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Students' and Lecturers' Perceptions of the Effectiveness and Challenges of Face-To-Face and Online Mathematics Instruction in Large-Scale Classes: The Case of the University of Yaoundé 1

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Abstract

This study, aiming at investigating the inclusion of e-Learning as a solution for improving how Mathematics is currently taught, addresses the use of e-Learning to mitigate current challenges in Mathematics teaching in Higher Education, especially in the context of Cameroonian universities with large size classes and too few classrooms. Seats' availability, safety issues, microphone/sound issues, difficulty interacting with lecturers/peers and an insufficient number of practice exercises solved with the students are critical challenges regardless of the size of the class in Cameroonian universities. From the information collected from both lecturers and students, the research team strongly believes that additional online teaching or tutorials combined with in-person sessions will help address several issues faced by students and lecturers in the local universities. Moreover, lecturers who participated in the survey clearly foresee the impact of the inclusion of additional online lectures and/or tutorials as an efficient way of increasing students' chances of success in Mathematics; improving the students' understanding of the mathematics courses and reducing the number of students dropping out after their first year at the university. The authors designed a sample online course and its implementation in the Learning Management System, Modular Object-Oriented Dynamic Learning Environment (Moodle), is ongoing.

Executive Summary

This report is the first of a series of research reports and survey results related to the use of ICT tools and e-Learning to improve the teaching and learning of mathematics in the Cameroonian context. This initial report focuses on the teaching and learning of Mathematics in Higher Education, and addresses the use of e-Learning to overcome some of the challenges faced by large size classes' lecturers and students in Cameroonian universities like seats' availability, safety issues, microphone/sound issues, difficulty interacting with lecturers/peers and an insufficient number of practice exercises solved with the students to name but few. The research team conducted this research in response to the latter challenges which generally results in lecturers' overload, students' poor success rate and students' high dropout rate in Mathematics courses. Instead of randomly surveying students and university lecturers about their online teaching needs, experiences, and support mechanisms, this study targeted (i) lecturers with some experience in mathematics online teaching and in-presence teaching of large size classes (above 200 students), and (ii) graduate mathematics students with some experience in mathematics online learning and in-presence learning in large size classes at local universities.

The objective of this research was to (i) validate what the research team thought were the common obstacles and needs; (ii) learn about both lecturers' and students' experiences/perception, confidence in their ability; as well as (iii) identify the tools already used as a teaching/learning resource. The findings indicate that many mathematics lecturers at local universities already have some online teaching experience but need proper training to improve their skills.

Background of Respondents

- Student respondents: All student respondents were graduate students from public Cameroonian universities; 41% of them being females.
- Lecturer respondents: Unfortunately, all lecturer respondents were males from public Cameroonian universities with undergraduate teaching experience, depicting a profession largely dominated by males in Cameroon. Eighty-five percent of lecturer respondents had more than 10 years of teaching experience and 15% fewer than 5 years of teaching experience.

Summary of Survey Responses

- According to a great majority of the respondents, the main obstacle to using online teaching was the poor internet connection.
- Sixty-seven percent of lecturers teaching in a class of above 500 students do have one single tutorial session for the whole class regardless of its size.
- Sixty-seven percent of lecturer respondents who need three to four hours of tutorial per week actually have one to two hours of tutorial per week only.

- Half of the student respondents did face the issue of unavailability of seats.
- Half of the student respondents reported having difficulties interacting with lecturers whereas 23% reported having difficulties interacting with peers in traditional face-to-face classes.
- Forty-two percent of the student respondents felt unsecured when the face-to-face class was starting too early in the morning or ending late at night and the same proportion of respondents found insufficient the number of practice exercises solved with the students.
- Sixteen percent of the student respondents reported one single tutorial session is organized for the whole class regardless of its size.
- Remote learning has been moderate to extremely stressful for 77% of the student respondents.
- Eighty-two percent of the student respondents find face-to-face communication very to extremely important while learning remotely.
- Eighty-two percent of the student respondents who have already taken an online course are confident (scale from 5 to 10) in their ability to learn remotely.
- Group video or audio calls (e.g., Zoom, Skype) happen to be the most used tools with which respondents feel confident (scale ranging from 5 to 10) in their ability to learn/teach remotely.
- When asked if they anticipate any challenges to completing the work required for an online course, some of the student respondents answered:
    - Adaptation to the new online course platform.
    - Loss of concentration.
    - Sound system issues - microphone not working and lecturer can't hear me clearly.
    - The lecturer cannot keep the student from getting bored.
    - Difficulty to keep the student motivated.
    - Poor internet connection.
    - Interaction with the lecturer is difficult.
    - Power outage.
    - Issues in doing groups’ homework.
    - Device stops working during online exam.
    - The situation whereby the learning system or platform is not interactive.
    - Typing mathematics equations online.
    - The use of materials and learning management system (LMS) is challenging.
- When asked to report possible ways to improve the accessibility of online courses, some of the student respondents answered:

- After class discussions online.
- Good internet connection.
- Good interactiveness in the learning platform.
- Provide online tutorials and create a summary video at the end of each session.
- Start by training the students on the use of the learning platform.
- Etiquette should be taught about online teaching and learning.
- Provide French subtitles for courses taught in English.
- Make the records always available and easy to access.
- Making it possible for students to easily interact with online lecturers.
- More practical examples to better understand the courses.

Recommendations Based on Findings

Based on these findings, the research team recommends that Mathematics lecturers in Cameroonian universities are trained in both online pedagogy and instructional design to build their digital teaching capacity as well as their capacity for online and blended teaching. It is worth noting that this should go hand in hand with students' training on the usage of the LMS and online learning etiquette before the start of any online course.

The recommended approach at the initial stage is to provide students with blended learning experiences, combining traditional classroom teaching with online learning tools with particular attention paid to designing the online section in a way that fosters both lecturer-student interactions and students' peer-to-peer interactions.

Project Description

Project Background

Teaching large classes is a challenge that several university lecturers' on the African continent face daily. From managing the limited number and small size of lecture halls to following up with each student's progress, teaching a large face to face class requires a lot of effort. Even though evidence from the literature (Carpenter, 2006) indicates that several issues including student engagement; provision of quality instruction, assessment and feedback; classroom management are encountered in both large and smaller classes, there is no doubt that these issues become more challenging as the size of the class increases. For example, as the size of the class increases, there is a significant reduction of the amount and intensity of interactions between students and lecturers which might result in passivity among students (Carbone & Greenberg, 1998); high absenteeism (Gibbs, 2014) etc. In the context of Cameroonian public universities in general and more specifically at the University of Yaoundé 1, the size of the class is just one of several other factors, which affect the quality of instruction.

