# Students' Insights on the Suitability and Adaptability of Two Undergraduate Medical and Dental Curricular Pathways before and during COVID-19 Pandemic: A Cross-sectional Survey

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**Abstract**

The COVID-19 pandemic and lockdown disrupted every human endeavour including the world of medical education, halting pre-clinical and clinical trainings as well as graduation of physicians for the healthcare workforce thus posing a double jeopardy at a time of dire need for increased healthcare personnel. The adaptability and preparedness of training curricula for emergencies such as natural and man-made disasters ultimately determine the degree of disruption in medical education. This study explored students' insights on the efficacy and suitability of two curriculum pathways before and during the COVID-19 pandemic.

This is a descriptive, cross-sectional study conducted between 2020 and 2021 in a public medical school using 102-item questionnaire administered online to 300 medical and dental students exposed to different training curricula- a "Traditional Curriculum", and a new "SPICCES Curriculum" that emphasizes student-centred designs.

The questionnaire response rate was 93.3% comprising 55.7% and 44.3% female and male respondents, and 78.6% and 21.4% medical and dental students respectively with a mean age of 22.1 ± 2.39 years (range: 18-33 years). A total of 65.4% and 34.6% respondents were on the SPICCES and Traditional curriculum pathways respectively. More respondents in the SPICCES curriculum compared with the traditional curriculum track (70.5% vs 52.6%; $\chi^2 = 8.862$, $p = 0.003$, $\varphi = -0.178$) had favourable perspectives on the relevance of their program and the overall quality of the curriculum in preparing them to be rounded physicians for the 21st-century (59.0% vs 27.8%). Approximately 47.0% and 33.0% ($\chi^2 = 3.990$, $p = 0.046$, $\varphi = -0.119$) respondents in dentistry and medicine respectively had unfavourable perception about the relevance of the SPICCES curriculum.

Findings in this study echo the need for student-centred curriculum designs and conducive educational environments that are resilient to emerging and established threats to educational pedagogy and programs. The study highlights the need for programs that support social and extracurricular activities for students.

**Keywords:** curriculum adaptability, medical education, COVID-19, students' perspectives

## 1. Introduction

Curriculum drives training of well-rounded future physicians and its adaptability to changes in its environment as well as the constantly changing needs of students and society that it serves, remain paramount for value addition. The landscape of medical education across its continuum continues to witness innovations in curriculum designs to respond to an increasingly complex and competitive healthcare systems. The positive impact of innovative curricular have been widely published (Green-Thompson, 2012, Frambach, 2017) although many medical schools in low- and middle-income countries struggle to implement such innovations because of the high financial and human resource implications.

The duration of a medical or dental degree usually varies between four to six years depending on the country, university and entry-level requirements. The medical and dental degree in Nigeria (Bachelor of Medicine, Bachelor of Surgery – MBBS/MBChB; Bachelor of Dental Surgery – BDS) is an undergraduate professional course that lasts for a minimum of six years. Undergraduate medical and dental education in Nigeria is traditionally divided into pre-medical, pre-clinical and clinical training involving one, two and three -year periods of training respectively. This pattern of time allocation is not strictly followed by all medical and dental institutions in Nigeria as some schools opt for a more integrated approach with definite overlap between the stages and early clinical exposure.

*1.1 Undergraduate Medical and Dental Curriculum at CMUL*

Since its inception in 1962, the medical and dental program of the College of Medicine, University of Lagos (CMUL) has undergone three major curriculum redesigns and several minor changes aimed at meeting best global practices. The last major review was conducted over five years and resulted in the SPICCES (student-centred, problem-based, integrated, competency and community based, electives and systematic) curriculum, without changing the six-year structure of the program. The SPICCES curriculum was adapted from the acronym SPICES, pioneered by Harden, which refers to six main concepts in medical education – student-centred teaching, problem-based learning, an integrated curriculum, community-based teaching, electives with a core, and the use of systematic methods (Harden, Sowden, Dunn, 1984), while the competency-based concept was derived from the AAMC-Association of American Medical Colleges (Englander, 2013) and Canadian physician core competencies. (Frank, 2005)

SPICCES represents a hybrid innovative curriculum. The pre-clinical stage of the SPICCES curriculum is characterized by integrated horizontal system-based modules of didactic teaching and laboratory work, and vertical integration and longitudinal progression of basic clinical skills and core concepts of foundation of medicine (communication skills, professionalism and ethics, evidence-based medicine, sociology and psychology of medicine, research and biostatistics), with early community exposure and fieldwork. The clinical stage incorporates fewer didactic lectures compared to the previous curriculum and instead includes student-led seminars, case-based tutorials, community-based fieldwork, clinical clerkship, clinical exposure in the outpatient, inpatient, emergency and operating room settings for exposure to clinical and laboratory procedural skills. The curriculum before the adaptation of the SPICCES curriculum, the traditional curriculum, which is in transition, is still in use for students admitted before 2015, and focuses more on didactic teaching and information gathering approaches in contrast to a student-centred and problem-based approach, and lacks the horizontal and vertical integration present in the SPICCES model.

Assessment methods in the SPICCES and traditional curriculum are similar. They include written tests (essay and multiple-choice questions), objective structural practical examinations (OSPE), objective structured clinical examinations (OSCE), clinical long case evaluations and research projects, as well as directly observed and supervised performance of basic procedures for clinical students, although in the SPICCES curriculum there is more emphasis on formative assessments, student-led presentations and research projects. Additionally, test item for both formative and summative assessments reflect best global practices in blueprinting, test item development, assessment administration and management. At the time of this study, 200, 300 and 400 level students were using the SPICCES curriculum while 500 and 600 levels were using the traditional curriculum.

*1.2 COVID-19 Pandemic and Undergraduate Medical Education*

COVID-19 is a viral respiratory illness caused by Systemic Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2) (Centre for Diseases Control and Prevention [CDC], 2020) that was declared a pandemic on 11$^{th}$ March 2020 (World Health Organization [WHO], 2020). Due to the propensity of the virus for rapid human to human transmission, lockdown measures were implemented to prevent and reduce the transmission of the virus. In the face of the pandemic and due to initiatives aimed at limiting the transmission or "flattening the curve", medical and dental education around the world was upended. In Nigeria, the Federal Government directed the closure of all universities on the 23$^{rd}$ of March, 2020, effectively suspending undergraduate medical and dental training across the country (Erezi, 2020).

