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Full Length Research Paper

Does neuro-anatomy award/ prize impact on student performance in the first professional examination in anatomy

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Concern has been expressed about the motivational impact of neuro-anatomy award/prize in determining the overall student performance in the final professional anatomy examinations by comparing it with the result outcome of a high stake examination like neuro-anatomy incourse examination using the concept of convergent validity. A total of 57 third year medical students with the records of their grades/scores (Mean ± SD) in the various assessments criteria, were analyzed. In this study, the neuro-incourse examination was consistently a high predictor (r = 0.80; P<0.01) of student performance compared to other incourse examinations (1st incourse, r = 0.60; P<0.01 and 2nd incourse, r = 0.30; P < 0.01 respectively). However, the neuro-incourse examination tests students' performance in a relatively difficult module and was found to be consistently correlated and highest when compared with the overall professional examination as a result of student motivation.

Key words: Motivation, medical students, neuro-anatomy, curriculum, assessment, professional examination, anatomy, performance, Lagos.

INTRODUCTION

Our starting hypothesis was that naturally anatomy, as a course in itself, will promote self-determination (Deci and Ryan, 1991) and indeed would have a positive impact on the motivation of the students and on their learning. Since, it is one of the basic medico-biological disciplines in higher medical formation that medical students first meet in their career which give them a sense of being a 'doctor' or a 'practicing surgeon' in the theatre.

However, educators and researchers generally agree that motivation as a concept is an important factor in school performance and academic achievement (Atkinson and Feather, 1966; Bishop, 1989; Matthews and Odom, 1991). Student motivation is seen as a student's willingness, need, desire and compulsion to engage in and be successful in the learning process (Bomia et al., 1997). More so, motivational effect is the same for both male and female students across all grade levels, and varies from school to school and Lagos State University College of Medicine (LASUCOM) is no exception.

Generally, motivation can be intrinsic or extrinsic. Intrinsic motivation arises from the satisfaction within due to one's behaviour. Hence, incentives will indeed motivate learning. In a general learning situation, self-motivation without rewards will not succeed. Whereas, Lumsden (1994) indicated that the earliest influences on children's motivation to learn is parents especially their mothers (Dev, 1997) and others at home. By the time

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students gain admission into school, their level of interest and desire to engage in learning will thus be heavily influenced by other extrinsic factors such as the teachers, administrators, the school environment, and their classmates.

It has also been claimed that student learning is assessment-driven (Habeshaw et al., 1993), and that assessment is of singular importance to the student experience (Rust, 2002). Reduced dropout rate and increased levels of student success have consistently been linked to high motivation and engagement in learning (Blank, 1997; Kushman, 2000).

Consistently, assessment has been recognized as probably the most influential factor related to how students learn (Brown and Glasner, 1999), which is directly linked to effective teaching and learning by rewarding understanding and achievement (Jenkins, 2004). However, the fundamental cause of student apathy is lack of rewards for students' effort and learning. Hence, the key to student motivation is the recognition and rewarding of academic effort (Bishop, 1989). Assessment of a student's performance on a particular module such as the neuro-anatomy may often be thought of as a single evaluation of the extent to which the student has met some or the entire module's learning outcomes. The time spent on learning activities and intensity of students' involvement in the learning process is often of two characteristics which are used as indicators of students' motivation. Bishop, (1989) emphasized that the intensity of students' involvement is even more important than time devoted to learning. However, the motivation to learn is defined as that natural response to learning opportunities which is enhanced by the following:

Ability to recognize one's role of thinking and conditioned thoughts in learning and the motivation to learn under a variety of conditions, including self-constructed evaluations of the meaning and relevance of a particular learning opportunity.

The understanding of one's natural endowment and capacities for self-regulation. Contextual conditions that support natural learning as well as perceptions of meaningfulness and self-determination, expectations and values, or the view that a student's behavior results from the combined function of student's prospects for attaining particular outcome and the degree to which they place some worth in the outcome (Atkinson, 1957; Eccles, 1983). Indeed, the process of providing motivation to the stud-ents will be such that the teachers must create learning opportunities that will help the students to developing positive self-concepts and a sense of responsibility and self-reliance (Wright, 1974), which is often times one of the strategies that the neuro-anatomy prize/award has employed and achieved. The curricular model of LASUCOM with different structural phases (basic and clinical sciences) is similar to what obtained in other medical schools (Shittu et al., 2006). One hypothesis that will lead to greater achievement in student's performance is the use of a high-stake testing environment with a positive serious consequences on the students (e.g., for grade promotion). The neuro-anatomy award was an innovation initiated by the department to enhance students' interest and consequently their performance in the 3rd semester and final professional examinations.

However, there is paucity of knowledge on the role that motivation plays in the students` academic performance while keeping the environmental condition which the students are exposed to constant, especially in this part of the world. We also hypothesized that the neuro-anatomy award/prize winners usually performed excelently well in the final professional examinations including anatomy and other basic sciences. However, to test this hypothesis further in this present study, we employed the concept of convergent validity (Shittu et al., 2006) in determining the motivational impact of the neuro-anatomy award/prize on the overall performance of the third year medical students in the final professional anatomy examinations.

