The predictive influence of interest in online learning of Pharmacy Students' achievement in General Biology

Abstract

Objectives: This study determined the prediction of students` interest in online learning on their academic achievement in general biology among the first-year undergraduate pharmacy students in Nigeria.
Design:A correlational research design was adopted for the study.
Place and Duration of Study: The study was conducted in Nigeria between 2020/2021 academic session.
Methodology: The study participants comprised of 370 undergraduate students drawn from faculty of pharmacy using multistage sampling procedure. Interest in online rating scale (IORS) and general biology achievement test (GBAT) wereresearch instruments used for the study. The internal consistency reliability indices of the instruments were established using Cronbach alpha and Kudder-Richardson formula 20 (K-R_{20}) to be 0.79 and 0.71 respectively.
Results: The findings of the study showed that students` interest in online learning significantly predicted their academic achievement in general biology. It was also found that the influence of gender on the amount of prediction of interest in online learning on students` academic achievement in general biology was not significant. The study showed that the regression model for predicting students` academic achievement in general biology from their interest in online learning is: BAA = 17.145 + 0.235(SLA) -0.505(SSA) + 0.305(SCA) -1.0143 (ARA) -0.012(ORA).
Conclusion: Interactive online learning platforms and forums where students can have access to question and answers on previous examinations as well as interact with instructors in solving examination problems should be made available. Students should make relentless efforts to engage in online related activities that will stimulate their interest and that teachers and parents should make online learning tools available to students so as to engage them in online learning often.

Keywords:e-learning, pharmacy student's interest and achievement, general biology, regression model

Introduction

Science generally has been seen as the foundation of modern development. It is a body of knowledge that has become responsible for man`s advancement and development in different areas of life. The knowledge of science is an indispensable asset to any nation that is willing to be independent technologically, economically, socially, politically etc. in this our contemporary times. Perhaps, this is part of the reasons[1] opined that the benchmark for any long-lasting development in a country`s economy and other relevant sectors is for her citizen to be educated in the areas of science. Science is concerned with the study of phenomena and occurrences around man through systematic/careful observations and experimentations [2]. Science according to [3] deals with the study of the universe, arrangement and composition of matter, the preservation and transfer of energy including the relationship between living things and the natural environment. Science may be seen contextually as a body of knowledge that is concerned with the study of living and nonliving things through careful observations and experimentations. The knowledge of science has become very vital in building formidable nations.It has been noticed that the development of any nation as a result of education is traceable to the utilization of the knowledge and skills of science and technology. According to [4], science is an instrument that can help a nation become economically, technologically, socially, politically and culturally stable. In view of the above, it is important that the study of science be taken seriously.

Perhaps, it is in the realization of these importance of science that the Nigerian government at the national level stressed that a greater proportion of educational expenditure be devoted to the study of science and technology [5]. The National Policy on Education in a bid to stressing on the importance of science stated that enough provisions should be made for the study of science at every level of learning in the national education system. Maybe, this is to enable Nigeria rise to the level of other developed nations through the knowledge and skills of science.Principally, science is divided into Physics, Chemistry and Biology. These basic subjects have undoubtedly established their importance over time in fostering science related carriers [6]. Physics is concerned with the study of matter and energy; chemistry deals with the study of the composition, properties, reactions and structures of matter while biology is concerned with the study of life and living things [7].

Biology is a branch of science that is concerned with the structure, function, evolution and distribution of organisms. It involves the study of life and living organisms [8; 9]. Furthermore, biology may be referred to as the study of different forms, their evolutions, structures, growth, distribution and taxonomy. It serves as a pre-requisite to other professions like pharmacy, medicine, biochemistry, agriculture, microbiology etc. thus, the role of biology to health sector, economic, industrial and other aspect of human endeavors cannot be overemphasized [10; 11].

The knowledge and understanding of biology as a subject have helped in several areas of human advancement such as in the medicine, pharmacy, agriculture etc. by providing better understanding of the human system, providing drugs for curing sicknesses and diseases, providing necessary knowledge for improving varieties of agricultural produce etc. [12]. From the foregoing, it is imperative to say that the importance and contribution of biology to human advancement and development in different spheres of life cannot be overemphasized. It is logical to say here that this importance of biology may be some of the reasons why the government of Nigeria at the national level has ensured its inclusion in the national curriculum. The objectives of biology in the national curriculum include to prepare students to acquire: a. understanding of the structures and functions of living organisms as well as appreciation of nature; b. adequate laboratory and field skills in biology; c. meaningful and relevant knowledge in biology; d. apply scientific knowledge to everyday life

in matters of personal and community health and agriculture and e. reasonable and functional scientific attitudes [13].

