Insights on the Implementation of Learning Management System in Mathematics Class

Fabiana P. Peneda[a], Majean R. Placigo[b], Richelle R. Esporas[c], Thea A. Ticoy[d]*

[a] *fabiana.peneda@lnu.edu.ph*
[a]College of Education, Leyte Normal University, Tacloban City, Leyte, 6500, Philippines
[b]majean.placigo@lnu.edu.ph
[b]College of Education, Leyte Normal University, Tacloban City, Leyte, 6500, Philippines
[c]richelle.esporas@lnu.edu.ph
[c]College of Education, Leyte Normal University, Tacloban City, Leyte, 6500, Philippines
[d]thea.ticoy@lnu.edu.ph
[d]College of Education, Leyte Normal University, Tacloban City, Leyte, 6500, Philippines

Abstract

Learning Management Systems (LMS) are becoming increasingly important in today's educational system. The study aimed to determine students' insights and the advantages and disadvantages of using a learning management system in mathematics class. The participants in the study were ten (10) students who were carefully chosen for the study. Vygotsky's sociocultural and e-learning theories were the foundation for this study. A single descriptive case study design was utilized in this study, and thematic (Braun & Clarke, 2006) data analysis was used to analyze the data acquired through a semi-structured questionnaire in a google form and a virtual focus-group conversation. The results demonstrated the following insights: feasible learning tools, adequate learning resources, and a depository of learning. The antecedent of knowledge and self-driven growth are advantages of using a learning management system in a mathematics class, then the disadvantages include unpredictable learning occurrences and internet service disruption. The findings of this study enable the academic community to develop additional online techniques and materials that can enhance learning outcomes and engage students even during a pandemic.

Keywords: Advantages; disadvantages; insights; learning management system; mathematics; thematic analysis

1. Introduction

Learning management systems (LMS) is already well-known in first-world countries as a viable alternative to face-to-face classroom instruction (Garbers, 2018). Since the pandemic outbreak, the importance of this learning tool has increased. It allows teachers and learners to continue learning without physical presence inside a classroom. This tool also allows knowledge to continue to aspire between teachers and learners. However, the use of a learning management system in the Philippines is still relatively new, so there is a need to consider the insights, advantages, and disadvantages of this learning tool, especially in mathematics classes.

Other nations, remarkably the Philippines, witnessed a sudden shift from face-to-face interactions to module and online delivery methods (Baticulon et al., 2021). Many schools that wish to reach students despite the Covid-19 pandemic utilize online learning modalities administered by a learning management system. All subject areas use a learning management system, with mathematics being the most prevalent. Mathematics is one of the essential subjects in elementary school, and special attention must be paid to it because students

must acquire the skills necessary for lifelong learning. This research is necessary because the city of Tacloban has conducted few studies on the effect of learning management systems on acquiring knowledge, particularly in mathematics.

Since the pandemic outbreak, private and public schools in Tacloban City have been required to adopt new educational pedagogies and approaches. When communicating with students, the learning management system has become indispensable. This learning management system aids school administrators, especially teachers, in delivering lessons to pupils without endangering their health. A learning management system enables pupils to retain and comprehend mathematics lessons without their teachers. In addition, this study centered on insights regarding implementing a learning management system in mathematics classrooms, which serves as a line for transmitting mathematical concepts and knowledge between pupils and widely distant teachers during the pandemic.

The sudden shift in learning which uses a learning management system gives a dilemma in the education system of the Philippines. As a result, mathematics concepts being taught through a learning management system, many students are confronted with obstacles that add to the difficulty of their schoolwork. In addition, the students need assistance grasping fundamental mathematics skills because the concept was introduced with a time limit in the learning management system. If this scenario continues, it will have a cumulative effect for the coming years. Due to this pre-existing condition, a study was conducted to determine how to resolve the issue using a learning management system in mathematics class.

