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Culturally-relevant pedagogy and students' preferences over online teaching/learning modalities in sub-Saharan African Universities: A case of the University of Abomey-Calavi

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Abstract

This study assessed the responsiveness of the online learning techno-pedagogical materials to the students' cultural and socio-economic conditions at Abomey-Calavi University through a student-centered lens. The study used the multi-stage sampling procedure to select 360 students from four professional training programs that have rich experience in online learning/teaching. Descriptive statistics and a logit model were deployed to analyze collected data. The results displayed that though there were diverse ethnic groups among surveyed students, the majority of them were of the Benin nationality (98.3%) against only (1.7%) who were from neighboring countries. The mean age of the students was 20.35 years with less than one-quarter (24.2%) having a full scholarship, 12.8%, and 63.1% having half scholarship and financial support from their parents or relatives, respectively. More than half (57.8%) of the respondents preferred mixed classrooms while the overwhelming majority (84.4%) preferred asynchronized over synchronized interventions for teachers and learners. More than half of the respondents (56.7%) mentioned that lecturers do not practice ethnics-based discrimination during their classes against 10.8% who indicated that they did and 32.5% who did not know. Furthermore, when students were asked to rank 5 items that contribute to a smooth condition for online classrooms, students mentioned in priority order the five items as follows: Smartphone ownership, equipped lecture rooms, connexion data support for students, open connexion points establishment on campus, and finally, laptop ownership.

Results from the econometric regression revealed that the key drivers that were likely to shape students' preference over online or in-person classroom modalities, were age, experience in 2020 government-supported online classes, Smartphone or laptop ownership, no scholarship, and no connexion support to students. Therefore, the study suggested policies that create enabling conditions for students to attend online teaching or learning, especially by providing students with data for connexion and other necessary internet assets.

Contents

Executive Summary

The paradigm shift from the traditional chalk-and-talk teaching to the digitalizing pedagogical approach has exposed the unreadiness of the Sub-Saharan African countries to implement online teaching/learning. In Benin, High universities had adopted pure online teaching/learning amid Covid-19 but came back to the in-person classrooms system due to students' protests as they faced serious challenges to cope with. This shows the importance of investigating factors that drive successful online learning/teaching.

Supported by the MasterCard Foundation small research grant initiative, this study aimed to assess the responsiveness of the online learning techno-pedagogical materials to the students' cultural and socio-economic conditions at Abomey-Calavi University through a student-centered lens.

To achieve this goal, the study deployed both quantitative and qualitative methods through descriptive statistics and regression analysis. The study used the multi-stage sampling procedure to select 360 students from four professional training programs in the human Biology department of the polytechnical school of Abomey-Calavi University, notably (i) Biomedical Analysis, (ii) Food Technology engineering, (iii) Environmental engineering, and (iv) Medical imaging engineering which have a well-documented experience in online learning/teaching. Descriptive statistics and a logit model were deployed to analyze collected data.

The results displayed that though there were diverse ethnic groups among surveyed students, the majority of them were of the Benin nationality (98.3%) against only (1.7%) who were from neighboring countries. The mean age of the students was 20.35 years with less than one-quarter (24.2%) having a full scholarship, 12.8%, and 63.1% having half scholarship and financial support from their parents or relatives, respectively. More than half (57.8%) of the respondents preferred mixed classrooms while the overwhelming majority (84.4%) preferred asynchronized over synchronized interventions for teachers and learners. More than half of the respondents (56.7%) mentioned that lecturers do not practice ethnics-based discrimination

during their classes against 10.8% who indicated that they did and 32.5% who did not know. Furthermore, when students were asked to rank 5 items that contribute to a smooth condition for online classrooms, students mentioned in priority order the five items as follows: Smartphone ownership, equipped lecture rooms, connection data support for students, open connection points establishment on campus, and finally, laptop ownership.

The econometric regression results revealed that the key drivers that were likely to influence students' preference over online or in-person classroom modalities, were age, experience in 2020 government-supported online classes, Smartphone or laptop ownership, no scholarship, and no connection support to students. Therefore, the study suggested policies that create enabling conditions for students to attend online teaching or learning, especially by providing them with data for connection and other necessary internet assets.

Introduction

Problem Statement

Online education has grown at a fast-paced rate over the last three decades thanks to technological advancement (Simon, 2012). Its importance has been revealed by the Covid-19 pandemic that disrupted across the world the learning process in academia since its outbreak with the attendant social distancing, lockdown, etc. recommended by the World Health Organisation (WHO) (Gouëdard et al., 2020). So, online education was considered a panacea to mitigate the disruption effect (Mishra et al., 2020). Online teaching/learning has also the advantage of handling problems resulting from massification faced by public universities, mostly in developing countries in which it has become a major concern (Noui, 2020). Many universities in Sub-Saharan Africa, including those of Benin, are shifting to the online teaching regime. Yet the ICT infrastructure that reflects the economic level of these countries seems not to respond to this shifting ambition since it does not offer a conducive environment for inclusive access to students (Asim et al., 2020). This indicates that a successful transition into online learning policy must be responsive to students' socioeconomic conditions.

Context and Rationale

Dating back to the 1990s, online education is not new but the novelty relies on its massive adoption and the attendant developments of technology-led facilitating materials (Dung, 2021; Noui, 2020). It encompasses a range of technologies such as the world wide web, email, chat, new groups and texts, audio, and video conferencing delivered over computer networks to impart education (Dhull, 2017). Online teaching, as teacher-led online learning, when compared to face-to-face learning gives rise to elusive conclusions (Barbara et. Al, 2013). There are two categories of researchers when coming to comparing the outcome of online teaching with that of face-to-face teaching. Some found that online teaching provides better outcomes than face-to-face teaching while other researchers found the other way round (that

face-to-face teaching provides better outcomes than provides online teaching). Literature also, showed that the success of online courses and curricula depends largely on the use of student-centered pedagogical practices suggesting that the role of the online teacher is to design, create and facilitate rich interactions among learners to keep them motivated (Subasini & Jayanthy, 2021; Alawamleh et al., 2020; Simon, 2012). This raises the issue of adaptation of the pedagogical contents to the socio-cultural context of the learners.

In Benin, though some teachers use somewhat web-based or computer-assisted content to teach in their respective disciplines, online training will not be officially adopted until 2012 when, with the support of the Francophone Universities Agency (AUF), Beninese universities started developing online training via designing of Modular Object-Oriented Dynamic Learning Environment (Moodle) (Noukakis, 2012). This online practice was reinforced in 2014 thanks to the MOOCs for Africa initiative which was a project of the Federal Polytechnic School of Lausanne (EPFL). This project has mainly focused on Open Massive Online Courses (MOOCs) and Educational Online Resources (EOR). Thus, MOOCs were realized by many lecturers for training purposes. With the COVID-19 event, Beninese universities started using integrated online teaching with video conferencing delivery and associated techno-pedagogies.

However, this technology-led education practice lost its momentum due to students' movement against the practice as a consequence of some difficulties they were facing through this transition to technology-led pedagogy.

Research questions

The situation depicted above raises some questions including the following:

What are the appropriate techno-pedagogical materials for students in Sub-Saharan Africa considering the socio-cultural context, peculiarly in Benin?

How prepared are the universities in Sub-Saharan Africa technically ready to embark on this learning transition?

What is the preparedness of the ICT infrastructure available for SSA universities to embark on this transition to online teaching/learning?

What is the relevance of the tertiary policy for lecturers' assessment to online teaching?

Many questions in this area remain with no answer. Overall, to our best knowledge, studies on online learning, mostly focusing on countries in Sub-Saharan Africa and addressing specific questions as raised above are quite seldom. So, this study intends to provide answers to them considering particularly learner-centered perspectives so as to provide policymakers with evidence-based information.

Broad and specific objectives of the study

Broad objective

The overall objective is to assess the responsiveness of the online learning techno-pedagogical materials to the students' cultural and socio-economic conditions at Abomey-Calavi University.

Specific objectives

This broad objective is split into specific objectives as follows:

Describe the different online learning techno-pedagogical materials used in the selected training programs of the UAC;

Examine the cultural and socio-economic conditions of sampled students;

Identify factors that influence students' preference for online learning versus face-to-face teaching approach;

Literature Review and Theoretical/Conceptual Framework

Theories related to online learning/e-learning

Online learning is a term that encompasses a lot of things that in turn make it hard to define (Marcial et al., 2015). Following Dhull & Sakshi (2017), Simon (2012), Marcial et al. (2015), and Blackmon & Major (2012), online learning encompasses a range of technologies such as the world wide web, email, chat, new groups and texts, audio and video conferencing delivered over computer networks to impart education. For Means et al. (2013), online learning is the learning that takes place entirely or significantly over the internet. The authors distinguished then purely online learning (learning that takes place entirely over the internet) from blended/hybrid learning (learning through a combination of online and face-to-face experience).