MATERIAL AND METHODS

Course logistics

The Gross Anatomy course at the LASUCOM is taught for three semesters, during the second and third year of the students' curriculum. The class usually contains about 50 - 68 second year Medical Students (MS) depending on the set admitted and their year of admission. The students normally receive lectures as a group (average of 5 h/week), and are then scheduled for 6 h of laboratory time. In a traditional curriculum like in LASUCOM, all 50 - 68 students are assigned to dissect and required to be in the laboratory for all 6 h every week, for the 17 weeks per semester for the whole three semesters. The ancillary teaching, dissection protocol and other teaching protocols employed in the departmental programme are well elucidated in the previous publication (Shittu et al., 2006). Briefly, the students are allowed access to prossected pots and audiovisual materials among others in the museum and assigned two academic instructors per group to coordinate each group of students' activities during their whole stay in the Anatomy Department.

Professional examinations protocols

The Gross Anatomy and Embryology subject examinations was administered at the end of the third semester as the students' only final examination in Gross Anatomy, which account for 70% of the final grade. The examination is made of two parts namely, paper 1 which is multiple choice questions (MCQ) of 200 questions and paper 2 which is a short essay questions (SEQ) of 8 questions covering the various units and aspects of the course. In addition, the practical examination was timed (40 s per item), 50 question identification examinations with about 80% of the questions being two-part questions ('a' and 'b'). Examined material included tagged cadaver items, in addition to radiology, pots/cross-section, neuro-anatomy, osteology, embryology and histology questions. Students had prior knowledge of the regions upon which they would be assessed during the practical examination, but were randomly assigned to one of the stations on arrival for the practical.

Table 1. The Scored grades in anatomy at the final professional exam for the sets of 57 students.

Grade level	Number	Percentage
Fail	6	10.5
Pass	20	35.1
Credit	30	52.6
Distinction	1	1.8
Total	57	100

Table 2. Performance of 57 medical students (3rd Year) in anatomy.

Predictor variable	Mean	Standard deviation (SD)
Neuro-incourse Exam	60.50	7.49
Practical (Neuro-incourse) Exam	30.55	6.63
MCQ (Neuro-incourse) Exam	60.12	6.11
Essay (Neuro-incourse) Exam	59.19	10.57
Overall Professional Performance	59.17	7.06

The end incourse assessment carries 30%, while the other professional examination assessment parameters (MCQ, SEQ and practical) carried 70% of the overall score. Each of the assessment parameters (such as Essay, MCQ and practical) carries 100% of the 70% student's total grade in the final professional examination. Faculty members are encouraged to contribute questions in a scenario format questions, based on their areas of expertise. These questions are sent to external examiners for moderation.

Subjects

A blinded cohort retrospective study was carried out on the third year medical students "2002 set" in which all 57 students in the class participated in the first professional examination in anatomy with records of their grades utilized in this study. Students' grades/scores can range from 0 to 100 percent. The 2002 set was considered suitable for this study based on the following premises: homogenous background having been admitted through Joint Admission Matriculation Board Examination (JAMB) and being the second set to enjoy the award. The professional examination is a multifaceted, dynamic examination designed to assess proficiency and performance related to each required course taken at LASUCOM for the past 18 months.

Data analysis

Student performance data (i.e. percentage marks/grade) for each assessment point were acquired from central student records of electronic module results. The data were initially cleaned by removing student marks when no attempt was made at an assessment point, and were then sorted out using Student identification number in order to match students across the module. Computerized analysis of the data was done using SPSS 11 (SPSS inc. Chicago, Illinois), software package.

Based on the convergent validity principle, the professional examination was correlated with the neuro-incourse examination using correlation matrix (Pearson's correlation and modified in this study using the Rank-Spearman's correlation). Regression analysis and Anova of predictive variables were also analyzed. Data were expressed as Mean ± S.D and $P < 0.01$ was considered statistically significant (Shittu et al., 2006).

Ethics

The University's principles and procedures on research ethics were adhered to throughout the study. Data Protection Act and Helsinki declaration were equally and strictly adhered to.

RESULTS AND DISCUSSION

The male to female ratio for the two sets combined was found to be 1 to 2. 89% of the students passed while 11% failed. However, out of those who passed, 2% had distinction, 53% with credits grades and 35% with passes in the professional examination at first sitting as shown in Table 1. The mean ± S.D value for the Overall Professional Examination was found to be 59.2 ± 7.06, almost the same value with the essay component of the neuro-incourse. However, the neuro end-incourse has the highest value of 60.5 ± 7.5. The MCQ component in the neuro-incourse assessment examination has the lowest value of 30.6 ± 6.6 (Table 2). The average end-incourse examination was highly ($r = 0.88$) and significantly ($P<0.01$) correlated with the overall student performance. However, the 3rd semester-neuro incourse examination was the highest ($r = 0.80$; $P< 0.01$) as compared to other incourse examinations and closely similar to the average end-incourse examination (Table 3). For all the assessment parameters studied, their comparison with the overall performance in the professional examination using both the Pearson's correlation (r) and non-parametric correlation were found to be significant ($P<0.001$). The neuro-incourse examination has the highest value (r=0.80

Table 3. Correlation matrices for the various assessment parameters.