2. Theoretical Framework

This research is founded primarily on the following theories:

Lev Vygotsky's sociocultural theory defines how people helped form their ideas and understandings through community-provided learning resources (McLeod, 2014). This theory is relevant to the study because it enables students to learn with the available learning resources, such as using a learning management system. Tomasello et al. (1993) agreed that it provides students with a means to acquire the knowledge the education sector provides, particularly in mathematics.

E-learning theory refers to the study of how media and digital technology can be used and associated with electronic learning tools to facilitate the transfer of knowledge (Kumar Basak et al., 2018). This theory is pertinent to the study because it supports using a learning management system in mathematics classes, encouraging students to expand their prior knowledge and exercise creativity in constructing their understanding of new concepts. According to Janelli (2018), e-learning theory allows students to comprehend learning delivered by teachers through the internet, specifically the learning management system in mathematics class.

3. Research Questions

This study aimed to determine students' insights, advantages, and disadvantages of using a learning management system in mathematics class. It identified to answer the following research questions:

1. What are the students' insights into the learning management system in mathematics class?
2. What are the advantages of using a learning management system in mathematics class?
3. What are the disadvantages of using a learning management system in mathematics class?

4. Review of Literature

Learning Management Systems (LMS) is a popular e-learning tool for enhancing the educational process and developing students' subject-area knowledge and skills (Kasim & Khalid, 2016). Also, platforms

for learning management systems typically consist of integrated tools that allow for the online delivery of instructional content, interaction and collaboration, and tracking and reporting student participation (Rhode et al., 2017). This online tool helps teachers and students continue their education without a traditional classroom setting.

Some countries, such as the United States, the United Kingdom, Australia, and Saudi Arabia, are currently using various learning management systems for their academic endeavors (Aldiab et al., 2019). According to the findings of a study conducted by Adzharuddin and Ling (2013), students attending schools in Malaysia used the learning management system for activities related to their classes. Despite this, there is still a sizeable population, particularly among students in the Philippines, that still needs to prepare to embrace the technological change occurring in the education field (Garcia, 2017). Therefore, as a result, the study can investigate the impact of the learning management system on the student's mathematical performance.

A learning management system allows for more accurate tracking of academic achievement across the board, particularly in mathematics. According to Ngafeeson and Gautam (2021), using a learning management system is one of the most critical factors contributing to pupils' academic achievement in mathematics during the pandemic. Ojada-Castro et al. (2017) agreed that using an e-learning tool is associated with significantly improved academic performance in mathematics. Asabere et al. (2021) came to the same conclusion as the other researchers and stated that a learning management system is an e-learning tool that students may use to share ideas and learn mathematics paperwork and assignments. On the contrary, Saygili and Cetin (2021) conducted a study, and their findings showed that the use of a learning management system has a minor influence on the academic performance of students in mathematics. Therefore, Shaame (2020) proposed incorporating some mathematical skills and tricks into the learning management system as an innovative solution to some of the challenges in both the teaching and the process of learning mathematics.

Lakarcha et al. (2020) stressed the importance of addressing the challenges that can arise while utilizing a learning management system to acquire mathematical knowledge. Therefore, it is essential to investigate the students' insights on the learning management system utilized in mathematics class. Al-Mamary (2022) concurred that students need to be aware of the significance of learning management systems in their academics, as this can lead to more motivated students. Even in a catastrophe, the goal of student motivation and learning management should be to improve students' learning capacity and aptitude, particularly in mathematics. (Nadeem et al., 2022).

Students' insights about learning management systems in mathematics class include it as a feasible learning tool. A learning management system is a feasible learning tool because it links the teaching and learning processes in mathematics. According to Ristovska et al. (2021), learning management is a digital system that aids in the occurrence of knowledge concepts. In addition, Juhanak et al. (2019) stated that it is also where activities take place, and learning takes place without students having physical contact with their teachers. A learning management system makes learning more convenient for students and motivates them to learn at their own pace.