E-learning is a part of distance education that historically traces back to the 1850s (Marcial et al., 2015). These authors tried to distinguish three generations that distance learning has been moved through. The first generation, situated between 1850 to 1960, was a generation among which technology that was predominately used included such items as printing, radio, and television. The second generation from 1960 to 1985, used multiple

technologies but without computers, including audiocassettes, television, videocassettes, fax, and print. The third generation, the more modernized distance learning, is made up of multiple technologies including computers, smartphones, etc. (Marcial et al., 2015; Keairns, 2003; Alawamleh et al., 2020)

In the case of this study, online learning (e-learning) is considered teacher-led learning that takes place entirely or significantly over the internet as opposed to self-paced computer-based training.

Culturally responsive teaching and its humanistic roots

Culturally Responsive Teaching (CRT) also known as Culturally Relevant Education (CRE), Culturally Responsive Pedagogy (CRP), and Culturally Relevant Teaching (CRT), is a humanistic teaching approach based on a learners-centered lens that acknowledges not only learners' cognitive needs but also their affective, and social needs (Meléndez-Luces & Couto-Cantero, 2021; Hutchison & Mcalister-shields, 2020). A better understanding of the humanistic approach to teaching and learning is paramount for the appropriation of the CRT concept.

Humanistic approach underpinning the concept of CRT

The humanistic approach rests on the premise that people develop themselves as social individuals whose minds are constructed by social influences through their attempt to respond to these influences and therefore, learners should be at the center of any education (Meléndez-Luces & Couto-Cantero, 2021). Dewey, (1929), is one of the educational reformers who believed in the humanistic approach arguing that school is primarily a social institution. As a result, students' functions as the center of the educative process (Meléndez-Luces & Couto-Cantero, 2021). They concluded that humanistic factors must be considered, taught, and demonstrated in learners' educational environments (Hutchison & Mcalister-shields, 2020).

Other pioneers that laid down the theoretical basis of the humanistic approach to teaching and learning include Jean Piaget and Lev Vygotsky (Piaget, 1964; Vygotsky, 1978).

Culturally responsive teaching

Following Meléndez-Luces and Couto-Cantero (2021) and Byrd (2016), CRT is a student-centered approach to learning that considers not only the students' cognitive process but also the cultural background they belong to so as to make their learning effective and personal. The CRT approach is expected to create a conducive environment for a bilateral flow of ideas that enriches both teachers and students through the teaching and learning process. CRT seeks to address the inequality among students by taking into account characteristics such as race, social, political, and economic conditions that are responsible for the diversity among them. So, in designing pedagogical materials, teachers must consider these factors that are responsible for diversity (Meléndez-Luces & Couto-Cantero, 2021; Tanase, 2020).

Ladson-Billings theory of Culturally Responsive Teaching

According to Ladson-billings, (1995), the CRP is a theoretical model that focuses on multiple aspects of student achievement and supports students to uphold their cultural identities. CRP also calls for students to develop critical perspectives that challenge societal inequalities. So, based on this, Ladson-Billings proposed three principle components of CRP, notably: (i) a focus on student learning and academic success, (ii) developing students' cultural competence to assist students in developing positive ethnic and social identities, and (c) supporting students' critical consciousness or their ability to recognize and critique societal inequalities.

Previous research on culturally responsive teaching

literature showed that much research has been conducted on CRT either in terms of online teaching or face-to-face teaching (Azwahanum et al., 2021; Morrison et al., 2019; Hsiao, 2015; Cabrera et al., 2014; Smith & Ayers, 2006). However, prior studies which are mostly realized in the global north, focused much on race/culture as the main diversity factors, leaving almost untouched socioeconomic conditions.

As for the methodological approach used, the vast majority of the previous papers used qualitative methods.

In the case of this study, apart from culture, much consideration will be given to socioeconomic factors, since they are seemingly the diverse factors in sub-Saharan Africa. Plus, both quantitative and qualitative approaches will be applied.

Synoptic view on MasterCard Foundation Scholars Program at the UAC

The Mastercard Foundation Scholars Program seeks a transformative network of young people and institutions that drive inclusive and equitable socio-economic change throughout Africa. It works with a variety of organizations to provide greater access to education, training, and financial services for young people that are from poor backgrounds with a core mission to advancing learning and promoting access to finance so as to create an inclusive and equitable world. So, the University of Abomey-Calavi (UAC) has been granted funds by the Mastercard Foundation in 2016 in order to support academically excellent students that are from poor socioeconomic backgrounds through a program called "Capacity Building Program in Leadership and Entrepreneurship for Young Students in Benin". The overall objective of the program is to train young Beninese leaders from the poorest social groups who have obtained satisfactory academic results in scientific and technical fields for their university entrance exam. Its duration is seven (7) years, and has three components, namely (i) to provide full scholarships to 200 bright students with outstanding academic records from poor families with leadership and entrepreneurial skills for their self-development and acquisition of entrepreneurial skills (Junior Scholars); (ii) to provide opportunities for 100 students to receive entrepreneurial training to launch their businesses through the UAC business incubation program (Senior Fellows); and (iii) to strengthen the University of Abomey-Calavi Foundation's business incubation program. The program uses a gender-sensitive approach in selecting qualified students. The program has already released three batches of graduate students that are on the job market.

With the event of the COVID-19 outbreak, the Foundation, through a team (e-learning team) is supporting its partnering institutions to find solutions to circumvent the disruption created in academia by the outbreak. This e-learning team, through small research grants,

supports research initiatives on topics related to e-learning in order to provide policymakers with evidence-based information. So, this research is conducted as part of this small research grant initiative.

Conceptual Framework

As aforementioned, online learning encompasses a lot of things. So, to be precise, the study adopted a similar conception to that of Means et al. (2013) by admitting two categories of online teaching viz teacher-led purely online (no face-to-face at all) and blended/hybrid learning (combination of face-to-face and online experience). For a course to be qualified as blended learning it must have at least a teaching unit fully happening online, this helps avoid including courses in which learners make incidental use of the internet at a time. As for the culturally responsive teaching approach, the study will focus on the students' side to assess the appropriateness of the techno-pedagogical materials (easiness of access to the platforms created, online live animation, ready-made videos for students' self-paced learning, etc.) to their cultural and socio-economic conditions. This conception is expected to provide insight into the question of whether the techno-pedagogical materials used are students' socio-economic conditions responsive. Attention will be given to institutional factors such as ICT infrastructure, physical infrastructures such as lecture rooms, established free connection points on campus, etc. The ultimate goal is to provide evidence-based information to policy-makers that can help them build an inclusive and performant outcome-led online learning environment. The conception can be represented by the following logic flow chart.