Each year, Mathematics' lecturers at the University of Yaoundé 1 have to teach overcrowded classrooms of level 1 students. Quite often, after the first year, about 50% of students drop out. Brainstorming sessions with a few dropout students and lecturers yield to the identification of some key determinants which contribute to increased dropout rates.

1. Small classrooms (number and size) vs. huge number of students: with the limited number of lecture halls, students' tutorial groups are allocated much less time than what is needed by an average student to master the course, yielding poor success rates and high dropout rates.
2. Late/early classes and safety of students: there are several instances of rape and/or theft (mainly on female students) when returning home after late courses (scheduled from 7:00 PM to 9:00 PM) or when going to the university at early hours to secure a seat for the first lecture (generally scheduled to start at 7:00 AM) given that the number of students per group exceeds the number of seats available in the lecture hall. Consequently, female students very often do not attend late sessions (classes, tutorials and group work) and when they manage to attend early lectures, they are generally standing because all seats are already taken upon their arrival. This is an important disadvantage for female students who tend to get discouraged and drop out at the end of their first year.
3. Absence of sound equipment and poor quality blackboards in classrooms: Classrooms are not equipped with good sound equipment (speakers, microphones, etc.) yielding lots of frustrations due to the fact that the majority of students are not able to clearly hear the voice of the lecturer. Furthermore, classrooms are equipped

with chalk boards of poor quality. One can consider breaking the class into smaller groups but unfortunately, this option cannot be implemented because of the lack of classrooms.

4. The impossibility to cover the required syllabus within the time allocated: the courses and continuous assessments are scheduled on a period of 14 weeks (duration of a semester) and with this, it has never been possible for lecturers to cover the required syllabus.
5. Blindness inclusive course: There is currently one blind student and lecturers always read his exam questions for him so he can write the answers. Using for example the Jaws software and Moodle, such a student could be able to read his course online easily and even the mathematics formulae.
6. Difficulty in following up the students' progress: it has been very challenging for lecturers to follow up the huge number of students enrolled without an appropriate platform.
7. Difficulty in marking students' scripts and providing them with feedback on time: given the large number of students allocated to each lecturer, marking students' scripts is a time consuming and stressful task. Consequently, students do not often get feedback on time.

Problem Statement

At the University of Yaoundé 1 as well as other local universities in Cameroon:

1. There is a considerable amount of content to be delivered to a large number of students/learners.
2. Learners have limited mobility when it comes to early and late classes.
3. Learners' listening and reading skills are hindered by the poor equipment/setting of the lecture hall.
4. Learners have at least basic computer and internet skills.
5. There is a need for developing homogeneous background knowledge on mathematics related topics.
6. Learners are highly motivated to learn.
7. Content can be reused for different learners' groups the same year or in the future.
8. There is a need to mark students' scripts and provide them with feedback on time.
9. There is a need to collect and track data on the students' progress.

According to FAO (2021), in such an environment, e-Learning is an appropriate solution to design a complete interactive mathematics course to either be delivered completely online or supplement face-to-face classes.

To design a solution that meets the needs of the target audience composed of mathematics' students and lecturers, we will (1) first conduct a research study involving both

mathematics lecturers in different universities in Cameroon and students who have already been involved in teaching/learning in a large size class setting or who have already taught and/or taken some online mathematics courses; (2) then, design or recommend a solution based on the study findings.

Context and Rationale

From a lecturer perspective, teaching mathematics to students at the university comes with several challenges like:

1. The diverse backgrounds of students from their high school training
2. Difficulties to efficiently deliver courses to a huge number of students
3. Difficulties to identify the appropriate teaching strategies and gain insights into learners' difficulties, especially in large classes
4. Difficulty in following up the individual students' progress given the huge number of students enrolled
5. Difficulty in marking students' scripts and providing them with feedback on time
6. Impossibility to cover the required syllabus within the time allocated, etc.
7. From a student perspective, learning mathematics at the University of Yaoundé 1 equally comes with several challenges like
8. Difficulties to secure a seat because of the inadequacy between the size of the classroom and the number of students
9. Increased insecurity of students after late lectures (scheduled from 7:00 pm to 9:00 pm) or before early lectures (generally scheduled to start at 7:00 am)
10. Frustrations due to the fact that the majority of students are not able to clearly hear the voice of the lecturer or see what s/he writes on the board (because of the absence of sound equipment and poor quality blackboards in classrooms)
11. Long waiting time for the release of exam results.

To design or recommend an e-Learning solution that meets the needs of the target audience, the research team will in the first phase survey the university's mathematics lecturers and then past and current students who have been involved in teaching and/or learning mathematics courses online or have been involved in teaching and/or learning mathematics in large-size class setting in order to discover their perception and readiness for online learning. In the second phase, the research team will build upon the first phase's findings to design or recommend an appropriate e-Learning strategy.

Research Questions

This study investigated the use of e-Learning to improve the teaching of mathematics in Cameroonian universities. In order to be able to ascertain what is and is not working in the universities, lecturers and researchers must be willing "to critically examine what they do and how they do it" (Mertler & Hartley, 2017, p. 5). In this line of thought, Carr and Kemmis

(1986) saw improvement as three-fold: the improvement of a practice, the improvement of the understanding of that practice, and the improvement of the situation in which the practice takes place. This study's approach is to examine the parties involved in the process of delivering mathematics lectures (namely the lecturers and the students); to examine the impact e-Learning could have (or has had) in the current practice; to investigate an e-Learning based approach as a possible solution to the problem; to identify the appropriate place to implement new approaches or future changes; and finally to understand how this proposed approach is going to impact the current practices.

The results of this study served as basis for general recommendations and the design of a sample Mathematics course (MAT1081: "Mathématiques pour les Biosciences et Géosciences") for level 1 Bioscience and Geoscience students of the Department of Biology and Geology (Faculty of Science, the University of Yaoundé 1, Cameroon) which is a large size class with more than 5000 students enrolled. The designed course will be delivered in September/October 2023 and the outcome evaluated.

Specifically, the study aimed at answering the following students' research questions (SRQ) and lecturers' research questions (LRQ):

Students' Research Questions (SRQ)

To answer each of the students' research questions, some Students Interview Questions (SIQ) will be asked and are indicated alongside.

(SRQ) (1) What are the students' related factors in terms of device ownership and perceived Internet speed?

SIQ1.1- Do you have access to a device to attend online courses and contribute efficiently?

SIQ1.2- What device do you use for distance learning?

SIQ1.3- How reliable is the WiFi/internet connection that you generally access?

(SRQ) (2) What is the students' experience/perception with/of in-presence learning in terms of size of classes and difficulties encountered?

SIQ2.1- What is the size of your largest class?

