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STUDENTS' LMS EXPERIENCE AND THEIR LEARNING MOTIVATION AND ACADEMIC PERFORMANCE IN MATHEMATICS

Romalyn DC. Macayaon, LPT
Marinduque State College
Marinduque, Philippines

Noel R. Palomares, MAEd
Marinduque State College
Marinduque, Philippines

ABSTRACT

This study assessed the junior high school students' LMS experience and its effect on their learning motivation and academic performance in Mathematics at the MSC – Integrated High School. It used a descriptive-evaluative research design, and the respondents were all officially enrolled junior high school students. Adapted questionnaires were utilized to collect the data based on the research questions. The first part of the tool assessed the students' experience in using the LMS, which is categorized into four (4) major components, namely: system navigation, use of course content, knowledge acquisition, and report generation. Meanwhile, the second part of the instrument measured the level of students' learning motivation in mathematics, which was subdivided into two (2) significant elements, namely: intrinsic motivation and extrinsic motivation. Moreover, the student's academic performance in mathematics, obtained from the Principal's Office of the Integrated High School, was evaluated based on their first and second-quarter grades. The gathered data were analyzed using descriptive and inferential statistics. Based on the analysis of the collected data, the students are satisfied with their LMS experience, which pertains to navigating the system, accessing the course contents, acquiring knowledge through the use of the LMS, and checking their performance report; they are both intrinsically and extrinsically motivated to study mathematics; and they earned a very satisfactory rating in mathematics in using the LMS. Nevertheless, students have still encountered challenges using the platform due to inevitable factors such as internet connectivity and the availability of devices. Furthermore, the interrelationships among the involved variables were examined, and it was found that the students' LMS experience significantly impacts their learning motivation. Surprisingly, their LMS experience does not significantly affect their academic performance. Nonetheless, it is good to note that the student's learning motivation predicts their academic performance in mathematics. Hence, as the students' LMS experience increases, so does their learning motivation in mathematics. Likewise, as they get motivated to learn mathematics, they can perform better academically.

Keywords: academic performance, learning motivation, LMS experience

1. Introduction

Technology, regarded as the primary driver of social change, has greatly influenced nearly all facets of modern life, and education is no exception. As technological innovation expands its range of development in this sector, demands, innovations, advancements, and educational setups become global concerns. To sustain the international demand to integrate technology into teaching, Education 4.0 was born, which focuses on transforming education through advanced technology.

Technology has profoundly changed education. Traditionally, getting educated requires pupils to travel from their homes to school. Now, several institutions provide distance learning to cater to students who opt to learn even outside of the traditional classroom setting. The Internet today also provides instant access to vast volumes of information (books, music, photographs, and videos), and formal learning possibilities are available online in all parts of the world through the

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Khan Academy, MOOCs, podcasts, conventional online degree programs, and more, instead of typically carrying books to and from school. Due to technology, access to educational possibilities is now more widespread than before. It is a powerful tool that may improve the education system in various ways, such as by making it more straightforward for teachers to develop learning materials and facilitate learning (Purdue Online, 2022).

Unfortunately, as a developing country, the Philippines is one of those nations lagging in terms of technological innovations and advancements in education. According to a recent study by the World Bank and the National Economic and Development Authority (NEDA), the Philippines is falling behind some of its Southeast Asian neighbors in the use of digital technologies (ABS-CBN News, 2020). Hence, as the education sector continues to encourage schools to integrate technology into teaching because it has been shown to harness teachers in doing online learning, increase student engagement, and help students build 21st-century skills, it has become challenging to keep up with already developed countries when we are only halfway through adapting to the technology-based era.

However, as the COVID-19 pandemic spread, it created more opportunities for the education sector to rely on technology to continue the instructional process. Despite all the issues attributed to this pandemic, things can sometimes go according to what seems to be needed by chance. This event opened the door for us to adapt, learn, and keep in touch with the world's demands. According to Kondakciu (2020), as remote learning was implemented, the opportunity to strengthen our knowledge and skills when it comes to integrating technology into education paved the way. With the right technology, the Philippines would greatly benefit. She added the study by Corcoran (2018) about the positive effects of using technology as a reading instruction tool for students. Students use of technology significantly improved their academic performance and achievements. Such an outcome is an exemplary manifestation of keeping up with the demand for education 4.0. Bangayann-Manera (2019) asserted that with a focus on intelligent and innovative technology, education 4.0 entails using tablets and smartphones as supplementary aids in the classroom. Future students of today will spend much of their time using these technologies.

New teaching and learning approaches have emerged due to the advancement of Information and Communication Technologies (ICT) in education. Education places much emphasis on e-learning, which is using computers for instructional purposes. E-learning has the potential to significantly increase students' academic performance and motivation when studying computers and fundamental network concepts like sharing devices. E-learning can also boost students' involvement in the learning process (Hoerunnisa et al., 2019).

One of the e-learning systems is the Learning Management System (LMS), a software application or platform that organizes learning materials like lessons, training modules, and courseware. The fundamental purpose of these technologies has been to disseminate and manage pre-written material. For a more thorough learning experience, many of these systems now include writing tools, analytics dashboards, and user controls (Malmstrom, 2018). In order to enhance the teaching-learning process, instructors can exchange learning resources, upload and organize their courses, construct exams, and digitally communicate with students using learning management systems (LMS). Students are also more motivated to learn the material when the LMS's various features are introduced and used because this instruction technique differs from more conventional ones. Through LMS, the students can access the learning activities and recorded lectures shared by their teachers. Apart from allowing the students to access the LMS content, they are also taught the concepts of independent learning and a self-paced learning style. Moreover, by using the platform at their own pace to manage their learning, the student's learning motivation can be heightened (Andres, 2022).

According to Andres (2023), teaching and learning in higher education are now much more practical, engaging, and innovative, mainly because of the evolution of LMS. Its usage in universities and other educational institutions nowadays to support online and face-to-face learning is prevalent. School administrators, teachers, and students receive numerous benefits from LMS. Rosmiana et al. (2020) noted that some studies had confirmed the positive effects of applying Learning Management Systems (LMS) on students' motivation, learning outcomes, and teaching

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and learning quality. Hakim et al. (2019) added that LMS could help teachers and students to achieve effective and efficient learning goals and to increase student learning achievement and mastery concepts.

Student learning motivation naturally concerns students' desire to participate in the learning process, for reasons or goals that underlie their involvement or non-involvement in academic activities. It is essential for teachers as it is related to the student's achievement and academic performance (Bangayan-Manera, Vecaldo & Saquing, (2020). According to studies, students' learning performance and motivation are positively correlated. Motivated students tend to perform better academically and are more likely to go further to ensure they meet their objectives (Potter and Johnston, 2006). Thus, they would benefit more if they used LMS to facilitate their learning, whether in online or face-to-face classes. It is also essential to consider the teacher's role in assisting and motivating the students to use LMS to engage students in learning.

As a mathematics teacher at the MSC Integrated High School, the researcher has observed how mathematics subjects should be taught using technology. It aids teachers in motivating their students to study mathematics and would increase student engagement in the subject since difficult concepts would be taught through engaging presentations. Numerous studies have discovered a positive relationship between using LMS and students' learning motivation and academic performance. Since MSC-Integrated High School is implementing LMS in teaching for the first time, the researcher would like to assess if the student's LMS experience has something to do with their learning motivation and academic performance in mathematics.

2. Statement of the Problem

This study aimed to determine the students' LMS experience and their learning motivation and academic performance in mathematics.

Specifically, it sought to answer the following questions:

1. What is the students' LMS experience in the following components:
   1.1 system navigation;
   1.2 use of course content;
   1.3 knowledge acquisition;
   1.4 report generation?
2. What is the level of the students' learning motivation in mathematics in terms of:
   2.1 intrinsic motivation;
   2.2 extrinsic motivation?
3. What is the academic performance of the students in mathematics through the use of the LMS?
4. Does the LMS experience of the students have a significant effect on:
   4.1 learning motivation in mathematics;
   4.2 academic performance in mathematics?
5. Does the students' learning motivation predict their academic performance in mathematics?
6. What are the challenges encountered by the students in using the LMS?
7. What research output can be drawn based on the results of the study?