The medical and dental curriculum represents a bedrock component of medical and dental education. It is therefore pertinent to gain students' insights on the efficacy of their curriculum and evaluate their viewpoints about its adaptability to the challenges presented to medical and dental education by the COVID-19 pandemic.

Published reports on COVID-19 related undergraduate medical or dental education activities have largely focused on the impact of the pandemic on teaching, learning, assessment and students' graduation, highlighting challenges and opportunities for educational innovations (Alec, Aswar, Farrokhi 2021). Additionally, COVID-19 pandemic created

a unique opportunity for a comparative curriculum performance study in our medical school with a transitioning undergraduate medical and dental curriculum from traditional to innovative. This study aimed to assess the suitability and adaptability of two undergraduate medical and dental curricular pathways before and during the COVID-19 pandemic in the College of Medicine, University of Lagos, to determine issues in teaching and learning that should be addressed, explore how medical and dental education can be adapted to the COVID-19 pandemic, and to compare patterns in students' perspectives against the applicable curriculum pathways.

## 2. Methods

This is a descriptive, cross-sectional study conducted between 2020 and 2021 in a public medical school using 102-item questionnaire.

### *2.1 Study Population*

The participants were medical and dental students at various levels of the six-year undergraduate program of the College of Medicine University of Lagos, Nigeria, but excluding 200 Level students who had spent only two weeks in training because they were adjudged to be insufficiently exposed to the training program to substantially contribute to the study.

### *2.2 Sample Size Determination*

The study had a sample size of 300 students calculated using Cochran's formula and enrolled using the stratified sampling method.

### *2.3 Data Collection Tool*

The questionnaire was distributed from December 9$^{th}$, 2020 to January 6$^{th}$, 2021 via the online platform, WhatsApp.

### *2.4 Data Analysis Method*

Questions were in two formats: multiple-choice and five-point Likert scale. For statistical analysis of the Likert scale questions, a score of 1 was attributed to "strongly disagree" for some questions or "very poor" for others, a score of 2 was attributed to "disagree" for some questions or "poor" for others, a score of 3 was attributed to "neutral" for some questions or "average" for others, a score of 4 was attributed to "agree" for some questions or "good" for others, and a score of $^{5}$ was attributed to "strongly agree" for some questions or "very good" for others. The questionnaire comprised seven sections assessing socio-demographic characteristics, knowledge and perspectives on COVID-19, students' perceptions about their educational experience before, during and after the COVID-19 pandemic, the attitude of students towards e-learning, students' readiness towards e-learning, and e-learning challenges. Data were analysed using the Statistical Package for the Social Sciences (Version 22) software. The relationships between the type of curriculum applicable to respondents, teaching and learning before the pandemic, the relevance of curriculum, the relevance of online assessment, perception of readiness for e-learning and challenges to e-learning were analysed. The analysis included descriptive statistics, chi-square test, p-value and mean square contingency coefficient test. Results were expressed as frequencies and percentages. The significance level was stated as $p < 0.05$.

### *2.5 Ethical Considerations*

Ethical approval for the study was obtained from the Health Research and Ethics Committee (HREC) of the Lagos University Teaching Hospital (LUTH).

## 3. Results

### *3.1 Basic Demographic Characteristics*

Of the 280 questionnaires completed, 55.7% were female and 44.3% were male with a mean age of 22.1 ± 2.39 years (range: 18-33 years).

A total of 78.6% of the respondents were studying Medicine and Surgery, compared with and 21.4% in Dentistry. When distributed according to the level of training, a high percentage of respondents were 400 level (25.4%) and 300 level (22.1%) students. A total of 65.4% of respondents were using the SPICCES curriculum while 34.6% were on the traditional curriculum track. A total of 67.3% and 58.3% medical and dental students respectively were on the SPICCES curriculum track, compared with. 32.7% and 41.7% medical and dental students respectively on the traditional curriculum track.

*3.2 Perspectives on Teaching, Learning and Assessment before the COVID-19 Pandemic*

The majority of respondents to whom the SPICCES curriculum was applicable (70.5%) had a favourable perception about the relevance of their curriculum. A notable percentage of respondents to whom the Traditional curriculum was applicable (52.6%) had a favourable perception about the relevance of their curriculum although this percentage is significantly smaller than that of respondents in the SPICCES curriculum [$\chi^2 = 8.862$, $p = 0.003$, $\varphi = -0.178$]. More respondents studying Dentistry (46.7%) had an unfavourable perception about the relevance of the curriculum compared to respondents studying Medicine and Surgery (32.7%) [$\chi^2 = 3.990$, $p = 0.046$, $\varphi = -0.119$].

Compared to those in the traditional curriculum, respondents in the SPICCES curriculum had a higher percentage of good ratings towards the overall quality of the curriculum in preparing them to be a rounded 21st-century physician (27.8% vs 59.0%), student-centeredness (19.6% vs 54.1%), emphasis on research (18.5% vs 45.4%), active engagement of students (22.7% vs 60.7%), community centeredness (20.6% vs 40.4%), quality and appropriateness of assessment of students (34.0% vs 49.2%) and adequacy of methods of assessment (35.0% vs 47.0%). Respondents using the traditional curriculum generally felt that their curriculum had an average rating in parameters assessing relevance to medical and dental education except for emphasis given to research in which the majority (51.6%) expressed poor rating.

A significant percentage of respondents (46.5%) in the SPICCES curriculum assessed the time given for social and extracurricular activities as poor [$\chi^2 = 2.995$, $p = 0.559$]. Also, respondents making use of the SPICCES curriculum had mixed opinions on the efficacy of delivery of course contents, as 31.7%, 35.0% and 33.4% gave poor, average and good ratings respectively [$\chi^2 = 5.405$, $p = 0.248$]. When compared against those in the traditional curriculum, the majority of whom had average ratings, respondents in the SPICCES curriculum had the highest percentages of poor and good rating in the effectiveness of imparting appropriate knowledge, skills and behaviours and clarity of learning objectives.