SIQ2.2- What are the difficulties you used to encounter when attending in-person courses for large classes?

SIQ2.3- How are you distributed in groups for large classes' tutorials?

(SRQ) (3) What are the students' experience/perception with/of online learning?

SIQ3.1- Have you ever taken an online course?

SIQ3.2- How effective has remote learning been for you?

SIQ3.3- How stressful has remote learning been for you?

SIQ3.4- How important is face-to-face communication for you while learning remotely?

SIQ3.5- What might you be worried about in taking a course online?

SIQ3.6- What motivates or excites you about online learning?

SIQ3.7- How was your experience learning from home during the pandemic compared to in-presence learning?
SIQ3.8- How confident are you in your ability to learn remotely?
SIQ3.9- Which tools have you already used to learn remotely?
(SRQ) (4) What are the students' expectations/fears of online learning?
SIQ4.1- Do you anticipate any challenges to completing the work required for an online course? If so, what challenges do you anticipate?
SIQ4.2- Is there anything that we can do to help make an online course more accessible for you and/or help you learn?
(SRQ) (5) How do students foresee the impact of the inclusion of online learning on their safety/studies?
SIQ5.1 Do you think providing you with additional online lectures and/or tutorials could:
- increase your chances of success in Mathematics?
- reduce the number of students dropping out after their first year at the University?
- reduce the risk of students becoming a Sexual Assault, Robbery or Rape victims when coming to school too early in the morning to secure a seat or when going back very late at home?
- improve your understanding of the mathematics courses?
- increase interaction between the lecturer and the students?
SIQ5.2 In your point of view, could online teaching or tutorials combined with in-person sessions help solve the following issues?
- No seat available.
- Students feeling unsafe on their way to or from the campus when the course is starting too early in the morning or ending late at night.
- The mike and sound equipment not powerful enough for you to hear clearly.
- Difficulty to interact with lecturers.
- Difficulty to interact with peers.
- Insufficient number of practice exercises solved with the students.
- Other:

Lecturers' Research Questions (LRQ)

To answer each of the lecturers' research questions, some Lecturers Interview Questions (LIQ) will be asked and are indicated alongside.
(LRQ) (1) What are the lecturers' related factors in terms of device ownership and perceived internet speed?
LIQ1.1- Do you have high-speed Internet at home or at the university?
LIQ1.2- What device do you use for distance teaching?

(LRQ) (2) What is the lecturers' experience/perception with/of in-presence learning in terms of size of classes and difficulties encountered?

LIQ2.1- What is the size of your largest class?

LIQ2.2- In case you teach large classes, what are the difficulties you used to encounter to deliver your courses?

LIQ2.3- How do you manage tutorials for your large class?

LIQ2.4- Do you have enough time for in-person tutorials with all the students taking Mathematics courses you deliver in your University and ensure the mastery of the content?

LIQ2.5- How many hours of tutorial on average could be necessary per week for an efficient delivery of each of your mathematics courses?

LIQ2.6- How many hours of tutorial per week are you currently delivering in average for each of your mathematics courses?

(LRQ) (3) What are the lecturers' experience/perception with/of online learning?

LIQ3.1- Have you ever taught a mathematics course online?

LIQ3.2- How stressful do you find teaching remotely during the COVID-19 pandemic?

LIQ3.3- How stressed are your students while learning remotely during the COVID-19 pandemic?

LIQ3.4- How was your experience teaching students from home?

LIQ3.5- How confident are you in your ability to teach remotely?

LIQ3.6- Which tools are you using or will you use to teach remotely?

(LRQ) (4) How do lecturers foresee the impact of the inclusion of online learning on their practice?

LIQ4.1 Do you think providing additional online lectures and/or tutorials could:

- increase the rate of success in Mathematics in your university?
- reduce the number of students dropping out after their first year at your University
- reduce the risk of students becoming a Sexual Assault, Robbery or Rape victims when coming to school too early in the morning to secure a seat or when going back very late at home?
- improve the students' understanding of the mathematics courses?

LIQ4.2 In your point of view, could online teaching or tutorials combined with in-person sessions help solve the following issues? (select all that apply)

- No seat available for all students.
- Students feeling unsafe on their way to or from the campus when the course is starting too early in the morning or ending late at night.
- The mike and sound equipment not powerful enough.
- Difficulty to get a satisfactory knowledge of each student’s needs.
- Difficulty to engage learners actively in the learning process.

- Difficulty to measure effectiveness of the teaching.
- Difficulty to identify reluctant students.
- No available classroom to split the class in groups and make the tutorial more effective.
- No available tutors to split the class in groups and make the tutorial more effective.
- Other:

Literature Review

The Value of Teacher Research

"Teachers have often felt that traditional educational research is not relevant to their needs" (Stremmel, 2007, p. 4). Given that finding solutions to the problems of teaching and learning in universities is of utmost importance for university researchers, they nowadays recognize the value of research taking place in universities with lecturers and university administrators as key actors. Carr and Kemmis (1986) provided theoretical rationale for lecturers' involvement and justifications for their role in educational research. The authors proposed the notion of a critical educational science which embodies a strong belief in active participation of all concerned parties (e.g., students, lecturers, school administrators) in critically analyzing their own practices with intentions of transforming and improving them. There are actually numerous similarities between traditional educational research and action research; nevertheless, there is one crucial difference: action research is educational research conducted by educators for themselves (Mertler, 2017). Mertler and Hartley (2017) described and examined the nature of classroom-based, lecturer-led action research in schools with an emphasis put on its applications and benefits. The same authors later introduced central theoretical concepts and research procedures providing guidance to readers through the planning stage including identifying and narrowing down a research topic and conducting a literature review (Mertler & Hartley, 2020). Miskovic et al. (2012) conducted a multiyear mixed-method study engaging both pre-service and in-service lecturers in action research in order to allow them gain meaningful knowledge and enhance their professional practice and consequently contribute in ensuring success for all students.

Mathematics Online Teaching

Several existing studies reported the factors that influenced the successful achievement of online mathematics instruction. Wadsworth et al. (2007) found that online mathematics students' grades could be predicted using some factors like motivation, concentration, self-testing and self-efficacy. Another study by Glass and Sue (2008) showed that assignments were the key factor and had the most impact on students' learning. A comparative study of the students' mathematics achievement in web-based mathematics instructions (WBMI) and traditional mathematics instructions was conducted by Güzeller and

Akin (2012) who found significantly better results on the WBMI in terms of mathematics achievement, attitudes, anxiety, and self-efficacy of students.

