and stakeholders in the educational sector. Additionally, the government should provide a platform for oral exam with children with special needs especially the dyslexic ones so as to give them a sense of belonging and for effective educational trainings for them.

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PRE-SERVICE TEACHERS' PERFORMANCE AND ATTITUDE TOWARDS MATHEMATICS COMPUTER- BASED EXAMINATION; DIFFERENTIAL EFFECTS OF GENDER AND SCHOOL OF AFFILIATION IN OYO, OYO STATE

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Abstract

The study investigated pre-service teachers' performance and attitude towards mathematics CBE; Differential effects of gender and school of affiliation. The study assessed the differential effects of gender on pre-service teachers' performance and attitude towards mathematics computer-based examination and evaluated pre-service teachers' performance and attitude towards mathematics computer-based examination based on field of affiliation. A mixed methods of research in concurrent triangulation and descriptive survey design was adopted for the research. All the 100 level pre-service teachers of Emmanuel Alayande College of Education, Oyo constituted the population for the study. Stratified random sampling technique was adopted to select 24 students for in-depth interview. Secondary data of students' performance scores in Mathematics CBE and primary data using Pre-service Teachers' attitude towards Mathematics CBE Interview (PTMCI, IRR=0.79) were collected for quantitative and qualitative analyses respectively. Data were analyzed using thematic analysis for the qualitative data, frequency counts, percentages and bar charts for descriptive data, t-test and ANOVA for hypotheses testing. Pre-service teachers had positive disposition towards Mathematics CBE. The male students from the school of science were more favorably disposed to CBE than the female counterparts in the non-science schools. There is significant difference in pre-service teachers' performance in Mathematics CBE based on gender in favour of the male ($t=9.41$, $df=1260$, $p<.05$) and school of affiliation ($F_{(5,1255)}=13.29$, $p<.05$). Therefore, CBE is recommended for Basic General Mathematics for enhanced students' performance and attitude towards BGM.

Keywords; Pre-service teachers' performance; Pre-service teachers' attitude; Mathematics Computer Based Examination; Gender; School of affiliation

Introduction

Empirical observations by the authors identified that pre-service teachers have phobia and dislike attitude towards Paper and Pencil Test (PPT) in Basic General

Mathematics (BGM). This has a negative impact on their performance in BGM. Efforts towards jerking up the pre-service teachers' attitude and performance in BGM have not yielded positive results. The lecturers are interchanged school by school, sometimes they co-lecture or team-teach the students, yet, the attitude and performance of the pre-service teachers in BGM have not significantly improved. The use of Computer Based Examination (CBE) was suggested as a way out of the hook as it aided learners' performance in many subjects and courses, improving the learners' cognitive, affective and psychomotor domains of learning (Olagunju, Bolaji & Adesina, 2013; Adebisi, 2019; Obanya, 2021; Okebukola, 2021).

Classification of test based on mode of presentation has the Paper-Pencil Test (PPT) and the computer-Based Test (CBT). The paper-pencil test consumes more time, materials and energy of the learners than the computer-based test that is more reflective, more instructive, more formative and more corrective in nature. The trending path of teaching and learning in the 21st century which is in tandem with CBT prescribed by the National Science Teaching Association (NSTA) in America that the Next Generation Science Standard (NGSS) is teaching and learning with technology and reflective thinking (NSTA, 2012; 2015; 2020). When teaching and learning is done technologically with the Instructional System Design (ISD) it is systematically sync with reflection in formative and summative types. The formative type of evaluation when done technologically has the capability to diagnose, identify and establish the learners' weaknesses and strength in instructional process, it equally has the aptitude of raising the intelligence and the educability of the learners in a course of instruction. Thus, CBT has latent capacity to raise learners performance in Basic General Mathematics, one of the courses pre-service teachers found aversive and negatively disposed to (Animasahun & Akinsola, 2019).

If computer-based test has inherent traits of raising students' performance in instructional process, does it

equally have the propensity in raising learners' attitude and disposition to learning? Learners' attitudes are learners' behavior and formed response to situations, events or objects formed from their precarious experiences and learned pattern of life emulated from the older members of the society or the peer affiliate. Technology and technological devices have the qualities of attention grabbers, interest sustainers, heuristic, hands-on-mind-on, activity-based and embedded with Immediate Knowledge of Results (IKOR) that prone learners to positive disposition and attitudes when adopted in CBT (Olagunju, Bolaji & Adesina, 2013; Adebisi, 2019; Obanya, 2021). Does computer-based examination improve the pre-service teachers' performance and attitude towards Basic General Mathematics? Do gender and school of affiliation differentiate the pre-service teachers' performance and attitude towards Mathematics Computer-Based Examination? All these shall be unraveled in this study.