A total of 43.9% of respondents with a favourable perspective on the relevance of curriculum had unfavourable perspectives on teaching and learning before the COVID-19 pandemic. A greater number of respondents using the SPICCES curriculum (50.3%) had a favourable perspective on teaching and learning before the COVID-19 pandemic when compared to respondents using the traditional curriculum (40.2%) [$\chi^2 = 2.581$, $p = 0.108$]. Of the respondents that had an unfavourable perspective on teaching and learning prior to the COVID-19 pandemic, 53.0% had a favourable perception of relevance of curriculum while 47.0% had an unfavourable perception [$\chi^2 = 17.604$, $p = 0.000$, $\varphi = 0.251$].

Respondents in the SPICCES curriculum (when compared to those in the traditional curriculum) had a greater number of good ratings for conduciveness of number of students during lab sessions, active engagement of students, personal and workspace safety measures in the laboratories, personal protection and safety measures for students and adequate workplace safety and hygiene. Although, a significant percentage of respondents in both the traditional and SPICCES curriculum reported poor assessment of overall conduciveness of teaching and learning environment (44.4% and 53.6%), conduciveness of number of students during lab sessions (60.8% and 45.9%), personal and workspace safety measures in the laboratories (46.4% and 33.8%), personal protection and safety measures for students (53.6% and 39.9%) and adequate workplace safety and hygiene (48.5% and 34.5%).

In the assessment of the conduciveness of the number of students in clinical units, respondents in the traditional curriculum (43.3%) had a higher percentage of poor ratings when compared to those in SPICCES (17.5%) [$\chi^2 = 28.593$, $p = 0.000$, $\varphi = 0.320$]. 53.6% of respondents in the SPICCES curriculum assessed the overall conduciveness of the teaching and learning environment to be poor while 44.4% of those in the Traditional curriculum gave a similar rating [$\chi^2 = 3.309$, $p = 0.507$]. Table 1 compares students' viewpoints on questions assessing the relevance of their curriculum to the type of curriculum applicable to them, whether the Traditional or SPICCES curriculum. Table 2 highlights the relationship between students' responses to questions assessing their views on teaching and learning before the COVID-19 pandemic and the curriculum applicable to their education.

**Table 1.** Relationship between Type of Curriculum Used for Medical and Dental Education and Students' Perspectives on the Relevance on the Curriculum

| Concerning teaching and learning before the covid-19 pandemic, please rate your perception about the relevance of the curriculum regarding your set on the following items | traditional/ pre-spicces curriculum (%) n = 97 | spicces curriculum (%) n = 183 | total (%) n = 280 |
|---|---|---|---|
| The overall quality of the curriculum you selected in preparing you to be a rounded compassionate and competent physician suited for the 21st century | | | |
| Very poor | 8 (8.2) | 5 (2.7) | 13 (4.6) |
| Poor | 14 (14.4) | 19 (10.4) | 33 (11.8) |
| Average | 48 (49.5) | 51 (27.9) | 99 (35.4) |
| Good | 24 (24.7) | 79 (43.2) | 103 (36.8) |
| Very good | 3 (3.1) | 29 (15.8) | 32 (11.4) |
| Student-centeredness of the curriculum | | | |
| Very poor | 9 (9.3) | 10 (5.5) | 19 (6.8) |
| Poor | 30 (30.9) | 33 (18.0) | 63 (22.5) |
| Average | 39 (40.2) | 41 (22.4) | 80 (28.6) |
| Good | 18 (18.6) | 74 (40.4) | 92 (32.9) |
| Very good | 1 (1.0) | 25 (13.7) | 26 (9.3) |
| Emphasis given to research in the curriculum | | | |
| Very poor | 12 (12.4) | 8 (4.4) | 20 (7.1) |
| Poor | 38 (39.2) | 31 (16.9) | 69 (24.6) |
| Average | 29 (29.9) | 63 (33.3) | 90 (32.1) |
| Good | 17 (17.5) | 62 (33.9) | 79 (28.2) |
| Very good | 1 (1.0) | 21 (11.5) | 22 (7.9) |
| Active engagement of students in the learning and teaching process in the curriculum | | | |
| Very poor | 7 (7.2) | 6 (3.3) | 13 (4.6) |
| Poor | 23 (23.7) | 16 (8.7) | 39 (13.9) |
| Average | 45 (46.4) | 50 (27.3) | 95 (33.9) |
| Good | 20 (20.6) | 75 (41.0) | 95 (33.9) |
| Very good | 2 (2.1) | 36 (19.7) | 38 (13.6) |
| Efficacy of delivery of course contents in the curriculum | | | |
| Very poor | 5 (5.2) | 14 (7.7) | 19 (6.8) |
| Poor | 19 (19.6) | 44 (24.0) | 63 (22.5) |
| Average | 47 (48.5) | 64 (35.0) | 111 (39.6) |
| Good | 24 (24.7) | 53 (29.0) | 77 (27.5) |
| Very good | 2 (2.1) | 8 (4.4) | 10 (3.6) |
| Effectiveness of imparting appropriate knowledge, skills and behaviours/attributes | | | |
| Very poor | 5 (5.2) | 10 (5.5) | 15 (5.4) |
| Poor | 13 (13.4) | 30 (16.4) | 43 (15.4) |
| Average | 51 (52.6) | 71 (38.8) | 122 (43.6) |
| Good | 25 (25.8) | 61 (33.3) | 86 (30.7) |
| Very good | 3 (3.1) | 11 (6.0) | 14 (5.0) |
| Clarity of learning objectives | | | |
| Very poor | 5 (5.2) | 11 (36.0) | 16 (5.7) |
| Poor | 16 (16.5) | 35 (19.1) | 51 (18.2) |
| Average | 42 (43.3) | 63 (34.4) | 105 (37.5) |
| Good | 29 (29.9) | 61 (33.3) | 90 (32.1) |
| Very good | 5 (5.2) | 13 (7.1) | 18 (6.4) |