Barriers to Online Learning

Gledhill et al. (2017) revealed that constraints of e-Learning in less developed countries included limited or poor access to the devices, technology, Internet and networks. Another constraint that cannot be overlooked is the intermittent power supply in such countries (Bhuasiri et al., 2012). Fabito et al. (2021) studied 300 Computer Science and Information Technology students and found that the top three challenges were (1) difficulty communicating with the lecturers, (2) lack of study/working area dedicated for course's online activities, and (3) poor internet connection. Device ownership was found to have a positive influence on the perceived online learning performance of students in a similar study (Bringula et al., 2021a). During the COVID-19 pandemic, "Internet connection and power interruption were the most problematic aspects of online learning" in learning mathematics online (Bringula et al., 2021b, p. 1).

Recommendations and Guidance for Online Teaching

Berge et al. (2000) set forth some recommendations for lecturers to guide them in an effective implementation of online learning courses including but not limited to: (1) the specification of both hardware and software required for the course, (2) providing creative ways of interacting with online students, (3) encouraging collaboration among students, (4) providing course performance feedback, and (5) clearly establishing course's policies, goals, objectives, and expectations.

FAO (2021) provided detailed guidance on designing and developing e-Learning-based solutions for beginners, including some key indicators which might suggest e-Learning is an appropriate solution such as (i) a considerable amount of content to be delivered to a large number of students/learners and (ii) learners having limited mobility, to name but few.

To the best of the research team's knowledge, no research has been conducted on the impact of mathematics online teaching in local universities in Cameroon. Consequently, the team would like to know if online teaching of mathematics would be an appropriate solution to challenges faced in large scale classes taking into consideration the local constraints. Studying students' and lecturers' perceptions about the effectiveness and challenges of face to face and online mathematics instruction in large scale classes would be the first step towards answering this question.

Research Design: Methods and Mode of Analysis

"Research can provide us with a systematic mechanism for (1) collecting meaningful student data (as well as data from other educational sources), and then (2) using those data as the basis for better-informed educational decision making" (Mertler & Hartley, 2017, p. 3). The research team has chosen a lecturer research approach and will use both qualitative and quantitative methodologies to examine current teaching practices.

Sample

The population is composed as follows:

1. Sixty-one graduate students at local universities in Cameroon who took mathematics courses either in large classes in person, online or both; composed of female (41%) and male (59%) students and
2. Thirteen mathematics lecturers at Cameroonian universities (Yaounde 1, Douala, Maroua, Ngaoundere, Bamenda, Dschang).

About 91.2% of respondent students already took online mathematics courses whereas 34.4% have already attended mathematics courses in large class sizes (above 200 students). About 54% of lecturers have already taught large classes whereas 76.9% of the lecturers surveyed already taught mathematics courses online.

Survey forms were sent via email and WhatsApp to the target audience: we mainly focused on students (lecturers) who either attended (taught) mathematics courses online or in a large class size. The total number of graduate students targeted was about 400 and the mathematics lecturers about 100. The students and lecturers were free to fill the survey as the research team wanted to collaborate with them as research partners rather than act as their former instructors. In the email, the research team explained the purpose of this research and asked the students and lecturers to take about 10 minutes of their precious time to respond if they wished to participate in the study. The rate of response was not high at the beginning for lecturers and the research team had to make use of WhatsApp to contact them again after sending out the emails. To students, the research team sent a reminder email given that the team did not keep any data to identify those who did not respond.

The pre-test of the questionnaire was done among the two research members in order to make sure that the data collected would be easily analyzed.

Data Collection and Analysis

The study utilized two survey forms, one for students and one for lecturers. The students' survey form included about 20 items and gathered information on students' related factors in terms of device ownership, perceived internet speed, size of classes and difficulties encountered with in-person lectures; students' experience/perception with/of

online learning; students' expectations/fears of online learning and how students' foresee the impact of the inclusion of online learning on their safety/studies. As for the lecturers' survey form, it gathered information on lecturers' related factors in terms of device ownership, perceived internet speed, size of classes and difficulties encountered with in-person lectures; lecturers' experience/perception with/of in-presence learning; lecturers' experience/perception with/of online learning and how do lecturers foresee the impact of the inclusion of online learning on their safety/studies. Most of the items included a statement with some multiple-choice responses. Some open questions were given at the end of the survey to get challenges and expectations of students on online mathematics courses.

Results and Discussion

The research team conducted research from the perspective of two of the parties involved in the process of delivering mathematics lectures (namely students and lecturers), the main focus being the improvement of classroom practice, through professional reflection and critical examination of one's own practices.

Students' Research Questions (SRQ)

(SRQ) (1) What are the students' related factors in terms of device ownership and perceived internet speed?

Table 1

Students' accessibility to a device for e-Learning

	What device do you use for distance learning?			
Do you have access to a device to attend online courses and contribute efficiently?	Desktop	Laptop	Smartphone	Grand Total
No, I share with others		4		4
Yes	3	31	5	39
Yes, but it doesn't work well	1	12	5	18
Grand Total	4	47	10	61

It is found that 93% of the respondents own a device (75% own laptops), so will be able to use it to participate in an online course. Only 6% of the respondents own a desktop, making the latter the least owned device.

Table 2

Students' accessibility to the Internet

	How reliable is the WiFi/internet connection that you generally access?					
Do you have access to a device to attend online courses and contribute efficiently?	1 (not reliable)	2 (poor)	3 (fairly reliable)	4 (reliable)	5 (very reliable)	Grand Total
No, I share with others			4			4
Yes	3	4	20	11	1	39
Yes, but it doesn't work well	2	7	5	2	2	18
Grand Total	5	11	29	13	3	61

Half of the respondents do have a fairly reliable internet connection while 16% have a reliable or very reliable internet connection. Therefore, internet connectivity remains a challenge to address. Nevertheless, there are some affordable internet bundles in Cameroon.

(SRQ) (2) What is the students' experience/perception with/of in-presence learning in terms of size of classes and difficulties encountered?

Table 3

Students' difficulties with in-presence courses and size of their largest class

	What is the size of your largest class? (Number of students)						
What are the difficulties you used to encounter when attending in-person courses for large classes?	0-100	100-200	200-300	300-400	400-500	Above 500	Grand Total
No seat available	16	1	2	4	4	4	31
feeling unsafe when the course is starting too early in the morning or ending late at night	12	2	0	5	2	5	26
The mike and sound equipment not powerful enough for you to hear clearly	20	2	3	5	4	6	40
Difficulty to interact with lecturers	17	2	1	5	1	5	31
Difficulty to interact with peers	6	1	0	3	2	2	14
Insufficient number of practice exercises solved with the students	11	2	1	4	4	4	26
Not applicable	1	0	0	0	0	0	1
The lecture can't answer all the questions asked by the students. On the other hand, it is only a part of the class that interacts and understands the lesson.	1	0	0	0	0	0	1

It is found that 65% of the respondents did face issues with the mike and/or sound. Furthermore, half of the respondents did face the issue of unavailability of seats and the same proportion of respondents reported having difficulty interacting with lecturers whereas 23% reported having difficulty interacting with peers. Forty-two percent of the respondents felt unsafe when the course was starting too early in the morning or ending late at night and the same proportion of respondents found insufficient the number of practice exercises solved with the students.

