


Open Access Article

 <https://doi.org/10.55463/issn.1674-2974.49.12.33>

Effectiveness of Moodle in Teaching and Learning

Janaki Bojiah*

Professor, Department of English, Velammal College of Engineering and Technology, Madurai, India

* Corresponding author: bj@vcet.ac.in

Received: August 17, 2022 / Revised: October 16, 2022 / Accepted: November 8, 2022 / Published: December 30, 2022

Abstract: Education advances every day, and one such advancement is the Learning Management System (LMS) which has been used in various countries worldwide. It gained greater impetus when online education came into the picture in 2020 globally to the entry of COVID-19. However, LMS is still an unexplored topic in some regions of the world. This paper aims to spell out how the inclusion of LMS can provide an easy imparting of education and a very convenient way of transferring knowledge so that the institutes not exposed to such experience could know about this. LMS helps instructors manage all academic activities from anywhere, anytime, as it is online-integrated software designed to support education online or offline. This paper intends to enlist the usefulness of one such LMS called Modular Object-Oriented Dynamic Learning Environment (Moodle), an e-learning platform that facilitates impactful teaching and learning. Instructors and students who have used Moodle are interviewed in a semi-formal way. The descriptive methodology was used to identify the highlights of the responses. The results of this study bring the effectiveness of Moodle into the limelight so that institutions adopt it to enhance the teaching process in effective learning. Hence, it lists the limitations of Moodle where the scope for development exists and intends to recommend to educationists to invest in LMS to contribute toward the holistic development of 21st-century education.

Keywords: learning management system, Moodle, e-learning, student engagement, student participation.

模塊化面向對象的動態學習環境在教學中的有效性

摘要：教育每天都在進步，其中一項進步就是學習管理系統，它已在全球多個國家/地區使用。當在線教育在 2020 年全球進入新冠肺炎時，它獲得了更大的推動力。然而，學習管理系統在世界某些地區仍然是一個未開發的話題。本文旨在闡明學習管理系統的包含如何提供一種簡單的教育傳授和一種非常方便的知識轉移方式，以便沒有接觸過此類經驗的機構可以了解這一點。學習管理系統幫助教師隨時隨地管理所有學術活動，因為它是在線集成軟件，旨在支持在線或離線教育。本文旨在利用一種稱為模塊化面向對象的動態學習環境的學習管理系統，這是一種促進有影響力的教學和學習的電子學習平台。使用過模塊化面向對象的動態學習環境的導師和學生以半正式的方式進行面試。描述性方法用於確定響應的重點。這項研究的結果使模塊化面向對象的動態學習環境 的有效性成為人們關注的焦點，因此機構採用它來加強有效學習的教學過程。因此，它列出了模塊化面向對象的動態學習環境 存在發

展空間的局限性，並打算建議教育工作者投資學習管理系統，為 21 世紀教育的全面發展做出貢獻。

关键词：學習管理系統、模塊化面向對象的動態學習環境、電子學習、學生參與、學生參與。

1. Introduction

Ever since the intervention of technology in education, evolution has never stops. It simply started in the form of PowerPoint presentations, audio-visual instructional materials, live streaming and gradually it has been advancing in leaps and bounds [17]. The more the technology is explored, the more it must offer. The more the technology is infused in teaching, the more it commands students' attention [30] despite its demand for the Internet [24]. As today's youth are considered as 'digital natives' [52], they look for more of e-resources [12 and 15] and enjoy acquiring knowledge from them [34] using a varied range of smart devices [37]. Now-a-days, there are too many digital applications available to enhance the teaching learning process and [46] confirms that these have intensified the motivation level of the students, resulting in commendable teaching experience and enjoyable learning experience. One such application is the Learning Management System popularly known by its abbreviation, LMS.

1.1. LMS: An Overview

A learning management system is a web-based application comprising a server that facilitates the fundamental functioning and a user interface that is accessed by the people to organize and manage a particular knowledge transfer process. An LMS promotes various levels of advanced learning by offering ample online operations [29]. An LMS is a conducive platform for learning to be synchronous or asynchronous in nature [4, 21] where synchronous is teaching and learning happening at the same time [38] and asynchronous is not at the same time [16]. In either mode, it provides an interactive and conducive virtual learning environment for the dissemination of information [10]. An efficient LMS encourages integrated learning atmosphere for academic excellence with arbitrating configurations that establish chatting between individuals, discussions on the forums, professional training, etc. [25]. However, [8] identified that the challenges related to the technicalities of accessing and using the LMS to approach the instructors can affect the student engagement [22] and student performance [9]. Nevertheless, the autonomy of the student to learn at his or her own pace [13] is effectively achieved through LMS access [53]. LMSs are cautious about hackers and so they authenticate the

user/users, assure that the login credentials are valid and offer filters at various stages to ensure privacy and safety.