3. Methodology

Research Design

The researcher used descriptive-evaluative research to determine the students' LMS experience and their learning motivation and academic performance in mathematics. According to McCombes (2019), the goal of descriptive research is to precisely and methodically describe a population, circumstance, or phenomenon. Instead of addressing why questions, it can respond to what, where, when, and how questions. In connection with

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this, this research design was used since the researcher aimed to obtain information about the students' LMS experience, level of learning motivation in mathematics, academic performance in mathematics, and the challenges they encounter in using the online platform to describe how the junior high school students used it in learning.

Meanwhile, evaluative research deals with the evaluation of policies, programs, or institutional frameworks. It measures results or requirements, how well a policy or program is working, and whether practices are effective or successful (Wollman, ND). Since the researcher wants to assess if the students' LMS experiences affect their learning motivation and academic performance, as well as if their learning motivation predicts their academic performance, an evaluative research design was also applied.

Research Locale

This study was conducted at Tanza, Boac, Marinduque, where the main campus of Marinduque State College (MSC) is located. MSC has three (3) other satellite campuses at Matalaba, Sta. Cruz; Poctoy, Torrijos; and Banuyo, Gasan Marinduque. Of the different colleges in the main campus, the College of Education is one of them, offering three (3) programs: BSEd, BCAEd, and BTLEd. Aside from this, the Integrated High School, formerly known as the Laboratory School, is affiliated with it.

The MSC-Integrated High School, where this study was specifically conducted, is the only school in the province subscribed to Kite Academy 2.0 LMS in basic education. This school offers two (2) programs: the junior high school program, which has one (1) section per grade level aside from grade 9, which has two (2) sections, and the senior high school program, which offers only three (3) strands for both grades 11 and 12 (ABM, HUMSS, and STEM).

Research Population and Sample

The respondents of this study were all the officially enrolled junior high school students of the Integrated High School, which is composed of forty-three (43) grade 7 students, twenty-nine (29) grade 8 students, fifty-three (53) grade 9 students, and thirty-two (32) grade 10 students, with a total of one hundred fifty-eight (157) students. They are the only group of students currently subscribed to the LMS; hence, their participation in providing the necessary data for this study is highly significant.

Methodology

This study was conducted during the first semester of the academic year 2022-2023. A week before the start of the school year, the LMS provider organized a one-day training session for the junior high school teachers of the Integrated High School on how to use the LMS platform. For all of the junior high school students, a separate half-day training session on using the platform was held. To access the platform, individual accounts were provided by the LMS provider for both teachers and students.

As the mathematics teacher in the Integrated High School during the first semester of the aforementioned academic year, the researcher employed LMS in response to the approved blended schedule of the students. During the synchronous session in the morning, the researcher conducts a physical classroom discussion. In the asynchronous session with the students every afternoon, learning activities in the LMS were assigned to them. The researcher either assigns a learning activity from the e-books, a topic that they will access in the e-lesson, or a self-made learning task that is being uploaded to the platform. This was done for each of the five (5) sections of the junior high school students, as they all have the same set-up for the synchronous and asynchronous schedules. Each assigned learning task has due dates that the students can see, so they are aware of when they can submit their activities. The students are obliged to submit their works on or before the due date, as they will not be able to access the submission thread once the deadline has passed.

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Thus, the researcher was able to monitor and remind the students to submit their assigned learning activities.

In connection with the mentioned procedure on the LMS use, the data for this study were gathered after the second-quarter grading period of the same academic year. The junior high school students were requested to answer the questionnaire intended for their LMS experience (system navigation, use of course content, knowledge acquisition, and report generation) and learning motivation in mathematics (intrinsic and extrinsic motivation) through Google forms.

Research Instrument

The data were collected using an adapted questionnaire from Joyce Hwee Ling Koh and Rebecca Yen Pei Kan (2020) to determine the students' experiences with using LMS. Similarly, the discussion of the challenges encountered by the students in using LMS was based on the same instrument. On the other hand, another adapted questionnaire from Kenneth Lee Butler (2016) was used to assess students' learning motivation in studying mathematics.

The first part of the questionnaire focused on the students' experience in using the LMS, which is categorized into four (4) major components namely: system navigation, use of course content, knowledge acquisition, and report generation that the respondents answered using a 5-point Likert scale. Likewise, the second part of the instrument was rated by the respondents using a 5-point Likert scale, which focuses on the students' learning motivation in studying mathematics. It was subdivided into two (2) major elements, namely, intrinsic motivation and extrinsic motivation.

The results of the instrument were analyzed using the rating scale presented below. Together with the mean interval and its description, the descriptive interpretation was also provided. Percentage was used to quantify the satisfaction and motivation levels of the students, in which 0% was assigned to the least mean interval as it was described as strongly disagree. Meanwhile, 100% was then equally distributed among the remaining mean intervals, each receiving an interval of 25%.

Rating Scale for the Students' LMS Experience

Mean Interval	Description	Descriptive Interpretation
4.20 – 5.00	Strongly Agree	The students are 76%-100% satisfied with their LMS experience
3.40 – 4.19	Agree	The students are 51%-75% satisfied with their LMS experience
2.60 – 3.39	Moderately Agree	The students are 26%-50% satisfied with their LMS experience
1.80 – 2.59	Disagree	The students are 1%-25% satisfied with their LMS experience
1.00 – 1.79	Strongly Disagree	The students are 0% satisfied with their LMS experience

Rating Scale for the Learning Motivation of the Students in Mathematics

Mean Interval	Description	Descriptive Interpretation
4.20 – 5.00	Strongly Agree	The students are 76%-100% motivated to learn math
3.40 – 4.19	Agree	The students are 51%-75% motivated to learn math
2.60 – 3.39	Moderately Agree	The students are 26%-50% motivated to learn math
1.80 – 2.59	Disagree	The students are 1%-25% motivated to learn math
1.00 – 1.79	Strongly Disagree	The students are 0% motivated to learn math

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To ensure the research instrument's validity and reliability, it was evaluated by five (5) experts, consisting of two (2) IT experts, a research faculty member, an English specialist, and a statistician. Upon revision of the instrument based on the experts' comments and suggestions, the researcher conducted a pilot test among the twenty-nine (29) former Grade 10 students of Integrated High School. They are the students who first used the Kite Academy Learning Management System (LMS) for the previous school year. After the responses were gathered, they were subjected to Cronbach's Alpha to measure the instrument's internal consistency. According to Statistics Solutions (2023), the general rule of thumb is that a Cronbach's alpha of .70 and above is good, .80 and above is better, and .90 and above is best. Based on the result of the reliability test, the items pertaining to students' LMS experience have an internal consistency result of .943 and .846 for the items involving students' learning motivation in mathematics. The results are both acceptable in terms of internal consistency.

Data Collection Procedures

Permission was sought from the principal of the Integrated High School for the online dissemination of the survey forms among the junior high school students. The students were given access to the survey forms through the link sent via Facebook groups. The researcher gave the respondents ample time to complete the survey about their LMS experience and learning motivation in mathematics. Upon compiling the responses, it was found that only 142 students had responded from the total population of 157.

Meanwhile**,** in terms of the academic performance of the students in mathematics, their academic grades from the first and second quarters were compiled by the researcher as the teacher of the students for the mentioned period. The learners' grades were treated with the utmost confidentiality and used solely for this research study.

Rating Scale for the Students' Academic Performance in Mathematics

Grading Scale	Description	Remarks
90-100	Outstanding	Passed
85-89	Very Satisfactory	Passed
80-84	Satisfactory	Passed
75-79	Fairly Satisfactory	Passed
Below 75	Did Not Meet Expectations	Failed

Source*: DepEd Order No. 8, s.2015. Policy Guidelines on Classroom Assessment for K to 12 Basic Education Program*

After gathering all the data, it was organized and encoded in the SPSS software for statistical processing and analysis.

Statistical Treatment

The gathered data were statistically analyzed in order to answer the questions in this study. To analyze the students' LMS experience, frequency count, standard deviation, and mean were used. The standard deviation was used to determine how spread out the responses are from the mean. On the other hand, the mean was computed using the 5-point Likert scale (5 – strongly agree; 4 – agree; 3 – moderately agree; 2 – disagree; 1 – strongly disagree). Similarly, the same statistical tool and Likert scale were used in determining the level of the students' learning motivation in studying mathematics using the LMS. Furthermore, the students' mathematics grade until the second grading period, which was reported in their Form 9, was used to determine their academic performance in mathematics. It was analyzed according to academic interpretation as outstanding, very satisfactory, satisfactory, fair, and poor performance. In addition, frequency count,

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percentage, and rank were used to present the results of the challenges encountered by the students in using the learning platform.