Consequently, seats' availability; safety issues; microphone/sound issues; difficulty interacting with lecturers/peers and an insufficient number of practice exercises solved with the students are critical challenges regardless of the size of the class in Cameroonian

universities. These are clear indicators that support the usefulness of e-Learning in this context.

Table 4
Students' learning teams' size and class size

	What is the size of your largest class? (Number of students)						
How are you distributed in groups for large classes' tutorials?	0-100	100-200	200-300	300-400	400-500	Above 500	Grand Total
Learning teams of more than 200 students				1			1
Lectures and tutorial sessions are combined in a single weekly session of maximum 3 hours	3	2					5
No division - one single tutorial session for the whole class regardless of its size	9	1					10
No tutorial scheduled					1	1	2
Not applicable	1						1
Small learning teams of maximum 20 students	1						1
Small learning teams of 50 to 100 students	2			1	2	1	6
Small learning teams of less than 50 students	21		3	4	2	5	35
Grand Total	37	3	3	6	5	7	61

Sixteen percent of respondents reported one single tutorial session is organized for the whole class regardless of its size, which for them ranges from 0 to 200 students. Eight percent of respondents reported having lectures and tutorial sessions combined in a single weekly session of maximum three hours. Consequently, additional online tutorials will definitely come in handy.

(SRQ) (3) What are the students' experience/perception with/of online learning?

Table 5

Students' perception of the effectiveness of remote learning

	How effective has remote learning been for you?						
Have you ever taken an online course?	Not Applicable	Not at all Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective	Grand Total
No	2		1	3			6
Yes		3	15	24	11	2	55
Grand Total	2	3	16	27	11	2	61

Remote learning has been moderately to extremely effective for 65% of respondents which is very encouraging. However, the implementation will be done with Level-1 students who are likely not to have been involved in online learning sessions.

Table 6

Students' perception of the stressfulness of remote learning

	How stressful has remote learning been for you?						
Have you ever taken an online course?	Not Applicable	Not at all Stressful	Slightly Stressful	Moderately Stressful	Very Stressful	Extremely Stressful	Grand Total
No	1		1	2		2	6
Yes	1	4	7	31	12		55
Grand Total	2	4	8	33	12	2	61

Remote learning has been moderate to extremely stressful for 77% of respondents which indicates that we should make sure the design is attractive, the content meets the students' expectations and the delivery is very interactive in order to address key factors influencing stress like: lack of feedback from lecturers, lack of communication with peers, technical problems using the learning management system etc.

Table 7

Students' perception of the importance of face-to-face communication in remote learning

	How important is face-to-face communication for you while learning remotely?				
Have you ever taken an online course?	Slightly Important	Moderately Important	Very Important	Extremely Important	Grand Total
No	1	1	1	3	6
Yes	3	6	25	21	55
Grand Total	2	7	26	24	61

Eighty-two percent of respondents find face-to-face communication very to extremely important while learning remotely. Therefore, a hybrid approach is likely to be more effective in this context.

Table 8

Worries of students regarding online learning

What might you be worried about in taking a course online?	Not Worried	Worried A Little	Worried A Lot
Navigating a course online	26	26	9
Managing my workload and meeting deadlines (i.e., course/work/life balance)	19	29	13
Remaining engaged and motivated	18	27	16
Interacting with peers online (e.g, discussions, peer feedback)	19	28	14
Interacting with lecturers	13	30	18
Doing group work	15	25	21
Feeling isolated or not connected to the teaching team and the learning community	9	30	22
Understanding and applying course content	16	33	12
Using technology required in the course	22	29	10

There are no significant discrepancies in the responses collected to identify what respondents might be worried about in taking a course online.

Table 9

Potential sources of motivation of students to taking online courses

What motivates or excites you about online learning? (Select all that apply)	Number of Respondents
Convenience and flexibility - I can work (mostly) around my schedule	28
More time to process information and respond thoughtfully to discussions	12
New approaches and innovative activities	31
Geographical accessibility – no need to move or commute	23
Accessibility of teaching team – easier to connect with instructors and TAs	13
Improved computer skills	36
Comfortable learning environment	13
Unlimited access to materials – I can revisit podcasts and review notes	31

It follows that new approaches and innovative activities, unlimited access to materials as well as the improvement of their computer skills are top factors that motivate or excite respondents about online learning.

Table 10

Students' experience of online learning during the COVID-19 pandemic

	How was your experience learning from home during the pandemic compared to in-presence learning?						
Have you ever taken an online course?	No Courses at This Time	I Did Not Like It	Much Worse	Somewhat Worse	About the Same	Somewhat Better	Grand Total
No		1	2	2	1		6
Yes	3		10	23	11	8	55
Grand Total	3	1	12	25	12	8	61

It is clear that the majority of respondents did not have a good experience learning from home during the pandemic. This may be due to the fact that lecturers were not prepared/ready to switch from in-person to online delivery for which they were not trained.

The research team will use the knowledge acquired as Mastercard e-Learning Champions to design and implement a course that would make learners' experience better.

Table 11

Students' confidence in their ability to learn remotely

	How confident are you in your ability to learn remotely? (From scale of 1 to 10)									
Have you ever taken an online course?	1 (not at all confident)	3	4	5	6	7	8	9	10 (very confident)	Grand Total
No	1	1	1	2		1				6
Yes	1	2	2	9	10	13	9	5	4	55
Grand Total	2	3	3	11	10	14	9	5	4	61

Eighty-two percent of respondents who have already taken an online course are confident (scale from 5 to 10) in their ability to learn remotely.

Table 12

Students' familiarity with online learning tools

	Which tools have you already used to learn remotely? (Check all that apply)					
How confident are you in your ability to learn remotely? (scale 1 to 10)	Virtual classroom, Learning management systems (e.g., Google classroom, Blackboard, Moodle)	Group video or audio calls (e.g., Zoom, Skype)	Recorded video and screencasts Slide presentations (e.g., PowerPoint)	Email	Social media (e.g., Facebook, WhatsApp, LinkedIn)	Slack
1 (not at all confident)	0	2	0	0	1	0
3	1	3	1	1	2	0
4	1	3	1	1	0	0
5	6	8	6	6	5	0
6	6	10	4	4	5	0
7	10	12	9	4	6	1
8	4	8	7	2	4	0
9	5	4	5	2	0	0
10 (very confident)	4	4	3	2	2	0
Grand Total	37	54	36	22	25	1

Group video or audio calls (e.g., Zoom, Skype) happen to be the most used tools with which respondents feel confident (scale ranging from 5 to 10) in their ability to learn remotely.