| | | | |
|---|---|---|---|
| Quality and appropriateness (relevance to course objectives and teaching and learning experience) of assessment of students | | | |
| Very poor | 5 (5.2) | 5 (2.7) | 10 (3.6) |
| Poor | 12 (12.4) | 22 (12.0) | 34 (12.1) |
| Average | 47 (48.5) | 66 (36.1) | 113 (40.4) |
| Good | 27 (27.8) | 75 (41.0) | 102 (36.4) |
| Very good | 6 (6.2) | 15 (8.2) | 21 (7.5) |
| Methods of assessment are adequate | | | |
| Very poor | 5 (5.2) | 6 (3.3) | 11 (3.9) |
| Poor | 16 (16.5) | 21 (11.5) | 37 (13.2) |
| Average | 42 (43.3) | 70 (38.3) | 112 (40.0) |
| Good | 30 (30.9) | 76 (41.5) | 106 (37.9) |
| Very good | 4 (4.1) | 10 (5.5) | 14 (5.0) |
| Time for social and extracurricular activities | | | |
| Very poor | 16 (16.5) | 32 (17.5) | 48 (17.1) |
| Poor | 21 (21.6) | 53 (29.0) | 74 (26.4) |
| Average | 42 (43.3) | 63 (34.4) | 105 (37.5) |
| Good | 16 (16.5) | 29 (15.8) | 45 (16.1) |
| Very good | 2 (2.1) | 6 (3.3) | 8 (2.9) |
| Community-centeredness | | | |
| Very poor | 9 (9.3) | 6 (3.3) | 15 (5.4) |
| Poor | 23 (23.7) | 24 (13.1) | 47 (16.8) |
| Average | 45 (46.4) | 79 (43.2) | 124 (44.3) |
| Good | 19 (19.6) | 56 (30.6) | 75 (76.8) |
| Very good | 1 (1.0) | 18 (9.8) | 19 (6.8) |

**Table 2.** Relationship between Students' Perspectives on Teaching and Learning before the COVID-19 Pandemic and the Type of Curriculum in Use for Medical and Dental Education

| Rate your perspectives on teaching and learning before the covid-19 pandemic. | Traditional/ pre-spicces curriculum (%) N = 97 | Spicces curriculum (%) n = 183 | Total (%) N = 280 |
|---|---|---|---|
| There is overall conduciveness of teaching and learning environment | | | |
| Strongly disagree | 12 (12.4) | 36 (19.7) | 48 (17.1) |
| Disagree | 31 (32.0) | 62 (33.9) | 93 (33.2) |
| Neutral | 31 (32.0) | 51 (27.9) | 82 (29.3) |
| Agree | 22 (22.7) | 33 (18.0) | 55 (19.6) |
| Strongly agree | 1 (1.0) | 1 (0.5) | 2 (0.7) |
| The number of students during lab sessions is conducive for teaching and learning | | | |
| Strongly disagree | 19 (19.6) | 31 (16.9) | 50 (17.9) |
| Disagree | 40 (41.2) | 53 (26.0) | 93 (33.2) |
| Neutral | 22 (22.7) | 45 (24.6) | 67 (23.9) |
| Agree | 16 (16.5) | 53 (29.0) | 69 (24.6) |
| Strongly agree | 0 (0.0) | 1 (0.5) | 1 (0.4) |
| The number of students in clinical units is conducive for teaching and learning | | | |
| Strongly disagree | 17 (17.5) | 12 (6.6) | 29 (10.4) |
| Disagree | 25 (25.8) | 20 (10.9) | 45 (16.1) |
| Neutral | 23 (23.7) | 96 (52.5) | 119 (42.5) |
| Agree | 30 (30.9) | 51 (27.9) | 81 (28.9) |
| Strongly agree | 2 (2.1) | 4 (2.2) | 6 (2.1) |
| Active engagement of students occurs | | | |

| | | | |
|---|---|---|---|
| Strongly disagree | 6 (6.2) | 5 (2.7) | 11 (3.9) |
| Disagree | 15 (15.5) | 32 (17.5) | 47 (16.8) |
| Neutral | 36 (37.1) | 46 (25.1) | 82 (29.3) |
| Agree | 35 (36.1) | 93 (50.8) | 128 (45.7) |
| Strongly agree | 5 (5.2) | 7 (3.8) | 12 (4.3) |
| There are personal and workspace safety measures in the laboratories | | | |
| Strongly disagree | 15 (15.5) | 16 (8.7) | 31 (11.1) |
| Disagree | 30 (30.9) | 46 (25.1) | 76 (27.1) |
| Neutral | 29 (29.9) | 63 (34.4) | 92 (32.9) |
| Agree | 21 (21.6) | 56 (30.6) | 77 (27.5) |
| Strongly agree | 2 (2.1) | 2 (1.1) | 4 (1.4) |
| There are personal protection and safety measures for students | | | |
| Strongly disagree | 21 (21.6) | 18 (9.8) | 39 (13.9) |
| Disagree | 31 (32.0) | 55 (30.1) | 86 (30.7) |
| Neutral | 29 (29.9) | 58 (31.7) | 87 (31.1) |
| Agree | 16 (16.5) | 51 (27.9) | 67 (23.9) |
| Strongly agree | 0 (0.0) | 1 (0.5) | 1 (0.4) |
| There is adequate workplace safety and hygiene | | | |
| Strongly disagree | 18 (18.6) | 16 (8.7) | 34 (12.1) |
| Disagree | 29 (29.9) | 49 (26.8) | 78 (27.9) |
| Neutral | 30 (30.9) | 62 (33.9) | 92 (32.9) |
| Agree | 20 (20.6) | 55 (30.1) | 75 (26.8) |
| Strongly agree | 0 (0.0) | 1 (0.5) | 1 (0.4) |