Moreover, regression analysis was utilized to determine if the students' LMS experience had a significant effect on their learning motivation and academic performance in mathematics. Likewise, the same statistical tool was used to analyze whether the students' learning motivation predicts their academic performance.

4. Results and Discussion

4.1 Junior high school students' LMS experience

Tables 1 to 4 present the LMS experience of the students in terms of system navigation, use of course content, knowledge acquisition, and report generation.

1.1 Students' LMS experience in terms of system navigation

Table 1 shows that the students are satisfied (51% - 75% satisfied) with their LMS experience in navigating the platform with a mean of 3.89 and a standard deviation of .993. The results indicates that the students are satisfied in navigating the system using technological tools (PC or laptop, mobile phone, or tablet); identifying the functions of icons used in the LMS; finding the homework and learning materials posted by the teachers as well as the already available e-books and e-lessons; and utilizing the platform in submitting their homework.

Table 1

Students' LMS Experience in System Navigation

Indicators	Frequency					SD	Mean	D	DI
	5	4	3	2	1				
1. I can browse the LMS using a PC or laptop.	77	43	14	7	1	.896	4.32	SA	VS
2. I can browse the LMS using a mobile phone.	40	42	34	18	8	1.183	3.62	A	S
3. I can browse the LMS using a tablet.	35	41	39	18	9	1.177	3.53	A	S
4. I know the functions of the icons used in the LMS.	23	55	49	13	2	.916	3.59	A	S
5. I can find the homework posted by the teachers in LMS.	56	52	24	7	3	.976	4.06	A	S
6. I can find the additional learning materials (PPTs, reading materials, and video presentations) posted by the teachers in the LMS.	57	48	30	3	4	.976	4.06	A	S
7. I can find where the e-books and e-lessons are stored for each subject.	60	53	23	6	0	.853	4.18	A	S
8. I can utilize the LMS for submitting my homework.	36	55	35	15	1	.970	3.77	A	S
					Grand Mean	**.993**	**3.89**	**A**	**S**

Legend:

4.20 – 5.00	*Strongly Agree (SA)*	*Very Satisfied – VS (76% - 100% satisfied)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Satisfied – S (51% - 75% satisfied)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Satisfied – MS (26% - 50% satisfied)*	*SD*	*Standard Deviation*
1.80 – 2.59	*Disagree (Di)*	*Dissatisfied – Dis (1% - 25% satisfied)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Very dissatisfied – VD (0% satisfied)*		

In view of the results, browsing the LMS using a PC or laptop obtained the highest mean (4.32), which indicates that the students are very satisfied since it is the most convenient device to use in browsing the platform for its bigger screen display compared to mobile phones or tablets. On the other hand, browsing the platform using tablets got the lowest mean (3.53), as only few of the respondents have these devices. They commonly have mobile phones and laptops. As Brush (2019) highlighted in her blog, she said that users should be able to access the LMS from whichever type of device they prefer, whether it's a desktop, laptop, tablet, or smartphone. The most appropriate version for the user's selected device should be displayed automatically by the LMS. Also, the findings indicate an underlying factor possibly affecting their satisfaction level. One factor that can be assumed is the fact that more than a quarter of the respondents only moderately agreed on the functions of LMS icons. This signifies that, more or less, there were students who

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were still figuring out the functions of icons or getting confused about how they work in the platform despite the training provided to them.

The results are in line with the study of Majeed et al. (2016), in which they highlighted the importance of having a simple system that students can use in order to engage with the learning materials instead of spending more time trying to figure out how to use these systems when they are difficult to use. If the LMS has a user-friendly interface, students will be able to become familiar with its features, including the icons used for them to browse the LMS as well as looking for the materials posted by the teacher or even the materials already available in the system.

The table also revealed that students agreed that they could utilize the platform to submit their homework. Since the institution continues to use blended learning, it is very beneficial for students to have a learning platform that they can use to submit learning activities in addition to accessing learning materials. They can submit their homework, which is usually in different formats like documents, images, or videos, that they might not be able to submit online using other platforms because they have limited features.

1.2 Students' LMS experience in terms of using the course contents

Table 2 shows that, with a mean of 3.87 and a standard deviation of.936, the students are also satisfied (51%–75%) with the platform's course materials. This signifies that the students agreed that they are guided by the learning objectives in the content they are browsing; the contents are also aligned with the teachers' lessons, which are basically based on the K-12 curriculum guide; the images and video discussions helped them in understanding the lessons; and they can also read and study in advance since they have access to all the lessons, even those that have not yet been discussed.

Table 2
Students' LMS Experience in using the Course Contents

Indicators	Frequency					SD	Mean	D	DI
	5	4	3	2	1				
1. In using the course content, I am guided by the learning objectives stated in each topic.	41	60	36	5	0	.829	3.96	A	S
2. I find that the topic presentations in the course content are aligned with the lessons presented by my teachers.	51	61	28	2	0	.774	4.13	A	S
3. I find the images used in the course content helpful to understand the topics I am studying.	45	52	37	7	1	.916	3.94	A	S
4. I find the video discussions in the E-lessons helpful to understand the topics I am studying.	51	53	31	7	0	.882	4.04	A	S
5. I can browse the course contents anytime for advanced reading.	54	44	34	6	4	1.024	3.97	A	S
6. I have offline access to the E-books through an application installed either in my laptop or mobile phone.	19	42	43	22	16	1.189	3.18	MA	MS
					Grand Mean	**.936**	**3.87**	**A**	**S**

Legend:

4.20 – 5.00	*Strongly Agree (SA)*	*Very Satisfied – VS (76% - 100% satisfied)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Satisfied – S (51% - 75% satisfied)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Satisfied – MS (26% - 50% satisfied)*	*SD*	*Standard Deviation*
1.80 – 2.59	*Disagree (Di)*	*Dissatisfied – Dis (1% - 25% satisfied)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Very dissatisfied – VD (0% satisfied)*		

The results convey that e-books and e-lessons are substantial learning resources that assisted students in learning through the use of the LMS. The topic discussions are parallel to the curriculum guide, and so are the learning activities that reinforce students' learning. Besides, students no longer have to carry heavy books from and to school every day; instead, they may store electronic books on their gadgets, which makes carrying them much easier. To ensure that

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these documents can be browsed easily on their devices, users must make sure that there is enough storage capacity for them.

In line with the results, Pappas (2015) mentioned that having clear learning objectives is a great tool for building the structure of eLearning content. The LMS provider is able to organize the eLearning content in a way that makes learning as simple as possible and, as a result, more engaging. This is made possible by having the exact goals that the students must achieve. Additionally, in terms of images and videos used, Simanullang & Rajagukguk (2020) asserted that video discussions included in the LMS encourage students to investigate the material being taught because they elicit a variety of questions from them and encourage them to explore deeper into the subject matter. Further, in the blog that was published on capytech.com in 2019, the significance of images and other types of visuals in e-learning courses was emphasized. E-learning courses are visually appealing due to images and other visuals. The learning experience will be enhanced, engagement rates will rise, and the training will be less burdensome for the students if the course is more visually appealing.

Additionally, it is also good to note that the second indicator presented in the table, which shows whether students agree that the LMS contents they are using are pertinent to the competencies they need based on the K–12 curriculum, had the highest mean (4.13). This pinpoints that the materials are aligned with the mandated curriculum guide. On the other hand, the sixth indicator had the lowest mean (3.18) and shows that some students lack offline access to the platform, possibly because their device does not have enough storage to store both the application and the downloaded content for offline surfing. As O'Connor (2020) stated, offline use of an LMS results in increased productivity, better utilization of time, and a more satisfying user experience. Additionally, students' experiences of media-rich courses are unaffected by poor internet connections when using offline learning. The user can still use the touch, video, and audio features as if they were online. Most of the time, offline learning happens through the official app of the LMS. Only the ability to download the app and the relevant learning content is required to update the LMS content. Also, sufficient storage on the device is needed to hold the size of the application itself and the downloaded contents.

1.3 Students' LMS experience in terms of knowledge acquisition

Table 3 illustrates that the students are 51% - 75% satisfied with learning the contents of the LMS, with a mean of 3.77 and a standard deviation of 1.009. This suggests that the students agreed that they could learn through the use of the LMS, as they were the ones involved in browsing and doing the learning tasks. They can also immediately see if their answers are correct since there is immediate feedback once they submit their answers. Likewise, they also agreed that using the LMS allowed them to learn independently for some, if not all, of the learning tasks, which helped them develop their critical thinking abilities. Once they realized they had made a mistake on a particular part of the learning task, they could try to figure out how the correct answer had been obtained.