(SRQ) (4) What are the students' expectations/fears of online learning?

Table 13

Students' anticipated challenges to completing online courses

Do you anticipate any challenges to completing the work required for an online course? If so, what challenges do you anticipate?	Number of Respondents
Adaptation to the new online course platform	1
Loss of concentration	2
Sound system issues - microphone not working and lecturer can't hear me clearly	1
the lecturer cannot keep the student from getting bored	1
Difficulty to keep the student motivated	1
Poor internet connection	12
Device not working well	1
Punctuality issue	1
Financial challenges - purchase internet bundles	3
Interaction with the lecturer is difficult	4
Power outage	4
Issues in doing groups' homeworks	1
Students' time management for self-paced courses	1
One of the challenges of distance learning would be in the area of student communication and engagement, including difficulty in reaching all students, concerns about completion of student work, and difficulties in holding students accountable for their academic work.	1
Device stops working during online exam	1
The situation whereby the learning system or platform is not interactive.	1
Typing mathematics equations online	1
The use of Materials and learning management system is challenging	2
Yes. Doing courses online is not that good because sometimes the lecturer might be going with high speed through his lecture notes and not everybody can tell him to reduce the speed. But if he was in-person, he would have noticed that students are not following.	1
No	4

As it could be predicted, poor internet connection is the most challenging factor to be addressed for a smooth delivery of the university's online course.

Below are some interesting responses collected on possible ways to improve the accessibility of online courses.

Table 14

Students' perspective on what should be improved for efficient delivery of online courses

Is there anything that we can do to help make an online course more accessible for you and/or help you learn?	Number of Respondents
After class discussions online	1
Good learning equipment	2
God internet connection	14
Good interactiveness in the learning platform	1
Provide online tutorials and create a summary video at the end of each session	1
Start by training the students on the use of the learning platform	1
Build a platform owned by the university which is not heavy, easily accessible and which will leverage at least 70% of the challenges faced by the students.	1
Etiquette should be taught about online teaching and learning	1
Every student may have personal access to the speaker, to ask or answer questions when necessary instead of sharing with everyone.	1
For this to happen, I believe the following must be in place: specific planning in terms of objectives and resources and specific practice on the part of lecturers.	1
Having the course videos afterwards and the course files is already good. But I would like to be able to understand and follow the course for that the online lecturer should go as slowly as possible and do a lot of exercises to be attentive and interactive during the course.	1
Provide French subtitles for courses taught in English	1
Make the records always available and easy to access	2
Making it possible for students to easily interact with online lecturers	1
More practical examples to better understand the courses	2
Lecturers should present as if it was a physical course using a lot of didactic materials especially with mathematics.	1
I don't know	3

(SRQ) (5) How do students foresee the impact of the inclusion of online learning on their safety/studies?

Table 15

Students' perception of the usefulness of additional online lectures and/or tutorials

Do you think providing you with additional online lectures and/or tutorials could:	Strongly Disagree	Disagree	Agree	Strongly Agree
Increase your chances of success in mathematics	7	19	26	9
Reduce the number of students dropping out after their first year at the university	15	19	21	6
Reduce the risk of students becoming a sexual assault, robbery or rape victims when coming to school too early in the morning to secure a seat or when going back very late at home	8	12	28	13
Improve your understanding of the mathematics courses	9	24	21	7
Increase interaction between the lecturer and the students	14	23	18	6

Respondents foresee the impact of the inclusion of additional online lectures and/or tutorials as an efficient way of increasing their chances of success in Mathematics and reduce the security risk linked with early/late in-person classes.

Table 16

Students' perception of the problems which could be solved by introducing additional online lectures and/or tutorials

In your point of view, could online teaching or tutorials combined with in-person sessions help solve the following issues? (select all that apply)	Number of Respondents
No seat available	32
feeling insecure when the course is starting too early in the morning or ending late at night	33
The mike and sound equipment not powerful enough for you to hear clearly	31
Difficulty to interact with lecturers	40
Difficulty to interact with peers	24
Insufficient number of practice exercises solved with the students	21

In your point of view, could online teaching or tutorials combined with in-person sessions help solve the following issues? (select all that apply)	Number of Respondents
No seat available	32
feeling insecure when the course is starting too early in the morning or ending late at night	33
The mike and sound equipment not powerful enough for you to hear clearly	31
Difficulty to interact with lecturers	40
We have to apply new technology and we learn about its use also. It is an occasion for me to organize or prepare my question before the course.	1

From the information above, the research team strongly believes that online teaching or tutorials combined with in-person sessions will help address several issues faced by students in the local universities.

Teacher research as “a form of local knowledge that leads to change” within classrooms is acceptable, but when it is “presented as public knowledge with . . . claims beyond the practice setting,” validity may be questioned”, said Anderson and Herr (1999, p. 14). In this regard, the research team would like to present these different findings from responses of some mathematics lecturers in Cameroonian universities.

(LRQ) (1) What are the lecturers' related factors in terms of device ownership and perceived Internet speed?

Table 17

Lecturers’ accessibility to a device for e-Learning

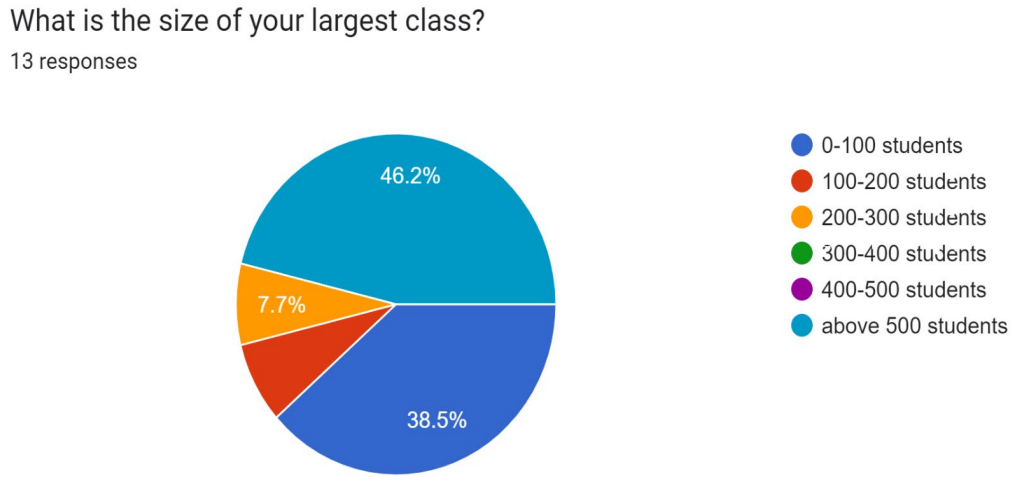
	What device do you use for distance teaching?		
Do you have high-speed internet at home or at the university?	Laptop	Smartphone	Grand Total
No	8	2	10
Yes	3		3
Grand Total	11	2	13

Eighty-four percent of respondents use a laptop for distance teaching. However, access to a good internet connection remains a challenge.

