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Impact of COVID-19 lockdown policy on the anxiety of the engineers-in-training in ABU Zaria Engineering Faculty in Nigeria

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Abstract

Anxiety is a public phenomenon that constitutes a public source of inadequate performance globally and plays a significant role in their lives. Engineering students and academics have been through immense changes in education because of the effect of the COVID-19 crisis. It is well-known that epidemics' occurrence creates or accentuates new stressors, including panic and fears for loved ones or oneself, constraints on social activities and physical movement due to quarantine, and unforeseen and radical change of lifestyle. This study aimed to assess the impact of the COVID-19 lockdown policy on engineering students' anxiety in Ahmadu Bello University Zaria, Nigeria. The study confirmed that the students had an increase in the anxiety level, in which the female student had a higher level of anxiety than the male students. The highest contributing factors to the anxiety include "worries about academic delays/extension of the academic calendar," "worries about a delay in life plans as a result of the suspension of school," and "worries about running out of supplies." The main areas that anxiety impacted the lives of the students include "a decline in book reading /studies/academics," "finding it hard to focus," "being unable to hang out with friends," and "difficulties in falling asleep." Finally, the students managed the level of anxiety mainly by "the use of internet/social media/chatting," "prayer/self-motivation/meditation/reflection," and "watching movies/TV/music."

Keywords: engineering; student; anxiety; COVID-19; lockdown policy; impact.

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INTRODUCTION

Anxiety is a public phenomenon that constitutes a public source of inadequate performance globally. Engineering students and academics have been through immense changes in education due to the impact of the COVID-19 crisis ([Kahan, 2012](#); [Donnelly, 2009](#)). Mental health issues are the leading encumbrance to academic attainment. Mental illness can impact the motivation, attention, social interactions, and factors essential to the success of engineering students ([Unger, 2007](#)). According to the Center for Collegiate Mental Health Annual Report for 2019, it was stated that anxiety remains the most common setback (62.7% of 82,685 respondents) encountered by the students ([CCMH, 2020](#)). As a result, various investigations focus their

study on the COVID-19 pandemic effect on students by evaluating anxiety among engineering students. It is well-known that the occurrence of epidemics has the potentials of creates or accentuates new stressors, including panic, worries, and fears for loved ones or oneself, constraints on social activities and physical movement due to isolation (otherwise known as quarantine), and unforeseen and radical change of lifestyle.

A recent review of virus outbreaks and pandemics documented stressors such as infection fears, inadequate supply, boredom, frustration, inadequate information, stigma, and financial loss ([Brooks, Webster, Smith, Woodland, Wessely, Greenberg, & Rubin, 2020](#)). Many studies assessed mental health problems during outbreaks, but most included health workers, children, patients, and the general population ([Lai et al., 2020](#); [Xie, Xue, Zhou, Zhu, Liu, Zhang, & Song, 2020](#)). Although findings made from the different piece of literature have thus far converged on the uptick of mental health issues among students due to coronavirus, one of such is a study on the effects of COVID-19 on college student, which was carried out in China ([Zhang et al., 2020](#); [Cao, Fang, Hou, Han, Xu, Dong, & Zheng, 2020](#); [Wang & Zhao, 2020](#); [Wang et al., 2020](#)), others are Greece ([Kaparounaki, Patsali, Mousa, Papadopoulou, Papadopoulou, & Fountoulakis, 2020](#)), India ([Varshney, Parel, Raizada, & Sarin, 2020](#)), Italy ([Mazza, Ricci, Biondi, Colasanti, Ferracuti, Napoli, & Roma, 2020](#)) and Nigeria ([Orok, David, Olajide, Sulaiman, & Oyewole, 2020](#)), yet the contributing element may not be generalized to that of the engineering students in the various institutions. Hence, there is an urgent need to determine the engineering student's anxiety due to what the coronavirus lockdown policy must have caused on their lives and determine the level of management adopted by these engineers-in-training during the lockdown period due to the dreaded pandemics (Coronavirus). Ojetunde, Bamigbala, & Oyegoke ([2020](#)) reported a recent study that encompassed secondary and tertiary institution students confirmed a significant level of behavioral and psychological changes in the students during the lockdown in the Gusau metropolis in Nigeria. However, this present study assessed the impact of the COVID-19 lockdown policy on engineering students' (i.e., engineers-in-training's) anxiety in Ahmadu Bello University, Zaria, Nigeria, as a way to understand how much the students were affected, the impact it created on their way of life, and identification of possible strategies that the students employed in combating these challenges faced by them.