Theoretically, the use of computer-based examination is premised on the behaviourists' and the constructivists' learning theories (Ehinder, 2014; Olagunju & Adesina, 2017). To the behaviourists, the presentation of Basic General Mathematics (BGM) in CBE is already a conditioned stimulus which is combined with unconditional stimulus to elicit conditional response. The BGM test is a conditional stimulus which on its own cannot elicit unconditional response (improved performance and attitude towards BGM), the computer mode of testing is an Unconditional stimulus which naturally can elicit an unconditional response, thus presenting BGM in CBE is combining what the students hate with what they like to elicit the desired response (Adesina, 2015). To the constructivists, learning is by posing a problem to stimulate knowledge construction, the use of BGM CBE is laden with several problems and mathematical issues which prompt the pre-service teachers to construct their knowledge either by assimilation or accommodation of the new experiences (Dewey, 1939, Glaserfeld, 1979).

Empirically, Dammas (2016) investigates students' attitudes towards computer-based test (CBT) in Chemistry course at KAU Saudi Arabia using quantitative survey design with 60 undergraduates' students, the findings revealed that the majority of the respondents have positive attitude towards CBT and irrespective of the anomalies encountered in the chemistry CBT the students were more successful in the computer-based examination and were more satisfied with CBT. Banna and Abu-Safe (2019) examine students' attitudes towards computer based and traditional paper-pencil testing in Physics course

at German Jordanian University using a quantitative survey research design and found that the students have positive attitude towards CBT than the PPT and that gender has no significant effects on the students' attitude towards CBT Physics examination.

Khoshshima, et al. (2019) examined computer-based (CBT) vs paper-based (PBT) testing: Mode effect, relationship between computer familiarity, attitudes, aversion and mode preference with CBT scores in an Asian private context found that although there is no significant difference in the scores of the students based on CBT and PBT, however, from the qualitative data analysis, the students prefer CBT to PBT and equally showed positive attitudes towards CBT examination. Olutola, Olatoye and Ademola (2021) investigated undergraduates' attitude towards computer-based tests as an assessment mode for general studies at Federal University Dutsin-Ma, Katsina state, adopted descriptive survey design found that undergraduates generally have positive attitude towards computer-based general studies examination.

Ricketts (2002) examine improving student performance through computer-based assessment: Insights from recent research on numeracy and statistics in biology found that there is no significant difference in the students' performance in students' online assessment and those on paper and pencil test. Garas (2018) studied student performance on computer-based tests versus paper-based tests in introductory financial accounting, the sample consists of 78 students undertaking financial accounting courses at Zayed University during the summer semester. A simple difference in means statistics test shows that there is no statistically significant difference between the students' paper-based and computer-based scores. However, benchmark regression analysis showed that males performed better than females on CBT, and females outperformed males on paper and pencil test.

Ceka and O'Geen (2019) evaluate whether student performance differs between handwritten and computer-based exams through a randomized field experiment conducted in a research methods course. Overall, the findings suggest a significant improvement in student performance on computer-based exams. Omowunmi and Salako (2020) analyzed the effect of computer-based examinations on the academic performance of Federal Polytechnic Ilaro students. The data for this study were obtained from primary source where a survey was carried out on the students of the school of management studies of the institution, 150 respondents were chosen as the

sample size from HND II, and the data was analyzed using chi square, the results showed that 78% of the respondents agreed that implementation of computer-based examination is more reliable and efficient than pen-on-paper examination.

The pre-service teachers are either male or female by gender classification, they are grouped into schools of Arts and Social Science, Early Childhood Care and Primary Education, the school of Education, Languages, Sciences and the school of Vocational and Technical education. Will the pre-service teachers' gender and school of affiliation differentiate their performance and attitudes towards Basic General Mathematics Computer-Based Examination? This research threadbare this.

Statement of the Problem

Pre-service NCE teachers have phobia and negative disposition towards answering paper and pencil examination in General Basic Mathematics. Many of them have apathetic attitude towards writing Mathematics examination. Efforts towards building positive traits in the students involves changing the lecturers handling the course, co and team-teaching, collaborative learning, yet, the students' disposition has not significantly changed and their performance remains deplorably low. The use of Computer Based Examination (CBE) instead of Paper and Pencil Examination (PPE) seems a step in the right direction to boost the students' attitude and performance in the course. Therefore, this paper investigates pre-service teachers' performance and attitude towards Basic General Mathematics CBE, investigating the differential effects of gender and school of affiliation on the students' learning outcomes.