(LRQ) (2) What is the lecturers' experience/perception with/of in-presence learning in terms of size of classes and difficulties encountered?

Figure 1

Pie chart of different sizes of the largest classes reported by LIcturers



Forty-six percent of respondents have taught a class of above 500 students. The table below presents the responses of lecturers for classes above 500 students.

Table 18

Lecturers' difficulties with in-presence courses with large class sizes

In case you teach large classes, what are the difficulties you used to encounter to deliver your courses?	Number of Respondents
No seat available for all students	3
Students feeling insecure when the course is starting too early in the morning or ending late at night	3
The mike and sound equipment not powerful enough	3
Difficulty to get a satisfactory knowledge of each student's needs.	4
Difficulty to engage learners actively in the learning process.	4
Difficulty to measure effectiveness of the teaching.	6
Difficulty to identify reluctant students.	4
Grading is too heavy for meaningful assignments and feedback	5
No available classroom to split the class in groups and make the tutorial more effective	6
No available tutors to split the class in groups and make the tutorial more effective	6

This is fully consistent with challenges listed in this context and rationale.

Table 19

Lecturers' choice of learning teams' sizes for tutorials

	What is the size of your largest class?	
How do you manage tutorials for your large class?	200-300 students	Above 500 students
Dividing students into small learning teams of 100 to 200 students		1
Dividing students into small learning teams of 50 to 100 students		
Dividing students into small learning teams of less than 50 students		
No division - one single tutorial session for the whole class regardless of its size		4
No time scheduled for tutorial	1	
Sometime Lectures and tutorials are combined in a single session		1
Grand Total	1	6

Sixty-seven percent of lecturers teaching in a class of above 500 students do have one single tutorial session for the whole class regardless of its size. Furthermore, 17% of these lectures have either lectures and tutorials combined in one single session or no time scheduled for tutorial. Therefore, having many practical exercises provided in the university's LMS may help to address these issues given that in Moodle, students can be allowed to make as many trials as possible to master what they are learning and get meaningful feedback after each trial to guide them towards the solution.

Table 20

Lecturers' perception of the required number of hours per week for an efficient delivery of their course as opposed to what they are currently offering

	How many hours of tutorial per week are you currently delivering in average for each of your mathematics courses?			
How many hours of tutorial on average could be necessary per week for an efficient delivery of each of your mathematics courses?	1 to 2 hours	3 to 4 hours	More than 4 hours	Grand Total
1 to 2 hours	2			2
3 to 4 hours	4	5	1	10
More than 4 hours		1		1
Grand Total	6	6	1	13

Sixty-seven percent of mathematics lecturers have 1 to 2 hours of tutorial per week whereas they need 3 to 4 hours. For this reason and because there are no classrooms available, additional tutorials should be conducted online for an improved success rate of students.

(LRQ) (3) What are the lecturers' experience/perception with/of online learning?

Table 21

Lecturers' perception of the stressfulness of online teaching during the COVID-19 pandemic

	Have you ever taught a mathematics course online?		
How stressful do you find teaching remotely during the COVID-19 pandemic?	No	Yes	Grand Total
Moderately stressful	2	4	6
Slightly stressful	1	3	4
Very stressful		3	3
Grand Total	3	10	13

Only 30% of lecturers who have taught a mathematics course online find teaching remotely very stressful. This is an indicator that lecturers will be receptive to online teaching if properly trained.

Table 22

Lecturers' confidence in their ability to teach remotely

	Have you ever taught a mathematics course online?		
How confident are you in your ability to teach remotely? (scale 1 - not at all confident to 10 - very confident)	No	Yes	Grand Total
4		1	1
5	1	2	3
6		2	2
7		2	2
8	2	2	4
9		1	1
Grand Total	3	10	13

Ninety percent of lecturers who have taught a mathematics course online are confident (scale ranging from 5 to 10) in their ability to teach remotely. This is why adequate training by Mastercard could be an additional push to lecturers as it will further boost their confidence and ability to deliver online teaching successfully. The table below lists tools used (or that will be used) by respondents to teach remotely.

Table 23

Lecturers' familiarity with online teaching tools

	Have you ever taught a mathematics course online?		
Which tools are you using or will you use to teach remotely?	No	Yes	Grand Total
Virtual classroom, Learning management systems (e.g., Google classroom, Blackboard, Moodle)	2	7	9
Group video or audio calls (e.g., Zoom, Skype, etc.)	2	4	6
Recorded video and screencasts Slide presentations (e.g., PowerPoint)	1	1	2
Email	0	1	1
Social media (e.g., Facebook, WhatsApp, LinkedIn)	1	3	4

(LRQ) (4) How do lecturers foresee the impact of the inclusion of online learning on their practice?

Table 24

Lecturers' perception of the problems which could be solved by introducing additional online lectures and/or tutorials

Do you think providing additional online lectures and/or tutorials could:	Strongly Disagree	Disagree	Agree	Strongly Agree
increase the rate of success in Mathematics in your university?		1	8	4
reduce the number of students dropping out after their first year at your University	1	3	8	1
reduce the risk of students becoming a Sexual Assault, Robbery or Rape victims when coming to school too early in the morning to secure a seat or when going back very late at home?	1	7	5	
improve the students' understanding of the mathematics courses?	1	3	9	

Respondents foresee the impact of the inclusion of additional online lectures and/or tutorials as an efficient way of increasing students' chances of success in Mathematics;

improve the students' understanding of the mathematics courses and reduce the number of students dropping out after their first year at their university.

Table 25

Lecturers' perception of the problems which could be solved by combining additional online lectures and/or tutorials with in-person sessions

In your point of view, could online teaching or tutorials combined with in-person sessions help solve the following issues? (select all that apply)	Number of Respondents
No seat available for all students	9
Students feeling insecure when the course is starting too early in the morning or ending late at night	6
The mike and sound equipment not powerful enough	5
Difficulty to get a satisfactory knowledge of each student's needs	6
Difficulty to engage learners actively in the learning process	5
Difficulty to measure effectiveness of the teaching	5
Difficulty to identify reluctant students	3
No available classroom to split the class in groups and make the tutorial more effective	7
No available tutors to split the class in groups and make the tutorial more effective	8
It will lead to another problem...internet access	1

From the information above, lecturers strongly believe that online teaching or tutorials combined with in-person sessions will help address several issues faced by lecturers and students in the local universities.