RESEARCH METHODOLOGY

Study area

Ahmadu Bello University (ABU) is one of the largest universities in the sub-Saharan part of Africa. It is located in Sabon-gari Local Government Area of Zaria City in Kaduna State of Nigeria.

The university was established in 1962 as the first university in the Northern Region of Nigeria, sited along Funtua-Gusau Road, and located at longitude 7°30'E to 7°45'E of the Greenwich Meridian, and latitude 11°15'N to 11°3'N of the equator ([Abbas & Arigbede, 2012](#)) as shown in [Figure 1](#).

Figure 1. The map shows the study area

Study population and sample size

The population comprises male and female students running programs in Ahmadu Bello University, Zaria, Kaduna State, with about 35,000 students. This study enrolled 139 respondents in this survey ranging from under 18 years to above 18 of age, which is slightly higher than the value obtained from the recommended sample size computed as 133 via the use of the mathematical expression presented below:

$$n = \frac{N \cdot X}{(X + N - 1)} \quad (1)$$

and

$$X = \frac{Z_{\alpha/2}^2 \cdot p(1-p)}{MOE^2} \quad (2)$$

Where, $Z_{\alpha/2}$ represented the critical value obtained for the Normal distribution at $\alpha/2$, for a given confidence level of 95%, α is 0.05, MOE denotes the margin of error, which was taken to be 8.3%, p represented the sample proportion which was taken to be 50%, and N is the population size (i.e., 35,000 students). The expressed was adopted from literature ([Daniel, 1999](#)).

Research instruments

To achieve the set goals for other studies, several performance variables were adequately selected to measure the attention and concentration of the student in their private study during the lockdown period as well as some personality variables like symptoms checklist were employed to assess their anxiety, depression, personality disorder, and lot more. Other personality variables considered were motivational structure and interest (especially those used in managing the anxiety during lockdown period), styles of their daily lives (like eating habits, reading/study habits, sleeping routine, and many others), and stress coping. The data for this assessment were collected via an objective test using a questionnaire (i.e., the research instrument) in which the study behaviors were rated, and the resulting outcome was used to measure their expressive behaviors.

The research instrument used for this study was tagged "COVID-19 Lockdown Policy Impact on the anxiety caused on Engineering Students of ABU Zaria Questionnaire". However, an electronic approach was employed via electronic questionnaires designed using Google OS Form (using cloud computing) to ease the one-on-one data collection for this study to obtain the relevant data. The questionnaire was divided into four sections: biodata/socio-demographic-data, evaluation of the anxiety level, the impact it caused on the students, and how they manage their respective situations. The response/opinions of the participating students were being collected on a scale of 1 to 3, where 1 stand for 'Affected' OR 'Yes,' 2 stands for 'Not Certain of Whether Affected or Not' OR 'Not-sure,' and 3 stands for 'Not affected' OR 'No.'

In the design of the questionnaire, it was ensured that the questionnaire items show a good correspondence with the research questions for the study. Moreover, in obtaining answers for each research question, several forms of related checklist items were provided for the respondents to tick to ascertain the consistency and reliability of their feedback and from which the average rating for their answers was used for the measurement.

Research design and analytical method

In line with the approach used in previous studies ([Ojetunde, Bamigbala, & Oyegoke, 2020](#)), a hybrid method that combines the use of descriptive and full factorial design method was adopted for this study, where the data were analyzed using frequency counts, mean, percentage, f-test, while using 2 by 3 design for the factorial analysis. A descriptive approach was employed to describe how it was varying from one engineering department to another.

A full-factorial design method ([Table 1](#)) was adopted for understanding how the different categories of students were affected and the impact of the selected 3 factors, which entails the students' age, educational level, and gender on how much it contributed to their level of anxiety and its impact on them.