1.2. Differences between Proprietary and Open Sources

Types of LMS entities exist that can equip the instructors to manage the academic process very effectively, but both need the support of the institution's infrastructure and a logical decision making to accommodate this [32]. This process considers the availability of the resources and the skillsets of the people involved in the institution [55]. The difference between these two entities is the cost that is involved in purchasing a propriety system which gets operated through a code that provides a license or a subscription to access it. The most used propriety systems are Apex Learning, Blackboard, Edline, eSchoolView, Intralearn, PowerSchool, SAP Enterprise Learning, Saba Software SchoolWires, and SchoolPointe [31]. Open-source systems like MOODLE and WordPress can be accessed without any cost as they provide a free license [47]. As there are costs and limitations involved in terms of access to the resources, the educationists recommend the open-source systems and the administrative heads prefer them to establish a conducive online learning environment that offers various digital tools for the learner's choice [3]. These open-source systems have progressed to accommodate more advanced features only in the web settings to customize their preferences and cater to the same. It offers more functional features for the extended usage and enhanced community source plug-ins. This paper intends to throw light upon such features of Moodle, the open-source learning management system, which is the most preferred among all [35, 43].

1.3. Moodle: An Overview

Moodle is an acronym of Modular Object-Oriented Dynamic Learning Environment that supports the instructors to create a quality curriculum and course materials to impart efficiently [7]. The learners find it easy to access synchronously or asynchronously to achieve a fantastic learning experience [4]. [33] described Moodle as follows, "Moodle is an LMS designed to provide educators, administrators and learners with a single, robust, secure and integrated system to create personalized learning environments."

Moodle is free software that issued a license under General Public Licence that accommodates the modifications and is customized as per the requirements [54]. It has various standard and innovative features for supporting the teaching and learning process [23]. Moreover, it allows for extending system functionality using community sourced plug-ins. It interacts with many websites like Facebook, Wikipedia, TedTalks, YouTube, etc., to make the learning experience more relaxing and impactful [20]. Additionally, it motivates the learners to do group learning or self-learning [6]; in both cases, active learning indeed [1]. It is based on a template that facilitates user friendly navigation [51] so that even people with less technical knowledge can derive benefits from it [57]. It appears in a flat view with small blocks on it; each block refers to the various items associated with a course. These are available 24x7 to all the permitted participants with the standard format specified for them [36].

2. Methodology

Moodle was introduced at Gulf University, Bahrain, in the academic year 2020-2021. With limited training and knowledge, both instructors and students attempted to explore its features to strike a convincing level of knowledge transfer and knowledge acquisition. When a team of 10 faculty members and a class of 30 students were interviewed in a semi-formal manner with a series of open-ended questions, the effectiveness of Moodle and its noteworthy features as well as the compromising tools were brought forth. Descriptive methodology was adopted for the analysis of responses as it is a qualitative study.

2.1. Synchronous and Asynchronous Digital Tools

Too many smart tools are available to enhance the virtual learning environment [39]. Texting the instructor or the peers instantaneously to ask for more information or clarify doubts is proved to command candid responses. However, this takes more time compared to audio or video conferencing as they provide more of a real-time communication. The tone, mood, and intent of the communication are also more explicit in such conferencing. Whiteboard provides a platform to write and explain, as well as share MS Word, MS PowerPoint, MS Excel etc., for a more interesting and engaging lecture [49]. Web conferencing enables collaborative discussions and facilitates group communication effectively [14]. Though these types of conferencing demand commendable and consistent bandwidth, the usefulness of it outlives the cost involved toward the Internet [28 and 48].

Email messages help in the transfer of materials, e-books, web blogs, discussion forums, website links, databases, streaming video, streaming audio, narrated slide show, online bulletin boards etc. that are not so

dynamic continue to be interactive asynchronously and have been identified to be the significant asynchronous digital tools that facilitate fruitful learning experiences according to [14]. The students access these in their own convenient time at a comfortable pace and do not guarantee responses spontaneously.