### *3.3 Perspectives on Teaching, Learning and Assessment During and After the COVID-19 Pandemic*

Overall, regardless of curriculum, students expressed willingness to resume physically as long as proper infection control measures were put in place. A higher percentage of respondents using the traditional curriculum (82.5%) compared to those using the SPICCES curriculum (64.4%) were willing to return to the traditional method of face-to-face teaching with infection control protocol. Also, 84.5% of respondents using the traditional curriculum in contrast to 78.1% of respondents in the SPICCES curriculum were willing to return to clinical postings/ laboratory sessions with infection control protocol. A significant percentage of respondents (76.3% of respondents using the traditional curriculum and 88.0% of respondents using the SPICCES curriculum) had unfavourable perspectives on the use of online assessments for medical and dental education during the COVID-19 pandemic [$\chi^2 = 6.422$, $p = 0.011$, $\varphi = 0.151$]. A total of 69.6% of respondents acknowledged that e-learning is feasible for students. Of the respondents using the traditional curriculum, 74.2% and 8.2% compared with 60.7% and 23.6% of respondents using the SPICCES curriculum, agreed and were neutral respectively to the feasibility of e-learning for students. All respondents that used the traditional curriculum had a favourable perception of readiness for e-learning similar to those in the SPICCES curriculum (95.1%) [$\chi^2 = 4.929$, $p = 0.026$, $\varphi = 0.133$]. Most of the respondents (98.9%) had a favourable perception of students' readiness of e-learning regardless of curriculum [$\chi^2 = 1.607$, $p = 0.205$].

Respondents using the Traditional curriculum were generally more in favour of e-learning for studies during and after the COVID-19 lockdown and pandemic. 84.5% compared to 75.9% of respondents using the Traditional and SPICCES curriculum respectively were in favour of e-learning for studies during the pandemic. [$\chi^2 = 9.637$, $p = 0.047$, $\varphi = 0.186$]. Similarly, 58.7% compared to 48.6% of respondents using the Traditional and SPICCES curricula respectively were in favour of e-learning for studies after the pandemic eases. [$\chi^2 = 8.533$, $p = 0.074$]. 12.4% of respondents that used the Traditional curriculum perceived that there were no significant challenges to e-learning as compared to 4.4% of respondents using the SPICCES curriculum [$\chi^2 = 6.117$, $p = 0.013$, $\varphi = 0.148$].

Table 3 outlines the type of curriculum in use by students' and relates it to their willingness for physical resumption during the COVID-19 pandemic. Table 4 shows how the type of curriculum used for medical and dental education relates to students' perspectives on the use of online assessments. Table 5 shows how students' perception of readiness for e-learning versus the type of curriculum that they use. Table 6 shows students' responses to questions on challenges to e-learning and how it relates to the type of curriculum they use.

**Table 3.** Relationship between Students' Willingness for Physical Resumption during the COVID-19 Pandemic and the Type of Curriculum in Use for Medical and Dental Education

| Students' willingness for physical resumption | Traditional/ Pre-SPICCES Curriculum (%) n = 97 | SPICCES Curriculum (%) n = 183 | Total (%) n = 280 |
|---|---|---|---|
| Are you willing to return to the traditional method of face-to-face teaching with infection control protocol? | | | |
| Yes | 80 (82.5) | 145 (64.4) | 225 (80.4) |
| No | 6 (6.2) | 7 (3.8) | 13 (4.6) |
| I'm not sure | 11 (11.3) | 31 (16.9) | 42 (15.0) |
| Are you willing to return to the traditional method of face-to-face teaching without infection control protocol? | | | |
| Yes | 12 (12.4) | 23 (12.6) | 35 (12.5) |
| No | 73 (75.3) | 148 (80.9) | 221 (78.9) |
| I'm not sure | 12 (12.4) | 12 (6.6) | 24 (8.6) |
| Are you willing to return to clinical postings/ laboratory sessions with infection control protocol? | | | |
| Yes | 82 (84.5) | 143 (78.1) | 225 (80.4) |
| No | 5 (5.2) | 13 (7.1) | 18 (6.4) |
| I'm not sure | 10 (10.3) | 27 (14.8) | 37 (13.2) |
| Are you willing to return to clinical postings/ laboratory sessions without infection control protocol? | | | |
| Yes | 11 (11.3) | 7 (3.8) | 18 (6.4) |
| No | 81 (83.5) | 158 (86.5) | 239 (85.4) |
| I'm not sure | 5 (5.2) | 18 (9.8) | 23 (8.2) |
| Are you willing to do face to face interactions with peers to facilitate your learning? | | | |
| Yes | 85 (87.6) | 158 (86.3) | 243 (86.8) |
| No | 6 (6.2) | 8 (4.4) | 14 (5.0) |
| I'm not sure | 6 (6.2) | 17 (9.3) | 23 (8.2) |
| Are you willing to do face to face interactions with learning instructors to facilitate your learning? | | | |
| Yes | 84 (86.6) | 145 (79.2) | 229 (81.8) |
| No | 6 (6.2) | 14 (7.7) | 20 (7.1) |
| I'm not sure | 7 (7.2) | 24 (13.1) | 31 (11.1) |

**Table 4.** Relationship between Type of Curriculum in Use for Medical and Dental Education and Students' Perspectives on the Use of Online Assessment during and After the COVID-19 Pandemic

| Perspectives on online assessment | Traditional/ Pre-SPICCES Curriculum (%) n =97 | SPICCES Curriculum (%) n = 183 | Total (%) n = 280 |
|---|---|---|---|
| Do you think there is a need for an online assessment? | | | |
| Yes | 73 (75.3) | 99 (54.1) | 108 (61.4) |
| No | 24 (24.7) | 84 (45.9) | 108 (38.6) |
| Do you think online assessments are better than physical assessments? | | | |
| Yes | 18 (18.6) | 22 (12.0) | 40 (14.3) |
| No | 79 (81.4) | 161 (88.0) | 240 (85.7) |
| Do you think your school is well equipped for online assessments? | | | |
| Yes | 7 (7.2) | 10 (5.5) | 17 (6.1) |
| No | 90 (92.8) | 173 (94.5) | 263 (93.9) |
| Do you think online assessments would reflect knowledge on a particular course? | | | |
| Yes | 52 (53.6) | 75 (41.0) | 127 (45.4) |
| No | 45 (46.4) | 108 (59.0) | 153 (54.6) |
| Do you think online assessments would increase the probability of examination malpractice? | | | |
| Yes | 32 (33.0) | 45 (24.6) | 77 (27.5) |
| No | 65 (67.0) | 138 (75.4) | 203 (72.5) |
| Do you think online assessments would be more restrictive? | | | |
| Yes | 42 (43.3) | 76 (41.5) | 118 (42.1) |
| No | 55 (56.7) | 107 (58.5) | 162 (57.9) |