The learning management system also provides adequate learning resources and a depository of learning. According to research conducted by Mehrolia et al. (2022), a learning management system is an archive for complete copies of lessons that can improve students' academic outcomes. In addition, Esawe et al. (2022) noted that well-organized storage of learning materials in the LMS aids in knowledge retention. Documents such as online discussions, course materials, and video recordings of lectures can all be found in an LMS. Fortunately, students can review these resources as often as they need to in order to fully internalize the information presented there.

This research divides the advantages of learning management systems into two categories: the antecedent of knowledge and self-drive growth. The antecedent of knowledge presupposes learning

management systems, which enable students to learn in a group setting or at their own pace. Also, Sayfouri's (2016) research found that LMSs contribute to stock knowledge because they provide students with more practical, relevant examples from the curriculum and a wider variety of interactive exercises to complete. According to Noreen (2020), knowledge occurs through a learning management system because of the availability of up-to-date and helpful learning materials that improve both procedural and conceptual understanding in mathematics. Connectedly, it stimulates a more interactive classroom environment (Endozo et al., 2019) and helps to stimulate students' interest in learning (Habeeb, 2019).

A learning management system provides self-driven growth by assisting students in school in achieving their academic potential in mathematics. According to research by Kant et al. (2021), students who engage in self-driven growth are better able to make informed choices about allocating their time between classwork and other responsibilities. Students' ability to make their own decisions is a critical component of self-driven growth since it promotes their initiative in completing their math assignments in the LMS (Lyashenko & Malinina, 2015). Since lessons and activities are published in the LMS, it is one of the obligations of the students to follow up and check their lessons every day (Muhardi et al., 2020). Thus, self-driven growth affects this kind of activity, and students must continue to take responsibility for their development to use a learning management system productively and creatively in mathematics (Yunus, 2021).

Unpredictable learning occurrences and internet service disruptions are two examples of the learning management system's disadvantages frequently highlighted in the research. Problems with the learning management system (LMS) stemming from a lack of familiarity with the content posted here are examples of unpredictable learning occurrences in education. It has also found out from the study by Al-Handali (2020) emphasized that students will lose motivation to learn if they lack the technical proficiency required to effectively use the learning management system in completing assigned activities. In addition, a lack of encouragement in navigating the lessons in the learning management system, as stated by Tawalbeh (2018), contributes to the failure of academic success. Given the nature of the situation, students are likely to run into several difficulties that will cause them to withdraw and replace their efforts with an abundance of excuses. They fail to complete or learn from lessons provided in the learning management system because of a lack of self-discipline triggered by unpredictable learning or caused by technological incompetence (Ülker & Yilmaz, 2016). Asamoah (2020) added that the management system must be adept at handling administrative tasks for students to succeed in school.

The academe implemented a learning management system as a prerequisite for utilizing the internet as a gateway for academic achievement. Nowadays, internet access is essential to school success, particularly during the pandemic. Al Rawashdeh et al. (2021) claimed that there is an effect on students' knowledge, such as learners' frustrations becoming apparent when they cannot access the materials they need to learn due to a frustrating internet connection (David, 2013). The student's enthusiasm dropped whenever an internet service was disrupted, especially during online classes (Hussein, 2011). Additionally, some of the learning management system's disadvantages result from internet service disruptions, causing a negative influence on the performance level in mathematics (Snoussi, 2019).

The learning management system determines student academic success and failure during a pandemic. This study considers students' insights and the advantages and disadvantages of implementing a learning management system in math class, allowing the education sector to be informed and take the necessary steps in addressing some of the disadvantages of learning. In Bhagat and Spector's (2017) study, students' insights that a learning management system is a feasible learning tool, contains adequate learning resources, and serves as a depository of learning contributes to their academic interest and motivation in learning. Opoku et al. (2021) noted that knowing the advantages, like knowledge antecedent and self-driven growth, and disadvantages, like unpredictable learning occurrences and internet service disruption, would contribute to the study, and school administrators could act immediately on the following results.

Furthermore, learning management systems help students track their mathematics progress despite a pandemic.

