



# Lecturers' and Students' Experiences about Using MOODLE in Mathematics Modules during the COVID-19 Pandemic

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**Abstract:** This study investigated lecturers' and students' experiences in using Modular Object-Oriented Dynamic Learning Environment (MOODLE) in mathematics modules during the COVID-19 pandemic at the University of Rwanda, College of Education. This is a descriptive study that used 120 participants, including 114 undergraduate students who have Mathematics among their core subjects, and six lecturers who teach mathematics. Both lecturers and students were selected purposively. The findings from semi-structured interviews with lecturers showed that lecturers at URCE view MOODLE as an effective tool that supports teaching and learning Mathematics since lecturers can teach a big number of students from wherever they are. It was found from lecturers that MOODLE is secured, and the content is stable unless one has the permission to change the content. It was also reported that MOODLE facilitates assessment since lecturers prepare assignments and different activities, and they post them on MOODLE, and then, students start working on them. However, MOODLE was found not easy to be used, as students did not have skills of using it. Some students from rural areas did not have electricity and for those who had electricity, the network connection was not strong enough to access the MOODLE platform.

**Keywords:** MOODLE, mathematics, E-learning Management System (LMS), undergraduate students, Rwanda

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## 1. Introduction

In this digital era, societies on the globe are embracing the fourth industrial revolution, whereby technology is being used in teaching and learning. It is in this context that during COVID-19 pandemic, institutions prepared vigorously for digital pedagogy through e-learning (Naidoo, 2020). The concept of e-learning is not new, as it started in the 1990s and has gained increasing legitimacy (Mlotshwa & Chigona, 2018; Perraton, 2000). The education sector as a whole has been undergoing a

more general paradigm shift with the advent of technology since technology integration in education was found to be the key to global development (Perienen, 2020). In the educational field, the use of technology is reflected in the development of information and communication technologies. The use of an e-learning platform influences the development of teaching and speeds up learning processes. E-learning encourages innovative pedagogical actions and creates new learning spaces in industrialized countries like the USA, England, and France (Li et al., 2019). The education sector has

changed the way it is working due to world digitalization, schooling, and learning, which are converted into technology-based education mechanisms (Grand-Clement et al., 2017). The use of computers, computer interconnections, and computer application literacy skills are the components of technology skills required in this era (El Mhouthi et al., 2018).

COVID-19 is a pandemic which was declared by the World Health Organization (WHO) as worldwide issue since March 11, 2020. It was found to be highly contagious and spreading worldwide (Nyiringango et al., 2022; Zu et al., 2020). On March 12, 2020, the majority of countries worldwide took measures of closing schools (Mukuka et al., 2021). The spread of COVID-19 at high speed has affected many sectors of human lives, whereby education sector has been touched. For instance, many countries imposed to their citizens strict social distancing and whereby schools were also closed to avoid the spread of the virus through physical contact as at school setting students are in dense social network which may facilitate the contamination (Nyiringango et al., 2022). Although schools were closed, yet students had to continue learning. This imposed a distance learning whereby a new and innovative way of teaching and learning using technology was adopted (Perienen, 2020).

The COVID-19 pandemic has brought a change in education system across the world at an extent of affecting over 90% students in the whole world (United Nations Educational, Scientific and Cultural Organization, [UNESCO], 2020). It is in this context that the institutions facing these challenges came up with a different mode of learning whereby technology were used to make students continue learning even when they were in their homes (Hasibuan & Selviandro, 2013; Nsengimana et al., 2021). To face the outbreak of COVID-19 in Rwanda, the Government of Rwanda (GoR) immediately closed all schools on 14<sup>th</sup> March 2020. Schools were reopened on 2<sup>nd</sup> November 2020 (Ukobizaba & Nizeyimana, 2021). The University of Rwanda (UR) started online lectures through various e-learning platforms to ensure continuity of learning (Nyiringango et al., 2022). Though the University had already implemented the Modular Object-Oriented Dynamic Learning Environment (MOODLE) platform even before the COVID-19 pandemic the level of interactions among students and lecturers using the platform was still limited in favor of face-to-face (Nsengimana et al., 2021).