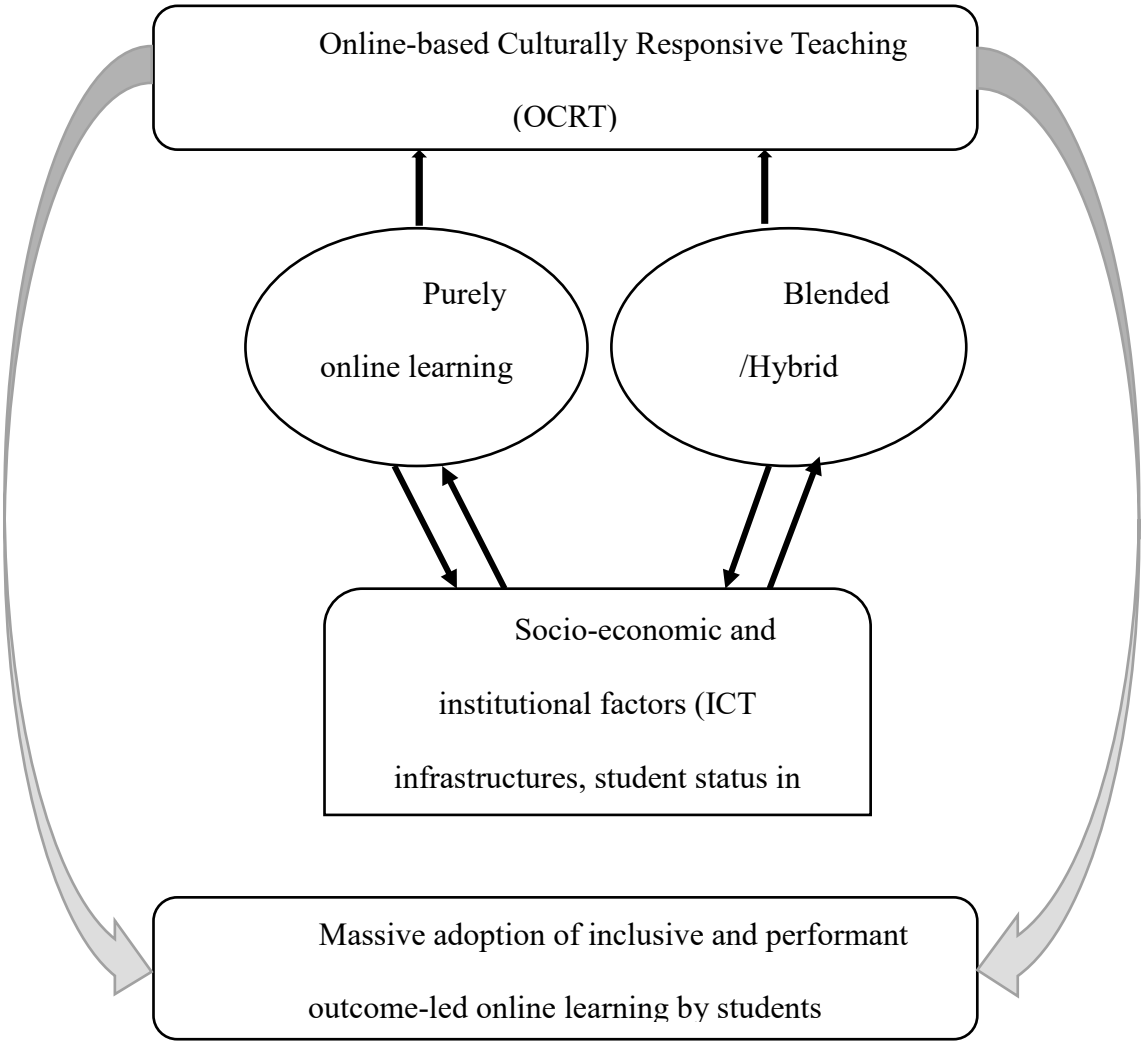


Figure 1: Logic flow chart of conceptual framework

Research Design: Methods and Modes of Analysis

Study area

Due to the topic specificity, time-bound, and budget constraints, the study was conducted at the main campus of the University of Abomey-Calavi. To keep focus, the study considered the polytechnical School of the UAC since this school is well known for its rich experience in e-learning.

In fact, this school has participated in all initiatives of the UAC in e-learning/teaching, starting from the support of the Francophone Universities Agency (AUF) with helped some selected (based on the willingness) training program lecturers to be trained and design Modular Object-Oriented Dynamic Learning Environment (Moodle) (Noukakis, 2012). The school also participated in the MOOCs for Africa initiative which was a project of the Federal Polytechnic School of Lausanne (EPFL). This project has mainly focused on Open Massive Online Courses (MOOCs) and Educational Online Resources (EOR). So many professional training programs' lecturers realized MOOCs for training purposes. As far back as January 2020 (even before COVID-19) the department of human Biology of this school has realized additional MOOCs to cover all courses in biology through a program called "Microbe MOOCs" that if financed by the Francophonie Institute of knowledge engineering and Distance Training (IFIC) and Francophone Universities Agency. The project was carried out by the Research Unit in Applied Microbiology and Pharmacology of Natural Substances (acronymed URMAPha) of the school (EPAC-UAC, 2022). These MOOCs were used in this department in such a way that even during the COVID-19 outbreak, the department continued using the MOOCs for training.

With this well-documented experience, the study considered the biology-based professional training programs, notably (i) Biomedical Analysis, (ii) Food Technology engineering, (iii) Environmental engineering, and (iv) Medical imaging engineering.

Sampling technique and sample size

A multi-stage random sampling technique was used to select the sample units. Two stages were followed, notably, the selection of (i) training programs/curriculum for the first stage and (ii) students' selection at the second stage. Criteria such as (i) experience with online learning and (ii) participation of lecturers in the MOOCs for Africa project, were used for purposive sampling. Four training programs were selected and include (i) Biomedical Analysis, (ii) Food Technology engineering, (iii) Environmental engineering, and (iv) Medical imaging engineering.

For each program, the study used the students' lists obtained from the registration central office and has been updated the HOC of each program to ensure that those who dropped out during the year are excluded.

Following Saqib et al., (2016), to choose the size of respondents in the selected professional training programs, the simplified formula of Yamane (1967) was used as follows:

$n = \frac{N}{1+N(e^2)}$ where: N is the total size and e is the precision level.

The total sizes of the registered rice producers and processors obtained from their respective associations were 515. Thus, based on Yamane (1967) at a 2.5% level of precision, 389 students were sampled (Important to mention that with 1% the sample size was too much, so the study resorted to 2.5%). The selected students in each professional training programs are presented in Table 1 below.

Table 1: Distribution of sampled units by the implied training programs

	First-year			**Second year**			**Third year**			**Total**		**Overall**
	F	**M**	**ST1**	**F**	**M**	**ST2**	**F**	**M**	**ST3**	**F**	**M**	
Biomedical analysis	32	17	49	20	18	38	28	25	53	**80**	**60**	**140**
Food technological engineering	11	4	15	14	9	23	15	8	23	**40**	**21**	**61**
Environmental engineering	17	16	33	15	10	25	17	17	34	**49**	**43**	**92**
Medical imaging engineering	20	18	38	15	14	29	16	14	30	**51**	**46**	**97**
TOTAL	**80**	**55**	**135**	**64**	**51**	**115**	**76**	**64**	**140**	**220**	**170**	**390**

Finally, after the data collection, due to difficulties encountered in the field of survey, enumerators were unable to join some students who did not agree to cooperate. So, the final surveyed students were 360 (Table 2), and their distribution in terms of the academic year (Table 3) is presented as follows:

Table 2: Distribution of interviewed units by the implied training programs

	First-year	**Second year**	**Third year**	**Total**	**Overall**

	F	M	ST1	F	M	ST2	F	M	ST3	F	M	
Biomedical analysis	32	15	47	17	14	31	28	23	51	**77**	**52**	**129**
Food technological engineering	12	4	16	18	9	27	15	8	23	**45**	**21**	**66**
Environmental engineering	11	13	24	15	17	32	19	19	38	**45**	**49**	**94**
Medical imaging engineering	18	3	21	15	15	30	10	10	20	**43**	**28**	**71**
TOTAL	**73**	**35**	**108**	**65**	**55**	**120**	**72**	**60**	**132**	**210**	**150**	**360**

Table 3: Distribution of sampled units and interviewed units by implied training programs

Implied training programs	Levels	Sampled units	Interviewed units	Coverage rate
Biomedical analysis	Year 1	49	47	95.92%
	Year 2	38	32	84.21%
	Year 3	53	50	94.35%
Food technological engineering	Year 1	16	15	100
	Year 2	23	27	117.39%
	Year 3	23	24	104.35%
Environmental engineering	Year 1	33	24	72.73%
	Year 2	25	32	128
	Year 3	34	38	111.76%
Medical imaging engineering	Year 1	38	21	55.26%
	Year 2	29	30	103.45%
	Year 3	30	20	66.67%
Total		**390**	**360**	**92.31%**

Types of data collected

Data collected will are related to instructional design, different types of techno-pedagogical teacher-led teaching materials, ICT infrastructure, cultural, and socio-economic conditions, students' preference/choice towards the online or face-to-face classroom, online attendance mode (synchronized and asynchronized intervention of lecturer and students when it comes to a pure online classroom) choice over types of online teaching mode, learners' capabilities data, students' internet assets. A well-structured and digitalized questionnaire was

used for the data collection which was performed in August when students were already on break. The digital questionnaire was integrated into tablets which enumerators used to collect data after they have been trained for this job.

Analytical tools to be used

The study used both quantitative and qualitative approaches. While the qualitative method helped explore the context-specific issues, the quantitative method allowed me to dig deep by identifying through econometric techniques to explain sources of some specific issues identified through the qualitative one. Descriptive statistics such as frequency counts, percentages, and mean were used. Also, the study determined factors that influence students' adoption of online learning through econometric analysis. The main outcome will be a binary variable (students' preference toward online learning or face-to-face learning). This outcome variable helped capture factors that influence students' attitudes towards online learning and therefore, identify the students' cultural and socio-economic conditions-responsive techno-pedagogical materials.

Following econometricians like Wooldridge (2012), Gujarati (2004), Greene (2002) Amemiya (1985) such a binary dependent variable can be regressed with the logit or probit econometric models. But considering the normal assumption imposed on the error distribution coupled with the easy manipulation of the density function of the probit model (Wooldridge, 2012) probit model was retained for the regression analysis.