5. Methodology

Research Design

A single descriptive case study design was used to investigate students' insights as well as the advantages and disadvantages of the implementation of a learning management system in a mathematics class. According to the research that was conducted by Omair (2015), a descriptive single case study is a design that describes the fundamental characteristics of the common sample that was used in the study. Furthermore, the researchers were also interested in the advantages and disadvantages of implementing a learning management system in a mathematics class.

Research Locale

The investigation was carried out at a laboratory school in Tacloban City, Leyte, Philippines. Students at this school had access to qualified teachers who supported their growth academically and morally. Because of this, the students can develop into productive and competitive components of the school community and the larger society.

Research Participants

A total of ten (10) research participants were chosen and enrolled in a laboratory school in the city of Tacloban for the academic year 2021-2022. They were chosen through a process known as purposive sampling because they satisfied the selection criteria set forth by the researchers, which included being in the same class and grade as the other participants.

Research Instrument and Data Collection

The survey questionnaire was administered by means of a Google form, which, prior to its utilization in the research project, had been subjected to scrutiny and validation by the pertinent field experts. In the survey, students were questioned about their insights on the implementation of a learning management system in a mathematics classroom, as well as their experiences with such systems, the advantages and disadvantages of using such systems, and how they would feel about using one. In addition to that, researchers utilized online focus group discussions with the students who took part in the study. The questionnaire is the instrument that is most suited for the study because it makes it simpler for the researchers to collect the information that they require.

Data Gathering Procedure

The information was gathered from the participants employing a Google Meet session that included survey questionnaires in the form of Google forms as well as a discussion in a focus group setting. The results of the online survey, which asked participants about their insights, and the advantages, and disadvantages of utilizing a learning management system in mathematics class, were analyzed after the survey was completed online. A form requesting the participant's parent's informed consent was given to the participant's parents before the responses from the participants were collected. The parents of the participants and those who took part in the study were informed that the interview would be recorded as part of the process of gathering data. In addition, the researchers also obtained permission from the participants to observe them while they are utilizing the learning management system during the mathematics class which helped the researchers ensure that the study is valid. The findings were kept under wraps, and the transcribed data was given back to the

parents and participants so that they could verify the validity of the findings based on their responses to the Google form and the discussion that took place in the focus group. The investigation of each topic in the study was built upon the participants' unique points of view, which served as the study's foundation.

Data Analysis

The study used thematic data analysis, outlined by Braun and Clarke (2013), and consisted of the following steps, which were applied to the data gathered during the research study. This allowed for a more in-depth examination of the topic at hand. In the process of conducting research, the following steps were followed: a.) one must transcribe the data, b.) read the data in order to become familiar with it, c.) code the data, d.) look for themes, e.) review themes, f.) define and name themes, and g.) finally come to a conclusion regarding the analysis.

6. Results and Discussion

A descriptive single case study was utilized for the purpose of gathering the necessary data for this investigation. According to Crowe et al. (2011), a descriptive single case study offers a comprehensive and multi-faceted understanding of a particular issue that is shared by a specific group of individuals. The researchers developed the majority of the themes by using the method of thematic analysis, and they did so based on the responses given by the students during the online interview. This analysis made it possible to categorize the insights of the students in accordance with their level of comprehension regarding the implementation of the learning management system to the students' studies in mathematics during a pandemic.

In addition, the responses of the participants were separated into two categories: the advantages, which focused on how the learning management system assisted the students in acquiring knowledge during the pandemic; and the disadvantages, which focused on how the learning management system added to the difficulties that the students experienced during the pandemic. The answers that were given by the participants made it possible to recognize a significant number of recurrent themes. The following concepts have been singled out as being of utmost significance.

1. Students' insights into the learning management system in mathematics class

Theme 1: Feasible Learning Tool

Using a learning management system, particularly in online mathematics classes, is highly beneficial because it allows all student and teacher outputs, quizzes, and activities to be stored in a single location (Poon et al., 2017). As a result, students can navigate their lessons whenever they have free time, and teachers can direct students to the information they need to know to participate in the discussion.