Dougiamas and Taylor (2003) designed MOODLE in a way that it support social constructivism theory. MOODLE has necessary and important structures compared to other learning platforms. These include its abilities to embed resources, communications, and

activities reflecting to the content being delivered. MOODLE is flexible in a way that it enables the user to modify it for custom use. MOODLE has built up an extensive user community that adapts or customizes the software for its own and others' use. The MOODLE is one among the most widely open-sources used as E-learning platforms. It fosters the creation of a course website and ensures that only enrolled students can access it (Dougiamas & Taylor, 2003). This online learning platform allows students and their teachers to share information among themselves wherever they are, through a synchronous and an asynchronous mechanisms (Borba et al., 2016). The MOODLE is useful learning platform since it enhances collaboration, provides a timely feedback to both instructors and learners, promotes an effective communication and network between students and teachers (Costa et al., 2012; Zakaria & Daud, 2013).

From a functional perspective, MOODLE has easily configurable features that allow students to be assessed by giving them quizzes, online tests, and surveys. In this context, this e-learning platform enables students to manage their tasks based on timetable in addition to providing a wide variety of complementary tools that support instructions (Zakaria & Daud, 2013). Thus, MOODLE is a flexible tool in a way that instructors have freedom to add, change or use it as it is which make this tool important in improving teaching. On the other hand, this tool enhance active learning, reinforces students' abilities and knowledge since it is interactive and friendly to students. Thus, students learn in a fun environment (Kotzer & Elran, 2012; Zakaria & Daud, 2013).

It was declared that the use of e-learning in education is advantageous. However, the use of e-learning in teaching and learning mathematics was found challenging since mathematics requires face to face sessions whereby students and teachers share ideas, and demonstrate mathematics concepts within a conventional classes (Li et al., 2019). In this context, students did not have a chance to make practices while being with their teachers (Almarashdi & Jarrah, 2021). It is the reason why Naidoo (2020) argued that there are strengths and challenges of using e-learning in teaching and learning mathematics. Thus, it is imperative for researchers at higher institutional level to understand the complexity and embedded nature of distance learning, as well as challenges met by both lecturers and students through and online learning environment (Almarashdi & Jarrah, 2021) in Rwandan context. This study will provide insights on an effective implementation of teaching and learning the system through an e-learning platform commonly known as MOODLE within higher learning institutions, in Rwanda. The specific objectives of this study are:

- 1) To identify lecturers' and students' experiences about using MOODLE in mathematics modules during the COVID-19 period.
- 2) To identify challenges faced by both teachers and students when using MOODLE during COVID-19 period.

## 2. Literature Review

### 2.1 Students' perceptions of e-learning while learning mathematics

In their study about the use of e-learning while teaching mathematics, Moreno-Guerrero et al (2020) conducted a quasi-experimental study and found that e-learning enhances students' motivation, active learning, the retention of mathematical concepts towards the students' increase in results and grades compared to the expository methods. In the study conducted by Naidoo (2020) about postgraduate students experience of using e-learning platforms during COVID-19, students claimed that they first needed time to do mathematics examples before joining the online learning communities. Similarly, while investigating the role of MOODLE as a technological learning tool, Zakaria and Daud (2013) employed 21 university students who were given perception questionnaires. The results from the study showed that university students have positive perceptions towards MOODLE. The study also revealed that both lecturers and students benefit from MOODLE when used effectively.

While investigating students' perceptions amid COVID-19 in mathematics lesson, Almarashdi and Jarrah (2021) used a quantitative method through an online survey for 580 students. The findings showed that generally students did not take a position about the effectiveness of online learning. Instead, students have a negative perception linked with absence of interaction with lecturers and their colleagues. Thus, most students (78.3%), showed that they would not prefer to continue with online learning in future if they are given a chance to deliberate. Furthermore, Abar and Carnevale de Moraes (2019) found students reporting that they enjoyed using the e-learning platform since they could pause the video whenever they met with difficult mathematics concept, and they could review as many time as they could. In addition, students reported that the platform allowed them to try solving some exercises which helped them to reveal some confusion.