Probit model presentation

Assuming that a given student has some propensity to make a component (choice between online learning or face-to-face learning) y_i^* linearly related to a vector of observable variables, X_i, e.g., factors related to student's cultural and socio-economic conditions, students' appreciation of some techno-pedagogical elements, etc. and uncertainty, and other factors we cannot observe known, as an error term, ε_i. The specification of the model is as follows:

Probit model specification

$$Y_i = X_i\beta_i + \varepsilon_i \quad (1)$$

$$Y_i = \{1if, y_i^* \succ 0\ 0if, y_i^* \leq O \quad (2)$$

where Y_i is a binary variable that assumes 1 if a student prefers online learning over face-to-face learning and 0 otherwise; β_i is the vector of unknown parameters to estimate; X_i is the vector of explanatory variables that determine students' attitudes toward online learning or not; ε_i is the random error terms that are assumed to be independently and normally distributed with zero mean and constant variance; and y_i^* is the latent variable that is observed. STATA software was mainly used to run the analyses and to perform the econometric regression.

Results and discussions

Socio-cultural, demographic, and educational characteristics of the respondents

The descriptive statistics about socio-cultural demographic and educational characteristics presented in Table 4 revealed much information about the surveyed students. Almost all of the respondents are of Benin nationality (98.3%) against only a few respondents (1.7%) who are from other countries in Sub-Saharan and central Africa (Togo, Tchad, Congo, and Cameroon). In terms of ethnicity, the cultures of the respondents are richly diversified and grouped according to their closeness. The majority of them are of Fon, Gou, or Mahi ethnic groups while 14.2% are of Adja or Mina ethnic groups, 13.3% are of Nagot or Yoruba ethnic groups, and very few (7.5%) are of Baariba or Ditamari ethnic groups. This shows the multiplicity of different ethnicities in Benin country – which is about 50 different dialectic groups (C & C, 2008).

The average age of the surveyed students is 20.35 years with a standard deviation of 1.91, showing the youngness of the learners in the graduate (bachelor) programs. This remark dovetails with the findings of a study conducted by the UAC-based MCF's transition program that also showed the youngness of the graduate and postgraduate students at the UAC with a

mean age of 23.356 (MCF-UAC, 2021). These findings contrast with the statement of researchers of Trust Africa, (2015). who pointed out that the rate of enrollment of youth of the age class of 18-23 is very low (7%) in Africa compared to 29% globally. The findings here showed that youngness (age class of 17-22) is the major tendency (87.8%) at Abomey-Calavi university implying that as the youth population in Sub-Saharan African countries keeps growing, the enrollment rate of youth between the age of 18-23 is getting better than some years ago. As far as the government-based or non-government (NGO) financial support toward learners is concerned, less than one-quarter (24.2%) of the respondents had a full scholarship and 12.8% had half a scholarship while the larger majority (63.1%) received their financial support only from their parents and relatives. This showed that financial support coverage is still low suggesting more effort from the government for better coverage. Also, those that benefit from full scholarships include some students (1.7%) from the MasterCard foundation scholars program of the University of Abomey-Calavi. This is equally consistent with the fact that the food technological engineering training program is part of the programs covered by the MCF scholars program at the UAC. Also, the association between the type of the nature of scholarship and sex is statistically significant (Chi-squared = 4.31, P<0.01). This is consistent with the fact that the MCF scholarship program is gender sensitive. The majority (87.5%) of the respondents majored in biology for their university entrance certificate, 10.3% majored in mathematics, and only 2.2% majored in plant production. Finally, as far as the study level is concerned, 30% of the respondents are at the first-year level, 33.3% are in the second year-level, and 36.7% are at the third-year level. Further information can be seen in Table 4 below.

Table 4: Socio-cultural, and educational characteristics of the respondents

	Female		**Male**		**Total**		**Chi-Square**
	Freq	%	Freq	%	Freq	%	
Nationality of the respondents							
Beninese	208	99	146	97.3	354	98.3	1.569

Others	2	1	4	2.7	6	1.7	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Ethnic group of the Respondents							
Fon, Gou, or Mahi	109.0	64.5	125.0	65.4	234.0	65.0	
Adja or Mina	28.0	16.6	23.0	12.0	51.0	14.2	
Nagot or Yoruba	17.0	10.1	31.0	16.2	48.0	13.3	4.673
Baariba or Ditamari	15.0	8.9	12.0	6.3	27.0	7.5	
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
Age of the respondent							
17 – 19	77	36.7	42	28	119	33.1	4.34
20 – 22	112	53.3	85	56.7	197	54.7	
23 – 25	19	9	20	13.3	39	10.8	
26 – 29	2	1	3	2	5	1.4	
Mean		**20.11 (1.847)**	**20.68 (1.97)**		**20.35 (1.91)**		
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Scholarship status of the respondent							
Full Scholarship	48	22.9	39	26	87	24.2	
Half scholarship	26	12.4	20	13.3	46	12.8	**0.65**
None	136	64.8	91	60.7	227	63.1	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Nature of scholarship received							
Government funded scholarship	43	89.6	39	100	82	94.3	**4.31***
MCF funded scholarship	5	10.4	0	0	5	5.7	
Total	**48**	**100**	**39**	**100**	**87**	**100**	
University entrance certificate							
D-Biology based	188	89.5	127	84.7	315	87.5	
C-Mathematics-based	19	9	18	12	37	10.3	**2.407**
DEAT-agric-based	3	1.4	5	3.3	8	2.2	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Study level of the respondent							
First-Year	73	34.8	35	23.3	108	30	
Second Year	65	31	55	36.7	120	33.3	**5.445***
Third Year	72	34.3	60	40	132	36.7	
Total	**210**	**100**	**150**	**100**	**360**	**100**	

Online learning/teaching experiences, success minimum requirements according to learners

Students and online learning/teaching experience at Abomey-Calavi University

Surveyed students have much experience as far as online learning/teaching is concerned. This is shown in Table 5 where all of the respondents declared to have had experience in online learning with both synchronized and asynchronized animation (100%). Moreover, the majority (84.4%) of them prefer asynchronized animation when it comes to choosing between synchronized and asynchronized animations against only very few respondents (15.6%) who declared to have preferred synchronized animation. As the reason why the preference for asynchronized animation, they mentioned that it gives learners freedom in such a way that they can schedule their learning times as conveniently as they want. Furthermore, the majority (57.8***) of the respondents mentioned that they preferred integrated classes (a combination of online and in-person classes) against only 42.2% of them that preferred in-person classes. This shows that although students are inclined to online learning, they are still attached to in-person classes for some subjects. This remark is supported by information in Table 7 where respondents mentioned not all courses can be run online. Comparing both sub-groups (female-versus male), Table 5 shows that the percentage (64.7%) of male respondents who preferred mixed classes are higher ($P<0.05$) than that (52.9%) of females revealing that males are more than their female counterparts inclined to online learning. This result corroborates a previous study conducted in Asia that found that males are, more than their female counterparts, inclined to acquire technology skills (Salele & Khan, 2022).

Table 5 also displays that only 15.6% of the respondents experienced the government-supported online classes that are run amid COVID-19 against 84.6% who did not experience it because they were still in secondary school at that time. Among those that attended that government-supported online classes, the majority (87.5%) of them mentioned that lack of internet support was their major problem about it, and 8.9% of them feel that the major problem

was the instability of lecturers who may be running more than one online activity at the same time with its attendant overlap. And finally, very few of them (3.6%) thought that the major challenge was the inappropriateness of the platform. Further information can be seen in Table 5 below.

Table 5: Online learning/teaching experience and choice over different types of animation