Significant response 1: *"It is much better than the hard copy modules. Quizzes and Assignments are much easier to access and accomplish".*
Significant response 2: *"It is very easy to use".*
Significant response 3: *"It's easy to use and easy to understand".*
Significant response 4: *"It's very helpful, especially in submitting or answering quizzes / performance tasks in math".*
Significant response 5: *"For me, I think that the LMS in math class is very enjoyable and fun".*
Significant response 6: *"It is eye-catching and colorful".*

Theme 2: Adequate learning resources

The students in the mathematics class have the insight that the learning management system is unlimited storage with all the necessary information for their studies. This is supported by the responses that they have provided. In addition, Wintherhagen et al. (2022), the learning management system enables them to study on their own and maintain the level of organization necessary to accomplish the goals they have established for themselves while they are in the process of learning.

Significant response 1: "An organized system that helps the children continue their studies in this time of pandemic".
Significant response 2: "The LMS is really smart and it helps the students learn".
Significant response 3: "The learning management system really helps us in these times and is very useful to those students who attend online classes".

Theme 3: Depository of Learning

Students in mathematics class believe that the learning management system is a repository for knowledge and information (Bakar et al., 2017) that allows them to complete school assignments in their spare time. They could also use the system to ensure they got all vital information, even if they did not attend an online class.

Significant response 1: "It's good that they can put the recording session because some can have bad WIFI and can't attend the meeting".
Significant response 2: "It's a good system on how we can answer our quizzes and submit our homework".

2. Advantages of using a learning management system in mathematics class

Theme 1: Antecedent of knowledge

Using a learning management system in math class has many advantages, including that everything is compiled on display for everyone to see (Dong et al., 2020). This and other schoolwork can be done on the student's own time.

Significant response 1: "The PowerPoints posted and videos are helpful in learning".
Significant response 2: "It gives us access and challenges in answering math activities".
Significant response 3: "By putting the quizzes there and PowerPoints".

Theme 2: Self-driven growth

With the aid of a learning management system, students can learn to take the initiative and responsibility for completing all of their schoolwork (Fatima & Sutton, 2013), especially in the area of mathematics. With the help of teachers, parents, and other family members and friends, students can review and study course material at their own pace and convenience.

Significant response 1: "I gain more confidence in solving problems".
Significant response 2: "It gives us access and challenges in answering math activities".
Significant response 3: "It helps me to answer the quizzes and reminds me if I have any lacking".

3. Disadvantages of using a learning management system in mathematics class

Theme 1: Unpredictable learning occurrence

Students have reported that the learning management system's performance can be inconsistent throughout the day (Garcia et al., 2021), yet another drawback of using the software. There is no way to anticipate whether or not there will be any problems, and this is especially true for individuals unfamiliar with the methods for manipulating this new trend in materials manipulation.

Significant response 1: *"The one problem I encountered is I cannot open again the quiz even if I did not answer it yet".*

Significant response 2: *"Record of quizzes, assignments, and performance tasks get deleted from my account randomly".*

Significant response 3: *"I have encountered the LMS almost getting rid of my process in answering some quizzes and tests, not letting me submit or finish quizzes, and taking a bit too long to load up the next part of a test or quiz".*

Theme 2: Internet Service Disruption

These days, having access to the Internet is essential for learning because it serves as a source of education for both students and teachers, particularly in the form of information and idea sharing between the two groups. Unfortunately, a disruption in internet service can be detrimental to all students (Selwyn, 2016). However, it is especially detrimental to those students who are enrolled in mathematics classes because it causes them anxiety and prevents them from accessing their schoolwork or studying in advance for their lessons.