The above objectives are the expectations of the national curriculum on biology after exposing students to the various aspects of biology using syllabuses, scheme of work, lesson plans etc. In line with the above, it is clear that the importance of biology to national development is glaring. As such, it is important that students especially college of education students who are probable biology teachers achieve highin biology. Achievement may be seen as any score(s) which shows the amount of success attained by a learner at the end of a teaching and learning process [14]. More so, academic achievement as described by [15] refers to students` ability to recall learned facts and knowledge and being able to communicate the knowledge of facts orally or in a written form in any condition including examination conditions. In the scope of this study, academic achievement may be seen as the level of success or failure being experienced by a learner at the point of learning or after learning had taken place.In essence, academic achievement is a way of showing whether learning had taken place or not and the extent to which learning has taken place.

Shockingly, the academic achievement of students in biology over the years has been very poor. This is evident in the study of [16; 11]. This poor academic achievement of students in biology is apparent in the breakdown of West Africa Examination Council (WAEC) result as reported by Akanbi and Kolawole from 2000 to 2012 where only 31.52%, 44.15%, 24.69%, 35.04%, 48.60%, 33.37%, 33.94%, 33.87%, 33.90%, 38.50%, and 38.82% respectively had credit pass in biology [11]. More so the WAEC chief examiner`s reports from 2015 to 2019 clearly shows that academic achievement of secondary school students in biology has remained worsen as the mean scores of students' achievement over these years (2015-2019) has not gone close to 50 with mean scores of 25, 31,31, 30and 31 for the years 2015 to 2019 respectively. The implication of this is that the country will face setbacks in areas of advancement as biology forms an integral part of sciences which aids national development. Also, the standard of education will continue to decline since these students who eventually end up in colleges of education and other higher institutions will graduate with poor achievement in biology and will lack the required knowledge to transfer what was taught.

Literature Review

Several researchers have been able to identify a number of factors that are responsible for this poor academic achievement of students in biology. According to [16], lack of availability of textbooks, laboratory apparatus and other learning resources are factors responsible for students` poor academic achievement in biology. More so, [17; 18; 19] mentioned that parent`s educational status, socio-economic status and occupation are factors affecting students` achievement in biology. Additionally, [20] stated that factors such as lack of finance, lack of equipped laboratories/libraries, biology textbooks, teaching methods etc. are the factors that affect students` academic achievement in biology. Surprisingly, despite efforts of researchers and relevant stakeholders to bring the problem of poor academic achievement in biology under control using the factors mentioned above by previous researchers, in-depth literature reviewed show that such studies that considers students interest in online learning as a factor that may affect first-year undergraduate pharmacy students` academic achievement in general biology is lacking in Nigeria despite consistent poor academic achievement of students in biology in the country.

Online learning provides wide range of programs that require the use of internet in providing instructional materials and facilitating interactions between students and teachers and in some cases, among students as well[21]. More so, [21] stated that this kind of learning can either be fully online with all instructions taking place over the internet or by combining

online elements with face-to-face interactions in the form of blended learning. Online learning is any form of education that takes place over the internet[22]. According to the author, online learning is also referred to e-learning, it is offered synchronously and asynchronously. However, it is a type of distance learning that is different from the traditional classroom learning. [23] described online learning as an emerging approach to learn at students` own premise through advanced information-communication technologies such as Moodle, YouTube, virtual reality, zoom, google meet etc. either synchronously or asynchronously.

It is important here to understand that online learning is an essential aspect of teaching and learning as it can facilitate students` academic achievement to a high degree, but it appears that this area of learning have been given less attention by educators and stakeholders. This is because, results of studies with respect to online learning and students` academic achievement that have been carried out by researchers have not been very consistent and effective. More so, why researchers have concentrated on other aspects of online learning, literature shows that's studies that considers students interest in online learning as a predictor of student`s achievement is lacking especially in biology. This implies that online learning is not considered by some researchers as a determinant factor even though online learning has been found to be very beneficial to students learning. [22] stated that online learning creates room for convenience, enhanced learning, social interaction, improved creativity among students etc. More so, [23] mentioned that online learning makes contents and instructions flexible as well as efficient. Additionally, the authors mentioned that online learning increases educational productivity and efficiency in instructional delivery. Considering how valuable online learning is, it is important that the interest of learners toward this approach of learning be considered.