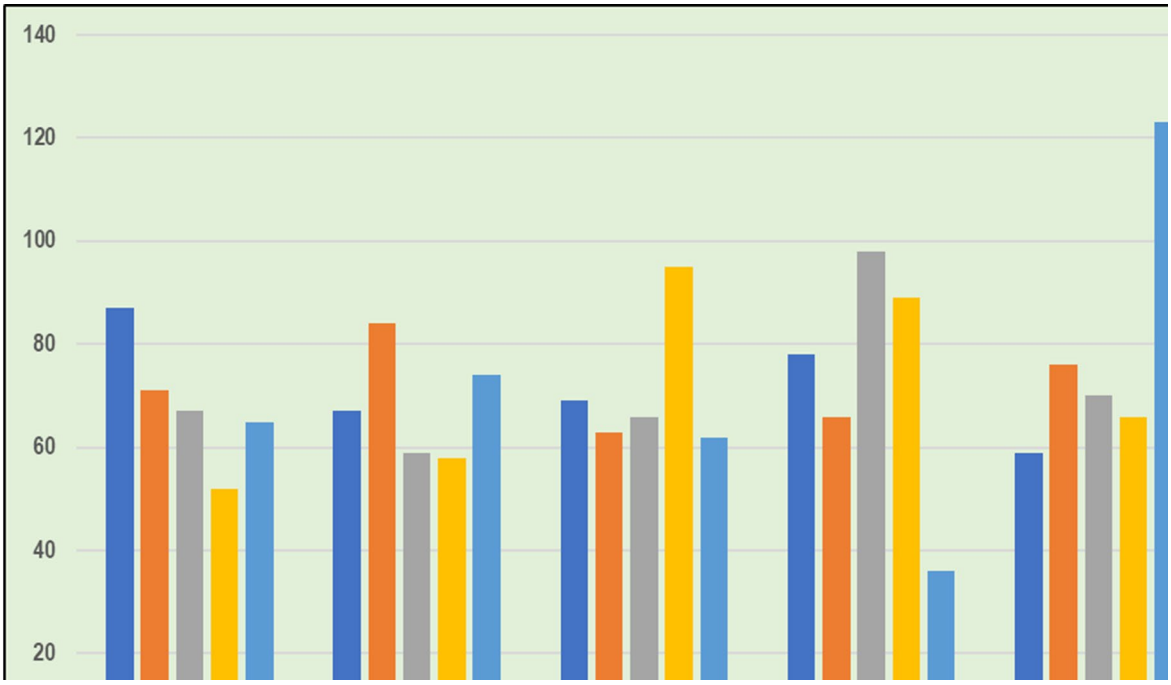
	Female		**Male**		**Total**		**Chi-Square**
	No.	%	No.	%	No.	%	
Experience in online learning							
Yes	210.0	100.0	150.0	100.0	360.0	100.0	
Total	**210.0**	100.0	150.0	100.0	**360.0**	**100.0**	NA
Types of animation experienced in terms of synchronized and asynchronized course							
Both	210	100	150	100	360	100	NA
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Type of animation preference							
Asynchronized	180.0	85.7	124.0	82.7	304.0	84.4	
Synchronized	30.0	14.3	26.0	17.3	56.0	15.6	0.6187
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Choice between in-person and integrated class reorganized							
Pure in-person class	99.0	47.1	53.0	35.3	152.0	42.2	
mixed classes	111.0	52.9	97.0	64.7	208.0	57.8	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	5.002**
Did you experience the online course recommended by the high education ministry							
No	185.0	88.1	119.0	79.3	304.0	84.4	
Yes	25.0	11.9	31.0	20.7	56.0	15.6	5.113**
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
What was your impression of that platform?							
Inappropriateness	0.0	0.0	2.0	6.5	2.0	3.6	
Lack of Internet support	22.0	88.0	27.0	87.1	49.0	87.5	2.091
Lecturers online instability	3.0	12.0	2.0	6.5	5.0	8.9	

Total	**25.0**	**100.0**	**31.0**	**100.0**	**56.0**	**100.0**

Source: Field survey, 2022

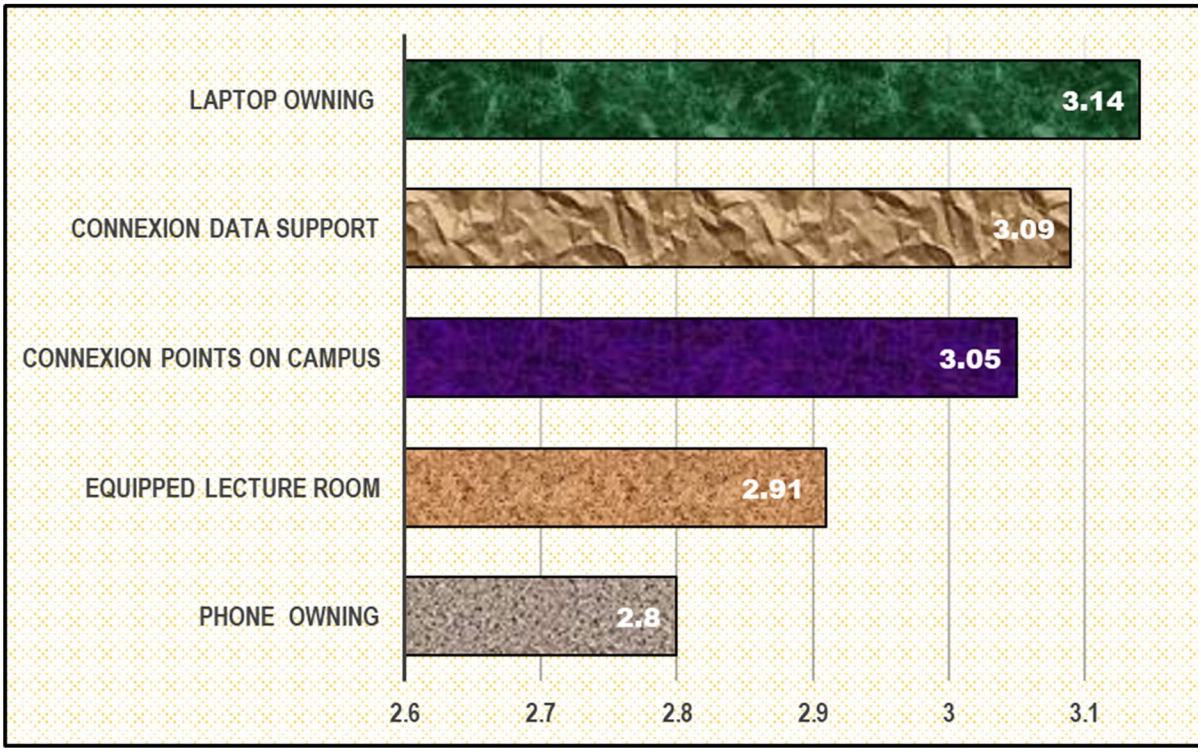
Smooth online course requirements in priority order according to students at UAC

Priority setting in terms of minimum requirements for successful online teaching/learning at the UAC varies greatly from one student to another. The question was put to students to rank in priority order over a scale of five ordered marks, five internet infrastructure items that can facilitate a smooth online course. These items are as follows: (i) Smartphone ownership, (ii) equipped lecture rooms, (iii) establishment of connection points on campus, (iv) students' connection data support, (v) laptop ownership. Students' choices from the first to fifth ranking order are displayed in Figure 2. For the first ranking, Smartphone ownership comes as the first prioritized item, equipped lecture rooms come as the first prioritized for the second ranking followed by students' connexion data support for the third ranking, establishment of connexion points on campus for the fourth ranking, and finally, laptop ownership at the fifth ranking (Fig 3). Overall, Smartphone ownership was ranked by students as the first prioritized item for a successful online class, followed by the equipped lecture rooms, the establishment of connexion points on campus, students' connexion data support, and finally, laptop ownership in third, fourth, and fifth ranking order respectively (Figure 3). This ranking is consistent as the calculated Kelldal coefficient concordance (τ=11,72, $P<0.001$) was statistically significant. This means that students are coherent in their priority choices ranking. The detailed information on the Kendall test results is displayed in Table 8 in the appendix.



Source: Field survey, 2022

Figure 2: Students'choices of internet infrastructure items from the first to fifth **ranking**



Source: Field survey, 2022

Figure 3: Students'priority-based average rank of internet infrastructure items for a successful online course

Residential conditions and students' internet assets ownership

Like in many other universities in Sub-Saharan Africa, students at the University of Abomey-Calavi have varied residential conditions. As can be seen in that Table 6, the largest percentage (40.8%) of the surveyed students mentioned that they live with their parents in their own house, 35.3 % of them declared that they were living in a rented house with their peers or alone, 20.3% mentioned that they stayed with their parents but in a rented house, and only 3.6% declared that they are living in the university hostel. Otherwise stated, far more than half (61.1%=40.8%+20.3%) of the survey respondents were living with their parents during their undergraduate studies. This percentage varies greatly when comparing the two sub-groups (female versus male). Almost 70% of female students reside with their parents in their own or a rented house against half (50%) of males who do so. This implies that parents are more sensitive to their female children than male ones. This may be justified by the fact that in the west African context, females are more than males exposed to Gender-Based Violence (GBV) and parents try as possible as they can to reduce eventual GBV threats against their female children (DSSR-UAC, 2021a; DSSR-UAC, 2021b; DSSR-UAC, 2021c). As far as the distance between residence and the university is concerned, the largest percentage (27%) of the surveyed students had their residence more than 10 Km far away from the university (with 31.4% among females and 22.7% among male students). 23.9% of the surveyed students had their residence less than 2 km away from the university, 18.9%, 15.0%, and 14.4% had their residence at a distance ranging from 5 to 10km, 3 to 5km, and 2-3 km, respectively.