Table 3
Students' LMS Experience in terms of Knowledge Acquisition

Indicators	Frequency					SD	Mean	D	DI
	5	4	3	2	1				
1. I can learn using the LMS as I am involved in performing the provided engaging learning tasks.	45	51	37	8	1	.931	3.92	A	S
2. I can learn using the LMS since there is immediate feedback on the learning activities in the e-lessons.	43	51	39	9	0	.909	3.90	A	S
3. I can learn through an LMS as it provides a learning environment that doesn't require a physical presence in the classroom.	39	43	41	12	7	1.115	3.67	A	S

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4. I find that this LMS is a good educational portal that improves critical thinking skills.	41	41	45	12	3	1.036	3.74	A	S
5. I can learn by myself using the course contents in the LMS.	32	47	45	13	5	1.054	3.64	A	S
					Grand Mean	**1.009**	**3.77**	**A**	**S**

Legend:

4.20 – 5.00	*Strongly Agree (SA)*	*Very Satisfied – VS (76% - 100% satisfied)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Satisfied – S (51% - 75% satisfied)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Satisfied – MS (26% - 50% satisfied)*	*SD*	*Standard Deviation*
1.80 – 2.59	*Disagree (Di)*	*Dissatisfied – Dis (1% - 25% satisfied)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Very dissatisfied – VD (0% satisfied)*		

Table 3 shows that among the listed indicators for knowledge acquisition, learning to use LMS through engaging students to perform the provided tasks (3.92), and immediate feedbacks on the learning activities (3.90) got the highest means respectively. These results clearly indicate the significant impact of learners' engagement in acquiring knowledge through experiential learning, effective activities and proper feedback on their tasks. Since feedbacks were immediately administered, learners would have ample time to evaluate their performance and do self-assessment. On the other hand, the last indicator which is independent learning got the lowest mean of 3.64. From this, it can be inferred that teachers still need to provide students with a lot of assistance until they can gradually learn the course material on their own. As Campbell (2020) asserted, self-directed learning is one of the biggest advantages of a learning management system (LMS). Not only are learners able to select their own learning paths, but they also have the option of completing the material at their own pace. In a similar manner, Nasser et al. (2011) also emphasized that online learners can become independent through the use of LMS as they can work around other commitments and responsibilities. They could learn how to use an LMS to explore the course materials, communicate effectively, and manage the course's technologies.

1.4 Students' LMS experience in checking the report generation

Table 4 also illustrates that the students are satisfied (51%-75% satisfied) with their LMS experience in checking the reports for the activities they do, with a mean of 4.02 and a standard deviation of .935. The findings indicate that the students agreed that they can see their progress report shown at the end of each topic in the e-lessons upon completing all the tasks indicated; they can also see their scores for the activities assigned by the teacher, and they can check if everything assigned to them has been submitted. Since the students have access to their scores, they can also see the corrections made by the teacher, which helps them see in which part of the lesson they are having difficulty with.

Table 4

Students' LMS Experience in Checking the Report Generation

Indicators	**Frequency**					**SD**	**Mean**	**D**	**DI**
	5	**4**	**3**	**2**	**1**				
1. I can see my progress report for the e-lessons I am browsing.	40	57	32	12	1	.947	3.87	A	S
2. I can see my actual score for the homework checked by the teachers once it is returned.	59	52	21	9	1	.934	4.12	A	S
3. I can check in which part of the lesson I am having difficulty.	42	54	35	10	1	.939	3.89	A	S
4. I can check if I have submitted all my homework.	67	46	21	7	1	.919	4.20	SA	VS
					Grand Mean	**.935**	**4.02**	**A**	**S**

***Legend*:**

4.20 – 5.00	*Strongly Agree (SA)*	*Very Satisfied – VS (76% - 100% satisfied)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Satisfied – S (51% - 75% satisfied)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Satisfied – MS (26% - 50% satisfied)*	*SD*	*Standard Deviation*
1.80 – 2.59	*Disagree (Di)*	*Dissatisfied – Dis (1% - 25% satisfied)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Very dissatisfied – VD (0% satisfied)*		

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Table 4 conveys that among the indicators about students' LMS experience in checking the report generation, checking whether they submitted all of their homework (4.20), and seeing their actual homework scores once returned by their teacher (4.12) got the highest means respectively. This means that these features of LMS were less confusing for students to identify and navigate through. However, the first indicator got the lowest mean of satisfaction (3.87) as this happens when the students do not answer the intended learning activities for the e-lesson they are browsing, hence the progress report will show zero percent at the end of the topic instead of the percentage for their correct answers.

In light of the results, Young (2018) asserted that reports from LMSs are an essential part of eLearning, both for managers and students. This is similar to the report by Green (2022) that says LMS reports help users keep track of their training process, what it means, and how to get better results. To put it another way, they tell users if their efforts are actually producing results. If a student completes a course and passes the exam, we infer that they have learned the necessary information and are prepared to put it into practice. The foundation of all reporting procedures is learner progress. Teachers might discover that a student requires additional motivation to complete their coursework. They will be able to comprehend this due to learner progress. Learner results provide them with a precise overview of a specific user's performance.

Furthermore, because students are aware of their scores for the particular learning activities that have been assigned to them, they will be able to evaluate their performance. Based on their individual reports, students can identify areas of difficulty and contact their teachers for assistance in overcoming those shortcomings.

1.5 Summary result of the students' LMS experience

Table 5 displays the summary result of the students' LMS experience. It was revealed that in all four components into which this domain was divided, the students are 51% - 75% satisfied with their LMS experience. In connection to this, it can be noted that the students got the highest mean of satisfaction (4.02) in checking the report generation component. This indicates how the students have appreciated using a platform where they can freely check their performance for the activities they do as it allows them to evaluate themselves. On the other hand, the component that got the lowest mean of 3.77 is the knowledge acquisition. It shows that students still need teacher's guidance in learning instead of solely utilizing the platform.

Table 5

Summary Table of the Students' LMS Experience

Components	SD	Mean	Description	Descriptive Interpretation
1. System Navigation	.993	3.89	Agree	Satisfied
2. Use of Course Content	.936	3.87	Agree	Satisfied
3. Knowledge Acquisition	1.009	3.77	Agree	Satisfied
4. Report Generation	.935	4.02	Agree	Satisfied
Grand Mean	**.968**	**3.89**	**Agree**	**Satisfied**

Legend:	*4.20 – 5.00*	*Strongly Agree (SA)*	*Very Satisfied – VS (76% - 100% satisfied)*	*D*	*Description*
	3.40 – 4.19	*Agree (A)*	*Satisfied – S (51% - 75% satisfied)*	*DI*	*Descriptive Interpretation*
	2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Satisfied – MS (26% - 50% satisfied)*	*SD*	*Standard Deviation*
	1.80 – 2.59	*Disagree (Di)*	*Dissatisfied – Dis (1% - 25% satisfied)*		
	1.00 – 1.79	*Strongly Disagree (SD)*	*Very dissatisfied – VD (0% satisfied)*		

Table 5 indicates that the students have interacted well with the platform as a whole while using it for learning. They can navigate, browse the course content, learn through this platform, and most importantly, they can see their learning performance. This also indicates that the platform served its purpose in enriching the students' learning experiences, especially since technology integration in the class is continuously implemented. However, the researcher believes that underlying factors such as internet connectivity, the response time of the platform, and lack of access to appropriate devices to be used might be some of the reasons why the students are not very satisfied with their LMS experience, even though it is evident that it has good qualities and features for promoting learning support.

In the study by Rahim (2021), he explained that the user experience, as one of the most important aspects of owning a learning management system, is often overlooked. The way a user

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interacts with and experiences a product, system, or service is referred to as the user experience. The design of dashboards, ease of navigation, accessibility features, responsive design, content placement, scalability, and adaptability are some of the most important parameters that influence the user experience in using LMS. Similarly, Pappas & Zaharias (2018) reported that an engaging user experience lays the foundation for all other features and functions the LMS provides. It covers everything from the LMS platform's navigation to its interface design. Behind an outstanding LMS user experience is an LMS that offers a complete package in terms of allowing anyone to utilize it with ease. There are no issues with accessibility that prevents the users in navigating the platform. Instead of serving as a tool that enables online learners to bridge gaps and improve task performance, an LMS that is more challenging to master becomes a barrier in the process of learning and development. To get the information they need, users must first learn how to use the system effectively.