2.2. Administration

Moodle manages the student profile for each student. This comprises the student name, institutional ID, email address, parents' details, guardian's details in case of parents not being available, contact numbers, addresses, ailments of the student, if any - which help the instructors know the students well with respect to their background. In the same way, it is used to maintain faculty profiles as well. The head of the department can monitor the progress of all academic activities of an instructor sitting in his or her office within seconds on Moodle.

When an instructor is assigned a course for a class, Moodle helps him or her in managing the addition of the student list onto the class icon labelled with course code and course name. This helps manage attendance and decide who is a defaulter who should be warned about the lack of attendance. This helps in arranging for academic advising or counselling to determine the reasons for absence and unwillingness for engagement [11]. When a student absents himself or herself in one particular course class immensely, the class in-charge can discover the reasons behind it and take the issue further to the respective subject instructor or to the academic head. A series of warnings can also be issued using Moodle, which will remain an official record on both sides for quality assurance purposes.

2.3. Teaching and Learning

The inclusion of program intended learning outcomes (PILOs) and course intended learning outcomes (CILOs) helps monitor whether the activities and instructional materials are planned for the CILOs. At the end of the course, the attainment of the same can be acquired from Moodle to determine the areas of excellence and areas of scope for improvement to take the necessary measures. This helps in identifying the need for redesigning the curriculum or reframing the intended learning outcomes to improve better student performance. If more students do not reach a certain CILO, then either the level of difficulty of the outcome should be reduced or more intensive instructional materials should be developed [2, 5]. This contributes toward the annual review and periodic review with respect to the syllabus design.

Synchronous teaching and learning platforms like Google Meet, MS Teams, Zoom, etc., can be linked [27] to Moodle to keep track of class log [19]. A copy of every lecture could be placed on the course page labelled as per the date/topic for referring later and recurrently. This gives a series of lecture links to help

students follow the progression of the course when they absent themselves from the classes or to revise the portion to verify the acquired knowledge. These lecture links continue to be the tutorials for the slow learners to learn at their own pace [56].

The instructional materials like MS Word files, MS Excel files, MS PowerPoint, URL links, audio files, video files, Google forms, Google sheets etc., can be posted on the course page of the Moodle [26]. They are easily accessible to students and at their own convenient time. Nevertheless, the instructor can open a resource from the course page and impart the lecture. This helps in the enrichment of the teaching learning process in terms of the availability of a varied range of study resources, especially videos [42].

2.4. Assessments

Assessments play a pivotal role in any educational institute, be it conducted online or offline. Moodle continues to be efficient in conducting assessments also.

2.4.1. Quiz

Moodle offers MCQs, short answer, fill in the blanks, true or false etc., types of templates to conduct the quiz by limiting the number of submission attempts and specifying the start and end timings. Moodle itself instantly evaluates the objective answers and communicates the feedback for the respective marks to the students instantly or later, as decided by the instructor. However, it provides the flexibility to change any of these later if deemed fit by the instructor. Moodle also accommodates the infusion of Google forms for this purpose.

2.4.2. Assignments

Moodle provides ample opportunities to make assignments completely original and error free. Assignments are given to the students with the deadline and the specified number of attempts. Whatever the student submits Moodle checks for its similarity index and generates a report giving the details of the percentage of plagiarism and the sources that are copied from. This supports the instructors in evaluating the students' writing or compiling skills and motivates the students to write originally.

2.4.3. Listening and Speaking Assessments

Moodle facilitates listening exercises that can be accessed and listened to by the students individually. They can replay the listening exercise ample number of times till they become convinced of having acquired the context [45]. Then, it is easy to record your answers and send them through Moodle, as it can accommodate such files in huge numbers without much effort. This helps the students submit the audio files on time as the submission time can be identified and keeps the student hassle free with respect to the clarity of the audio file.