As for the internet assets at the disposal of the surveyed students, the larger majority (82.5%) of them get connected through their Smartphone connexion followed by 10.6% of them who get connected with their parents' wifi-kits, and finally, 6.9% of them declared to have no mean to get connected. Also, 52.8% of the respondents declared to have owned both a laptop and Smartphone while 46.7% mentioned that they owned only a Smartphone and very few (0.6%) of

them declared to have owned only a laptop. Furthermore, more than half the surveyed students mentioned that they regularly used the internet, 33.3% of them stated that they used it often and 10.6% of them declared to have not often used the internet. For more details see Table 6 below.

Table 6: Students' residential status and internet assets ownership

	Female		**Male**		**Total**		**Chi-Square**
	No.	**%**	**No.**	**%**	**No.**	**%**	
Residential status of the student							
Renting with parents	51.0	24.3	22.0	14.7	73.0	20.3	
Own house with parents	94.0	44.8	53.0	35.3	147.0	40.8	19.543***
renting with peers or alone	55.0	26.2	72.0	48.0	127.0	35.3	
University hostel	10.0	4.8	3.0	2.0	13.0	3.6	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Distance between the UAC and the student's home							
Less than/equal to 2Km	42.0	20.0	44.0	29.3	86.0	23.9	
2-3 Km	28.0	13.3	24.0	16.0	52.0	14.4	
3-5 Km	31.0	14.8	23.0	15.3	54.0	15.0	
5-10 Km	43.0	20.5	25.0	16.7	68.0	18.9	
More than 10 Km	66.0	31.4	34.0	22.7	100.0	27.8	6.731
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Internet source at student's disposal							
Parents' wifi	22.0	10.5	16.0	10.7	38.0	10.6	
Data via hone	175.0	83.3	122.0	81.3	297.0	82.5	0.458
None	13.0	6.2	12.0	8.0	25.0	6.9	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Do you own a laptop or a Smartphone?							
Android Smartphone alone	92.0	43.8	76.0	50.7	168.0	46.7	
Laptop alone	0.0	0.0	2.0	1.3	2.0	0.6	
Laptop and Smartphone	118.0	56.2	72.0	48.0	190.0	52.8	4.793
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
How frequently do you use your laptop if you own any?							
Every day in the week	64.0	30.5	66.0	44.0	130.0	36.1	

Group works' time	92.0	43.8	45.0	30.0	137.0	38.1	8.819**
Not often	54.0	25.7	39.0	26.0	93.0	25.8	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
How frequently do you use the internet?							
Regularly	122.0	58.1	80.0	53.3	202.0	56.1	2.233
Often	70.0	33.3	50.0	33.3	120.0	33.3	
Not often	18.0	8.6	20.0	13.3	38.0	10.6	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	

Source: Field survey, 2022

Students' perception of the adaptability of courses to their socio-cultural conditions

Perceptions of the respondents are strongly diversified when it comes to the adaptability of the courses taught to their socio-cultural conditions. Table 7 shows that the overwhelming majority (85.0%) of the respondents thought not all kinds of courses can be run online against only 15.0% that thought otherwise. Among those who thought not all kinds of courses can be run online, more than three-quarters (77.8%) mentioned that scientific subjects cannot be run online, 20.3% thought that it is rather literary subjects cannot be run online while 2.0% of them thought laboratory practices and demonstrations cannot be run online. About the question of whether lecturers practice ethnics-based discrimination during their classes, the greatest part of them (56.7%) mentioned they don't do it, 10.8% thought that they do and the remaining 32.5% said they don't know about it. Among the fewest respondents that thought that lecturers discriminate based on ethnic groups, 56.4% mentioned this is noticed in examples lecturers give, 10.3% thought that it is rather in course contents and 33.4% thought the discrimination is felt in both course contents and examples. As for the adaptation of courses to west African culture, more than half (51.4%) of the respondents thought that course contents are not adapted to African culture against 48.6% who thought the course contents are adapted to their cultures.

When coming to the adaptability of the examples given by lecturers, far more than half of the surveyed students agreed that the examples are adapted against 31.9% who disagreed mentioning the non-adaptability of examples. It can be noticed here that the non-adaptability is more about the course contents than the examples given during classes. These remarks may be justified by the colonial effects as many training programs, despite several reforms, are still images of that of northern partners. So, lecturers try their utmost to adapt it to the African context to facilitate understanding for students. However, the impressions of learners about examples that portray some practices in the northern countries vary greatly among them. The largest percentage of the respondents mentioned that they appreciate examples if they are about technological advancement followed by 41.7% who stated that they always appreciate examples regardless of their natures while 10.0% mentioned they don't appreciate them if they are only about northern cultures and the remaining 4.7% said they never appreciate no matter what they may relate to. These remarks might be consistent with the theory of Ladson-billings, (1995), especially, the CRT's component that puts strength on cultural competence leading learners to affirm and appreciate their culture of origin.

Table 7 : Respondents' perceptions about courses' adaptability to sociocultural conditions

	Female		**Male**		**Total**		**Chi-Square**
	No.	**%**	**No.**	**%**	**No.**	**%**	
Is it all courses that can be lectured online according to you?							
No	162.0	95.9	144.0	75.4	306.0	85.0	
Yes	7.0	4.1	47.0	24.6	54.0	15.0	29.454
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
What kinds of courses can not be run online according to you?							
Scientific subjects	124.0	76.5	114.0	79.2	238.0	77.8	
Literary subjects	35.0	21.6	27.0	18.8	62.0	20.3	
Laboratory practice/word	3.0	1.9	3.0	2.1	6.0	2.0	0.395
Total	**162.0**	**100.0**	**144.0**	**100.0**	**306.0**	**100.0**	
Do lecturers practice ethnics-based discrimination according to you?							

Yes	21.0	12.4	18.0	9.4	39.0	10.8	
No	99.0	58.6	105.0	55.0	204.0	56.7	
Don't know	49.0	29.0	68.0	35.6	117.0	32.5	2.156
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
If they discriminate, is it in the course content or their examples?							
In course content	1.0	4.8	3.0	16.7	4.0	10.3	
In examples	15.0	71.4	7.0	38.9	22.0	56.4	
Both	5.0	23.8	8.0	44.4	13.0	33.3	4.396
Total	**21.0**	**100.0**	**18.0**	**100.0**	**39.0**	**100.0**	
Do you think that the courses taught to you are culturally adapted to African/Benin?							
No	83.0	49.1	102.0	53.4	185.0	51.4	
Yes	86.0	50.9	89.0	46.6	175.0	48.6	0.660
Total	169.0	100.0	191.0	100.0	360.0	100.0	
Do you think that the examples cited by your lecturers are adapted to Benin culture							
No	55.0	32.5	60.0	31.4	115.0	31.9	
Yes	114.0	67.5	131.0	68.6	245.0	68.1	0.052
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
What is your impression of examples lecturers give concerning western countries?							
Never appreciate	7.0	4.1	10.0	5.2	17.0	4.7	
Not appreciate if about culture	19.0	11.2	17.0	8.9	36.0	10.0	
Appreciate if technology	76.0	45.0	81.0	42.4	157.0	43.6	1.166
Always appreciate	67.0	39.6	83.0	43.5	150.0	41.7	
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	

Source: Field survey, 2022

In-person versus integrated online classes: factors influencing students' preferences

The logit model was deployed to identify factors that influence students' preference toward in-person versus integrated classes (a combination of online and in-person classes). The regression results are presented in Table 8 below. Factors such as age, having experienced 2020 government-supported online classes, and Smartphone or laptop ownership influenced

positively the likelihood of preferring integrated classes. On the other hand, age squared, no scholarship at all, and no internet source at disposal influenced negatively the likelihood of preferring integrated classes. The statistical significance of the variable sex means that males, more likely than females, preferred integrated to in-person classes. This finding is consistent with that of Salele & Khan, (2022) and Rahman, (2011) who pointed out from their respective findings that males showed, more likely than females, technology skills. As for age, its negative sign and statistical significance indicate that older learners preferred less integrated classes than the younger. This means, based on its odds ratio, that year older learners were 0.078 times as likely as a year younger to prefer integrated classes. The opposite sign shown by the age squared indicates the diminishing return effect on the age factor. Students who had no scholarship at all were less likely than their counterparts who had a full scholarship, to prefer integrated to in-person classes. Students who had experienced government-supported 2020 online classes were more likely than their counterparts who did not experience it, to prefer integrated to in-person classes. Likewise, learners who did not own a smartphone and/or a laptop were less likely than their counterparts who own one, to prefer integrated to in-person classes. finally, learners with no internet source were less likely than their counterparts who own one, to prefer integrated to in-person classes. These findings support the finding of Ezin, (2015) who pointed out that the laptop ownership of each student is a key factor for online classes.

