

# Impact of some low-cost interventions on students' performance in a Nigerian medical school

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## Abstract

**Background:** Students' poor performance in physiology examinations has been worrisome to the university community. Reported preference of peer-tutoring to didactic lectures at the University of Nigeria Medical School has not been investigated.

**Aim:** The aim of this work is to design/implement low-cost interventions to improve teaching and learning of physiology.

**Materials and Methods:** This is a postintervention retrospective review of medical Student's performance in 2<sup>nd</sup> Bachelor of Medicine and Bachelor of Surgery examinations physiology. Data were collected and analyzed by descriptive and inferential statistics using the MedCalc Statistical software (Turkey). The odds ratio (OR) was used to determine the chances of passing before and after the intervention. The level of significance was set at  $P < 0.05$ .

**Results:** A total of 2152 students sat for the professional examination over the study period, and 1485 students passed the examination at first attempt giving an overall pass rate of 69%. The pass rate from 2008 when our interventions started was significantly higher than the pass rate before this reform (OR: 0.53; 95% confidence interval: 0.43-0.64;  $P < 0.0001$ ).

**Conclusion:** Results support the engagement of teachers with strong translational interests and clinicians to augment existing faculty in basic sciences, innovative alternatives to passive lecture formats and students involvement in program evaluation.

**Key words:** Learning, low-cost innovation, medical school, Nigeria

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## Introduction

The Bachelor of Medicine and Bachelor of Surgery (MBBS) degree in Nigeria is a 6-year program consisting of 12 months of basic sciences, 18 months of preclinical study, and the rest spent in Clinical Departments.<sup>[1]</sup> The preclinical period is for the basic medical sciences courses (Anatomy, Biochemistry, and Physiology), which run concurrently. The exit preclinical examination called 2<sup>nd</sup> MBBS professional examination involves the above three departments. In the Physiology Department, during these 18 months, preclinical students are exposed to 6-7 h/week of a supervised learning experience made up of didactic lectures (3 h), a tutorial (1 h), and laboratory practical sessions (2-3 h).<sup>[1]</sup> Traditionally, the learning of physiology has relied heavily

on systems-based didactic lectures.<sup>[2]</sup> In Nigerian medical schools, teaching activities are conducted in English language in all cases, led by the departmental academic staff and the students are the passive recipients. Tutorial classes are also conducted by the departmental academic staff.

Previous evaluation of students' perception of physiology learning environments in our medical school reported declining interest in passive lecture formats/practical sessions, with significant preference of peer-tutoring.<sup>[1]</sup> In physiology subject in the preclinical program, it is mandatory that a student scores 50% in order to proceed to the clinical session, and generally knowledge is usually what is assessed

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at the examinations.<sup>[3]</sup> Students are usually assessed on essay questions, short answer questions, multiple choice questions, practical questions and viva or oral examination. The questions are formulated to test the student knowledge and prepare them for clinical sessions. The continuous assessments contribute 30% of the total 2<sup>nd</sup> MBBS examination, while the final examination at the end of 18 months training contributes 70% of the total 2<sup>nd</sup> MBBS examination scores. Examination grades are modeled on the British system whereby >70% is a distinction grade, 50-69% is a passing grade and <50% is a failing grade.

Admission is mainly through a Nigerian National University Matriculation Examination (UME), but both inter- and intra-university transfers from related academic programs are approved by the institution. Furthermore, students with a previous first degree can be admitted through a direct entry mode into the 2<sup>nd</sup> year of the 6-year medical program. In Nigeria, the implementation of the current trend in physiology education which is to highlight ways in which teaching can be converted from a staff-centered passive learning environment to one that encourages student-centered active learning<sup>[4]</sup> appear currently limited. However, at the Department of Physiology, College of Medicine of University of Nigeria, earlier reported preferences of students, students poor performances in examinations, and poor student: Lecturer ratio<sup>[1,5,6]</sup> led to futile attempts to increase academic staff due to funding gaps. We thus designed some low-cost interventions to improve learning outcomes and evaluated the impact of some of these locally designed interventions on students' performances in examinations. The aim is to determine and share appropriate interventions that can improve learning in Nigerian medical schools.