### 2.2 Teachers' perceptions about the use of MOODLE in teaching mathematics

In a study conducted on the use of MOODLE in higher education in Saudi Arabia, Costa et al. (2012) reported that most of the participants argued that MOODLE is easy to use and was highly satisfying. Also, the study conducted by Godber and Atkins (2021) on two lecturers about the impact of COVID-19 on teaching and learning, lecturers revealed that there have been changes in life style and livelihood. For lifestyle, lecturers reported that COVID-19 forced change in course delivery such as unprecedented way of working from home that created a social isolation, disempowerment and feeling overwhelmed. Lecturers added that there has been a stress in lecturers as lecturers were striving to meet higher level academic standards in delivering the learning courses.

In the study on the use and benefits of using MOODLE in teaching and learning mathematics at Al Ain University, Hamada et al. (2019) used qualitative and quantitative approaches to collect data from lecturers. The findings from the study revealed that the teaching of mathematics through the use MOODLE was easy and interesting compared to the traditional teaching methods. As reported by Hamada et al. (2019), teachers consistently affirmed that MOODLE create an interesting learning environment compared to the traditional way of learning. Both teachers and students believed that MOODLE has potential indicators of success in the future to enhance an effective teaching and learning of mathematics.

### 2.3 Challenges linked with the use of E-learning during COVID-19 period

The unprecedented spread of COVID-19 obliged institutions to teach curricula via distance learning (Almarashdi & Jarrah, 2021). The literature showed that institutions faced challenges linked to the implementation of this new e-learning (O'Brien, 2021). In the study conducted by Rajan and Manyala (2021) students reported challenges such as lack of the internet in some remote areas, network connectivity issues, the high cost of ICT equipment and insufficient training (Rajan & Manyala, 2021). By using a qualitative study, Naidoo (2020) explored postgraduate students experience of using e-learning platforms during COVID-19. The findings from the study showed that lecturers faced difficulties that affected students learning. Naidoo (2020) suggested that lecturers need to provide resources that are easy to use, readily available, and cost effective. In addition, students should be oriented on how to use e-learning platforms to use these tools effectively and successfully.

The reviewed literature showed that the use of MOODLE is advantageous in supporting education. This is shown by the literature whereby both lecturers and students who believe that MOODLE has potential indicators of success in the future to enhance an effective teaching and learning of mathematics. However, the reviewed literature did not show how both lecturers and students interacted with MOODLE as a teaching and learning tool. In addition, the reviewed literature did not maximize to explore the challenges linked to the use of MOODLE. Thus, this study intends to dig in depth lecturers' and students' experiences about using MOODLE in mathematics modules during the COVID-19 pandemic. It also sought the challenges linked to the use of MOODLE in teaching and learning mathematics during COVID-19 within University of Rwanda, College of Education (URCE).

### 3. Methodology

#### 3.1 Research design

The study adopted a descriptive research design (Cohen et al., 2007) that explored students' and lecturers' insights about teaching and learning mathematics through MOODLE. We collected data from both teachers and lecturers to enhance the production of deep information about the research questions (Creswell, 2014; Noble & Heale, 2019).

#### 3.2 Population and sampling procedure

The population of the study were all users of E-learning platforms in mathematics education at found at the University of Rwanda-College of Education (UR-CE), Rukara Campus. URCE is a public higher learning Institution of Rwanda located in Gahini Sector, Kayonza District, within the Eastern Province of Rwanda. The participants were only Year 3 students doing mathematics modules in the academic year 2021-2022, since they were the ones who experienced the use of MOODLE during the school closure imposed by the COVID-19 pandemic.