3. Results and Discussion

Moodle facilitates online education in terms of ease and flexibility and that is why it is preferred in many countries in Asia [35]. Moreover, Moodle is a free open source that can create content, which makes it all the more likable [43]. An instructor can organize the academic activities like lesson plans, teaching aids, course materials, attendance, assessments, academic advising, academic events, social interaction, group activities, instant chatting, etc., in one platform [43]. Additionally, it enables the instructors to merge MOOCs into their pedagogies to engage the students informally in learning activities in the formal situations [7]. [50] suggests that one should plan the academic initiatives keeping in mind the expected performance, expected amount of efforts, and social factors that may mould the fabric of the academic procedures, and the available amenities. Moodle facilitates the best when promoting outcome-based education and tracking the course intended learning outcomes against program intended learning outcomes. These results indicate that Moodle brings in a better teaching and learning experience when devised and used in an appropriate manner.

3.1. Implications of the Study

Moodle can be recommended for a few reasons namely:

- To make the instructor's role easy and effective;
- To make the student's learning experience more comfortable;
- To enhance the teaching and learning processes to a greater extent.

The instructors can create and modify instructional content on Moodle, post the list of study materials and assessments for reference, help the students in clarifying doubts, engage them in discussions, provide constructive and timely feedback to show progress, track of student's progress then and there, identify the weak students and arrange remedial classes accordingly, maintain the attendance record of students and so on. The students can access the instructional materials and learn the content at their own pace. They can connect with the instructors and peers for any academic activity round the clock. By these, Moodle facilitates a smooth and effective knowledge transfer hassle-free.

4. Conclusion

In a nut shell, Moodle is user-friendly, expandable, and dependable. The course content can be created, revised, recorded, and reused without much effort. Students who miss classes for defined and undefined reasons can still get a chance to follow the progress of the module/course. It generates a question bank and helps instructors to duplicate the set of materials for a

course when the same is repeated the next time. Moodle is flexible enough to accommodate the user demands and is proven to add value to the effectiveness of teaching and learning.

Moodle provides motivation to the students as they can study by accessing the course materials round the clock. Hence, it can be concluded that the Moodle provides perceived satisfaction, e-collaborative learning, and better academic results. The students proclaimed that Moodle as an online learning platform facilitates the various aspects of academics and enhances effective teaching and learning both in the synchronous and asynchronous modes. Furthermore, it commands better student engagement and promotes a positive learning attitude. Based on the results of this study, Moodle can help students engage in active learning, self-learning, and assure independent learning. Additionally, it is proved to result in the enhancement of improved study skills, integrated content development, collaborative learning, self-regulation, and social interaction.

5. Limitations and Future Research

Moodle can quantitatively track the access time of students [18]. Students tend to be obsessed with being tracked and so they may feel some discomfort and insecurity abiding this. Instead of placing a safe and conducive environment, it is threatened with the fear of failure and mismanagement of time. This may result in slowing down the progress of learning rather than promoting it [5].

Additionally, Moodle is not efficient enough to measure the real-time learning duration of a student be it qualitatively or quantitatively.

Though there are readymade templates available for generating the course content online, they have proved inefficient in catering to the needs of the subjects like Mathematics, Science, Engineering Drawing etc., as they demand practical exposure and demonstrative lectures [41]. Therefore, the training of the people in accessing Moodle becomes mandatory for the complete exploration of the features and plug-ins of Moodle.

As technology continues to evolve, the users always look for advanced features. Hence, it is never considered enough.

Owing to the lack of formal training as to how to use Moodle and due to lack of time, most of the competent features of Moodle are unexplored [44].

Online proctoring should be improved to command real-time integrity with respect to the conduct of examinations.

The lockdown browser attempts to stop the users from opening other tabs or windows but does not have the control of their other movements, such as referring to a book or looking at someone who is prompting. Plus, it corrupts the device in some cases.

Assignments are subjected to similarity check but who writes the assignment continues to be in need of

authenticity and evidence.

Moodle does not keep the record of submission and removal of submission by the students before the instructor evaluates it. Though it maintains a deadline for submission, the number of attempts of the draft should also be calculated in terms of task accomplishments, which may be reflected in the academic performance to a greater extent.

Moodle can be compared with other learning management systems for further development of its functionalities. More workshop materials as to how to explore advanced tools of Moodle should be made available to make this LMS the most preferred. In this regard, more research on the technical and cost effectiveness part of it could be initiated. Intense research on specific tools of Moodle could bring into limelight the significance of the same. The scope to embed interactive tools like EDpuzzle into Moodle should be analyzed as this will bring a more vivid learning experience. Research initiatives should be generated to bring in online proctoring effectively using browsers in Moodle. Peer assessment of Moodle requires intense examination in the future.