## Materials and Methods

Undergraduate medical students of the Faculty of Medical Sciences University of Nigeria, Enugu Campus (UNEC) who were admitted through the UMEs were used for this study. The department analyzed students performances and based on observed findings and earlier research reports, we designed and implemented some innovations (listed below) from the year 2008, which were aimed at improving observed poor performances of students in 2<sup>nd</sup> MBBS physiology in our institution. The students' numbers and performances were collated based on pass/fail grades over a total of 7-year period (2004-2010) representing periods before and after our interventions. The result presented is thus a retrospective review of medical students' performance in 2<sup>nd</sup> MBBS examinations at the College of Medicine, UNEC, Enugu, Nigeria and the 2008-2010 period represents the time of implementation of our interventions, which are described below.

### Exclusion criteria

Students who were admitted through inter-university transfers or direct entry (have completed a previous bachelor's degree) were excluded from the study.

### The interventions

#### *Securing the services of faculty clinicians to augment existing number of lecturers in Physiology*

We requested and received faculty approval for the deployment of specialists in Clinical Departments (Medicine and Obstetrics/Gynecology). Five specialists were thus given dual appointments and participated in the teaching, supervision of tutorial classes and examinations in the Department of Physiology as well as their base departments. This increased the number of lecturers in the department without additional cost to the faculty from 7 (2 with clinical background) to 12 (7 with clinical background). Systems were distributed to all without any change in course content or duration.

#### *Use of assessments that promote student to student interactions*

The format of class assignments changed. Students are given the questions for the essay assessment at least 72 h before the assessment date. The students then have time to research and seek answers before the assessment date. The aim was to improve capacity to seek for information and communication skills, thus the scores from these assessments was not used as part of continuous assessment. This question-driven format allows for students to engage in both active learning and peer learning.

#### *Change in tutorial format*

The students were to make to lead the discussions in the tutorial classes, but an academic staff sits-in to guide discussions and make corrections where necessary. The aim was to use their preference of peer-tutoring to improve learning, but with efforts at authenticating facts learned at such sessions. The timing of the tutorial sessions remained the same.

#### *Review of assessment results/questions*

After each continuous assessment, the students are given back their corrected scripts for review. Subsequently, the faculty member that set the questions reviews each question and expected answers with the students in an interactive format.

### Data analysis

Data were collected and analyzed by descriptive and inferential statistics using the MedCalc Statistical software (Turkey) (MedCalc 12.1. MedCalc Software bvba, Ostend, Belgium). The odds ratio (OR) was used to determine the chances of passing before and after the intervention. The level of significance was set at  $P < 0.05$ .

### Ethical clearance

No serious ethical issue was identified but study was approved by relevant Departmental/Faculty Boards.

Confidentiality was maintained as there was no disclosure of the names of the students from the origin of the data.

## Results

Table 1 shows an increase in student population admitted into the medical school since 2004. Furthermore, there was an improvement in 2<sup>nd</sup> MBBS physiology passes since 2008 with percentage pass rate of over 70% since 2008.

Table 2 shows that the pass rate from 2008 to 2010 when our innovative interventions commenced was 76.5%, whereas the pass rate before the intervention, from 2004 to 2007 was 63.4%. This was significantly higher than the pass rate before this reform (OR: 0.53; 95% confidence interval: 0.43-0.64;  $P < 0.0001$ ).