The sample size was obtained from the population of the study from the Rukara Campus. The sample was made of students and lecturers that employed E-learning platforms in mathematics education within Rukara Campus. To calculate the sample size, this study used a 10% of margin error and a privacy level is 95%. The study applied the formula of Madow (1968) to determine the sample size of this study:

$$n = \frac{N}{1 + [N * (e)^2]}$$

Where: n = Sample Size, N = Study Population, e = Margin of error

$$\text{Thus, } n = \frac{553}{1 + [553 * (0.05)^2]} = 232$$

Thus, the calculated sample was 232 students. Random sampling was applied to get students involved in this research. Two hundred and thirty-two (232) undergraduate students from seven combinations were sampled and involved in this study. Besides, a purposeful sampling method was used to get lecturers for the study. Thus, six lecturers who teach mathematics at Rukara Campus, that used an online platform, MOODLE, were purposively sampled and used for this study.

#### 3.3 Research instruments

This research used two research instruments namely, survey questionnaires and an interview guide. The researchers set the questionnaires and administered them to the students. Besides, the semi-structured interview was developed and given to lecturers.

#### 3.4 Instruments validity and reliability

Researchers developed both an interview guide and a survey questionnaire. These instruments were given to the supervisor to check whether the instruments' items are linked to the research objectives and if the set items made sense. Thus, in the first step, the supervisor reviewed instruments and provided feedback whereby he requested to revise some questions. Thus, some questions from the interview and survey questionnaire were removed. This exercise served as an instrument validity check.

#### 3.5 Data collection procedures

To collect data from undergraduate students, the researcher looked at Year Three students who were in Year One in 2020 when COVID-19 was escalating. Before data collection, the researcher uploaded the questionnaire into the Google form that immediately created the link. The researcher called the class representatives and explained the purpose of the research, who in turn shared the link with fellow students. Students opened the link and fill in the required information and submit.

To collect qualitative data for this study, semi-structured interviews with lecturers were used for six mathematics lecturers. This interview was accomplished through open-ended questions asked to lecturers. Interviews were conducted face to face at the University of Rwanda;

College of Education and took about 40 minutes. The researchers made records and then transcribed the responses from lecturers.

### 3.6 Data analysis process

The first stage and second stage were for the researchers to transcribe the interviews and familiarize them with data before data analysis. Second, the transcription of the interviews was done word by word to guarantee that nothing was excluded. The third stage is to code the data. The process of coding consisted of labeling the interviews.

The quantitative data collected through survey questionnaires were analyzed through Google Forms that generated percentages and graphs for each questionnaire item. Like for data from interview, the open-ended question involved in the questionnaire were analyzed thematically. Thus, a descriptive analysis was performed to characterize the behavior of each variable measured.

### 3.7 Trustworthiness of the study and ethical consideration

Ethical issues were considered in this research by obtaining an approval letter from the School of Education at the University of Rwanda College of education. This letter was presented to the College Principal to approve the start of data collection. This letter was also attached to the consent form given to lecturers and students to ensure official permission to carry out the research. Consent forms were given to the participants after explaining the importance of the research to them and the community at large. The signed consent form ensured that participation in this study is voluntary. The participants were assured of the confidentiality and anonymity by keeping the respondents' identity secret.

## 4. Results and Discussion

### 4.1 Lecturers' experience from using MOODLE during COVID-19

The interview started by asking lecturers whether they used e-learning platforms in the period of COVID-19, and how it was used, especially MOODLE, for their teaching and learning of mathematics. The majority (four out of six) lecturers agreed that they used MOODLE immediately after the University of Rwanda started implementing the e-learning platform. Lecturers reported that they started using it by posting all the content on MOODLE platform including notes, assignments, exercises, and videos related to content. In addition,

revisions were required after school reopening since some students were not able to access the shared content due to various factors, including internet connectivity. For instance, one lecturer (L1) said: *The way MOODLE works cannot help students to learn. As an example, it can take two months without working. It needs internet and technology devices to access it and here in the University, we have many numbers of students who come from different areas, all of them they cannot study using MOODLE (Interview: 11th January 2022).* Another lecturer (L2) complemented: *I used it, but after lockdown when we come to school, we revised the content because some students didn't get the opportunity to access the materials I posted on MOODLE (Interview: 11th January 2022).*

While asking how lecturers developed teaching activities using MOODLE platform, whether MOODLE was easy to use, stable, fast, and secure, all the participants reported that they planned teaching activities by searching for all relevant contents, and then invited students to visit MOODLE to access the posted materials that could helped them to learn.