Significant response: *"I encounter the hardest part in solving because other problems are hard when there is a low signal of an internet connection".*

Significant response: *"I have encountered the LMS almost getting rid of my process in answering some quizzes and tests, not letting me submit or finish quizzes, and taking a bit too long to load up the next part of a test or quiz. These may be due to my WIFI but those were the problems I've encountered".*

The purpose of this study was to determine the insights, benefits, and drawbacks of implementing a learning management system in a mathematics class during the pandemic. According to the findings, during a pandemic, the learning management system assists students in learning as a feasible tool, adequate learning resources, and a depository of learning, particularly in mathematics. As a result, students can use the learning management system as a source of information and motivation to complete schoolwork even when a teacher is not present. Furthermore, the benefits of the learning management system, such as the antecedent of knowledge and self-driven growth, allow students to be independent in performing their school tasks effectively and efficiently while the pandemic is in effect. However, unpredictable learning occurrences and internet service disruption are the disadvantages of the learning management system that make it difficult for students to accomplish and submit school activities and other performance tasks on time in mathematics.

In addition, the findings suggest the necessity for a learning management system in the delivery of learning, particularly in the context of a worldwide pandemic. It is essential to have a tool in place that is designed to minimize potential health hazards in order to ensure that students and teachers can continue to learn even if they are not physically present in a school setting. In addition, the results demonstrate that the LMS is valuable and beneficial for students to pass all of the requirements that are necessary to finish their tasks in mathematics. Since the current investigation focuses solely on the insights of students as well as the advantages and disadvantages associated with the use of the learning management system in mathematics

classrooms, additional research might be necessary to establish whether or not teachers are effective in their implementation of the learning management system.

7. Conclusion

It has been demonstrated that a learning management system is one of the tools for learning in mathematics classes during the pandemic. The learning management system allows students to continue the learning process even without the presence of a teacher. It also allows them to have initiative and be resourceful to develop mathematics skills. Since some strengths are seen in implementing the learning management system, teachers may continue to expand the use of LMS even during the limited or expanded face-to-face classes. Therefore, it is to ensure that teaching and learning should continue even if a catastrophe occurs. However, the learning management system also has some disadvantages, particularly internet disruptions, which can cause a decrease in their performance in mathematics because they cannot attend their online class due to poor internet connection.

Moreover, school administrators, teachers, and parents may find a way to provide good internet connectivity during synchronous and asynchronous classes for continuity of learning despite a global disease outbreak. Lastly, to achieve more in-depth research about other issues regarding the use of LMS in other subject areas.

References

Adzharuddin, N. A., & Ling, L. H. (2013). Learning management system (LMS) among university students: Does it work. International Journal of e-Education, e-Business, e-Management and e-Learning, 3(3), 248-252.

Aldiab, A., Chowdhury, H., Kootsookos, A., Alam, F., & Allhibi, H. (2019). Utilization of Learning Management Systems (LMSs) in higher education system: A case review for Saudi Arabia. Energy Procedia, 160, 731-737.

Al-Handhali, B. A., Al-Rasbi, A. T., & Sherimon, P. C. (2020). Advantages and disadvantages of earning Management System (LMS) at AOU Oman. International Journal of Technology, 1(2), 222-228.

Al-Mamary, Y. H. S. (2022). Why do students adopt and use learning management systems? Insights from Saudi Arabia. International Journal of Information Management Data Insights, 2(2), 100088.

Asamoah, M. K. (2020). Reflections and refractions on Sakai/Moodle learning management system in developing countries: A case of Ghanaian universities' demand and supply perspective analyses. African Journal of Science, Technology, Innovation and Development, 12(2), 243-259.

Asabere, N. Y., Agyiri, J., Tenkorang, R., & Darkwah, A. (2021). Learning Management System (LMS) Development for Higher Technical Education in Ghana. International Journal of Virtual and Personal Learning Environments (IJVPLE), 11(2), 87-109.

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., ... & Reyes, J. C. B. (2021). Barriers to online learning in the time of COVID-19: A national survey of medical students in the Philippines. Medical science educator, 31(2), 615-626.

Bakar, M. S. A., Jalil, D., & Udin, Z. M. (2017). Knowledge repository: Implementing learning management system into corporate environment. Journal of Telecommunication, Electronic and Computer Engineering (JTEC), 9(2-12), 141-145.