Interest may be seen as an individual`s temporary experience of being captivated by an object as well as lasting feelings that the object is enjoyable and worth further exploration. It is both a psychological and emotional state that is characterized by increased attention and effort experienced in a given moment, as well as an enduring predisposition to reengage with a particular object or topic over time; it can either be situational or individual [24]. According to the authors, situational interest combines affective qualities such as feelings, excitement and enjoyment with cognitive qualities such as focused attention and perceived value. Thus, the state of interest makes the affective reactions, perceived value and cognitive functioning become intertwined, thereby making attention and learning become effortless [25].

Individual interest on the other hand highlights an individual`s stable preference for specific contents. It is a stable, underlying disposition that is triggered in some particular situation. Individual interest here reflects a well-developed personal experience to enjoy and value a particular subject or activity across situations [25]. It is a personal orientation or an individual`s ability to engage with something [26].From the forgoing, interest is a very strong motivational process that empowers learning, guides academic and career paths, and it is also essential to academic success. As such, interest is very important in education as it is capable of motivating learners positively [27]. Furthermore, [28] maintained that higher level of interest can lead to higher levels of cognitive activation which can then lead to stronger learning. Interest in online learning therefore needs proper attention.

Interest in online learning is concerned with learners` desire, excitement and preference for online related education. It has been linked to students` academic achievement. According to [29], interest of students in online learning has proven to improve student's academic achievement as it increases enthusiasm and willingness to learn among students. Additionally, [30] stated that interest in online learning is related to academic achievement of students. Equally, [27] revealed that interest in learning predicts academic performance. Contrary to these views, [31] stated that interest in learning does not predict academic

achievement of students. From the foregoing, it is possible to say that there exists a relationship between students` interest in online learning and their academic achievement.However, students` interest in online learning may not be the only variable capable of influencing students' academic achievement in biology as demographic variable such as gender may also influence academic achievement of students in biology.Gender distinguishes the males from the females with respect to the roles, behaviour and characteristics they possess as determined by the society [32].In a study conducted by [33] on the impact of e-learning on academic performance while considering education policy revealed that ICT which include e -learning statistically influences students learning positively. [34] found out that online classes positively impacted students` performance while [35] conducted a study on the relationship between interest and mathematics performance in technology-enhanced learning context in Malaysia and revealed that interest of students is not significantly related to their academic performance in mathematics.

Gender according to [36] simply refers to women, men, girls' and boys' characteristics such as norms, behaviours and roles that are socially constructed. It however varies from society to society. Perhaps, one may say gender plays vital role in the education system as it has been shown to influence curriculum and career choices.Gender has been found to influence students` academic achievement. According to [37], one of the major factors that largely influence students' academic achievement in sciences especially biology is gender. [38] carried out a study and found that gender significantly influenced student's academic achievement in biology in favour of the male students. Contrary to these findings above, [4] and [39] in their separate studies found that the female students performed better than the male students in the sciences. However, [40] in their study revealed that gender does not significantly influence the academic achievement of students.

The steady fall in the achievement of students in biology has become bothersome. Several factors have been investigated by researchers and stakeholders to ensure that this alarming rate of failure is regulated. However, literature is lacking on seeing students` interest in online learning as being a possible cause of this poor achievement in biology. More so, disagreement exist among researchers on the influence of this variable as some researchers found a significant influence whereas, others found no influence. Additionally, gender has been found to moderate this variable and influence academic achievement of students as some researchers found significant difference in the influence of gender or academic achievement of students whereas, others found no significance difference. Disagreement as reported above necessitated further findings. As such, it is pertinent that this present study be carried out to find the prediction of students` interest in online learning on college of education students` academic achievement in biology and how gender influences this achievement in Nigeria.