Lecturers argued that the structured content accessible on MOODLE is secured, except for some students who can use them for an illegal purpose or post unnecessary content or other materials that may disturb other students. Lecturers reported that the content is stable, and no one can change the content except the lecturer who posted it, has the permission to change the content.

### 4.2 Challenges linked to the use of MOODLE in teaching and learning mathematics

Although lecturers reported different advantages of using a MOODLE, they also listed challenges connected to the teaching and learning mathematics through MOODLE. Lecturers reported that students were not having materials (ICT devices) to access MOODLE. It was reported that MOODLE does not allow direct lecturer-students and students-students communication. MOODLE reduces collaboration among students because everyone can access MOODLE anywhere, any time. Lecturers and students could not meet on MOODLE at the same time for discussion. One Lecturer said: *There is a forum for discussion, but when a lecturer is active; students are not active, which made chatting sometimes difficult (Interview: 11th January 2022).*

Students are not willing to visit MOODLE for different reasons. Lecturers reported that students do not have enough skills while this e-learning platform requires much time to understand how to use it. Lecturers also

argued that rural areas do not have internet. Lecturers also revealed that they sometimes post assignments, but no students work on them till they reach the deadline because of lack of internet connection. For instance, one Lecturer (L6) said: *MOODLE requires the internet to some extent that we were not able to access it everywhere we are. Most of the students were not active on MOODLE because they did not have devices and internet at their home. Instead, students were busy doing different activities with their parents (Interview: 11th January 2022).*

It was revealed by lecturers that MOODLE contributes to increasing students' distraction since students can spend much time on the internet searching for unrelated content. Thus, when it comes to submission, students failed to submit. On the side of lecturers, lecturers reported that the use of MOODLE requires much time to prepare all

content at the same time fulfilling other assigned tasks. In addition, lecturers reported that MOODLE does not allow flexibility in marking and the provision of the feedback was not detailed.

### 4.3 Students' perspective on using MOODLE

Figure 1 shows the effectiveness of using MOODLE in teaching and learning mathematics. The majority (61% and above), of students agreed or strongly agreed that MOODLE helps them to interact and communicate with their fellow students, make them feel comfortable while learning, enhances their learning capability, allows them to get and provide feedback, enhances their creativity, critical thinking, and performance. Figure 1 shows students' agreements where SD= Strongly Disagree, D= Disagree, U= Undecided, A= Agree, and SA= Strongly Agree.

