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Controlling a Constraint to Authentic Learning of Mathematics in Katsina State Tertiary Institutions, Nigeria

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Abstract

The research refers "overcrowded class" as a Constraint to authentic learning of Mathematics in Katsina State Tertiary Institutions, Nigeria. Learning would never be effective in an overcrowded class, is a situation whereby teachers are not convenient to teach, also students are not convenient to learn. This would no doubt have serious negative effect on the teachers and students' performance. It was against this background that this research was conducted. The research is survey in nature, Katsina State has five tertiary institutions, out of which three institutions were randomly selected for the research. From each of the three institutions, results of six Mathematics courses were randomly selected across the levels making a total of eighteen (18) independent results for the research. The objectives of the research were to determine the teacher to students ratios, investigate relationship between class size and students' performance, identify the negative consequences of overcrowded class on students' performance and offer solutions for improvement. The research questions were examined and the major null hypothesis formulated was tested at 1% significance level using Pearson Product Moment Correlation (PPMC) statistic. Major findings of this research are, "teacher to students ratios in Mathematics classes in Katsina State tertiary institutions are far from ideal", "there is significant negative relationship between class-size and students' Mathematics performance in Katsina State tertiary institutions" and "there is significant negative impact of overcrowded class on students' Mathematics performance in Katsina State tertiary institutions". Finally, conclusions and recommendations were made.

Keywords

Authentic, Constraint, Controlling, Tertiary institutions, Katsina State.

INTRODUCTION

In developed nations, problem of overcrowded class in institutions of higher learning does not exist. But it is not so in developing countries like Nigeria [1]. In Nigeria for instance, the classes are becoming more crowded from one session to another with particular emphasis to Mathematics classes [2].

Among the factors that lead to overcrowded Mathematics classes in Nigerian tertiary institutions is liberation of education without manpower and facilities matching the sharp increase in class size [3].

It is obvious that demand of higher education in the tertiary institutions is on sharp increase and available infrastructure does not meet the demand. Many educators reveal that large class is an obstacle to qualitative teaching and learning [4]. The class size limit recommended by the regulatory body of the tertiary institutions in the state is 1:30 ratio. This ratio is ignored by the teachers, administrators and governments due to insufficient manpower and facilities [5].

Teachers use traditional lecture method in teaching the overcrowded classes. However, in overcrowded class, lecture method has a number of disadvantages including; teacher centeredness, passive learning, poor formative evaluation, neglect of individual differences among students and lack of room for acquiring social values. Hence, challenges of overcrowded classes would not be controlled by lecture method [6].

STATEMENT OF THE PROBLEM

Observation by the researchers reveals the existence of overcrowded Mathematics classes in Katsina State tertiary institutions. However, this observation needs to be verified by means of empirical research. In fact, there are many factors militating against effective teaching and learning of Mathematics in Katsina State tertiary institutions and by observation overcrowded class is one among the major ones [6].

In an overcrowded class, teacher and students are not convenient to teach and learn respectively. On the part of teaching, teacher finds it difficult to make effective communication as in such class public address system is not made available. The teachers cannot have close contact with individual student. It is difficult for them to take attendance regularly and hardly for them to identify the students by their names. Class control and management become difficult hence they hardly identify sleeping, noise and trouble makers in the class. Scoring tests, assignments and class work and returning the feedback to the students before examination becomes tedious. During examination, the teachers could neither invigilate the crowds properly nor could they effectively control misconduct and irregularities. Poor

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marking and recording examination results also emanate [7].

On the part of the learning, students suffer lack of space and facilities. They lack proper communication and contact with the teacher hence cannot receive the attention they deserve. They tend to lose interest and concentration, some may be sleeping or looking through the doors and windows. Some sit on the floor, some standing while some kneeling on doors and windows. Hence, they have little chance to respond to teacher's instructions and are likely to become indiscipline, unruly, noisy and trouble makers who may likely indulge into examination misconduct.

It is worthy to say that I personally observed all these challenges in overcrowded Mathematics classes in Katsina State tertiary institutions, hence this observation needs to be verified by means of empirical research and solutions be offered.

OBJECTIVES OF THE RESEARCH

This research was conducted to achieve the following objectives:

1. To determine the specific and average teacher to students ratios in Mathematics classes in Katsina State tertiary institutions;
2. To investigate the relationship between class size and students' Mathematics performance in Katsina State tertiary institutions;
3. To discover the negative consequences of overcrowded Mathematics classes on students' performance in Katsina State tertiary institutions; and
4. To offer solutions to the negative consequences of overcrowded Mathematics classes in Katsina State tertiary instructions.