8 categories of students were identified as possible, out of which categories of respondents did not participate such was acknowledged as 'one with

an uncertain view' whose scores were taken to be as 2 based on this study's scale. The response (i.e., output) variable was the anxiety level (AL), anxiety impact level (AIL), and anxiety management level (AML) were recorded as the mean scores. Also, the factors were designed to be on two levels each.

Table 1. Factorial design parameters

Study Type	Factorial	Experiments	8	Blocks	No Blocks	
Initial Design	2 Level Factorial	Center Points	0	Design Model	3FI	
Response	Name	Units	Obs	Minimum	Maximum	Trans
Y1	AL	%	8	50	81.82	None
Y2	AIL	%	8	47.73	72.73	None
Y3	AML	%	8	50	90.91	None
Factor	Name	Type	Low Actual	High Actual		
A	Gender	Categorical	FEM	MAL	Levels:	2
B	Age	Categorical	U18	G18	Levels:	2
C	Education Level	Categorical	BENG/ PGDE	MSC/PhD	Levels:	2

The hypotheses articulated were evaluated at 0.05 levels of significance using both the mean and ANOVA. In the evaluation, when the 'mean is less than 2,' or 'prob>f value is less than 0.05,' it implies hypothesis acceptance, while if otherwise, it would be rejected.

Ethical consideration

Assent was obtained from every respondent individually before filling the questionnaire. The respondents' privilege was secured by illuminating each respondent about this research purpose and not constraining them to participate—anonymity guaranteed that distinguishing data about each respondent was not gathered. Respondents' identities during the research and after the research were not disclosed. And all data was for only research purposes and kept classified.

RESULTS AND DISCUSSIONS

Biodata distributions

From the data collected from the survey represented in [Table 2](#), the female percentage was 10.8%, while that of the male was 89.2%. The findings unveiled that the engineering faculty is dominated mainly by male students in the selected tertiary institution. The percentage of students whose age is over 18 years (that is, adult) was 97.1% for age distribution. In comparison, the percentage of those whose age was below 18 years (that is, teenager or underage ones) was 2.9%, which indicated that the number of adult students outweighs the teenage/underage ones from the data collected for engineering students in the Ahmadu Bello University. The findings indicate that

the engineering students are primarily aged 18 and above, implying that most students are adults.

Table 2. Biodata representation

Characteristics	Class	Count	Percent, %	Total Count	%
Gender	Female	15	10.8	139	100
	Male	124	89.2		
Age	Greater than 18 years	135	97.1	139	100
	Less than 18 years	4	2.9		
Education Level	BEng/PGDE	105	75.6	139	100
	MSc/PhD	34	24.4		

Moreover, the distribution of the participating students' education levels represented in [Table 2](#) indicated that most of the respondents are undergraduate (BEng) and postgraduate graduate diploma (PGDE) students, which account for 75.6%, while MSc and PhD students carried about 24.4% which shows a good correlation with the general relative population of undergraduate to postgraduate student ratio.

The Pareto chart represented in [Figure 2](#) indicated that students from the Electrical Engineering department displayed the highest participation (41%), followed by the Department of Chemical Engineering (33%). Next was the Environmental Engineering (26%), Mechanical Engineering (24%), Agricultural Engineering (9%), and other Engineering departments like Polymer, Textile and Materials Engineering, account for only 6%.

Figure 2. A Pareto chart was pictorially showing the distribution of the engineering department's students in this study

Level of anxiety among the engineering students

[Table 3](#) presents the contributing factors (also known as term) that influences the respondents' level of anxiety, where "effect" was used to shows the nature of the influence the factors must have contributed, whether it was a negative or positive influence. The largeness of values obtained for "SumSqr" indicates the height of influence it must have contributed in either increasing or decreasing the level of the students' anxiety. Likewise, the "% Contribtn"

represents the amount of influence the factors (or terms) contributed to rising or falling the students' anxiety level. Any term (or factor) with a percentage contribution of less than 5% was termed to be insignificant.