4.2 Students' level of learning motivation in mathematics

Tables 6 and 7 display the level of students' learning motivation in mathematics in terms of intrinsic and extrinsic motivation.

2.1 Students' level of learning motivation in mathematics in terms of intrinsic motivation

Table 6 shows that the students' level of intrinsic motivation in mathematics is 51% - 75%, with a mean of 3.84, and a standard deviation of 1.029. This suggests that the students agreed that the driving factor for why they learn mathematics comes from within themselves. They are motivated because of the satisfaction they would feel upon completing a challenging task in mathematics, solving a particular problem using their own strategy, and becoming better at this subject. Hence, they engage in learning mathematics out of the enjoyment that their actions will bring.

Table 6

Students' Level of Intrinsic Motivation in Mathematics

Indicators	Frequency					SD	Mean	D	DI
	5	4	3	2	1				
1. I would describe mathematics as one of the subjects I enjoy learning most.	41	41	36	19	5	1.135	3.66	A	M
2. I study mathematics because I like being totally immersed in doing mathematical tasks.	28	48	40	20	6	1.090	3.51	A	M
3. I study mathematics because I like challenging tasks.	23	52	43	16	8	1.070	3.46	A	M
4. I feel accomplished upon completing a task in mathematics.	74	34	31	2	1	.895	4.25	SA	VM
5. I like to thoroughly understand mathematics, not just memorize it.	55	43	33	10	1	.986	3.99	A	M
6. I study mathematics because I want to get better at it.	72	40	26	4	0	.858	4.27	SA	VM
7. I enjoy learning mathematics on my own.	30	44	38	14	16	1.244	3.41	A	M
8. I love to discover strategies in solving mathematical problems.	48	51	31	7	5	1.035	3.92	A	M
9. I am motivated to learn mathematics because it is needed in all fields of life.	47	44	42	7	2	.973	3.89	A	M
10. I like to learn mathematics as it plays a role in reaching my future goals.	58	39	37	5	3	1.003	4.01	A	M
					Grand Mean	**1.029**	**3.84**	**A**	**M**

Legend:

4.20 – 5.00	*Strongly Agree (SA)*	*Very Motivated – VM (76% - 100% motivated)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Motivated – M (51% - 75% motivated)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Motivated – MM (26% – 50%) motivated*		
1.80 – 2.59	*Disagree (Di)*	*Less Motivated – LM (1% - 25% motivated)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Not Motivated – NM (0% motivated)*		

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The table shows that wanting to get better at mathematics and feeling accomplished upon completing a task in it got the highest mean of 4.47 and 4.25 respectively. These shows that these internal factors mainly drive the students why they study mathematics. They aim to become better in this subject for self-satisfaction and they are fulfilled once they perform in mathematics on their own. Meanwhile, learning mathematics on their own got the least mean of 3.41 as this suggest that though the students have this internal determination to study mathematics, not all of them are comfortable to learn it independently since most students view it as a difficult subject.

The results further revealed that the students agreed that mathematics is one of the subjects they enjoy learning most because it involves challenging tasks that require understanding and not just rote memorization; they like to learn it independently; it allows them to discover strategies for problem-solving; and it is needed in their future goals and all fields of life. According to Montague (1992), as mentioned by Froiland (2011), students who are intrinsically motivated are more likely than their peers to employ efficient math strategies and are more likely to choose deeper learning and performance strategies. The student uses his or her imagination to find an unconventional solution to the problem and perseveres through it with the expectation of success if the solution is not immediately apparent. Moreover, as cited by Adamma et al. (2018), Stipek (1988) found that students with intrinsic motivation always choose challenging tasks and learn independently.

Additionally, the students strongly agreed that they are motivated to study mathematics so that they can get better at it and that they feel fulfilled upon completing mathematical tasks. This was in line with Stipek's (1988) study cited by Adamma et al. (2018), in which it was found that students with intrinsic motivation persevere in completing their responsibilities. They combine the experiences they have had outside of school with the information they have learned in school. They take pride in their work and express positive emotions throughout the learning process. They frequently ask questions to broaden their knowledge and learn, despite any external pressure or assistance from teachers. Students who are highly intrinsically motivated are able to master new concepts and demonstrate a deeper comprehension of the material.

However, the table also shows that there are students who are less motivated or not motivated at all to study mathematics, as shown in the frequency count record. Thirty (30) or 21.1% do not want to learn mathematics on their own, 26 (18.3%) do not like doing mathematical tasks, and 24 (16.9%) do not agree that they enjoy learning this subject and that they do not like challenging tasks. Despite these results, it is good to note that only 3 (2.1%) did not agree that they felt fulfilled upon completing a mathematical task. This means that, though some of the students find this subject difficult, they still feel rewarded once they persevere in doing mathematical tasks on their own.

2.2 Students' level of learning motivation in mathematics in terms of extrinsic motivation

In the same manner as with intrinsic motivation, table 7 displays that the level of students' extrinsic motivation in learning mathematics is 51% - 75%, with a mean of 3.97 and a standard deviation of .991. This pinpoints that the students agreed that there are external factors why they study mathematics, such as their family, friends, teachers, etc. They engage in learning mathematics because they want to get something or avoid punishment. They are doing it to get external rewards, such as passing the examination, being praised by their family, teachers, and friends, and meeting their expectations.

Table 7
Students' Level of Extrinsic Motivation in Mathematics

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Indicators	Frequency					SD	Mean	D	DI
	5	4	3	2	1				
1. I study mathematics because I want to pass the examinations given by my teacher.	85	48	8	1	0	.638	4.53	SA	VM
2. I want to perform well in mathematics because I want to be praised by my family, teachers, and classmates.	65	40	31	3	3	.969	4.13	A	M
3. I study mathematics because I want to have good grades in this subject.	93	37	12	0	0	.646	4.57	SA	VM
4. I want to perform well in mathematics because I don't want to be punished by my parents for having poor grades.	59	37	26	14	6	1.172	3.91	A	M
5. I want to perform well in mathematics to meet the expectations of my family and teachers.	67	46	21	6	2	.940	4.20	SA	VM
6. I want to perform well in mathematics to be recognized in school.	33	28	45	29	7	1.187	3.36	MA	MM
7. I want to perform well in mathematics to get a reward from my family.	44	32	36	21	9	1.246	3.57	A	M
8. I like to be regarded in class as a role model in terms of my mathematics performance.	31	40	40	26	5	1.128	3.46	A	M
9. I have an ideal school/university to attend that requires good mathematics performance.	46	40	34	18	4	1.126	3.75	A	M
			Grand Mean			**.991**	**3.97**	**A**	**M**

Legend:

4.20 – 5.00	*Strongly Agree (SA)*	*Very Motivated – VM (76% - 100% motivated)*	*D*	*Description*
3.40 – 4.19	*Agree (A)*	*Motivated – M (51% - 75% motivated)*	*DI*	*Descriptive Interpretation*
2.60 – 3.39	*Moderately Agree (MA)*	*Moderately Motivated – MM (26% – 50%) motivated*		
1.80 – 2.59	*Disagree (Di)*	*Less Motivated – LM (1% - 25% motivated)*		
1.00 – 1.79	*Strongly Disagree (SD)*	*Not Motivated – NM (0% motivated)*		

The table reveals that in terms of external factors, the students mostly like to study mathematics to earn good grades (4.57) and to pass the examinations given by their teacher (4.53). Meanwhile, being recognized in school (3.36) is the least factor why students want to study mathematics. This shows that they are not after of being known in school for being good in mathematics.

In addition, the students agreed that they want to perform well in mathematics so that they will be praised by family, teachers, and classmates; to get a reward from their families instead of receiving punishment; to be a role model in the class; and to enroll in a particular university/school requiring good math performance. As mentioned by Herges et al. (2017), extrinsic motivators include things like getting high grades, impressing parents, avoiding punishment, and getting something as a reward. Their study also revealed that middle-level mathematics students were motivated by the prospect of a future job or good school. Similarly, Ergün (2012) mentioned that pupils study mathematics because they think that mastering the subject will improve their chances of getting into a better university. Further, the ability to graduate from high school has been determined to be the most powerful motivator for kids to study mathematics, followed by rewards.