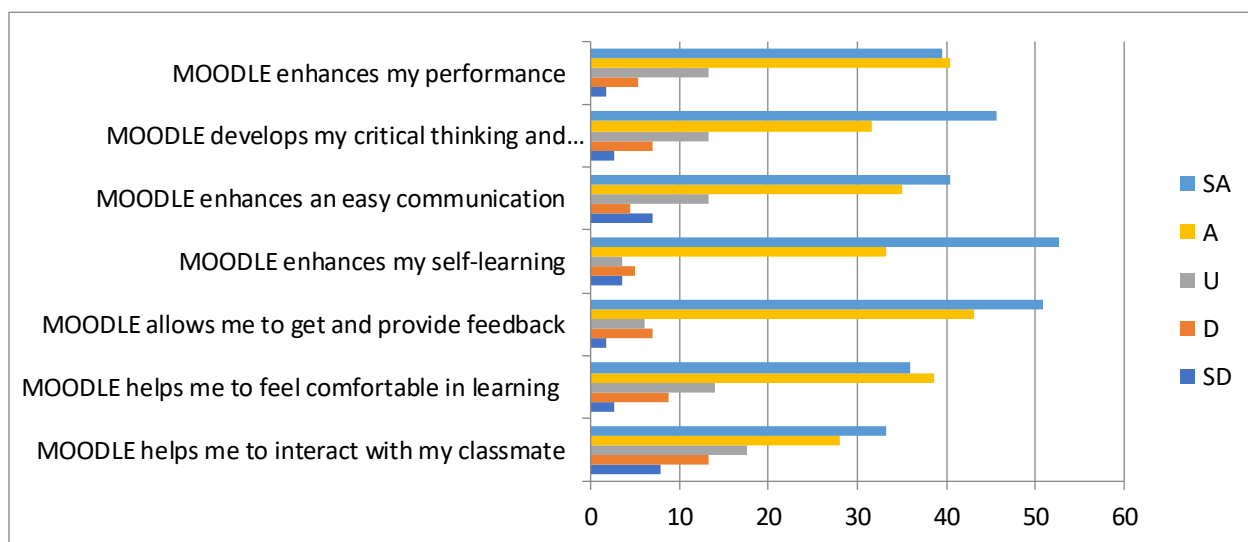


Figure 1: Students' experiences about the use of MOODLE

Table 1 is made of 5 items about the effectiveness of MOODLE in enhancing active learning. The results presented in the Table 1 show that the majority, (more than 69.3%), agreed or strongly agree that MOODLE helps them to prepare before class activities, enables them to make practices in mathematics lessons,

enhances their active participation, and that they achieve their expectations when they learn using MOODLE platform. The Table 1 shows students' agreements where SD= Strongly Disagree, D= Disagree, U= Undecided, A= Agree, and SA= Strongly Agree.

Table 1: Effectiveness of MOODLE in an actively learning

SN	Items	Students' agreement (%)				
		SD	D	U	A	SA
1	MOODLE is an effective tool to use in teaching and learning activities	0.9	5.3	7.9	43.9	42.1
2	MOODLE helps me to prepare themselves before class activities	0.9	4.4	10.5	42.1	42.1
3	MOODLE enables me to practices in mathematics lessons	3.5	7	15.8	43.9	29.8
4	MOODLE enhances my active participation	4.4	12.3	14	40.4	28.9
5	I achieve my expectations when I learn using MOODLE platform for the course	2.6	7.9	13.2	43	33.3

Table 2 represents students' views about their preferences to use MOODLE. The results from Table 2 show that most students, (59.7% and more), agreed and strongly agreed that they preferred using MOODLE while downloading all learning files, concentrating lectures' lesson delivery when they are using MOODLE

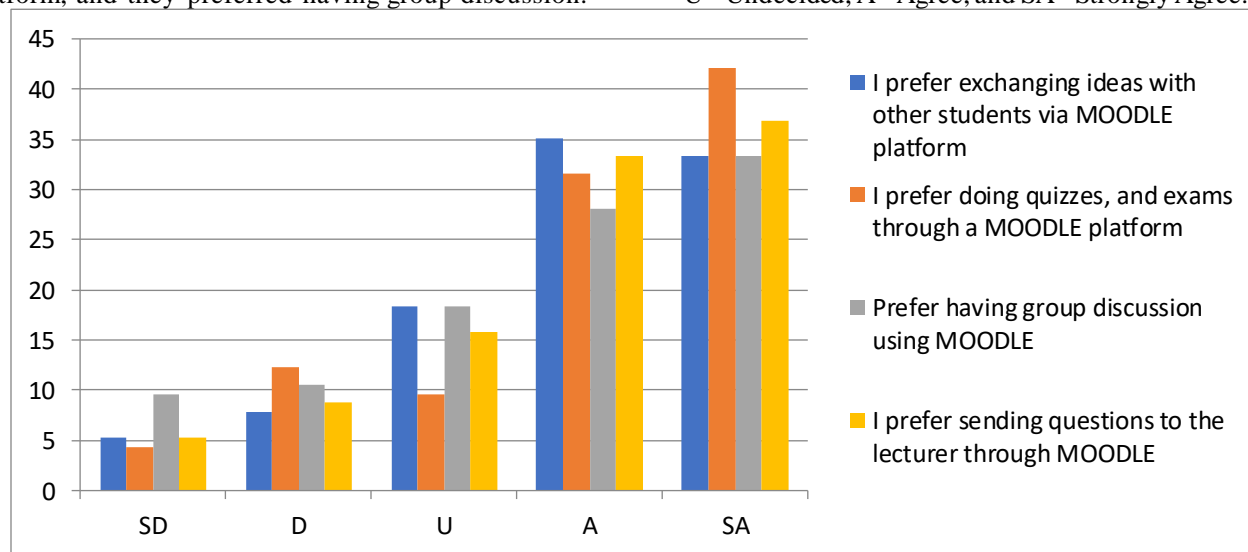
platform, prefer doing self-study through MOODLE, and posting every activity related to learning and teaching on MOODLE platform. Table 2 shows students' agreements where SD= Strongly Disagree, D= Disagree, U= Undecided, A= Agree, and SA= Strongly Agree.