The knowledge of science subjects especially biology is increasingly becoming essential as the society has become science and technology oriented. The knowledge of biology is essential for national development. Thus, it is expedient that students` achievement in biology be high. On the contrary, literature is replete on the poor achievement of students` in biology. This alarming rate of failure has become worrisome to researchers, parents and relevant stakeholders. Literatures reviewed show efforts made by researchers and stakeholders to bring this trend of poor academic achievement of students to an end by identifying factors such as parents`, qualification, lack of finance, lack of functional laboratories, libraries, biology textbooks, teaching methods etc. to be responsible for this menace. In addition, gender of students has been identified as a factor that may influence students` academic achievement in biology. Regardless of educational stakeholders' quests to solve this problem of poor academic achievement of students in biology considering the factors identified by previous studies, the problem of poor academic achievement of students

in biology has continued to persist. The researchers therefore believe that students` interest in online learning may affect the academic achievement of first-year undergraduatepharmacy students in general biology. The purpose of this study generally was to determine first-year undergraduate pharmacy students` interest in online learning as predictor of academic achievement in general biology. Based on the objectives of the study, the following research questions guided this study:

1. what is the amount of variation in students` academic achievement in general biology that can be attributed to students` interest in online learning?
2. What is the amount of variation in students` academic achievement that can be attributable to their interest in online learning as moderated by gender?
3. What is the regression model that can be used to predict students` academic achievement by their interest in online learning?

Theoretical Framework

Theoretically, this study was hinged on cognitive interest theory byHaberma, 1971 which believes that all knowledge is constituted through one of three cognitive interests. Each of these three interests, the technical, practical, and emancipatory (control, understanding & empowerment), implies specific ways of learning. A better understanding of these cognitive interests and how they affect learning could lead to more informed decisions concerning curriculum and instruction. According to Herbamas, these three levels of control, understanding and empowerment characterizes the cognitive interest theory. This theory aligns with the present study because when students gain control over their interest in learning online, it will help them understand themselves, thus empowering themselves. The findings of this study aligned with this theory as it showed that students` interest in online learning predicted their academic achievement in general biology (BIO 102). We adopted this theory because it provides basis for understanding interest in online learning towards general biology (BIO 102).

Methodology

This study was a quantitative correlational research design. This research design was found suitable for this study because it attempted to quantify the relationship between combinations of variables (independent variables and the dependent variable). According to [41], the quantitative correlational research design which gained much attention in the mid-20th century is used to describe in quantity the relationship existing between two or more variables. An existing quantified relationship determined through correlation is computed and analysed on computer using data analysis software packages such as the Statistical Packages for Social Sciences (SPSS) [41]. This design was employed to determine the pattern of relationship that exists between gender, interest in online learning and academic achievement among first-year undergraduate pharmacy students in general biology (BIO102). The participants comprised370 undergraduate pharmacy students drawn through multi-stage sampling procedures involving purposive and simple random sampling techniques.

Two instruments were used for data collection, they are Interest in Online Rating Scale (IORS) and General Biology Achievement Test (GBAT)developed by the researchers. The IORS consisting of twenty (20) items was designed to assess interest in online learning. The responses of the students were score on a 4-point scale options of strongly agree (SA)=4, agree (A)=3, disagree (D)=2 and strongly disagree (SD) =1. The IORS has two sections, Section A and B. Section A contained students' personal data (gender) and section B expressed students' interest in online learning.The GBAT was constructed from the first-year pharmacy students scheme of work using table of specification to ensure adequate coverage of the content. GBAT consisted of thirty (30) items used to measure first-year undergraduate

pharmacy students` academic achievement in general biology (BIO 102). Each item contained four (4) options with one right response. Each right response to an item was awarded one (1) mark to get a total of 30marks.

To estimate the reliability of the instruments, a trial testing was conducted on a group ofundergraduate pharmacy students outside the main study area with similar characteristics to the intended sample of students. The data for the reliability estimation was collected using the various instrument IORS and GBAT.The internal consistency reliability of the instrument (IORS) was established using Cronbach-alpha method. While the internal consistency reliability of GBAT was established using Kudder-Richardson formula 20 (K-R_{20}). The essence is because it is most suitable for an instrument that is dichotomously scored. The reliability indices for IORS and GBAT were arrived at to be 0.79 and 0.71 respectively.