In the same manner with intrinsic motivation, the table also shows that there are students who are less motivated or not motivated at all to study mathematics in terms of external factors. Thirty-six (36) or 25.4% of the students are less motivated or are not even motivated to study mathematics at all because they are not interested in being recognized in school; 31 (21.8%) are not interested in being regarded as role models in the class for having a good performance in mathematics; and 30 (21.1%) are not interested in gaining a reward from their family. Despite this result, all of the students aimed to have a good grade in this subject, and only one (1) of them is not motivated to pass the examination given by their teachers.

As a result, it can be noted that the students have the same level of motivation in terms of intrinsic and extrinsic motivation. This indicates that these categories equally contribute to the students' level of learning motivation in mathematics.

4.3 Academic performance of the students in mathematics through the use of LMS

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Table 8 illustrates the academic performance of the students in mathematics based on their report card during the first semester, A.Y 2022-2023.

Table 8

Academic Performance of the Students in Mathematics through the use of LMS

Grading Scale	Description	Frequency	Percentage
90-100	Outstanding	15	10.56
85-89	Very Satisfactory	69	48.59
80-84	Satisfactory	50	35.21
75-79	Fairly Satisfactory	5	3.52
Below 75	Did not meet expectations	3	2.11
	Total	**142**	**100.00**

**Mean grade = 85 (very satisfactory)*

Table 8 revealed that most of the students have passed the subject and only three (3) or 2.11% did not meet the expectations and earned a grade lower than 75. They were not able to comply with the requirements needed to achieve a passing mark in the mentioned subject. It also shows that of 142 respondents, the highest frequency count of 69 students (48.59%) received a very satisfactory mark; followed by 50 students (35.21%) who earned a satisfactory grade. Meanwhile, only 15 students (10.56%) earned an outstanding mark and 5 students (3.52%) have fairly satisfactory grades. As a result, with the use of LMS the students have earned a mean grade of 85, which is interpreted as very satisfactory.

In the K to 12 curriculum, to assess the academic performance of the learners, DepEd Order no. 8, s. 2015 otherwise known as Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program, is being used in the Philippines. In the aforementioned DepEd Order, the learners are assessed using the three (3) components namely written works, performance tasks, and quarterly assessment. The learners' grades are calculated based on the overall computation of the weighted raw score for each component. The minimum grade that a learner must have to pass a specific learning area is 60, which is transmuted to 75 in the report card. The lowest mark that can appear on the report card is 60 for quarterly grades and final grades (Llego, N.D).

4.4 LMS Experience as predictor of learning motivation and academic performance in mathematics

Tables 9 to 12 illustrate the results of the statistical analysis on the significant effect of the students' LMS experience on their learning motivation and academic performance in mathematics.

Table 9

ANOVA results

Model		Sum of Squares	Df	Mean Square	F	p-value
1	Regression	23.809	1	23.809	88.846	.000[b]
	Residual	37.518	140	.268		
	Total	**61.327**	**141**			

Dependent variable: Learning motivation in mathematics
Predictor: Students' LMS experience

Table 9 demonstrates that the students' LMS experience (independent variable) significantly influence the students' learning motivation in mathematics (dependent variable), since $F\ (1, 140)\ =\ 88.846, p < .05$.

Table 10

Significant effect of the students' LMS experience on their learning motivation in mathematics

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	Decision
	B	Std. Error	Beta			

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1	(Constant)	1.655	.241		6.877	.000	Reject
	LMS Experience	.575	.061	.623	9.426	.000	Ho

Dependent Variable: Students' learning motivation in mathematics (y_1)
Model: R = .623[a], R^2=.388, Std. Error = .518
Predictor: Students' LMS experience
Regression equation model: y_1=1.655+.575(LMS experience) +.518(Std. Error)

Table 10 illustrates that the students' LMS experience has a significant influence on their learning motivation in mathematics ($p = .000, < .05$), with a regression model of y_1 (learning motivation in mathematics) = 1.655 + .575 (LMS experience) + .518 (Std. error). This means that an increase in the students' LMS experience causes an increase in their learning motivation of .575. The results confirmed that with the use of a learning management system (LMS), the students' learning motivation will progress. The more that the students are satisfied with using the learning platform, the more they will be motivated to learn mathematics. For instance, Sheffield (2021) mentioned that to help students keep track of their progress and recognize a task's accomplishment, tools like checkboxes, lists of prerequisite tasks, and badges can be used. These can be utilized to engage students in doing the learning tasks and to motivate them to work more. In fact, a study conducted by Rau et al. (2019) about motivational factors in the learning process in the use of LMS proves that the motivation of students to learn when using LMS is increased, in particular, by means of verifying forms of learning such as open badges or test items.

In this case, the LMS is merely one of the variables that could increase students' motivation for learning since it is more engaging and dynamic and allows students to try out a variety of apps (O'Leary, 2002). The LMS, however, shouldn't be the sole tool utilized to improve teaching and learning. Breen et al. (2003) discovered in their study that a mixed approach is more beneficial than online teaching alone, and they advise both online and face-to-face engagement, especially for undergraduate students.

Table 11
ANOVA results

Model		Sum of Squares	Df	Mean Square	F	p-value
2	Regression	21.816	1	21.816	1.374	.243[b]
	Residual	2222.426	140	15.874		
	Total	**2244.241**	**141**			

Dependent variable: Academic Performance in Mathematics
Predictor: Students' LMS Experience

Table 11 shows that the students' LMS experience (independent variable) does not significantly influence the students' academic performance in mathematics (dependent variable), since $F\ (1, 140) = 1.374, p > .05$.

Table 12
Significant effect of the students' LMS experience on their academic performance in mathematics

Model		Unstandardized Coefficients		Standardized Coefficients	T	p-value	Decision
		B	Std. Error	Beta			
2	(Constant)	82.424	1.853		44.486	.000	Do not reject
	LMS Experience	.550	.469	.099	1.172	.243	Ho

Dependent Variable: Academic Performance in Mathematics (y_2)
Model: R = .099[a], R^2=.010, Std. Error = 3.984
Predictor: Students' LMS Experience

Table 12 indicates that the LMS experience has no significant influence on the students' academic performance ($p = .243, > .05$). This surprisingly implies that the LMS experience does not influence the students' academic performance. The researcher believed that there might be

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other factors, like the students learning motivation in mathematics, that could help explain the connection between LMS use and academic performance.

Meanwhile, the results coincide with the study of Tus et al. (2021), on the use of a Learning Management System (LMS) and its relationship to the academic performance of Filipino senior high school students. A Pearson correlation coefficient was performed on the data, which revealed that there was no relationship between LMS usage and the students' academic performance. Kim (2017) asserted that there is still much to understand about the connection between LMS and academic success, despite the fact that this relationship has been the focus of some studies over the years. Particularly, there is a lack of study on the elements that influence performance and academic achievement when utilizing LMS.

However, the results are in contrast to most of the research conducted about the impact of LMS use on students' academic performance. Cavus' (2007) study indicated that LMS can enhance students' academic performance, and Georgouli et al. (2008) suggested that LMS increases academic performance when used effectively. Also, in the study of Ahmed & Mesonovich (2019), they analyzed how well the online learning platform McGraw Hill Education's Connect affected the performance of students taking a pre-calculus course at a university in a GCC nation. After employing statistical tests to assess the data, it was found that the use of Connect had a significant impact on student grades. Similarly, the impact of undergraduate students' LMS learning behaviors on their academic performance was examined by Firat (2016). Using learning analytics, the participating students' online learning behaviors in the LMS were examined for 14 weeks. The relationship between the students' behaviors and their academic achievements was then examined, as well as their perceptions of the impact of the LMS on their academic achievement. Results revealed that almost all students agreed that LMSs only improved their academic performance if they had qualities like effectiveness, interactivity, reinforcement, beautiful design, social media support, and accessibility.

As a result, tables 9 to 12 shows that the students' LMS experience has a significant influence on their learning motivation. However, it does not predict the students' academic performance in mathematics.

4.5 Learning motivation as predictor of academic performance

Tables 13 and 14 illustrate the results of the statistical analysis on the significant effect of the students' learning motivation on their academic performance in mathematics.

Table 13
ANOVA results

Model		Sum of Squares	Df	Mean Square	F	p-value
3	Regression	78.606	1	78.606	5.082	.026[b]
	Residual	2165.635	140	15.469		
	Total	**2244.241**	**141**			

Dependent variable: Academic Performance in Mathematics (y_2)
Predictor: Learning Motivation in Mathematics

Table 13 illustrates that the students' learning motivation in mathematics (independent variable) significantly influence their academic performance in mathematics (dependent variable), since $F\,(1, 140) = 5.082, p < .05$. The learning motivation of the students served as the moderating variable between the LMS experience and the students' academic performance.