**Table 2: Students' preferences about the use of MOODLE while learning Mathematics**

SN	Item	Students' agreement (%)				
		SD	D	U	A	SA
1	I prefer using MOODLE to download all learning files	4.4	4.4	7	36	48.2
2	MOODLE platform facilitates me as a student to access the course content anytime and anywhere I am, not necessarily being at school	1.8	8.8	8.8	27.2	53.5
3	I prefer to fully concentrate with lectures when they are using MOODLE platform.	3.5	18.4	18.4	31.6	28.1
4	I prefer doing self-study through MOODLE	1.8	10.5	11.4	34.2	42.1
5	I prefer posting every activity related to learning and teaching on MOODLE platform	4.4	6.1	7.9	42.1	39

Similarly, Figure 2 shows that the majority, (60% and more), agreed that they preferred exchanging ideas with other students via MOODLE platform, doing mathematics quizzes, and exams through a MOODLE platform, and they preferred having group discussion.

Students also agreed that they preferred doing self-study and sending questions to their lecturers through MOODLE platform. Figure 2 shows students' agreements where SD= Strongly Disagree, D= Disagree, U= Undecided, A= Agree, and SA= Strongly Agree.



**Figure 2: Students' preferences of using MOODLE while enhancing active learning**

#### 4.4 Challenges faced by students and lecturers while using MOODLE in teaching mathematics

We provided open-ended questions whereby students were free to provide challenges met when they were using MOODLE, while learning Mathematics. The common challenges provided by students were lack of ICT devices like computers and smart phones, poor

internet connection due to many students who were using MOODLE at the same time, lack of internet bundles (MBs), lack of electricity, especially for those students who were in rural areas, lack of skills of using MOODLE, and lack of facilitators who could assist students on how to use MOODLE.

Students stressed that mathematics needs more practice and demonstration, which was difficult when only MOODLE was used. Within this context, students

suggested that face-to-face interaction is much more effective than online learning. Students argued that MOODLE does not allow making graphs and some calculations. In addition, self-study for mathematics subject requires handwriting than using MOODLE. Moreover, students revealed that the way lecturers posted mathematics activities was not convenient for them. Students explained that typing mathematics expression is not easy and faster.

## Discussion

### Mathematics lecturers' and students' experiences about using MOODLE during the period of COVID-19 pandemic

The results from students' views show that students were aware of MOODLE even before it became popular within the University. However, the results showed that students did not have any further knowledge about how it works, though only some students were already learning through the MOODLE with one lecturer at the University. The results from this study show that MOODLE was previously viewed as an effective tool of teaching since one lecturer was using it even before the COVID-19 pandemic. MOODLE was found to be cost effective for both lecturers and students since both lecturers and students did not need to come to the Campus to teach and learn. Thus, MOODLE was viewed as an effective tool since a big number of students can be taught from wherever they are.

Indeed, MOODLE was viewed by higher learning institutions and universities as an effective tool since it could accommodate many students at the same time (Al-Marroof et al., 2021). This is because students can learn from their home areas and they are given opportunities to discuss and communicate as they would do in physical settings (Lin et al., 2017). Indeed, this LMS has the potential to provide time and space to both instructors and students, where they can interact in addition to allowing them to access learning resources (Mlotshwa et al., 2020). In addition, Singh et al. (2019) argued that LMS (MOODLE) has the affordance to share and communicate with the students the content, to collect assignment to be marked by lecturers.