Data generated through the research instrument were analysed using the SPSS version 23 involving simple linear regression analysis, ANOVA and t-test. This analysis technique was chosen because this study sought to find out the amount of prediction of academic achievement in general biology (BIO 102) that can be attributed to interest in online learning among the first-year undergraduate pharmacy students. Correlation coefficient of 0-0.3 was considered low, 0.31-0.8 was taken to be moderate while 0.8 above was regarded as high.

Results

Table 1a shows the regression model for the relationship between students` academic achievement in general biology and interest in online learning. From the table, a correlation coefficient of 0.12 which means a low relationship was obtained for students` academic achievement in biology and their interest in online learning. A coefficient of determination of 0.015 was obtained. The coefficient of determination implies that only 1.5% of the amount of variation of students` academic achievement in general biology was attributed to their interest in online learning.Table 1b revealed the associated probability for the calculated *F*-ratio of 5.702 for the amount of variation in students` academic achievement in general biology that can be attributed to their interest in online is 0.017. Thus, there is a significant prediction of interest in online learning on academic achievement of students in general biology since the probability value is less than the 0.05 level of significance ($p<0.05$).

Table 1a. Variation in students' Academic Achievement in General Biology that is accounted for by student's interest in online learning

Model	*R*	R^2	Adjusted R^2	Std. Error of the Estimate
1	.124[a]	.015	.013	5.25090

a. Predictors: (Constant), interest in online learning

Table 1b. ANOVA[a]

Model		*SS*	*df*	*MS*	*F*	Sig.
1	Regression	157.216	1	157.216	5.702	.017[b]
	Residual	10146.484	368	27.572		
	Total	10303.700	369			

a. Dependent Variable: Scores

b. Predictors: (Constant), Mean

Table 2 shows the amount of variation in students` academic achievement in general biology that can be accounted for by their interest in online learning that is moderated by gender. The result shows that the correlation coefficient (R) between interest in online

learning and academic achievement in general biology as moderated by gender is 0.17. This implies a low relationship. The coefficient of determination (R^2) of 0.03 means that 3% of the amount of variation in students` academic achievement in general biology that can be attributed to their interest in online learning as moderated by gender. The mean general biology achievement scores for male and female students are 13.26 and 14.09 respectively with standard deviations of 4.68 and 5.76 accordingly. This implies that the mean achievement of the female students in general biology is higher than that of the male students. Standard deviation values of 4.68 and 5.76 indicate a high level of differences among the scores of both the male and female students.The moderating influence of gender on the amount of variation in students` academic achievement in general biology that is attributed to their interest in online learning has a t-value of -1.8531 and a probability value of 0.0647 which is greater than the 0.05 level of significance. Thus, the null hypothesis is not rejected. This implies that gender of students does not significantly influence the prediction of interest in online learning on students` academic achievement in general biology.

Table 2. Variation in students` academic achievement in general biology that can be attributed to interest in online learning as moderated by gender

Gender	*N*	*M*	*SD*	*R*	R^2	*SE*	*t*	Sig
Male	175	13.26	4.68	.1712	.0293	1.5028	-1.8531	0.0647
Female	195	14.09	5.76					

a. Predictors: (Constant), interest in online learning

The regression constant has a value of 17.145 while the predictors variables; SLA, SSA, SCA, ARA and ORA have values of 0.235, -0.550, 0.305, -1.143 and -0.012 respectively. The table also shows that the dependent or criterion variable of the study is general biology academic achievement. Based on this, the regression model for predicting students` academic achievement in general biology using their interest in online learning is expressed as: GBAA = 17.145 + 0.235(SLA) -0.505(SSA) + 0.305(SCA) -1.0143 (ARA) -0.012(ORA). The result is documented on Table 3.

Table 3. Regression coefficient table on prediction of students` academic achievement in general biology by their interest in online learning

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	*SE*	Beta	*t*	Sig.
1	(Constant)	17.145	2.215		7.4740	.000
	Student-Lecturer Activity (SLA)	.235	.653	.023	.360	.719
	Student-Student Activities (SSA)	-.550	.538	-.062	-1.024	.307
	Student-Content Activities (SCA)	.305	.612	.031	.499	.618
	Assessment Related Activities (ARA)	-1.143	.513	-.135	-2.226	.027
	Outcome Related Activities (ORA)	-.012	.630	-.001	.019	.985

a. Dependent Variable: General Biology Academic Achievement (GBAA)