Table 3. Factorial analysis to ascertain the level of anxiety

Term	Effect	SumSqr	% Contribtn
A-Gender	-1.01918	2.077445	0.217298
B-Age	14.60582	426.660100	44.628130
C-Educ	-7.04313	99.211270	10.377380
AB	-6.70100	89.806680	9.393670
AC	-3.91813	30.703430	3.211542
BC	12.27506	301.354000	31.521260
ABC	1.763692	6.221216	0.650732

The anxiety level (AL) of the respondents is represented in [Table 3](#). From the results collected in [Table 3](#), the age variation effect was discovered to have shown the highest level of contribution (44.62813 %) towards the rise in the students' anxiety. In other words, the change in age from students lesser than 18 to students greater than 18 resulted in a significant increase in AL, which means students that are greater than 18 years of age showed a greater level of anxiety than students below 18. This could be because most of the respondents in this study were older than 18 years of age or due to the age factor, as they get older without an end to their academic life insight ([Table 3](#)). The next term with a higher % Contribtn (31.52126%) is the multiple effects of age and education (which account for the collective effect of age and education); the result showed a greater level of anxiety in students that are greater than the age of 18 and running an MSc/PhD programs reported in [Table 3](#) for BC term. This could occur due to possible pressure to acquire a higher degree to seek work or promotion at a place of work. [Table 3](#) points out that the anxiety level among the engineering students is mainly influenced by the student's age and educational level, while gender has the most negligible impact on the engineering students' anxiety. In general, students who were older than the age of 18, and students running an MSc/PhD program, likewise female students had more anxiety in this study.

Distribution of contributing factors to the anxiety level of the students

The factors influencing the anxiety level of the engineering students are diagrammatically represented in [Figure 3](#), where the degree of significance was accounted as the percentage contribution of the respective factors evaluated in the study. The ranking of the contributing factors was also presented in the figure using the first to eleventh positions.

In respect to the contributing factors to the anxiety level of the students, 92% and 91% of the students were worried about the delay in their life plan as a result of the lockdown, and academic delay/calendar extension, respectively,

representing the highest factors that contributed to the anxiety level of the students as graphically represented in [Figure 3](#), displayed as the first-two contributing factors significantly influencing the level of their anxiety.

Figure 3. **Factors that resulted in the anxiety**

Other contributing factors are represented in [Figure 3](#). The mean value of 70% indicated a high level of anxiety among the engineering students; similarly, 67% was reported for the study carried out on nursing students in Turkey, indicating a moderate to severe generalized anxiety disorder ([Temiz, 2020](#)).

Impact of the anxiety on the lives of the engineering students

The results obtained for the impact of anxiety on the engineering students' lives are represented in [Table 4](#). The "effect" shows the direction, that is, negative or positive influence/effect of the factor (or term) on the impact caused by the students' anxiety. Also, "% Contribtn" shows the magnitude of each factor (or term). However, the contribution percentage ("%Contribtn") of less than 5% was termed to be insignificant in this study.

Table 4. **Factorial analysis to determine the impact of the anxiety**

Term	Effect	SumSqr	% Contribtn
A-Gender	-5.032420	50.65055	11.254210
B-Age	8.035759	129.14690	28.695570
C-Educ	3.288692	21.63099	4.806261
AB	-1.623330	5.27041	1.171050

Term	Effect	SumSqr	% Contribtn
AC	-5.234040	54.79025	12.174030
BC	4.425056	39.16223	8.701586
ABC	-8.643130	149.40730	33.197290

Following the results gotten from the application of factorial design analysis, the term having the highest % Contribtn were the multiple effects ABC (Gender, Age, and Education) with a negative effect (-8.643130), meaning students who are female, below 18 years of age, and running a BEng/PDGE had a very high impact of the anxiety, indicating that, female students with lower age and education level were highly affected. The deduction was realized to be similar to our previous study ([Ojetunde, Bamigbala, & Oyegoke, 2020](#)), where it was confirmed that female students were more vulnerable to psychological distress and anxiety in the course of the COVID-19 lockdown policy in Gusau, a city in Nigeria. The next most significant factor was age (B), a single-effect factor whose percentage contribution was 28.69557% with a positive effect (+8.03576), which indicated that students whose age is above 18 years had a more significant impact of the anxiety.

Distribution of areas that the anxiety impacted on the lives of the students

The areas that anxiety impacted the engineering students are represented in [Figure 4](#). The figure displayed the contribution of the respective areas evaluated in the study, including the ranking of the areas.