Purpose of the Study

The paper investigated pre-service teachers' performance and attitude towards mathematics computer-based examination. The specific objectives of the study are to:

- I. assess the differential effects of gender on pre-service teachers' performance and attitude towards mathematics computer-based examination;
- ii. evaluate the pre-service teachers' performance and attitude towards mathematics computer-based examination based on field of affiliation.

Research Questions

- I. What is the pre-service teachers' attitude towards mathematics computer-based examination?
- ii. Is the pre-service teachers' attitude towards mathematics computer-based examination differ

by gender and field of affiliation?

Hypotheses

Ho1: There is no significant difference in pre-service teachers' performance in mathematics computer-based examination based on gender;

Ho2: There is no significant difference in pre-service teachers' performance in mathematics computer-based examination based on field of affiliation.

Methodology

Mixed methods of qualitative and quantitative research types were adopted for the study. All the pre-service teachers of Emmanuel Alayande College of Education, Oyo constitutes the population of the study. There are 266, 69, 27, 232, 355 and 313 pre-service teachers from schools of Arts and Social Sciences, ECCPED, Education, Languages, Sciences and Vocational and Technical Education respectively. Altogether, 1261 pre-service teachers constituted the population of the study. A stratified random sampling technique was adopted to select 24 pre-service teachers with one male and a female based on their school of affiliation (Sciences, Languages, Arts and Social Sciences, Education, Early Childhood Care and Primary Education and Vocational and Technical Education) for the qualitative data collection while the whole population was used for quantitative data.

A self-constructed instrument titled: Pre-service Teachers' attitude towards Mathematics CBE Interview, PTMCI. The original scale of 10 items was revalidated for content, construct and face validity, the scale was reduced to 5 items. The 5-item PTMCI was pilot-studied on 2 pre-service teachers outside the population of the study, the collated data was subjected to Inter-rater Kappa reliability statistics which yielded a value of 0.79.

The researchers went to the sampled pre-service teachers to collect the qualitative data from the participants. The pre-service teachers were first briefed and sought their consent to interview them. After the consent to be interviewed, the participants were asked the interview questions one after another and their responses were recorded for further processing. The Basic General Mathematics Computer-Based Examination scores for all the 100 level students, 2020/2021 session were used as the secondary data for pre-service teachers' performance. The socio-demographic attributes of the respondents were represented in tables of frequency counts and percentages. The research questions were answered with thematic analysis of the in-depth interviewed

data, t-test and Analysis of Variance (ANOVA) were used for the quantitative secondary data to test the hypotheses at 0.05 level of significance.

Results

Research Question 1: What is the pre-service teachers' attitude towards Basic General Mathematics CBE?

Research Question 2: Is the pre-service teachers' attitude towards mathematics computer-based examination differ by gender and field of affiliation?

The male pre-service teachers showed more positive disposition towards Mathematics CBE than their female counterparts like the two respondents that

averred no interest in Mathematics CBE were female while the entire male indicated positive attitude towards Mathematics CBE. On the basis of school of affiliation, the pre-service teachers from School of Science displayed more positive attitude than all other students followed by those in Vocational and Technical Education, followed by those in Arts and Social Sciences, followed by those in Education, followed by those in Languages while the pre-service teachers from ECCPED had the least attitudinal disposition to Mathematics Computer Based Examination.

Hypotheses Testing

Ho1: There is no significant difference in pre-service

Table 1: T-test Analysis of difference in Pre-service Teachers' Mathematics CBE Scores Based on Gender

Gender	N	Mean	SD	Df	t	Sig.	E
Male	913	39.26	8.19	1260	9.41	.008	*S
Female	349	34.83	12.52				

From Table 1, there is a significant difference in the pre-service teachers' Mathematics CBE based on gender ($t = 9.41$, $df = 1260$; $p < .05$). Therefore, the null hypothesis that says there is no significant difference in pre-service teachers' Mathematics CBE

scores based on gender is not accepted.

Ho₂: There is no significant difference in pre-service teachers' Mathematics CBE scores based on school of affiliation.

Table 2: Analysis of Variance of Pre-service Teachers' Mathematics CBE Scores based on School of Affiliation

Gender	Sum of Square	df	Mean Square	F	Sig.	R
Between Groups	470.85	5	8.19	13.26	.015	*S
Within Group	889.95	1255	12.52			
Total	9368.80	1260				

Table 2 reveals that there is a significant difference in the pre-service teachers' Mathematics CBE scores based on school of affiliation ($F_{(5,1255)} = 13.29$, $p < .05$). Therefore, the null hypothesis that says there is no significant difference in the pre-service teachers'

Mathematics CBE scores based on school of affiliation is not accepted. To know the direction of the difference, scheffe posthoc test was conducted and presented in Table 2.1.