Bhagat, K. K., & Spector, J. M. (2017). Formative assessment in complex problem-solving domains: The emerging role of assessment technologies. Journal of Educational Technology & Society, 20(4), 312-317.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.

Crowe S, Cresswell K, Robertson A, Huby G, Avery A, Sheikh A. The case study approach. BMC Med Res Methodol. 2011 Jun 27;11:100. doi: 10.1186/1471-2288-11-100. PMID: 21707982; PMCID: PMC3141799.

David, S. A. (2013). A critical understanding of learning management system. Education India Journal: A Quarterly Refereed Journal of Dialogues on Education, 2(4), 4-12.

Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. The Lancet infectious diseases, 20(5), 533-534.

Endozo, A. N., Oluyinka, S., & Daenos, R. G. (2019, October). Teachers' experiences towards usage of Learning Management System: CANVAS. In Proceedings of the 2019 11th International Conference on Education Technology and Computers (pp. 91-95).

Esawe, A. T., Esawe, K. T., & Esawe, N. T. (2022). Acceptance of the learning management system in the time of COVID-19 pandemic: An application and extension of the unified theory of acceptance and use of technology model. E-Learning and Digital Media, 20427530221107788.

Fathema, N., & Sutton, K. L. (2013). Factors influencing faculty members' Learning Management Systems adoption behavior: An analysis using the Technology Acceptance Model. International Journal of Trends in Economics Management & Technology (IJTEMT), 2(6), 20-28.

Garbers, R. (2018). An e-learning instructional design framework for mobile devices in Africa (Doctoral dissertation).

Garcia, M. B. (2017). E-learning technology adoption in the Philippines: an investigation of factors affecting filipino college students' acceptance of learning management systems. The International Journal of E-Learning and Educational Technologies in the Digital Media.

Garcia, R. E., Abaratigue, A. M., & Alcantara, N. V. (2021). Integration of Learning Management System as an Aid in Teaching: An Assessment. European Journal of Educational Research, 10(4), 1907-1918.

Habeeb, K. T. (2019). E-learning platform/learning management system in education. International Journal of Reflective Research in Social Sciences, 2(1), 64-66.

Hussein, H. B. (2011). Attitudes of Saudi universities faculty members towards using learning management system (JUSUR). Turkish Online Journal of Educational Technology-TOJET, 10(2), 43-53.

Janelli, M. (2018). E-learning in theory, practice, and research. Вопросы образования, (4 (eng)), 81-98.

Kasim, N. N. M., & Khalid, F. (2016). Choosing the right learning management system (LMS) for the higher education institution context: A systematic review. International Journal of Emerging Technologies in Learning, 11(6).

Juhaňák, L., Zounek, J., & Rohlíková, L. (2019). Using process mining to analyze students' quiz-taking behavior patterns in a learning management system. Computers in Human Behavior, 92, 496-506.

Kant, N., Prasad, K. D., & Anjali, K. (2021). Selecting an appropriate learning management system in open and distance learning: a strategic approach. Asian Association of Open Universities Journal.

Kumar Basak, S., Wotto, M., & Belanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. E-learning and Digital Media, 15(4), 191-216.

Mehrolia, S., Alagarsamy, S., & Sabari, M. I. (2021). Moderating effects of academic involvement in web-based learning management system success: A multigroup analysis. Heliyon, 7(5), e07000.

Lakarnchua, O., Balme, S., & Matthews, A. (2020). Insights from the implementation of a flipped classroom approach with the use of a commercial learning management system. Turkish Online Journal of Distance Education, 21(3), 63-76.

Lyashenko, M. S., & Malinina, I. A. (2015). The Use of Learning Management System projects for teaching a foreign language in the university. Procedia-Social and Behavioral Sciences, 182, 81-88.

McLeod, S. A. (2007). Lev Vygotsky. Retrieved from http://www.simplypsychology.org/vygotsky.html

Muhardi, M., Gunawan, S. I., Irawan, Y., & Devis, Y. (2020). Design of web based LMS (learning management system) in SMAN 1 Kampar Kiri Hilir. Journal of Applied Engineering and Technological Science (JAETS), 1(2), 70-76.