Figure 4. Areas that the anxiety impacted on the lives of the students

Consequently, most students (76% and 75%) lost interest in book reading/studies/academics and found it challenging to focus, respectively. In a previous study, losing interest in book reading is part of the significant factors that affected students in the course of the COVID-19 lockdown policy implementation ([Ojetunde, Bamigbala, & Oyegoke, 2020](#)). In another study, about 83% of the respondents reported that learning was challenging during the lockdown because of many distractions at home ([Orok, David, Olajide, Sulaiman, & Oyewole, 2020](#)). Also, a more significant percentage of the students (67%) confirmed having difficulties falling asleep in the course of the lockdown, which could occur due to fear of contracting the coronavirus or the fear that their friends/family members could contract the virus. Similarly, in a study, about 61% of the respondents reported difficulties falling asleep and woke up many times during the night ([Segre, Campi, Scarpellini, Clavenna, Zanetti, Cartabia, & Bonati, 2020](#)).

Level of management taken by the student

The contribution or influence of gender, age, and education level on the level of anxiety management employed by the students are presented in [Table 5](#), where the "effect" tells us about the impact or influence in terms of being positive or negative. In contrast, the "% Contribtn" presented the weight or significance of the effect toward the anxiety management level in percentage.

Table 5. Factorial analysis to ascertain the level of management taken by the student

Term	Effect	SumSqr	% Contribtn
A-Gender	-10.3071	212.4712	17.03867
B-Age	16.68157	556.5497	44.63131
C-Educ	-1.39944	3.916865	0.314105
AB	-3.48888	24.34461	1.952264
AC	-1.68353	5.668553	0.454578
BC	12.23692	299.4846	24.01653
ABC	-8.50171	144.5582	11.59254

From [Table 5](#), the students who are greater than 18 years of age significantly had a higher level of management than students below 18 years of age. Moreover, female students significantly had an increased level of anxiety management than male students. And a student in MSc/Ph.D. level managed the anxiety more than the student undergoing BEng/PGDE.

Distribution of the management approach taken by the students

The management approach employed by the engineering students in managing the negative impact of the COVID-19 lockdown is represented in [Figure 5](#). The percentage contribution and ranking of the respective management approaches evaluated in the study were also presented in the figure.

Figure 5. The management approach employed by the students in combating the anxiety

The students used different coping strategies during the lockdown caused by the pandemic. Majority of the students (93%) employed the internet, social media, and chatting to manage their anxiety level during the lockdown. Previous reports have shown that there was an increase in media consumption, the use of social media platform, and the use of the internet during the lockdown ([Chauhan & Shah, 2020](#); [Orok, David, Olajide, Sulaiman, & Oyewole, 2020](#); [Ojewale, 2020](#); [Temiz, 2020](#); [Saltzman, Hansel, & Bordnick, 2020](#); [Hatun, Dicle, & Demirci, 2020](#); [Gao et al., 2020](#)). Studies have discovered that the reasons for the increase in the level of internet usage were: Boredom, more online conversations because of social isolation, increased homework because of distant learning, and trying to get more information about COVID-19 ([Saltzman, Hansel, & Bordnick, 2020](#); [Hatun, Dicle, & Demirci, 2020](#); [Bilge & Bilge, 2020](#)).

In this study, a more significant percentage of the students also reported prayer/self-motivation/meditation/reflection as an anxiety management approach, which may be since Nigerians are highly religious.

Distribution of anxiety, its impact on students' lives, and the management level employed by the students across the engineering departments of the faculty

The results represented for the distribution of the engineering students' anxiety level (AL), anxiety impact management (AIL), and anxiety management

level (AML) across the departments are graphically represented in [Figure 6](#). It was discovered that the Chemical/Petroleum Engineering department showed the highest AL (79%), indicating the department with the most affected students, while Mechanical, Mechatronics, Automobile, and Metallurgical Engineering Department was showed the lower AL (62%). In terms of AIL, the Chemical/Petroleum Engineering Department was discovered to have shown the highest impact (73%), while Agricultural/Bioresources Engineering recorded the lowest impact (42%). The evaluation of the AML across the department, Chemical/Petroleum Engineering was found to have displayed the highest management, which is relatively low when compared to the AL, unlike that of Mechanical, Mechatronics, Automobile, and Metallurgical Engineering, which was relatively high when AML is compared to be AL which must have contributed in maintaining a lower AIL.