References

- [1] ABAR C.A.A.P., and DE MORAES C.U. Flipped classrooms and Moodle: Digital technologies to support teaching and learning Mathematics. *Acta Didactica Napocensia*, 2019, 12(2): 209-216. <https://doi.org/10.24193/adn.12.2.16>
- [2] ABULOUM, A., FARAH A., KASKALOGLU E., and YAAKUB A. College students' usage of and preferences for print and electronic textbooks. *International Journal of Emerging Technologies in Learning*, 2019, 14(7): 80-97. <https://doi.org/10.3991/ijet.v14i07.9871>
- [3] ADEYINKA T., DARE O., ADEBISI O., and LAWAL A. Perception and usage pattern of e-books among library and information science students in selected universities in Nigeria. *Journal of Library and Information Technology*, 2018, 38(2): 132-140. <http://doi.org/10.14429/djlit.38.2.11111>
- [4] AL-FRAIHAT D., JOY M., MASA'DEH R., and SINCLAIR J. Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior*, 2020, 102(1): 67-86. DOI: 10.1016/j.chb.2019.08.004
- [5] ALFIRAS M., and BOJIAH J. Printed textbooks versus electronic textbooks: A study on the preference of students of Gulf University in Kingdom of Bahrain. *International Journal of Emerging Technologies in Learning*, 2020, 15(18).
- [6] ALGAYRES M., and TRIANTAFYLLOU E. Learning analytics in flipped classrooms: A scoping review. *Electronic Journal of E-Learning*, 2020, 18(5): 397-409. <https://doi.org/10.34190/JEL.18.5.003>
- [7] ALJARAIDEH Y. Massive open online learning (MOOC) benefits and challenges: A case study in Jordanian context. *International Journal of Instruction*, 2019, 12(4): 65-78. <https://doi.org/10.29333/iji.2019.1245a>
- [8] ALKHASAWNH S., and ALQAHTANI M.A.M. Fostering students' self-regulated learning through using a learning management system to enhance academic outcomes