Nadeem, A., Malik, N., & Noreen, S. (2021). Learning management system: an innovation in teaching learning process at university level. Journal of Entrepreneurship, Management, and Innovation, 3(2), 409-428.

Ngafeeson, M. N., & Gautam, Y. (2021). Learning management system adoption: A theory of planned behavior approach. International Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 16(1), 27-42.

Noreen, S. (2020). Implementation of learning management system: A way ahead on the digital journey in distance learning. Open Praxis, 12(3), 329-342.

Ojeda-Castro, A. M., Murray-Finley, P., & Sánchez-Villafañe, J. (2017). Learning management system use to increase mathematics knowledge and skills in Puerto Rico. International Journal of Technology and Human Interaction (IJTHI), 13(2), 89-100.

Omair, A. (2015). Selecting the appropriate study design for your research: Descriptive study designs. Journal of health specialties, 3(3), 153.

Opoku, D. G. J., Perera, S., Osei-Kyei, R., & Rashidi, M. (2021). Digital twin application in the construction industry: A literature review. Journal of Building Engineering, 40, 102726.

Poon, L. K., Kong, S. C., Yau, T. S., Wong, M., & Ling, M. H. (2017, June). Learning analytics for monitoring students participation online: Visualizing navigational patterns on learning management system. In International conference on blended learning (pp. 166-176). Springer, Cham.

Al Rawashdeh, A. Z., Mohammed, E. Y., Al Arab, A. R., Alara, M., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using e-learning in university education: Analyzing students' perspectives. Electronic Journal of e-Learning, 19(3), 107-117.

Ristovska, A. K., Rashikj-Canevska, O., Tasevska, A., Bruziene, R., Orechova, M., BRITO, E., & HAUBRO, H. (2021). Accessible Learning Management Systems: Studentsâ€™ Experiences and Insights. Prizren Social Science Journal, 5(2), 1-13.

Rhode, J., Richter, S., Gowen, P., Miller, T., & Wills, C. (2017). Understanding faculty use of the learning management system. Online Learning, 21(3), 68-86.

Sayfouri, N. (2016). Evaluation of the learning management system using students' perceptions. Medical journal of the Islamic Republic of Iran, 30, 460.

Saygili, H., & Çetin, H. (2021). The Effects of Learning Management Systems (LMS) on Mathematics Achievement: A Meta-Analysis Study. Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 15(2), 341-362.

Selwyn, N. (2016). Digital downsides: Exploring university students' negative engagements with digital technology. Teaching in Higher Education, 21(8), 1006-1021.

Shaame, A. A. (2020). Effectiveness of Moodle learning management system for fostering teaching and learning mathematics in secondary schools in Zanzibar (Doctoral dissertation, The University of Dodoma).

Snoussi, T. (2019). Learning management system in education: Opportunities and challenges. International Journal of Innovative Technology and Exploring Engineering, 8(12S), 664-667.

Tawalbeh, T. I. (2018). EFL Instructors' Perceptions of Blackboard Learning Management System (LMS) at University Level. English Language Teaching, 11(1), 1-9.

Tomasello, M., Kruger, A. C., & Ratner, H. H. (1993). Cultural learning. Behavioral and brain sciences, 16(3), 495-511.

Ülker, D., & Yılmaz, Y. (2016). Learning Management Systems and Comparison of Open-Source Learning Management Systems and Proprietary Learning Management Systems. Journal of Systems Integration (1804-2724), 7(2).

Winterhagen, M., Hedderoth, A., Srbecky, R., Fischman, F., Wallenborn, B., Then, M., ... & Hemmje, M. (2022). Enabling adaptive courses in moodle. In Edulearn22 Proceedings (pp. 4707-4713). IATED.

Yunus, H. (2021). Online learning management system (OLMS) in Indonesian Higher Education: investigating benefits and obstacles. PJEIS: Parahikma Journal of Education and Integrated Sciences, 1(1), 1-8.