Assessment parameter	Incourse Neuro	Practical-Neuro	MCQ Neuro	Essay-Neuro	Overall professional examination
Incourse-Neuro	1.00	0.82**	0.75**	0.89**	0.80**
Practical -Neuro		1.00	0.63**	0.55**	0.70**
MCQ-Neuro			1.00	0.52**	0.62**
Essay -Neuro				1.00	0.68**
Overall professional examination					1.00

Number of students = 57. **Considered significant at P<0.01 (2-tailed).

Table 4. Comparison of the three end-incourse examinations with the overall professional examination performance.

Paired assessment parameters	Pearson's Correlation (r)
1st Semester (Incourse Exam) – Overall Prof. Exam	0.60** (p<0.01)
2nd semester (Incourse Exam.) – Overall Prof. Exam.	0.40** (p< 0.01)
3rd Semester (Neuro-Incourse Exam) – Overall Prof. Exam.	0.80** (p< 0.01)
Average End –Incourse Exam. – Overall Prof. Exam.	0.88** (p< 0.01)

**P<0.01 is significant.

and 0.73), whereas the MCQ (r =0.62 and 0.53) showed the lowest correlation with the overall performance in this order (Tables 3 and 4).

Comparison with the overall professional examination was consistently correlated and highest with the neuro-end incourse examination. However, the MCQ elements of the neuro-incourse examination was the least consistent with overall performance (F-value = 2.48; P> 0.01 but P< 0.05) (Table 4).

This particular set (2002) of third year medical students was chosen in view of the fact that, they represent the second set of students to benefit from the reality of the neuro-prize/award incentives and had prior sensitization from their predecessors. Our concern of this hypothesis is that low motivation will lead to an underestimation of student performance in any examination because of the lack of stake. Neuro-incourse examination is a high stake examination which tests the performance in a relatively difficult module for student to learn.

In other study, Allington and McGill-Franzen, (1992) have shown that the increased use of high-stakes reading assessment in the primary grades in New York led to increase in the average student performance with also a greater increase in proportion of students retained in the grade prior to the grade at which the high-stakes assessment occurred. McCormack-Brown (1999) has demonstrated that an individual's perception of their ability to succeed heavily impacts on their motivation, which is a powerful predictor of academic performance as depicted in this present study (Stipek, 2002). Self confidence in the students` ability and the perception of their control over their learning have both played important roles in students motivation, which was what the incentives introduced by the Anatomy Department for the neuro-anatomy module aimed to achieve for the student by creating similar enabling environment with self instructional materials among others for the students to explore in order to make their perception and grasping of this module a lot easier. However, the tendency to avoid failure motivates the individual to defend against the loss of self esteem, the loss of social respect and the fear of social punishment and embarrassment (Birney et al., 1969).

An interesting finding is that students who eventually won the prize or among the awards winners (usually given to the top 5% of students) were new discoveries, that is students who normally have been on borderline as evidenced by the results outcome of the other two previous incourse examinations (1st and 2nd semesters) (Birney et al., 1969). This finding was also supported by Savage (1972) who had earlier reported that students who do well are usually no more intelligent on the average than those who do poorly. This view was supported in other studies; Atkinson (1957) and Eccles (1983) who reported that the expectations and values attached or the way that a student behaves usually results from the combined function of student's prospects for attaining a particular outcome and the degree to which they place some worth in the outcome. This was well reflected in the outcome of this study , such that all the students having been motivated were craving to have their names written in gold in the Department and College as whole as a Neuro-award/prize winners and distinction candidates. Also, such students tend to perform well in other basic sciences with distinctions including Biochemistry and Physiology. The reason for this may be that when a student learns and feels an actual sense of progress and

real accomplishment, there is a significant motivation for future effort and learning in a similar direction (Wlodkowski, 1978). To our knowledge after extensive literature search, this appear to be the first study to look into the motivational effect of various institution incentives such as anatomy neuro-award/prize available to students in this environment.

Conclusion

This study has indeed emphasized the role of incourse assessment in the curriculum and further demonstrated that the Practical, Essay and MCQ components of the neuro-incourse examination are predictors of student's performance in that order of strength.

Furthermore, the incorporation of innovation like Neuroanatomy awards/prize has contributed towards improving the student's performance as reflected in this study. It is hoped that this study will contribute towards appraisal of the relevance of setting motivational goals for the students in order to improve on the efficiency and effectiveness of the curriculum taking into consideration the dynamism of the evolving educational technology in the area of basic medicine in the developing countries like Nigeria.

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