RESEARCH QUESTION

This research examined the following questions:

1. What are the specific and average teacher to students ratios in Mathematics classes in Katsina State tertiary institutions?
2. What is the relationship between class size and students' Mathematics performance in Katsina State tertiary institutions?
3. What are the negative consequences of overcrowded Mathematics classes on students' performance in Katsina State tertiary Institutions? And
4. What are the solutions to the negative consequences of overcrowded Mathematics classes in Katsina State tertiary instructions?

RESEARCH HYPOTHESES

On the basis of the research objectives, the following null hypotheses were formulated:

H_{01}**:** Specific teacher to students ratios in Mathematics classes in Katsina State tertiary institutions are not significantly different compared to the recommended ratio.

H_{02}. Average teacher to students ratios in Mathematics classes in Katsina State tertiary institutions are not significantly different compared to the recommended ratio.

H_{03}. There is no significant relationship between class size and students' Mathematics performance in Katsina State tertiary institutions.

H_{04}. There is no significant solution to the negative effect of class size on students' Mathematics performance in Katsina State tertiary institutions.

SIGNIFICANCE OF THE STUDY

Students:

Students would have adequate space and learning facilities. They would have proper communication and contact with the teacher. Their interest and concentration in the lesson would improve. They would become disciplined, ruly and free from noise and troubles making. They would shun examination misconduct and irregularities. In turn, this would have an overall effect of improving and promoting the students' perception, attitude, understanding, performance and retention of the subject.

Teacher:

Teacher would have effective communication in class, and have close contact with the individual student. He could take attendance regularly and identify the students by their names. He could control and manage the class properly. He would find it easy to score and record results of the tests, assignment, class work, and return the feedback to the students before examination. During examination, he could invigilate properly and control examination misconduct and irregularities, in turn, this would have overall effect of improving and promoting teacher's effectiveness and efficiency.

Governments/Administrators:

Findings of this research if properly implemented, would enable government/administrators to build more classes, employ more teachers and provide more facilities to decongest the overcrowded classes. They would be influenced to organize sensitization workshops, conferences and seminars for the teachers on methods for effective handling of overcrowded classes.

Mathematics Associations:

Mathematics associations would be influenced to contribute in building more classes and employment of more teachers. They could also liaise with the governments to make good policies, organize sensitization workshops, conferences, seminars and publish textbooks and journals on methods of minimizing the negative effect of overcrowded classes.

Future Researchers:

By means of this research, future researchers would have literature, data and results which they could build upon to make further researches on class size.

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METHODLOGY

The research was survey in nature where by sample was used and the findings were generalized on the population. The research was determined to control the negative consequences of overcrowded mathematics classes in Katsina State tertiary institutions. There are five tertiary instructions in Katsina State namely; Katsina State University (KSU), Katsina State Polytechnic (KSP), Katsina State College of Education (KSCE), Katsina State College of Legal Studies (KSCLS) and Katsina State College of Technology and Management Studies (KSCTMS). Out of the five institutions, three were randomly selected for the research namely; KSU, KSP and KSCOE. In each of the three institutions, results of six mathematics courses across the levels as at 2022/2023 academic session were randomly selected making a total of eighteen independent results for the research.

Number of teachers and students for each of the eighteen courses were identified, hence, specific and average teacher to students ratios were computed. Equally, performances of the students in the courses was identified, hence, relationship between class size and students' performance was established using Pearson Product Moment Correlation (PPMC) statistic in SPSS application. Earlier, the data was identified to be normally distributed through “test of normality" in SPSS application.

ANALYSES

Proportion was used to determine the teacher to students ratios while Pearson Product Moment Correlation (PPMC) statistic in SPSS application was used to establish relationship between class size and the students’ performance. More information is provided in tables 1-6 below:

Table I. Teacher to Students ratio (T:S): (KSU)

Course	Teacher (T)	Student (S)	T:S	Recommended T:S
Mat 101	1	304	1:304	1:30
Mat 102	1	300	1:300	1:30
Mat 221	1	206	1:206	1:30
Mat 232	1	218	1:218	1:30
Mat 314	1	174	1:174	1:30
Mat 316	1	183	1:183	1:30
Average	1	231	1:231	1:30

Source: Head count done by the researchers

Table I shows that the average number of teachers is1 and the average number of students is 231. Hence, the average teacher to students ratio is 1:231 against the recommended ratio of 1:30.