Table 8: Factors influencing students' preference towards in-person versus integrated online class

Variables explicatives	Coefficients	SE	Odds ratio
Sex of the respondent	0.722***	0.245	2.058***
Age	-2.551***	0.905	0.078***
Age Squared	0.0521**	0.021	1.053**
Half allowance as Scholarship status	-0.211	0.415	0.810
No allowance as Scholarship status	-0.615**	0.296	0.541**
Mathematics-based (BAC C)	0.182	0.395	1.199

Agric-based (DEAT)	0.425	0.79	1.530
Experience of 2020 online class	0.889***	0.341	2.433***
Smartphone or laptop ownership	0.516**	0.24	1.676**
Smartphone-based data as an internet source	-0.0762	0.394	0.927
No internet source	-1.006*	0.584	0.366*
Constant	30.32***	9.625	
Log-Likelihood	-216.408		
P-Value	0.0000		
LR chi2(22)	0.1173		
Observations	360		

*** p<0.01, ** p<0.05, * p<0.1;

Source: Field survey, 2022

Conclusions and recommendations

Conclusions

The forced paradigm shift from the traditional chalk-and-talk teaching to the digitalizing pedagogical approach caused by the massification problems and COVID-19 has exposed the unreadiness of the developing education sector, especially SSA countries to implement online teaching/learning. This study assessed the responsiveness of the online learning techno-pedagogical materials to the students' cultural and socio-economic conditions at Abomey-Calavi University through a student-centered lens. Specifically, it aimed to (i) described the different

online learning techno-pedagogical materials used in the selected training programs of the UAC, (ii) examine the cultural and socio-economic conditions of sampled students, and finally (iii) identify factors that influence students' preference for online learning versus face-to-face teaching approach. To achieve these goals, descriptive statistics and a logit model have been applied. Results from the descriptive analysis showed that the majority of respondents were of Benin nationality (98.3%) and from diverse ethnic groups with the major (95.5%) ethnic groups being Fon, Goun, Mahi, Adja, Yoruba, and Mina. The average age of the surveyed students is 20.35 years with a standard deviation of 1.91, showing the youngness of the learners in the graduate (bachelor) programs. Less than one-quarter (24.2%) of the respondents had a full scholarship and 12.8% had half a scholarship while the larger majority (63.1%) received financial support only from their parents and relatives. All respondents (100%) mentioned that they have had experience in online learning/teaching with both synchronized and asynchronized course animation. More than half of the respondents declared that they prefer integrated classes to in-person classes. The majority (84.4%) of students mentioned that they prefer asynchronized animation against only a very few respondents (15.6%) who declared to have preferred synchronized animation. Freedom of attending classes at convenient times is indicated as the major reason why they preferred asynchronized animation. Concerning the government-supported pure online classes run amid COVID-19 in 2020, the majority (87.5%) of the respondents who experienced it mentioned that lack of internet support was their major challenge about it, and 8.9% of them feel that the major problem was the instability of lecturers who may be running more than one online activity at the same time with its attendant overlap and finally 3.6% mentioned that the major challenge was the inappropriateness of the platform used.

When the question was put to students to rank in priority order over a scale of five ordered marks, five internet infrastructures items that can facilitate a smooth online course, overall, Smartphone ownership was ranked by students as the first prioritized item for a

successful online class, followed by the equipped lecture rooms, the establishment of connexion points on campus, connexion data support, and finally, laptop ownership in third, fourth, and fifth ranking order respectively. Far more than half (61.1%) of the surveyed students were living with their parents during their undergraduate studies against only 38.9% who were living either in rented houses close to the campus or in the university hostel.

As for the internet source, the larger majority (82.5%) of the respondents indicated that they get connected through their Smartphone data followed by 10.6% of them who get connected with their parents' wifi-kits and finally 6.9% of them declared to have no mean to get connected. An overwhelming majority (85.0%) of the respondents thought not all kinds of courses can be run online against only 15.0% that thought otherwise, and scientific subjects were mentioned by the majority (77.8%). More than half of the respondents (56.7%) mentioned that lecturers do not practice ethnics-based discrimination during their classes against 10.8% who indicated that they do and 32.5% who said they don't know anything about that. Roughly half (51.4%) of the respondents thought that course contents are not adapted to African culture against 48.6% who thought the course contents are adapted.

On the other hand, results from the logit model regression revealed that factors such as age, experience in 2020 government-supported online classes, and Smartphone or laptop ownership influenced positively the likelihood of preferring integrated classes. On the other hand, age squared, no scholarship at all, and no internet source at disposal of the learner influenced negatively the likelihood of preferring integrated classes.

Recommendations

Based on the results obtained from this study, the following recommendations are made.

i. Education policymakers should pay greater attention to the hybrid format in refining the online teaching/learning programs at the UAC given that this format was highly appreciated by learners in the study area.

ii. In designing instructional materials for hybrid classrooms, the lecturer's interventions and that of the learners online should be asynchronized in a way that learners should plan their attendance as conveniently as possible.

iii. Student-assisted policies that aim to make successful e-learning in public universities in SSA countries, should prioritize some key assets and infrastructures including, in priority order, equipped lecture rooms, the establishment of connexion points on campus, students' connexion data support, and finally, laptop for each student.

iv. Curriculum designers should make a greater effort to ensure that the course contents are grounded in SSA countries' realities enough for learners to have a better and easier understanding.

Research Contributions and Limitations

Online learning/teaching is an educational fast-growing practice nowadays in Sub-Saharan Africa (SSA) in general and particularly in Benin given that it is seen as a solution to the massification problem and the disruption caused by the covid-19 outbreak. However, documented information on issues around e-learning is seldom. This study has the merit to investigate important aspects of these issues: responsiveness of the online learning techno-pedagogical materials to the students' cultural and socio-economic conditions at Abomey-Calavi University through a student-centered lens and has suggested some actionable policy recommendations.

Nevertheless, it is deemed important here to point out the limitations of this study to guide future studies. The study used a student-centered lens which was relevant to understanding driving factors that shape students' willingness to accept the shift from in-person to the online classroom. It would be interesting if the lecturers' side can also be investigated. So, future studies may address this aspect.

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Appendix

Tables

Table 1
Distribution of sampled units by the implied training programs

	First-year			Second year			Third year			Total		Overall
	F	M	ST1	F	M	ST2	F	M	ST3	F	M	
Biomedical analysis	32	17	49	20	18	38	28	25	53	**80**	**60**	**140**
Food technological engineering	11	4	15	14	9	23	15	8	23	**40**	**21**	**61**
Environmental engineering	17	16	33	15	10	25	17	17	34	**49**	**43**	**92**
Medical imaging engineering	20	18	38	15	14	29	16	14	30	**51**	**46**	**97**
TOTAL	**80**	**55**	**135**	**64**	**51**	**115**	**76**	**64**	**140**	**220**	**170**	**390**

Table 2
Distribution of interviewed units by the implied training programs

	First-year			Second year			Third year			Total		Overall
	F	M	ST1	F	M	ST2	F	M	ST3	F	M	
Biomedical analysis	32	15	47	17	14	31	28	23	51	**77**	**52**	**129**
Food technological engineering	12	4	16	18	9	27	15	8	23	**45**	**21**	**66**
Environmental engineering	11	13	24	15	17	32	19	19	38	**45**	**49**	**94**
Medical imaging engineering	18	3	21	15	15	30	10	10	20	**43**	**28**	**71**
TOTAL	**73**	**35**	**108**	**65**	**55**	**120**	**72**	**60**	**132**	**210**	**150**	**360**

Table 3
Distribution of sampled units and interviewed units by implied training programs

Implied training programs	Levels	Sampled units	Interviewed units	Coverage rate
Biomedical analysis	Year 1	49	47	95.92%
	Year 2	38	32	84.21%
	Year 3	53	50	94.35%
Food technological engineering	Year 1	16	15	100
	Year 2	23	27	117.39%
	Year 3	23	24	104.35%
Environmental engineering	Year 1	33	24	72.73%
	Year 2	25	32	128
	Year 3	34	38	111.76%
Medical imaging engineering	Year 1	38	21	55.26%