**Table 5.** Relationship between Students' Perception of Readiness for E-learning During and after the COVID-19 Pandemic and the Type of Curriculum in Use for Medical and Dental Education

| Perception of readiness for e-learning | Traditional/ pre-spicces curriculum (%) N = 97 | Spicces curriculum (%) n = 183 | Total (%) N = 280 |
|---|---|---|---|
| I have basic computer skills e.g., typing | | | |
| Strongly disagree | 0 (0.0) | 2 (1.1) | 2 (0.7) |
| Disagree | 0 (0.0) | 1 (0.5) | 1 (0.4) |
| Neutral | 3 (3.1) | 14 (7.7) | 17 (6.1) |
| Agree | 29 (29.9) | 83 (45.4) | 112 (40.0) |
| Strongly agree | 65 (67.0) | 86 (45.4) | 118 (52.9) |
| I can use online search engines e.g., google | | | |
| Strongly disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Neutral | 1 (1.0) | 2 (1.1) | 3 (1.1) |
| Agree | 25 (25.8) | 71 (38.8) | 96 (34.3) |
| Strongly agree | 71 (73.2) | 110 (60.1) | 181 (64.6) |
| I have used online platforms like email, whatsapp | | | |
| Strongly disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) |

| | | | |
|---|---|---|---|
| Disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Neutral | 1 (1.0) | 3 (1.6) | 4 (1.4) |
| Agree | 24 (24.7) | 65 (35.5) | 89 (31.8) |
| Strongly agree | 72 (74.2) | 115 (62.8) | 187 (66.8) |
| I have used video conferencing tools such as zoom, skype, google classroom, etc. For some form of learning | | | |
| Strongly disagree | 1 (1.0) | 7 (3.8) | 8 (2.9) |
| Disagree | 1 (1.0) | 19 (10.4) | 20 (7.1) |
| Neutral | 3 (3.1) | 16 (8.7) | 19 (6.8) |
| Agree | 29 (29.9) | 62 (33.9) | 91 (32.5) |
| Strongly agree | 63 (64.9) | 79 (43.2) | 142 (50.7) |
| I have tools for e-learning such as mobile phones, smartphones, laptops etc. | | | |
| Strongly disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Disagree | 0 (0.0) | 4 (2.2) | C |
| Neutral | 2 (2.1) | 7 (3.8) | 9 (3.2) |
| Agree | 30 (30.9) | 82 (44.8) | 112 (40.0) |
| Strongly agree | 65 (67.0) | 90 (49.2) | 155 (55.4) |
| Have access to internet connectivity | | | |
| Strongly disagree | 0 (0.0) | 4 (2.2) | 4 (1.4) |
| Disagree | 2 (2.1) | 2 (1.1) | 2 (2.1) |
| Neutral | 11 (11.3) | 20 (10.9) | 31 (11.1) |
| Agree | 34 (35.1) | 92 (50.3) | 126 (45.0) |
| Strongly agree | 50 (51.5) | 65 (35.5) | 115 (41.1) |
| Have attended train/ workshops on e-learning | | | |
| Strongly disagree | 1 (1.0) | 12 (6.6) | 13 (4.6) |
| Disagree | 21 (21.6) | 58 (31.7) | 79 (28.2) |
| Neutral | 9 (9.3) | 21 (11.5) | 30 (10.7) |
| Agree | 28 (28.9) | 49 (26.8) | 77 (27.5) |
| Strongly agree | 38 (39.2) | 43 (23.5) | 81 (28.9) |
| Learning institution has ict infrastructure to support e-learning | | | |
| Strongly disagree | 4 (4.1) | 28 (15.3) | 32 (11.4) |
| Disagree | 21 (21.6) | 46 (25.1) | 67 (23.9) |
| Neutral | 35 (36.1) | 54 (29.5) | 89 (31.8) |
| Agree | 24 (24.7) | 43 (23.5) | 67 (23.9) |
| Strongly agree | 13 (13.4) | 12 (6.6) | 25 (8.9) |
| Learning institutions housing support staff to assist e-learning | | | |
| Strongly disagree | 5 (5.2) | 27 (14.8) | 32 (11.4) |
| Disagree | 25 (25.8) | 48 (26.2) | 73 (26.1) |
| Neutral | 34 (35.1) | 61 (33.3) | 95 (33.9) |
| Agree | 21 (21.6) | 35 (19.1) | 56 (20.0) |
| Strongly agree | 12 (12.4) | 12 (6.6) | 24 (8.6) |

**Table 6.** Relationship between Students' Perspectives on Challenges to E-learning and the Type of Curriculum in Use for Medical and Dental Education