- at the University of Bisha. *TEM Journal*, 2019, 8(2): 662-669. DOI: 10.18421/TEM82-47
- [9] ALZHRANI A.A. The effect of distance learning delivery methods on student performance and perception. *International Journal for Research in Education*, 2019, 43(1): 12. <https://bit.ly/32bUuyq>
- [10] AMITI F. Synchronous and asynchronous E-learning. *European Journal of Open Education and E-learning Studies*, 2020, 5(2).
- [11] BERESTOK O.V. Synchronous and asynchronous e-learning modes: strategies, methods, objectives. *Engineering and Educational Technologies*, 2021, 9(1): 19–27.
- [12] BOTICKI I., AKÇAPINAR G., and OGATA H. E-book user modelling through learning analytics: The case of learner engagement and reading styles. *Interactive Learning Environments*, 2019, 27(5-6): 754-765. <https://doi.org/10.1080/1049482>
- [13] COMAN C., ȚIRU L.G., MESEȘAN-SCHMITZ L., STANCIU C., and BULARCA M.C. Online teaching and learning in higher education during the Coronavirus pandemic: Students' perspective. *Sustainability (Switzerland)*, 2020, 12(24): 1-22. <https://doi.org/10.3390/su122410367>
- [14] DADA E.G., ALKALI A.H., and OYEWOLA D.O. An Investigation into the Effectiveness of Asynchronous and Synchronous E-learning Mode on Students' Academic Performance in National Open University (NOUN), Maiduguri Centre. *International Journal of Modern Education and Computer Science*, 2019, 11(5).
- [15] DAYAKAR G. Use of e-resources in higher education: Advantages and concerns. *Journal of Applied and Advanced Research*, 2018, 3(1): 17-19. <https://doi.org/10.21839/jaar.2018.v3is1.160>
- [16] DURANTE P. Effectiveness of synchronous and asynchronous online learning delivery in developing oral communication competencies. *South Florida Journal of Development*, 2022, 3: 3529-3536. 10.46932/sfjdv3n3-039.
- [17] ENGBRECHT J.R. *Digital textbooks versus print textbooks*. Culminating Projects in Teacher Development. 2018. https://repository.stcloudstate.edu/ed_etds/35.
- [18] EGOROV E.E., PROKHOROVA M.P., LEBEDEVA T.E., MINEEVA O.A., and TSVETKOVA S.Y. Moodle LMS: Positive and Negative Aspects of Using Distance Education in Higher Education Institutions. *Purposes and Representations*, 2021, 9(2): e1104.
- [19] FLORJANCIC V., and WIECHETEK L. Using Moodle and MS Teams in higher education – A comparative study. *International Journal of Innovation and Learning*, 2022, 31: 264-286.
- [20] FRANCISCO C.D.C., and BARCELONA M.C. Effectiveness of an online classroom for flexible learning. *International Journal of Academic Multidisciplinary Research*, 2020, 4(8): 100-107.
- [21] FRISKA Y. Indonesian EFL Students' Perceptions on Synchronous and Asynchronous e-Learning. *Journal of English Language Education*, 2021, 6(1): 44-55.
- [22] GIATMAN M., SISWAT, S., and BASRI I.Y. Online learning quality control in the pandemic COVID-19 era in Indonesia. *Journal of Nonformal Education*, 2020, 6(2): 168-175. <https://journal.unnes.ac.id/nju/index.php/jne>
- [23] GUNAWAN G., SAHIDU H., SUSILAWATI S., HARJONO A., and HERAYANTI L. Learning management system with Moodle to enhance creativity of candidate physics teacher. *Journal of Physics: Conference Series*, 2019, 1417(1): 1-6. <https://doi.org/10.1088/1742-6596/1417/1/012078>
- [24] HABIBI M. Parents' hopes for early childhood education during the COVID-19 pandemic: A case study in Gunungsari sub-district, West Lombok Regency, West Nusa Tenggara, Indonesia. *South Florida Journal of Development*, 2022, 3(2): 1733-1737.
- [25] HADULLO K., OBOKO R., and OMWENGA E. Factors affecting asynchronous e-learning quality in developing countries university settings. *International Journal of Education and Development using ICT*, 2018, 14(1).
- [26] HERSKOWITZ N. *Gartner Recognises Microsoft as Leader in Unified Communications as a Service and Meetings Solutions*. Microsoft 365, 2021. <https://www.microsoft.com/en-us/microsoft-365/blog/2021/10/25/gartner-recognizes-microsoft-as-leader-in-unified-communications-as-a-service-and-meetings-solutions/>
- [27] IRONSI C.S. Google Meet as a synchronous language learning tool for emergency online distant learning during the COVID-19 pandemic: Perceptions of language instructors and preservice teachers. *Journal of Applied Research in Higher Education*, 2022, 14: 640-659.
- [28] JOAQUIN J.J. B., BIANA H.T., and DACELA M.A. The Philippine higher education sector in the time of COVID-19. *Frontiers in Education*, 2020, 5. <https://doi.org/10.3389/educ.2020.576371>
- [29] JUNG S., and HUH J.H. An efficient LMS platform and its test bed. *Electronics*, 2019, 8(2): 154. <https://www.mdpi.com/2079-9292/8/2/154/html>
- [30] KARABATZAKI Z., STATHOPOULOU A., KOKKALIA G., DIMITRIOU E., LOUKERI P., ECONOMOU A. and DRIGAS A. Mobile application tools for students in secondary education: An evaluation study. *International Journal of Interactive Mobile Technologies*, 2018, 12(2): 142-161. <https://doi.org/10.3991/ijim.v12i2.8158>.
- [31] KEHRWALD B.A., and PARKER B. Implementing online learning: Stories from the field. *Journal of University Teaching and Learning Practice*, 2019, 16(1). <https://bit.ly/2BQ5fvq>
- [32] KIMMONS R., HUNSAKER E.W., JONES, J.E., and STAUFFER M. The nationwide landscape of K-12 school websites in the United States. *The International Review of Research in Open and Distributed Learning*, 2019, 20(3). <https://bit.ly/2MSgDgM>
- [33] KROUSKA A., TROUSSAS, C., and VIRVOU M. Comparing LMS and CMS platforms supporting social e-learning in higher education. In: *2017 8th International Conference on Information, Intelligence, Systems and Applications*. 2017. DOI: [10.1109/IISA.2017.8316408](https://doi.org/10.1109/IISA.2017.8316408)
- [34] LEONARD A., and SNYMAN M. E-books: yes or no? A case study of undergraduate students at the University of Namibia. *Collection and Curation*, 2019, 38(3): 78-88. <https://doi.org/10.1108/cc-08-2018-0018>
- [35] LUK C.-H., NG K.-K., and LAM W.-M. The acceptance of using open-source learning platform (Moodle) for learning in Hong Kong's higher education. In: *International Conference on Technology in Education ICTE 2018: Technology in Education. Innovative Solutions and Practices*, 2018: 249-257. https://doi.org/10.1007/978-981-13-0008-0_23