Figure 6. Distribution of anxiety, its impact on students' lives, and the management approach employed by the students across the engineering faculty departments

The correlation/trend between anxiety level (AL), anxiety impact management (AIL), and anxiety management level (AML) across all the departments (Agricultural, Bioresources, Environmental, Civil, Electrical, Electronics, Computer, Mechanical, Mechatronics, Automobile, and Metallurgical Engineering) were discovered to be similar except for the department of Chemical Engineering that displayed a different trend as represented in [Figure 6](#) which could occur due to the relative low AML employed by the students of Chemical Engineering. The deduction is evident in [Figure 7](#), where it could be seen that for all the 11 tests/questions asked in the study for the AL, AIL, and AML from the engineering student of Chemical/Petroleum, only in few cases it can be seen that the AML is higher than the AIL and AL in [Figure 7](#).

Figure 7. Distribution of factors responsible for anxiety, its impact on students' lives, and the management level employed by the students in the chemical/petroleum department

The highest contributing factor to the anxiety level of the chemical/petroleum department was worried about academic delays/calendar extension (i.e., item 1), missing social activities enjoyed on the campus (i.e., item 8), and being worried about delay in life plan as a result of the suspension of the school (i.e., item 10) in [Figure 7](#) with relations to the items represented in [Figure 3](#) for the AL. The most significant impact of the anxiety on students of chemical/petroleum engineering is item 3 (i.e., they find it hard to focus) and item 4 (i.e., missing the freedom to hang out with their friends), which has significantly affected the students. The deductions are evident in [Figure 7](#) in relation to [Figure 4](#) (AL). However, the few anxiety management strategies adopted by the students of the Chemical/Petroleum engineering department which yielded a significant impact were item 2 (i.e., use of the internet, social media, and chatting), item 5-7 (i.e., watching movies/TV, listening to pieces of music, prayer, self-motivation, medication/reflection), and slightly item 9 (i.e., reading non-academic books) which are evident in [Figure 7](#) with relation to [Figure 5](#) (for AML).

CONCLUSIONS

The adverse effect of the lockdown policy that occurred due to the COVID-19 pandemic on the anxiety of ABU Zaria engineering faculty students was successfully studied through the application of factorial design analysis techniques by investigating the students' anxiety level, the anxiety impact level, and the anxiety management level during the COVID-19 lockdown period. That is a period when a physical barrier is introduced in between students and lecturer, turning the teaching method into becoming entirely

virtual and in some cases partially virtual, when a good number of students are not ready for the mode of training, especially in developing nations where student have insufficient knowledge of ICT due to inadequate ICT facilities in their local institutions.

In general, the study affirmed that the students had an increase in their anxiety level, in which the female student had a higher level of anxiety than the male students. The higher contributing factors to the anxiety include "worries about academic delays/extension of the academic calendar," "worries about a delay in life plans due to the suspension of school," and "worries about running out of supplies." However, chemical/petroleum options of the engineering faculty studied were discovered to be highly affected, which was found to be connected with the relative lower anxiety management approach used by the students of the concerned department compared to the anxiety level experienced by the students, unlike the form of behavior or trends obtained from the other department.

The main areas of anxiety that impacted the lives of the students include "a decline in book reading/studies/academics," "finding it hard to focus," "being unable to hang out with friends," and "difficulties in falling asleep." Finally, the students managed the level of anxiety mainly by "the use of internet, social media, and chatting," "prayer, self-motivation, meditation and reflection," and "watching movies, TV, and music."

RECOMMENDATIONS

The National University Commission (NUC) and the university's management are encouraged to adopt a hybrid teaching and learning methodology for future engineers' (i.e., students) training. Adopting the approach would enable students and staff to get familiarized with virtual platform use during restriction and non-restriction periods. The approach would effectively lessen the level of depressions and anxiety that students go through during the lockdown, which boosts their morale that their school programs would not be affected and interest to pursue further studies would not be discouraged. The ministry of education should commission a national platform for a virtual learning training session and an online national students' counseling platform to support the universities and other schools in meeting the need of the students virtually and to several as a supporting unit for the growth of education standard and better management of students especially during the lockdown, labor strike or vacation periods.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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