Table 14
Significant effect of the students' learning motivation in mathematics on their academic performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	Decision
	B	Std. Error	Beta			

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3	(Constant)	80.159	1.980		40.484	.000	Reject Ho
	Learning Motivation	1.132	.502	.187	2.254	.026	

Dependent Variable: Academic Performance in Mathematics (y_2)
Model: R = .187[a], R^2=.035, Std. Error = 3.933
Predictor: Learning Motivation in Mathematics
Regression equation model: y_2=80.159+1.132(learning motivation) +3.933(Std. Error)

Table 14 shows that the learning motivation of the students significantly influences their academic performance in mathematics ($p = .026, < .05$), with an equation model of y_2 (academic performance) = 80.159 + 1.132 (learning motivation) + 3.933 (Std. error). This indicates that an increase in the students' learning motivation causes an increase of 1.132 in their academic performance. The more motivated the students are to learn mathematics, the better they will perform in this subject.

Several studies have reported a positive relationship between motivation and students' learning performance. According to Potter and Johnston (2006), motivated students are more likely to excel academically due to their greater willingness to make extra efforts to ensure that their learning goals are met. As a result, if they use LMS to facilitate their learning, they would benefit more. With the use of an appropriate learning management system, simple resources can be utilized to encourage learners and incorporate learning into the class. Students with high levels of motivation who put extra effort into their own learning are those who achieve well in academics. Studies have revealed that students' own self-motivation and aspirations, which could make them feel eager to succeed in academia, make up the largest portion of what contributes to student achievement.

As a result, the learning motivation is the intervening variable between LMS experience and academic performance in mathematics. The LMS experience does not directly influence academic performance; however, it significantly influences motivation, whereas motivation significantly influences the academic performance of the students.

Table 15
Summary table on the significant effect of LMS experience on the students' learning motivation and academic performance

		p-value	Interpretation	Decision
LMS experience	Learning motivation	.000	Significant	Reject Ho1
	Academic performance	.243	Not Significant	Do not reject Ho2

Table 15 shows the summary table of the significant effect of the LMS experience on the students' learning motivation and academic performance in mathematics. It implies that the LMS experience influences the students' learning motivation in mathematics (p-value = .000, <.05) at 0.05 significance level. Meanwhile, the students' LMS experience do not directly predict their academic performance in mathematics (p-value =.243, > .05) at 0.05 significance level.

4.6 Challenges encountered by the students in using LMS

Tables 16 to 19 show the challenges encountered by the students in using LMS. These results are also based on their LMS experience, in which, out of the 142 students, only the ones who disagreed and strongly disagreed were presented, as this shows the disadvantages of the platform. Despite the fact that the students are satisfied with their LMS experience, the challenges encountered by some of the users were also looked into.

6.1 Challenges encountered by the students in terms of system navigation

Table 16 reveals that the main problem encountered by the students in navigating the system is with the tools used in browsing. Twenty-seven (19.01%) and twenty-six (18.31%) students said they have difficulty accessing it through mobile phones and tablets. Additionally, sixteen students (16) or 11.27% also encountered issues utilizing the system to submit their

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homework or other learning tasks. Meanwhile, the least concern that the students encounter is browsing the platform using a PC or laptop.

Table 16
Challenges encountered by the students in system navigation

Indicators	D		SD		Total		Rank
	f	%	f	%	f	%	
1. I can browse the LMS using a PC or laptop.	7	4.93	1	0.70	8	5.63	6
2. I can browse the LMS using a mobile phone.	18	12.68	8	5.63	26	18.31	2
3. I can browse the LMS using a tablet.	18	12.68	9	6.34	27	19.01	1
4. I know the functions of the icons used in the LMS.	13	9.15	2	1.41	15	10.56	4
5. I can find the homework posted by the teachers in LMS.	7	4.93	3	2.11	10	7.04	5
6. I can find the additional learning materials (PPTs, reading materials, and video presentations) posted by the teachers in the LMS.	3	2.11	4	2.82	7	4.93	7
7. I can find where the e-books and e-lessons are stored for each subject.	6	4.23	0	0.00	6	4.23	8
8. I can utilize the LMS for submitting my homework.	15	10.56	1	0.70	16	11.27	3

**142 respondents*
***Legend**: D – Disagree SD – Strongly disagree*

In line with the findings, device storage and screen display may be included as factors explaining why the main concern that the students encounter is browsing the platform through tablets or mobile phones. These devices have smaller data storage in comparison to a PC or laptop, which is why navigating the system sometimes results in a longer response time. Additionally, tablets and mobile phones also have a smaller screen display, unlike laptops. It can portray the system's dashboard, but the students need to zoom in and out from time to time while navigating the platform. On the other hand, in terms of utilizing the system to submit their homework or other learning tasks, unstable internet connectivity hinders them from uploading their activities; hence, they use other platforms, such as Facebook or Messenger, to submit their homework.

According to Cabrera (2021), the Philippines, without being secretive about experiencing poor internet connectivity, ranked 107th out of 176 nations for fixed broadband speed and 111th out of 139 for mobile broadband speed in Ookla's October 2020 Speedtest Global Index, a ranking of mobile and fixed broadband speeds from all over the world. In fact, in the study of Alenezi (2018), some of the challenges found in using LMS were the poor internet connectivity of the students which was supported by Zain et al. (2018), as they also emphasized that a reliable internet connection is required for LMS to operate properly. The common difficulty that professors and students encounter is unstable internet connections, particularly during submissions and online assessments. Hence, they concluded that it should be suggested to the university to connect to a high-bandwidth network that can offer an affordable, high-capacity internet service.

6.2 Challenges encountered by the students in terms of using the course contents

Table 17 shows that the primary challenge that the students encountered was their offline access to the e-books through an application installed either on their laptop or mobile phone, as 38 (26.76%) students have stated. Additionally, there are 10 (7.04%) students who encountered difficulty browsing the course contents for advanced reading. Meanwhile, the least concern encountered by only two (2) students is the alignment of the course content with the teacher's lesson presentations that are based on the K–12 curriculum guide.

Table 17
Challenges encountered by the students in using the course contents

Indicators	D		SD		Total		Rank
	F	%	f	%	f	%	
1. In using the course content, I am guided by the learning objectives stated in each topic.	5	3.52	0	0.00	5	3.52	5

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2. I find that the topic presentations in the course content are aligned with the lessons presented by my teachers.	2	1.41	0	0.00	2	1.41	6
3. I find the images used in the course content helpful to understand the topics I am studying.	7	4.93	1	0.70	8	5.63	3
4. I find the video discussions in the E-lessons helpful to understand the topics I am studying.	7	4.93	0	0.00	7	4.93	4
5. I can browse the course contents anytime for advanced reading.	6	4.23	4	2.82	10	7.04	2
6. I have offline access to the E-books through an application installed either in my laptop or mobile phone.	22	15.49	16	11.27	38	26.76	1

**142 respondents*
***Legend**: D – Disagree SD – Strongly disagree*

Parallel to the results, the reason why students encountered issues accessing the platform offline may be attributed to the fact that some students do not have personal laptops, which is why they tend to use their mobile phones when installing the LMS application. But when there is insufficient storage for the application and the e-books that need to be downloaded, students opt to access them online. Moreover, in browsing the course contents anytime for advanced reading, unstable internet connectivity limits the students from doing this activity because there are areas in the province that have specific times when the internet connection is fast, such as at night or at dawn.

6.3 Challenges encountered by the students in terms of knowledge acquisition

Table 18 implies that the foremost concern faced by the students when learning through the LMS is the learning environment, as stated by nineteen (19) students, or 13.38% of the respondents. On the other hand, eighteen (18) students, or 12.68%, revealed that they are having difficulty learning the materials on their own. Meanwhile, the least concern encountered by the students is being involved in the learning task and receiving feedback for the learning activities they do.