Research Contributions

McLean (1995) delineates three major components of lecturer research: conceptualization, in which a significant problem and relevant research questions are identified; implementation, in which data are collected and analyzed; and interpretation, in which findings are examined for meaning and appropriate actions are taken as a result. After identifying and stating the problem, we draw upon experiences and knowledge of both students and valued colleagues to develop questions and assumptions relevant to the study's problem. Below are the research team's steps towards a possible solution:

1. Identify a problem: The teaching of Mathematics to students in large scale classes is not efficient in the local universities as it encompasses several challenges like a considerable amount of content to be delivered to a large number of students/learners; learners having limited mobility when it comes to early and late classes; learners' listening and reading skills being hindered by the poor

equipment/setting of the lecture hall; difficulty in grading students' assignment and providing them with feedback, etc.

2. Develop questions and examine assumptions: Two different surveys have been designed, one for mathematics lecturers in Cameroon public universities, and another for students with mathematics background who have already attended online mathematics courses.
3. Gather, analyze and interpret data: Data have been collected with Google Forms and analyzed using Microsoft Excel. The interpretation of these data helps the research team to address the problem the research team would like to solve. In addition, it was very important to make sure the problem stated is the one actually encountered by lecturers and students.
4. Take some actions: The research team started designing and implementing an online mathematics course which will be completed as soon as possible (Tcheutia & Wandji Nanda, 2023).

The main contribution of the implementation will be to address the issues raised as follows:

1. Small classroom (number and size) versus huge number of students: all students can simultaneously access the lecture materials online and face-to-face discussions can be organized to ensure their mastery of the content. The ability to communicate with students and to deliver tutorials/lectures, both synchronously and asynchronously, alleviates the burden.
2. Late/early classes and safety of students: Students can consult materials whenever they want from everywhere they want so they are not constrained to place and time.
3. Absence of sound equipment and poor quality blackboards in classrooms: This is no longer a concern with online materials. Nevertheless, it is worth mentioning that the problem persists for face to face discussions.
4. The impossibility to cover the required syllabus within the time allocated: With online materials, all the required syllabus is covered without challenges.
5. Blindness inclusive course: Appropriate software is used.
6. Difficulty in following up the students’ progress: The research team has information available about the students’ progress and ways of working, and about the amount of work they do too, which the research team simply does not have in face-to-face instruction.
7. Difficulty in marking students’ scripts and providing them with feedback on time: The grading is done automatically for quizzes and feedback is provided in due time using appropriate tools.

The research team has chosen Moodle as a LMS for several reasons. Moodle is actually an open source LMS that enables educators to create online courses supporting rich interactions between educators and their learners. With Moodle, instructors have the ability to add content and combine activities into sequences in a way that guides learners through structured learning paths. Moodle presents many advantages:

1. Quickly create assignments and quizzes to evaluate learners' progress and use the powerful Quiz module, which enables instructors to create any type of quiz, worksheet, or test using multiple choice, true/false, short answer, matching, and essay questions;
2. Using the online grading, this simplifies the grading of more than 5000 times two student's exams plus continuous assessment scripts. This implies the exam results can be published in less than three days;
3. Using the Moodle community, students will share ideas, tools, questions, help each other and learn from each other. The research team can set up activities and let the learners create projects, share them, and learn from each other;
4. Get quick feedback from students in order to solve quickly their problems;
5. Help to set up Moodle training sessions for other colleagues in order to involve them in this e-Learning teaching approach;
6. Support Latex typing which is a very big advantage since most of the scientific works are nowadays typed using Latex. Therefore, all the mathematics texts appear in a very nice way using Moodle;
7. Free Computer Algebra Software like Maxima can be combined with Moodle to allow direct computation after a student enters his input. This is very efficient since it allows students to make as many tries as possible to master what they are learning. When writing questions or answering questions, Moodle allows us to make use of the computer algebra system Maxima with its advantages such as its powerful simplification, or symbolic calculus functions. Indeed, this can be done via the module STACK, which is built on top of Maxima.
8. Book-like collections (with chapters) can be created with the help of the Book module inside Moodle. It is important to note that within a Moodle book, one can include links to discussion forums and even multimedia objects like audio or Flash movies.
9. Moodle has Geogebra embedded and this feature allows the user to enter equations directly and draw accurate graphs and diagrams.
10. Moodle offers anytime and anywhere access to learning resources, and consequently students can consult them as much as they need/want to.
11. With Moodle, the learner can be given meaningful feedback at the end of a quiz session, pointing out one’s strengths and weaknesses.

Limitations

As outlined by Bell (1985), four criteria may be used to evaluate the quality or rigor of lecturer research:

1. Credibility: Is the study believable to those who are competent to judge the subject of investigation? In the authors' point of view, this study which used a small sample population gives us credible results. However, extending the study to the population of students at the university, who are mainly facing the challenges addressed in this report, as well as their lecturers, is highly recommended as it will probably give more insight on the problem.
2. Transferability: Does the study promote the exchange of experience from one practitioner to another? What the research team did here for the department of mathematics can also apply to other departments since mathematics courses are taught to students in physics, computer science, chemistry, and biology. Furthermore, it could be extended to other local universities in Cameroon.
3. Dependability: Does the study use reliable procedures and produce findings that are trustworthy? The results the research team obtained from the studies are aligned with the research team's expectations.
4. Confirmability: Is the study capable of being scrutinized for absence of bias by making its evidence and methods of analysis available? The data collected could be made available in case of need. The data collection and analysis methods used have been clearly explained.

Recommendations

When it comes to research in education, one can boldly say "Tell me and I forget, teach me and I may remember, involve me and I learn" (Oduaran et al., 2021, p. 106). The research team recommends that Mastercard trains the lecturers of the mathematics department of the university of Yaoundé 1 on both online pedagogy and instructional design to build their capacity in designing and delivering online mathematics courses tailored to solve challenges related to the large size of classes they teach and hence reduce the number of drop out after the first year at the university. If this is successful at the university of Yaoundé 1 given that there is always strength in numbers, the mathematics lecturers from Yaoundé 1 could take the lead and train the lecturers of other departments or other universities. Bickel and Hattrup (1995) wrote that lecturers themselves must be viewed as knowledge generators and partnerships must allow for supportive and reciprocal relationships.

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