	Year 2	29	30	103.45%
	Year 3	30	20	66.67%
Total		**390**	**360**	**92.31%**

Table 4
Socio-cultural, and educational characteristics of the respondents

	Female		**Male**		**Total**		**Chi-Square**
	Freq	%	Freq	%	Freq	%	
Nationality of the respondents							
Beninese	208	99	146	97.3	354	98.3	1.569
Others	2	1	4	2.7	6	1.7	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Ethnic group of the Respondents							
Fon, Gou, or Mahi	109.0	64.5	125.0	65.4	234.0	65.0	4.673
Adja or Mina	28.0	16.6	23.0	12.0	51.0	14.2	
Nagot or Yoruba	17.0	10.1	31.0	16.2	48.0	13.3	
Baariba or Ditamari	15.0	8.9	12.0	6.3	27.0	7.5	
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
Age of the respondent							
17 – 19	77	36.7	42	28	119	33.1	4.34
20 – 22	112	53.3	85	56.7	197	54.7	
23 – 25	19	9	20	13.3	39	10.8	
26 – 29	2	1	3	2	5	1.4	
Mean		**20.11 (1.847)**	**20.68 (1.97)**		**20.35 (1.91)**		
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Scholarship status of the respondent							
Full Scholarship	48	22.9	39	26	87	24.2	**0.65**
Half scholarship	26	12.4	20	13.3	46	12.8	
None	136	64.8	91	60.7	227	63.1	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Nature of scholarship received							
Government funded scholarship	43	89.6	39	100	82	94.3	**4.31***
MCF funded scholarship	5	10.4	0	0	5	5.7	
Total	**48**	**100**	**39**	**100**	**87**	**100**	
University entrance certificate							
D-Biology based	188	89.5	127	84.7	315	87.5	**2.407**
C-Mathematics-based	19	9	18	12	37	10.3	
DEAT-agric-based	3	1.4	5	3.3	8	2.2	
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Study level of the respondent							

First-Year	73	34.8	35	23.3	108	30	**5.445***
Second Year	65	31	55	36.7	120	33.3	
Third Year	72	34.3	60	40	132	36.7	
Total	**210**	**100**	**150**	**100**	**360**	**100**	

Table 5: Online learning/teaching experience and choice over different types of animation

	Female		**Male**		**Total**		**Chi-Square**
	No.	%	No.	%	No.	%	
Experience in online learning							
Yes	210.0	100.0	150.0	100.0	360.0	100.0	
Total	**210.0**	100.0	150.0	100.0	**360.0**	**100.0**	NA
Types of animation experienced in terms of synchronized and asynchronized course							
Both	210	100	150	100	360	100	NA
Total	**210**	**100**	**150**	**100**	**360**	**100**	
Type of animation preference							
Asynchronized	180.0	85.7	124.0	82.7	304.0	84.4	
Synchronized	30.0	14.3	26.0	17.3	56.0	15.6	0.6187
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Choice between in-person and integrated class reorganized							
Pure in-person class	99.0	47.1	53.0	35.3	152.0	42.2	
mixed classes	111.0	52.9	97.0	64.7	208.0	57.8	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	5.002**
Did you experience the online course recommended by the high education ministry							
No	185.0	88.1	119.0	79.3	304.0	84.4	
Yes	25.0	11.9	31.0	20.7	56.0	15.6	5.113**
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
What was your impression of that platform?							
Inappropriateness	0.0	0.0	2.0	6.5	2.0	3.6	
Lack of Internet support	22.0	88.0	27.0	87.1	49.0	87.5	2.091
Lecturers online instability	3.0	12.0	2.0	6.5	5.0	8.9	
Total	**25.0**	**100.0**	**31.0**	**100.0**	**56.0**	**100.0**	

Source: Field survey, 2022

Table 6
Students' residential status and internet assets ownership

	Female		Male		Total		Chi-Square
	No.	**%**	**No.**	**%**	**No.**	**%**	
Residential status of the student							
Renting with parents	51.0	24.3	22.0	14.7	73.0	20.3	
Own house with parents	94.0	44.8	53.0	35.3	147.0	40.8	19.543***
renting with peers or alone	55.0	26.2	72.0	48.0	127.0	35.3	
University hostel	10.0	4.8	3.0	2.0	13.0	3.6	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Distance between the UAC and the student's home							
Less than/equal to 2Km	42.0	20.0	44.0	29.3	86.0	23.9	
2-3 Km	28.0	13.3	24.0	16.0	52.0	14.4	
3-5 Km	31.0	14.8	23.0	15.3	54.0	15.0	
5-10 Km	43.0	20.5	25.0	16.7	68.0	18.9	
More than 10 Km	66.0	31.4	34.0	22.7	100.0	27.8	6.731
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Internet source at student's disposal							
Parents' wifi	22.0	10.5	16.0	10.7	38.0	10.6	
Data via hone	175.0	83.3	122.0	81.3	297.0	82.5	0.458
None	13.0	6.2	12.0	8.0	25.0	6.9	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
Do you own a laptop or a Smartphone?							
Android Smartphone alone	92.0	43.8	76.0	50.7	168.0	46.7	
Laptop alone	0.0	0.0	2.0	1.3	2.0	0.6	
Laptop and Smartphone	118.0	56.2	72.0	48.0	190.0	52.8	4.793
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	
How frequently do you use your laptop if you own any?							
Every day in the week	64.0	30.5	66.0	44.0	130.0	36.1	
Group works' time	92.0	43.8	45.0	30.0	137.0	38.1	8.819**
Not often	54.0	25.7	39.0	26.0	93.0	25.8	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	

How frequently do you use the internet?							
Regularly	122.0	58.1	80.0	53.3	202.0	56.1	2.233
Often	70.0	33.3	50.0	33.3	120.0	33.3	
Not often	18.0	8.6	20.0	13.3	38.0	10.6	
Total	**210.0**	**100.0**	**150.0**	**100.0**	**360.0**	**100.0**	

Source: Field survey, 2022

Table 7
Respondents' perceptions about courses' adaptability to sociocultural conditions

	Female		Male		Total		Chi-Square
	No.	**%**	**No.**	**%**	**No.**	**%**	
Is it all courses that can be lectured online according to you?							
No	162.0	95.9	144.0	75.4	306.0	85.0	
Yes	7.0	4.1	47.0	24.6	54.0	15.0	29.454
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
What kinds of courses can not be run online according to you?							
Scientific subjects	124.0	76.5	114.0	79.2	238.0	77.8	
Literary subjects	35.0	21.6	27.0	18.8	62.0	20.3	0.395
Laboratory practice/word	3.0	1.9	3.0	2.1	6.0	2.0	
Total	**162.0**	**100.0**	**144.0**	**100.0**	**306.0**	**100.0**	
Do lecturers practice ethnics-based discrimination according to you?							
Yes	21.0	12.4	18.0	9.4	39.0	10.8	
No	99.0	58.6	105.0	55.0	204.0	56.7	
Don't know	49.0	29.0	68.0	35.6	117.0	32.5	2.156
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
If they discriminate, is it in the course content or their examples?							
In course content	1.0	4.8	3.0	16.7	4.0	10.3	
In examples	15.0	71.4	7.0	38.9	22.0	56.4	
Both	5.0	23.8	8.0	44.4	13.0	33.3	4.396
Total	**21.0**	**100.0**	**18.0**	**100.0**	**39.0**	**100.0**	
Do you think that the courses taught to you are culturally adapted to African/Benin?							
No	83.0	49.1	102.0	53.4	185.0	51.4	0.660

Yes	86.0	50.9	89.0	46.6	175.0	48.6	
Total	169.0	100.0	191.0	100.0	360.0	100.0	
Do you think that the examples cited by your lecturers are adapted to Benin culture							
No	55.0	32.5	60.0	31.4	115.0	31.9	
Yes	114.0	67.5	131.0	68.6	245.0	68.1	0.052
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	
What is your impression of examples lecturers give concerning western countries?							
Never appreciate	7.0	4.1	10.0	5.2	17.0	4.7	
Not appreciate if about culture	19.0	11.2	17.0	8.9	36.0	10.0	
Appreciate if technology	76.0	45.0	81.0	42.4	157.0	43.6	1.166
Always appreciate	67.0	39.6	83.0	43.5	150.0	41.7	
Total	**169.0**	**100.0**	**191.0**	**100.0**	**360.0**	**100.0**	

Source: Field survey, 2022

Table 8
Factors influencing students' preference towards in-person versus integrated online class

Variables explicatives	**Coefficients**	**SE**	**Odds ratio**
Sex of the respondent	0.722***	0.245	2.058***
Age	-2.551***	0.905	0.078***
Age Squared	0.0521**	0.021	1.053**
Half allowance as Scholarship status	-0.211	0.415	0.810
No allowance as Scholarship status	-0.615**	0.296	0.541**
Mathematics-based (BAC C)	0.182	0.395	1.199
Agric-based (DEAT)	0.425	0.79	1.530
Experience of 2020 online class	0.889***	0.341	2.433***
Smartphone or laptop ownership	0.516**	0.24	1.676**
Smartphone-based data as an internet source	-0.0762	0.394	0.927
No internet source	-1.006*	0.584	0.366*
Constant	30.32***	9.625	
Log-Likelihood	-216.408		
P-Value	0.0000		
LR chi2(22)	0.1173		
Observations	360		

*** p<0.01, ** p<0.05, * p<0.1;
Source: Field survey, 2022

Logic flow chart of conceptual framework