The results from Table 2 show that students have positive attitudes towards MOODLE since it is through MOODLE that they can download reading materials, do different evaluations such as quizzes and exams, and interacting with their fellow classmates and lecturers. Indeed, MOODLE has the features that allow students to do online quizzes, online tests, and surveys, in addition to complementary tools that support the teaching and

learning process (Zakaria & Daud, 2013). In addition, it was found that MOODLE fosters inclusiveness as it allows students to learn at their pace. Thus, this tool enhances active learning, reinforces students' abilities and knowledge (Kotzer & Elran, 2012; Zakaria & Daud, 2013). Similarly, Essel and Wilson (2017) found that students have positive perceptions about the use of MOODLE since students enjoyed the collaboration with other classmates through this tool. Indeed, from the social constructivist perspective, learners acquired knowledge by interacting with fellow classmates and lecturers through computers (Zakaria & Daud, 2013).

### Challenges faced by students and lecturers while using MOODLE in teaching mathematics

The results from the study showed that students have challenges mainly linked to the lack of ICT devices, lack of skills of using the MOODLE as an e-learning platform, and poor or lack of internet connection. The identified challenges were barriers for students to learn. For instance, the challenge linked to poor network connection led to students' failure to download notes since files could not open on some devices. Similarly, students argued that when there is poor internet connection, no courses, quizzes, or exams are uploaded. Indeed, by addressing the issue of internet connectivity, increases the rate of students who use MOODLE (Polhun et al., 2021). Similarly, Hasibuan and Selviandro (Hasibuan & Selviandro, 2013) also found that there are numerous challenges and problems linked to the high cost of start-ups and different skills in the use of ICT tools.

Our findings are in line with Rajan and Manyala (Rajan & Manyala, 2021)' findings who found that students met with challenges such as the lack of the internet in some remote areas, network connection, the high cost of ICT equipment and insufficient training. All these challenges were barriers to the effective implementation of an e-learning. It is the reason why Naidoo (2020) suggested that lecturers and students should be provided resources that are easy to use, readily available, and cost effective. Although MOODLE enhance students' learning where they can access learning materials and can collaborate, the results from the study show that it has also negative effects since students may get distracted and use the internet for other purposes rather than learning mathematics. In addition, MOODLE was viewed by students as ineffective since mathematics as a subject requires computations and demonstrations, which is difficult when students are isolated one by one within room. It is the reason why Naidoo (2020) suggested that students should be trained about the effective and successful use of the ICT tools. Thus, both students and



lecturers should be supported and trained about the effective use of the interactive tool and made it available for all students (Essel and Wilson, 2017).

## 5. Conclusion and Recommendations

### 5.1 Conclusion

This study was conducted in the University of Rwanda, College of Education. The study involved 114 undergraduate students who have Mathematics among the core subjects, and six lecturers who teach mathematics. The findings from the study showed that lecturers at URCE view MOODLE as an effective LMS that supports teaching and learning Mathematics since lecturers can teach a big number of students from wherever they are. It was also reported that MOODLE facilitates assessment since lecturers prepare assignments and different activities, and they post them on MOODLE, and then, students start working on them. MOODLE was reported by students to be effective since it was easier for them to access learning materials and download them. However, MOODLE was found not easy to be used, as students did not have skills for using it. Some students from rural areas did not have electricity, and for those who had electricity, the network connection was not strong enough to access the MOODLE platform.

### 5.2 Recommendations

It is recommended that URCE should provide adequate training to both lecturers and students about the use of MOODLE to some extent other e-learning platforms. Also, URCE should also hire technicians who are responsible to provide technical support in case either lecturers or students meet the challenges while using MOODLE. Further studies can be conducted to investigate lecturers and students' experiences about the use of other e-learning management systems rather than MOODLE, within the higher learning institutions. The focus should not only be put during COVID-19 (schools' closure) but also even after schools re-opening.

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