Table 18
Challenges encountered by the students in using LMS for knowledge acquisition

Indicators	D		SD		Total		Rank
	f	%	f	%	f	%	
1. I can learn using the LMS as I am involved in performing the provided engaging learning tasks.	8	5.63	1	0.70	9	6.34	4.5
2. I can learn using the LMS since there is immediate feedback on the learning activities in the e-lessons.	9	6.34	0	0.00	9	6.34	4.5
3. I can learn through an LMS as it provides a learning environment that doesn't require a physical presence in the classroom.	12	8.45	7	4.93	19	13.38	1
4. I find that this LMS is a good educational portal that improves critical thinking skills.	12	8.45	3	2.11	15	10.56	3
5. I can learn by myself using the course contents in the LMS.	13	9.15	5	3.52	18	12.68	2

**142 respondents*
***Legend**: D – Disagree SD – Strongly disagree*

In light of the findings on why the students encounter difficulty with the online learning environment, there are students who struggle to study when not in the physical classroom setup. This indicates how the students' learning space plays a part in their learning process. Certainly, a conducive learning environment will enable the students to learn better. Further, for students having difficulty learning independently, though there are video discussions provided, those are not sufficient for them to understand the contents on their own. When the correct answers are provided for the activities they do, they struggle to figure out how those were obtained. This is where the teacher's assistance comes into play. The students' learning must not solely come from the materials but also from the teacher's discussion.

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6.4 Challenges encountered by the students in terms of checking the report generation

Table 19 shows that thirteen (13), or 6.34% of the students encounter the primary concern of checking their performance in the report generation component for the e-lessons they browse. There are eleven (11) students, or 13.38% of the respondents, who also encounter issues in checking which part of the lesson they are having difficulty with.

Table 19

Challenges encountered by the students in checking the report generation

Indicators	D		SD		Total		Rank
	f	%	f	%	F	%	
1. I can see my progress report for the e-lessons I am browsing.	12	5.63	1	0.70	13	6.34	1
2. I can see my actual score for the homework checked by the teachers once it is returned.	9	6.34	1	0.00	10	6.34	3
3. I can check in which part of the lesson I am having difficulty.	10	8.45	1	4.93	11	13.38	2
4. I can check if I have submitted all my homework.	7	8.45	1	2.11	8	10.56	4

**142 respondents*

***Legend**: D – Disagree SD – Strongly disagree*

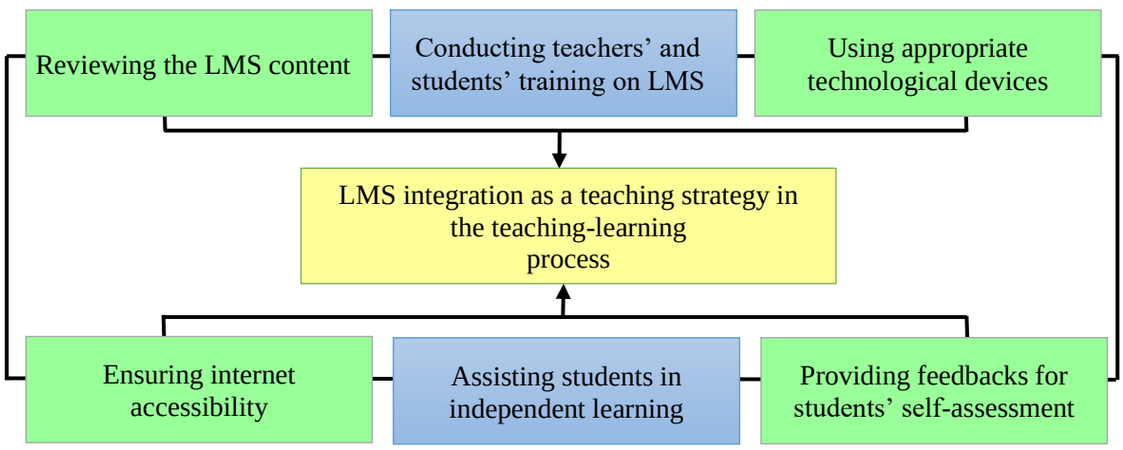
Based on the results, when the students cannot check their progress report for the e-lesson they are browsing, it indicates that they did not answer the specified learning tasks for the particular topic they are browsing. The lesson report at the end of the topic will show zero percent (0%) for the activities that were not answered, which is supposed to display the percentage of correct answers that they obtain in the activities they perform. Hence, they will not be able to check which part of the lesson they are having difficulty with, which is the second concern that they encounter when using LMS. Those mistakes they identified in the lesson report could be good points to raise in class for further clarification and discussion.

4.7 Proposed LMS Integration Framework

Figure 1 illustrates the framework for the output of this study. The main output is LMS integration as a teaching strategy in the teaching-learning process as it was found to be effective in motivating students to learn, which in turn influences the students' academic performance.

Figure 1

Framework for the output of the study



Implementing the use of LMS would benefit schools as they aim for quality education through the technological integration and innovation required by the demands of Education 4.0. These demands, including creativity, complex problem-solving, critical thinking, cognitive flexibility, and collaboration, make up the new face of our educational system. To continuously sustain and

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achieve these demands, institutions can further support and strengthen personalized learning and remote learning opportunities for students. A more individualized approach to instruction will help students easily achieve their objectives since the cornerstone of Education 4.0 is making learning accessible everywhere, at any time, with a suite of e-learning tools that support remote and self-paced learning.

As shown in figure 1, there are components that may be considered to integrate LMS as a teaching strategy that were also anchored on the findings of this study. First, the institution may review the LMS content for its suitability for the required competencies needed by the students and whether it would be helpful in assisting the students in learning. Second, teachers' and students' training on using the LMS is crucial, as it would capacitate them to utilize the platform properly. Teachers would be able to use it effectively if they were well-versed in browsing and manipulating it. This gives teachers the opportunity to gather a variety of resources on a subject to help students comprehend the context in the way that suits them best. Students, in the same manner, would be able to utilize it well if they were skilled in navigating and using it. Third, the use of appropriate technological tools must also be considered. Cellular phones are the most common devices that students have nowadays. It is a necessity for studying in this modern era. Likewise, laptops are also important, as they are best suited for navigating learning management systems due to their screen display and storage. Fourth, like using appropriate devices, ensuring internet access is also needed. Learning management systems can be accessed online; hence, the need for internet access is vital. Since this concern is not only a problem here in the province but also in other places in the country, every user may look into ways to be able to have good internet access. Fifth, since learning management systems can be accessed by any student, they should be utilized to encourage independent learning. The flexibility of the learning environment allows the learners to not only select their own learning paths but also attend course sessions at times that work best for them and progress through the learning materials at their own pace. That's why it is very important that the content be reviewed to fit the required competencies for the students. Also, teachers still need to guide the students to be engaged in studying on their own to have meaningful learning experience. Lastly, providing feedback to the students must also be recognized. One of the features of an LMS is the ability to provide feedback on the learning activities given to students. In the same manner, the activities given by the teachers through the platform must also have appropriate feedback so that students can assess their performance. Teachers may focus more on project-based learning and craft easy yet accurate assessments. With the advent of Education 4.0, assessment methods have become more useful. Students are evaluated on their projects, coursework, and fieldwork in both online and offline settings, and the project-driven technique that Education 4.0 promotes aids in students' enjoyable and engaging learning.

As a conclusion, LMS integration as a teaching strategy would allow teachers to focus more on content delivery than content preparation. Additionally, as students engage with the system to enrich their learning experiences, it will help them enhance their enthusiasm to learn, which may result in better performance. Their goal should be anchored more on collaboration and emotional intelligence to better achieve the competencies in this kind of setup. With the advancements and devices, they can mentally sync and collaborate anywhere, even without the need to contact physically. Further, among the components of this proposed framework, conducting teachers' and students' training as well as promoting independent learning were given emphasis in integrating LMS as a teaching strategy.

Conclusion

The students are satisfied (51%-75% satisfied) with their LMS experience, as they agreed that they can navigate the system, access the course contents, acquire knowledge through the use of the LMS, and check their performance report. As technological advancements are continuously needed in the educational system to adapt to the demands of 21st century education, it is a good practice for schools to have a learning platform that will cater to the technological advancements in the class while also addressing the demands of 21st century education. However, drawbacks are inevitable due to some factors, which is why students still encountered challenges while using the

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platform. These challenges will serve as the basis for choosing the LMS to use. Despite the encountered challenges, students' LMS experiences are concluded to have a significant influence on their learning motivation in mathematics but not directly influence their academic performance. In this case, the students' learning motivation in mathematics was used as the moderating variable between the LMS experience and the students' academic performance, as learning motivation significantly influences the academic performance of the students. Moreover, they are both intrinsically and extrinsically motivated to learn mathematics. Hence, they earned a very satisfactory grade in mathematics with the use of the LMS.

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