Discussion

We observed low relationship between students' academic achievement in generalbiology and their interest in online learning. Further analysis revealed that the relationship between students` interest in online learning and their academic achievement in general biology is

significant as the probability value of 0.017 associated with the *F*-value of (5.702) is less than the alpha level of 0.05. Hence, the null hypothesis is rejected. This result is supported by the findings of [42], [33] and also the finding of [34] who reported that students` interest especially towards e-learning is significantly related to the academic achievement of students. However, the finding of[35] disagreed with this result, that the interest of students does not significantly influence their academic achievement. This difference may be due to the location of the study and the nature of respondents used for the study as well as the subject area.

We further found out that gender has a moderating influence on the prediction of students` interest in online learning on their academic achievement in generalbiology. The prediction was not significant. This could be due to the fact that male and female students display similar level of interest towards learning generalbiology online. This means that the level of interest in online learning of male students does not differ from that of female students.The result of this study is in disagreement with the finding of [43], [44]. According to the authors, a significant difference exists in the level of relationship between the interest in online and academic achievement of male and female students. This contrary finding could be due to the location of the studies and the category of subjects used for the study.

It was further revealed that female students achieved higher than the male students. The standard deviation shows that high difference exists in the performance of male students as well as that of the female students. Further analysis carried out showedno significant difference in the mean achievement of male and female undergraduate pharmacy students. The result of this study is supported by the finding of [38],[40] who reported that gender of students does not significantly influence their academic achievement. In an opposing finding,[45] reported a significant influence of gender on the academic achievement of students in biology. This opposing view may be due to the category of students studied.

Conclusions

Interest in online learning of students is significantly related to their academic achievement in generalbiology and students' gender does not significantly moderate the relationship between academic achievement of undergraduate pharmacy students in generalbiology and their interest in online learning. There is no significant influence of gender on the academic achievement in generalbiology.The implication of this study to students is that students will generally works towards improving their interest in online learning by engaging more in online activities that are related to their academics such as studying online, searching for academic materials online, among others. This will aid their active participation in online related teaching and learning which will thus, facilitate their understanding and improvement in academics.

Lecturers will work towards engaging the students more in online related classes and academic activities such as submitting assignments online, having discussion classes online and so on in order to ensure active participations. This will stimulate the students` interest in learning online.The findings of this study will assist parents in making sure that the level of interest of their children towards learning online is improved. This will enable parents provide necessary online learning facilities such as smartphones, laptop computers, tablets and internet facilities such as modem, among others to their children to ensure their active and frequent engagement in online learning. This will simulate their interest and consequently leads to increase in their academic achievement.A similar study should be carried out focusing on other variables such as online learning attitude, online pedagogical competencies of students, among others in relation to their academic achievement.This study is only limited to undergraduate pharmacy students offering general biology subject, the findings may not completely be applied to other subject areas.

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AUTHORS' CONTRIBUTIONS

Anyaegbunamcontributed to conception, design, acquisition, analysis,or interpretation; drafted the manuscript; critically revised themanuscript; gave final approval; and agreed to be accountable forall aspects of work ensuring integrity and accuracy.

Ibehcontributed to conception, design, acquisition, analysis,or interpretation; drafted the manuscript; critically revised themanuscript; gave final approval; and agreed to be accountable forall aspects of work ensuring integrity and accuracy.

Oguguocontributed to conception, design, acquisition, analysis,or interpretation; drafted the manuscript; critically revised themanuscript; gave final approval; and agreed to be accountable forall aspects of work ensuring integrity and accuracy.

Enecontributed to acquisition, analysis, or interpretation; criticallyrevised the manuscript; and gave final approval.

Okekecontributedto conception, design, acquisition, analysis, or interpretation;critically revised the manuscript; and gave final approval.

Ugwu contributedto conception, design, acquisition, analysis, or interpretation;critically revised the manuscript; and gave final approval.

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Ukallacontributedto conception, design, acquisition, analysis, or interpretation;critically revised the manuscript; and gave final approval.

Onucontributedto conception, design, acquisition, analysis, or interpretation;critically revised the manuscript; and gave final approval.

ETHICAL APPROVAL
The ethics committee at the institutions where the research was conducted granted ethical approval. The informed consent forms were properly filled and signed by the lecturers.

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