Table 2.1: Scheffe Posthoc Test of Pre-service Teachers' Mathematics CBE Score based on School of Affiliation

School of Affiliation (i)	School of Affiliation (j)	Mean Difference (i-j)	Sig.
Science (42.80)	VTE (41.38)	1.42	1.25
	ASS (39.72)	3.08	.04
	Education (34.59)	8.21	.01
	Languages (31.64)	11.16	.00
	ECCPED (30.88)	11.92	.00

Table 2.1 indicates that the pre-service teachers in the School of Science had the highest mean score (42.80), followed by pre-service teachers from the School of Vocational and Technical Education (41.38), followed by School of Arts and Social Sciences (39.72), followed by School of Education (34.59). followed by pre-service teachers in the School of Languages (31.64) while students from Early Childhood Care and Primary Education have the lowest means Mathematics CBE score of 30.88.

Discussion of Findings

From the qualitative data thematic analysis revealed that the pre-service teachers' attitudes towards Basic General Mathematics (BGM) Computer-Based Examination (CBE) was positive and high. majority expressed that they enjoyed and like the use of Computer Based Examination for Basic General Mathematics than the paper and pencil examination. The reasons advanced by the majority of the participants that Mathematics CBE is easier and better than the mathematics paper and pencil examination in that CBE garbs and sustains the interest of the pre-service teachers in BGM examination. These results find supports in Dammas (2016), Banna and Abu-Safe (2019), Olutola, Olatoye and Ademola (2021) that students have positive attitudes to computer-based examination than the paper-pencil examination. The finding was conversed to the conclusion reached by Khoshsima, et al. (2019) that there exists no significant difference in students' attitude towards CBE and PPE.

Also, from the thematic analysis, it was revealed that the male pre-service teachers showed more positive disposition towards Mathematics CBE than their female counterparts. This was owing to the fact that male is more technologically savvy than the female counterparts. The result is converse to the findings of Banna and Abu-Safe (2019) that although students exhibited more positive attitude towards CBE in Physics, however, gender has no significant effects on the students' attitude towards CBT Physics examination

Additionally, from the analysed qualitative data, it was revealed that all the participants reported that they performed better with Mathematics CBE than the paper and pencil examination. The surge in the pre-service teachers' zeal and enthusiasm in using computer-based examination for BGM than the PPE account for their improved performance in the course. This result corroborates the findings of Ceka and O'Geen (2019), Omowunmi and Salako (2020) that students had improved performance when using the

computer-based examination. The result was conversed to the findings of Ricketts (2002), Garas (2018) that there is no difference in the students' performance when exposed to CBE and PPE.

From the tested hypotheses, it was realized that there is a significant difference between male and female pre-service teachers' performance in BGM CBE in favour of the male gender. This may be explained on the basis of male suaveness in technological devices that their female counterparts. The results align with Garas (2018) which showed that males performed better than females on CBT, and females outperformed males on paper and pencil test.

Furthermore, there exist a significant difference in the pre-service teachers' Mathematics CBE scores based on school of affiliation. The pre-service teachers in the School of Science had the highest mean score, followed by pre-service teachers from the School of Vocational and Technical Education, followed by School of Arts and Social Sciences, followed by School of Education. followed by pre-service teachers in the School of Languages while students from Early Childhood Care and Primary Education have the lowest means Mathematics CBE score. This is explained on the basis of the students' closeness and raptness to science and technology. It would be realized that pre-service teachers in School of Science, Vocational and Technical Education along with those in Arts and Sciences are closer to science and technology than their counterparts in School of Education, Languages and ECCPED.

Conclusion

From the qualitative and the quantitative results of the research, it could be precisely concluded that the pre-service teachers had positive attitude towards mathematics computer-based examination; had improved performance with mathematics computer-based examination and that the pre-service teachers' performance and attitudes towards mathematics computer based examination was different by gender and school of affiliation.

Recommendations

From the findings and conclusion reached in the study, it was recommended that:

1. The College management should continue to adopt computer-based examination for all the general courses of the 100 level students and even extend same to the remaining two levels of the pre-service teachers;
2. The lecturers and the examination officers

should prepare computer-based examination tutorial for Basic General Mathematics and other general courses to enhance and trigger more positive attitudes towards the CBE and an invariable improved performance of the pre-service teachers;

3. The lecturers and the examination officers should work on the standardization of the CBE especially in the areas of validity, building on test blue print content (table of specification), the CBE questions' difficulty indices and the effectiveness of questions' alternative answers distractors. This will enhance and enable more pre-service teachers' steadiness and preparedness for the CBE.

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