| CHALLENGES TO E-LEARNING | TRADITIONAL/ PRE-SPICCES CURRICULUM (%) N = 97 | SPICCES CURRICULUM (%) N = 183 | TOTAL (%) N = 280 |
|---|---|---|---|
| **THE FINANCIAL COST OF IMPLEMENTING E-LEARNING INFRASTRUCTURE** | | | |
| **STRONGLY DISAGREE** | 2 (2.1) | 1 (0.5) | 3 (1.1) |
| **DISAGREE** | 8 (8.2) | 11 (6.0) | 19 (6.8) |
| **NEUTRAL** | 14 (14.4) | 22 (12.0) | 36 (12.9) |
| **AGREE** | 44 (45.4) | 83 (45.4) | 127 (45.4) |
| **STRONGLY AGREE** | 29 (29.9) | 66 (36.1) | 95 (33.9) |
| **LIMITED ACCESS TO COMPUTERS** | | | |
| **STRONGLY DISAGREE** | 2 (2.1) | 2 (1.1) | 4 (1.4) |
| **DISAGREE** | 17 (17.5) | 13 (7.1) | 30 (10.7) |
| **NEUTRAL** | 13 (13.4) | 26 (12.6) | 36 (12.9) |
| **AGREE** | 44 (45.4) | 80 (43.7) | 124 (44.3) |
| **STRONGLY AGREE** | 21 (21.6) | 65 (35.5) | 86 (30.7) |
| **FREQUENT ELECTRICAL POWER FAILURES** | | | |
| **STRONGLY DISAGREE** | 0 (0.0) | 2 (1.1) | 2 (0.7) |
| **DISAGREE** | 8 (8.2) | 3 (1.6) | 11 (3.9) |
| **NEUTRAL** | 9 (9.3) | 14 (7.7) | 23 (8.2) |
| **AGREE** | 45 (46.4) | 76 (41.5) | 121 (43.2) |
| **STRONGLY AGREE** | 35 (36.1) | 88 (48.1) | 123 (43.9) |
| **COST OF INTERNET FACILITIES** | | | |
| **STRONGLY DISAGREE** | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| **DISAGREE** | 10 (10.3) | 5 (2.7) | 15 (5.4) |
| **NEUTRAL** | 5 (5.2) | 13 (7.1) | 18 (6.4) |
| **AGREE** | 43 (44.3) | 72 (39.3) | 115 (41.1) |
| **STRONGLY AGREE** | 39 (40.2) | 93 (50.8) | 132 (47.1) |
| **LIMITATIONS IN INTERNET CONNECTIVITY** | | | |
| **STRONGLY DISAGREE** | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| **DISAGREE** | 6 (6.2) | 4 (2.2) | 10 (3.6) |
| **NEUTRAL** | 7 (7.2) | 13 (7.1) | 20 (7.1) |
| **AGREE** | 45 (46.4) | 75 (41.0) | 120 (42.9) |
| **STRONGLY AGREE** | 39 (40.2) | 91 (49.7) | 130 (46.4) |
| **ACCESS TO ONLINE CONTENT PLATFORMS E.G. ZOOM, GOOGLE CLASSROOM** | | | |
| **STRONGLY DISAGREE** | 7 (7.2) | 8 (4.4) | 15 (5.2) |
| **DISAGREE** | 30 (30.9) | 50 (27.3) | 80 (28.6) |
| **NEUTRAL** | 18 (18.6) | 47 (25.7) | 65 (23.2) |
| **AGREE** | 27 (27.8) | 45 (24.6) | 72 (25.7) |
| **STRONGLY AGREE** | 15 (15.5) | 33 (18.0) | 48 (17.1) |
| **POOR BUDGETARY ALLOCATION** | | | |
| **STRONGLY DISAGREE** | 2 (2.1) | 0 (0.0) | 2 (0.7) |
| **DISAGREE** | 7 (7.2) | 2 (1.1) | 9 (3.2) |
| **NEUTRAL** | 11 (11.3) | 20 (10.9) | 31 (11.1) |

| | | | |
|---|---|---|---|
| **AGREE** | 45 (46.4) | 75 (41.0) | 120 (42.9) |
| **STRONGLY AGREE** | 32 (33.0) | 86 (47.0) | 118 (42.1) |
| **INCESSANT STRIKES** | | | |
| **STRONGLY DISAGREE** | 5 (5.2) | 3 (1.6) | 8 (2.9) |
| **DISAGREE** | 10 (10.3) | 17 (9.3) | 27 (9.6) |
| **NEUTRAL** | 8 (8.2) | 19 (10.4) | 27 (9.6) |
| **AGREE** | 25 (25.8) | 46 (25.1) | 71 (25.4) |
| **STRONGLY AGREE** | 49 (50.5) | 98 (53.6) | 147 (52.5) |
| **TIME COMMITMENT OF LECTURERS** | | | |
| **STRONGLY DISAGREE** | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| **DISAGREE** | 7 (7.2) | 7 (3.8) | 14 (5.0) |
| **NEUTRAL** | 15 (15.5) | 31 (16.9) | 46 (16.4) |
| **AGREE** | 43 (44.3) | 61 (33.3) | 104 (37.1) |
| **STRONGLY AGREE** | 32 33.0) | 84 (45.9) | 116 (41.4) |

## 4. Discussion

This study was carried out to evaluate the suitability and adaptability of two undergraduate medical and dental curricular pathways before and during the COVID-19 pandemic in the College of Medicine, University of Lagos, Nigeria, and highlight the impact that an educational curriculum can have on students' opinions about their education.

When respondents' insight on suitability and adaptability of the two undergraduate medical and dental curricular pathways were evaluated, a greater number of respondents using the SPICCES curriculum (50.3%) had a favourable perspective on teaching and learning before the COVID-19 pandemic, compared to respondents using the traditional curriculum.

Students using the SPICCES curriculum had a more favourable assessment of the conduciveness of the number of students in clinical units for teaching and learning, but this is likely more related to the size of the student population in the classes in the traditional curriculum compared to the classes in the SPICCES curriculum, as intake numbers into the College of Medicine, University of Lagos has declined in recent years. Additionally, we found that a majority of respondents using the SPICCES curriculum (70.5%) had a favourable perception about the relevance of their curriculum, compared to a lesser majority of respondents (52.6%) using the traditional curriculum. However, this may be as a result of the questions used to assess students' opinions on curriculum relevance, some of which looked at parameters that the SPICCES curriculum specifically seeks to address such as student-centeredness, emphasis on research, active engagement of students in teaching and learning, community centeredness, and quality and appropriateness of assessment of students.

Almost half of the respondents (45.9%) in the SPICCES curriculum did not give a good rating on the student-centeredness of their curriculum, and more than half of respondents using the SPICCES curriculum (59.6%) did not give a good rating on the community centeredness of the curriculum, despite these serving as core components of the curriculum. These may point to a number of factors, including poor implementation of the new curriculum, and poor communication of the curriculum objectives that may isolate students from the decision-making process. This further highlights the need to involve students as stakeholders in their medical education and to collect continuous feedback from them, as earlier noted.

A high percentage (60.7%) of students on the SPICCES curriculum track rated high their active engagement in the learning and teaching process, compared with 22.7% of students on the traditional curriculum. Also, Students using the SPICCES curriculum had positive perspectives on the emphasis given to research in their curriculum (45.4%) compared to those in the traditional curriculum (18.5%). Although the feedbacks in relation to SPICCES curriculum are positive and expected because of the student-centred educational strategies and emphasis on research, scholarship as well as evidence-based medicine, there is need to sustain students' engagement and to further improve on the implementation of these curricular components.