Table II. Teacher to Students ratio (T:S): (KSP)

Course	Teacher (T)	Student (S)	T:S	Recommended T:S
Mat 111	1	216	1:216	1:30
Mat 121	1	248	1:248	1:30
Mat 221	1	216	1:216	1:30
Mat 232	1	208	1:208	1:30
Mat 324	1	189	1:189	1:30
Mat 316	1	176	1:176	1:30
Average	1	216	1:216	1:30

Source: Head count done by the researchers

Table II shows that the average number of teachers is 1 and the average number of students is 216. Hence, the average teacher to students ratio is 1:216 against the recommended ratio of 1:30.

Table III. Teacher To Students Ratio (T:S): (Ksce)

Course	Teacher (T)	Student (S)	T:S	Recommended T:S
Mat 121	1	289	1:289	1:30
Mat 122	1	262	1:262	1:30
Mat 233	1	214	1:214	1:30
Mat 212	1	206	1:206	1:30
Mat 321	1	189	1:189	1:30
Mat 322	1	172	1:172	1:30
Average	1	222	1:222	1:30

Source: Head count done by the researchers

Table III shows that the average number of teachers is 1 and the average number of students is 222. Hence, the average teacher to students ratio is 1:222 against the recommended ratio of 1:30.

Table IV. Relationship between class size and students’ performance: KSU

Course	Class Size (Students)	Students’ Average Performance	Correlation Coefficient
Mat 101	304	32	
Mat 102	300	39	
Mat 221	206	42	r = -0.884
Mat 232	218	40	
Mat 314	174	48	
Mat 316	183	45	

Source: KSU Management

Table IV shows the correlation coefficient of Γ = -0.884 indicating high negative relationship between class size and students’ performance. The correlation coefficient was computed using SPSS application.

Table V. Relationship Between Class Size and Students’ Performance: Ksp

Course	Class Size (Students)	Students’ Average Performance	Correlation Coefficient
Mat 121	121	35	
Mat 122	122	37	
Mat 233	233	43	r = -0.978
Mat 212	212	48	

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Course	Class Size (Students)	Students' Average Performance	Correlation Coefficient
Mat 321	321	50	
Mat 316	332	53	

Source: KSP Management

Table IV shows the correlation coefficient of Γ = -0.968 indicating high negative relationship between class size and students' performance. The correlation coefficient was computed using SPSS application.

Table VI. Relationship between class size and students' performance: KSCE

Course	Class Size (Students)	Students' Average Performance	Correlation Coefficient
Mat 121	121	35	
Mat 122	122	37	
Mat 233	233	43	r = -0.978
Mat 212	212	48	
Mat 321	321	50	
Mat 316	332	53	

Source: KSCE Management

Table VI shows the correlation coefficient of Γ = -0.978 indicating high negative relationship between class size and students' performance. The correlation coefficient was computed using SPSS application.

CONCLUSION

From the analyses, it was concluded that teacher to students ratios in Mathematics classes in the three sample institutions were far from ideal; 1:231, 1:216 and 1:222 for KSU, KSP and KSCE respectively against the recommended ratio of 1:30. The analyses also shown that there exist significant negative relationship between class size and students' Mathematics performance in the three sample institutions; -0.884, -0.968 and -0.978 for KASU, KSUP and KSCE respectively. As class size increases, performance decreases drastically. Hence, overcrowded class has significant negative impact on students' performance. For instance, due to the overcrowds, class control and management tend to be poor which leads to poor perception, attitude, performance and retention of the subject. All these findings could be generalized to all Katsina State tertiary institutions.

However, due to insufficient teachers and facilities, governments and administrators tend to ignore the recommended teacher to students ratio of 1:30.

To decongest the overcrowded classes, the state government should build more classes, laboratories, staff offices, and employ more teachers and provide more teaching and learning equipment, facilities and materials.

The teachers should minimize the utilization of lecture methods (teacher centered method) for teaching the crowds and embark on learner centered methods of teaching like; cooperative learning approach, constructivist method, connectivism method, blended learning approach, flipped classroom method and so on. All these methods have the tendency to minimize the negative consequences of overcrowded class.

The institutions should adopt electronic and distance learning approach whereby a single teacher could conveniently teach thousands of students at the comfort of his room and at the comfort of their rooms, lessons could be recorded (audio and video) and be played repeatedly.

The government, administrators, and associations should organize seminars, workshops and conferences on class size which would lead to publications of journals, textbooks and other teaching and learning materials. And of course, these materials should be made available to the teachers and students for implementation.

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