## Discussion

The results show that our local innovations based on evidence from evaluations of our students performances led to significant improvement in students understanding cum performances. In the past, the Department of Physiology at the College of Medicine of University of Nigeria had limited number of tutors; however, the introduction of our innovations and five additional academic staff members with medical background and professional qualifications resulted in a higher pass rate in our 2<sup>nd</sup> MBBS physiology examinations from 63% to 77% [Table 1]. The major

contributing factor for the increased pass rate is still not very clear, a background in medicine has been documented to provide a good grasp of the physiological concepts that a medical students needs to understand.<sup>[7]</sup> And it is also noteworthy that during these periods there was no change in the course content, the examination/assessment pattern and educational infrastructure. However, what changed were cost-effective increase in the number of faculty from 2008 and introduction of student-centered learning techniques. The addition of people with clinical expertise may have contributed positively by changing the initial environment of “information smoothie” to that of “clinical and translational science activities”.<sup>[6]</sup> The question-driven format which we introduced also has the advantage of turning the internet and other forms of electronic media into the student’s friend in addition to supporting peer discussions/learning, a likely reason for the sustained improved performance in examinations since 2008. Results show that though there was a significant increase in class size from 2007 ( $n = 309$ ) to 2008 ( $n = 370$ ), the pass rate in 2008 is significantly better when compared with results from the years 2004 to 2005 when the class sizes were smaller. It is thus clear that innovations that are cost-effective and based on research evidence can feed back into improvement of learning outcomes. Thus, there is even a need for even a further evaluation of student’s perception of these innovations toward adjustments that can achieve optimal performance of our students. This would be easier with student feedback, but this is currently lacking in Nigerian Medical schools.<sup>[11]</sup> Basic science teaching is fraught with special difficulties ranging from sustaining interest and clinical correlation,<sup>[6,8-10]</sup> but our challenge is to make learning fun, as this will greatly motivate and inspire students, and unless students are inspired and motivated, our efforts are pointless.<sup>[11]</sup> The findings of this study support earlier findings that passive lecture formats negatively affect performance<sup>[12]</sup> and we must thus find ways to reduce their usage. We agree with the assertion that it may be difficult to innovate changes in a strictly traditional setting,<sup>[11]</sup> but students perceptions and our results confirm that effective management of educational change is crucial, with willingness to explore possibilities despite any apparent indigenous barriers.

It should be clear that training physicians is different from training undergraduate students to be researchers, and most importantly we as teachers should appreciate how the 21<sup>st</sup> century students learn.<sup>[7]</sup> There should thus be a sustained support for improvement of learning environments that encourage integrative reasoning<sup>[13]</sup> and institutional leadership at every level with clinical investigators and PhD holders with strong translational interests.<sup>[6]</sup>

## Conclusion

Reforms in Nigerian medical schools and indeed in other less developed countries, should include engagements of clinicians to augment teaching faculty in basic sciences,<sup>[6,7]</sup>

**Table 1: Yearly distribution of performance of medical student’s in 2<sup>nd</sup> MBBS examination**

Year	Total number of students	Total number that passed	Percentage pass	Total number that failed	Percentage fail
2004	285	197	69.1	88	30.9
2005	290	188	64.8	102	35.2
2006	347	196	56.5	151	43.5
2007	370	233	63.0	137	37.0
2008	309	238	77.0	71	23.0
2009	258	202	78.3	56	21.7
2010	293	217	74.1	76	25.9

MBBS=Bachelor of Medicine and Bachelor of Surgery

**Table 2: Performance of medical student’s in 2<sup>nd</sup> MBBS physiology examination before and after innovative interventions**

Periods	Total number of students that passed (%)	Total number of students that failed (%)	Total
Before (2004-2007)	814 (63)	478 (37)	1292
After (2008-2010)	657 (76.4)*	203 (23.4)	860
Total	1471	681	2152

\*OR=0.53; 95% CI=0.43-0.64;  $P < 0.0001$ . OR=Odds ratio, CI=Confidence interval, MBBS=Bachelor of Medicine and Bachelor of Surgery

support for peer-assisted learning,<sup>[5]</sup> active participation of students<sup>[14]</sup> and students involvement in evaluation of their teachers or academic curriculum.<sup>[1,15]</sup> There is need for governments in developing countries to improve education funding, but innovative cost-effective interventions will be helpful and teachers should develop ways for students to collaborate in different teaching settings.

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