Perspectives on the efficacy of the delivery of course contents among students using the SPICCES curriculum were mixed with 31.7%, 35.0% and 33.4% giving poor, average and good ratings respectively, compared to those using the traditional curriculum who had predominantly average ratings (48.5%). With the introduction of student-driven

modes of course content delivery such as student-led seminars, case-based tutorials and small group presentations in the SPICCES curriculum, further evaluation may be necessary to understand why students still feel that their course content delivery is inadequate.

In assessing students' perspectives on their education during and after the COVID-19 pandemic, we found that more respondents using the traditional curriculum (82.5%) compared to those using the SPICCES curriculum (64.4%) were willing to return to the traditional method of face-to-face teaching with infection control protocol, and 84.5% of respondents using the traditional curriculum (in contrast to 78.1% of respondents in the SPICCES curriculum) were willing to return to clinical postings/laboratory sessions with infection control protocol. Additionally, respondents using the traditional curriculum were more likely to be in favour of e-learning during and after the COVID-19 lockdown and pandemic and all respondents using the traditional curriculum had a favourable perception of their readiness for e-learning. Likely, these preferences are more greatly influenced by the level of study of the respondents in the traditional curriculum (500 level and 600 level students in the clinical phase of education), and their desire to continue and complete their medical education that has been significantly protracted by repeated strike actions by academic staff and the lockdown as a result of the COVID-19 pandemic. It may also be influenced by the more hands-on nature of clinical studies and the perceived difficulties in successfully replicating this form of learning virtually.

A total of 60.7% of respondents using the SPICCES curriculum agreed that e-learning was feasible for students (compared to 74.2% of those using the traditional curriculum), while 4.4% of these respondents perceived that there were no significant challenges to e-learning (compared to 12.4% of respondents that used the traditional curriculum). This relatively lower preference for e-learning among students in the SPICCES curriculum may be as a result of the varying forms of learning used in the SPICCES curriculum; beyond didactic lectures, the curriculum also calls for interactive discussions, student-led seminars and group presentations. It is likely, students in the SPICCES curriculum do not think that these forms of learning can be replicated successfully via e-learning platforms due to its myriad of challenges.

It is noteworthy that a significant percentage of respondents in both the traditional and SPICCES curricula rated poorly the overall conduciveness of the educational environment (44.4% and 53.6% respectively). These negative perceptions, even from respondents using the SPICCES curriculum may be related to high expectations for an educational environment that is commensurate with the demands of the new SPICCES curriculum and the comparatively high standards and expectations associated with the implementation of the new curriculum. This finding underscores the need for feedback from students on their learning and to apply students' suggestions to strengthen the implementation of any student-centred educational policy. A study conducted at a medical college in the US evaluated a student engagement programme in place at the institution known as a Student Curricular Board (SCB), that allowed medical students to provide direct feedback about their courses and their general curriculum (Geraghty et al., 2020)). The study surveyed the students to examine the impact of the SCB and found that a majority of students viewed the SCB and opportunities for student engagement favourably, agreeing that the programme advocates for all students, fosters collaborative relationships amongst faculty and students and that changes to a curriculum driven by the SCB have improved the student experience (Geraghty et al., 2020). We propose that a similar, formal means of student engagement and feedback be implemented in any medical institution undergoing curriculum review and/or changes, including the institution where this study was carried out.

Nevertheless, it is instructive that 43.9% of respondents with a favourable perspective on the relevance of curriculum had unfavourable perspectives on teaching and learning before the COVID-19 pandemic, underscoring the multifactorial influences on students' perspectives on their medical and dental educational experience. Other factors may include the lack of student engagement in institutional decision making, and unfavourable teaching styles and behaviour among lecturers, as well as factors particular to the wider Nigerian context: poor funding and infrastructure in both tertiary institutions and medical centres, incessant industrial strike actions by academic and non-academic staff of teaching institutions and the worsening socioeconomic status of many Nigerians. There is a paucity of literature exploring student perspectives on their educational curriculum and how it affects teaching, learning and assessment in their institution, especially in a Nigerian setting, underscoring the need for further research to explore these relationships.

## 5. Conclusion

In general, the students using the SPICCES curriculum had more favourable perspectives as regards the quality of the curriculum used in delivering their education proving the need for continuous evaluation and improvement of

existing curriculum used in the delivery of medical education. This also highlights the shift in curriculum development processes from instructor-led to a collaborative process between both the instructors and students. Student-centred curricula have proved to be more beneficial than non-student-centred ones as seen by the results of this study as they significantly increase the engagement of students by acknowledging them as major stakeholders in their own education. Nonetheless, certain demerits exist in the implementation of these innovative curricula such being more time and resource intensive. However, despite having improved on the curriculum, both groups of students felt that the teaching and learning environments were poor. This shows that despite improvements made to the processes of delivering education, attention should also be paid to the supporting infrastructure, facilities and equipment required to deliver quality education to medical students.

The use of e-learning provides endless opportunities and benefits chief among which is increased resilience and flexibility of the curriculum, despite this it does come with its unique challenges such as increased distractions, the need to filter information constantly as several incorrect data can be found online, technical know-how and reduced opportunities for human connection. It is therefore imperative that a hybrid of both face-to-face and e-learning styles are blended to truly achieve the best results in these times. Overall, findings in this study echo the need for student-centred curriculum designs and conducive educational environments that are resilient to emerging and established threats to traditional pedagogy and programs as highlight the need for programs that support extracurricular activities.

## 6. Limitations

This is a cross-sectional study that assessed the self-reported perspectives of respondents nine months into the pandemic. Although the questionnaire was distributed via online platforms accessible to a large number of students (WhatsApp and Google Forms), medical and dental students that had internet access constraints during the period of data collection would have been excluded from the study. Additionally, this is a study carried out in a single institution. As such, the results of this study cannot be generalized to other institutions in the nation or other countries. Within the limits of the present study in terms of the scope and scale of the survey, there is need to plan a more comprehensive evaluation of the SPICCES curriculum after the first cycle is completed, after students on this curriculum track graduate in 2024.

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