- [36] MAKRUF I., RIFA'I A.A., and TRIANA Y. Moodle-based online learning management in higher education. *International Journal of Instruction*, 2022, 15(1): 135-152. <https://doi.org/10.29333/iji.2022.1518a>
- [37] MAKWANYA C., and ONI O. E-books preference compared to print books based on student perceptions: A case on University of Fort Hare students. *International Journal of Interactive Mobile Technologies*, 2019, 13(12): 236-245. <https://doi.org/10.3991/ijim.v13i12.10840>
- [38] MANTASIAH R. Assessing verbal positive reinforcement of teachers during school from home in the COVID-19 pandemic era. *International Journal of Instruction*, 2021, 14(2): 1037-1050.
- [39] MERZIFONLUOGLU A., and GONULAL A. Review of digital language learning and teaching: Research, theory and practice. *Language Learning and Technology*. 2018, 22(1): 65-68.
- [40] MILLER T., MACLAREN K., and XU H. Online learning: Practices, perceptions, and technology. *Canadian Journal of Learning and Technology*, 2020, 46(1). <https://doi.org/10.21432/cjlt27894>
- [41] MLOTSHWA N., TUNJERA N., and CHIGONA A. Integration of Moodle into the classroom for better conceptual understanding of functions in Mathematics. *South African Journal of Education*, 2020, 40(3): 1-14. <https://doi.org/10.15700/saje.v40n3a1570>
- [42] NAGY J.T. Evaluation of online video usage and learning satisfaction: An extension of the technology acceptance model. *International Review of Research in Open and Distributed Learning*, 2018, 19(1).
- [43] NASH, S.S., and RICE W. *Moodle E-Learning Course Development*. 4th ed. Packt Publishing, Birmingham, UK, 2018.
- [44] NAZ T., and KHAN M. Functionality gaps in the design of learning management systems. *International Journal of Advanced Computer Science and Applications*, 2018, 9(11): 371-374. <https://doi.org/10.14569/ijacsa.2018.091152>
- [45] OGBONNA C.G., IBEZIM N.E., and OBI C.A. Synchronous versus asynchronous e-learning in teaching word processing: An experimental approach. *South African Journal of Education*, 2019, 39(2): 1-15.
- [46] OXKERT D. Using a tablet computer for EFL positive self-review: Increase in self-determination theory-based learning motives. *Calido Journal*, 2018, 35(2): 1-18. <https://doi.org/10.1558/cj.32185>
- [47] QUINN R., and GRAY G. Prediction of student academic performance using Moodle data from a further education setting. *Irish Journal of Technology Enhanced Learning*, 2020, 5(1): 1-19. Retrieved from <https://journal.ilta.ie/index.php/telji/article/view/57>
- [48] RADU M.-C., SCHNAKOVSKY C., HERGHELEGIU E., CIUBOTARIU V.-A., and CRISTEA I. The impact of the COVID-19 pandemic on the quality of educational process: A student survey. *International Journal of Environmental Research and Public Health*, 2020, 17(21): 7770. <https://doi.org/10.3390/ijerph17217770>
- [49] RAKIC S., TASIC N., MARJANOVIC U., SOFTIC S., LÜFTENEGGER E., and TURCIN I. Student performance on an e-learning platform: Mixed method approach. *International Journal of Emerging Technologies in Learning*, 2020, 15(02): 187. <https://doi.org/10.3991/ijet.v15i02.11646>
- [50] RAMLLAH R., and NURKHIN A. Analysis of factors affecting behavioral intention to use e-learning uses the unified theory of acceptance and use of technology approach. In: *2019 International Conference on Economics, Business and Economic Education*, 2020: 1005-1025. <https://doi.org/10.18502/kss.v4i6.6658>
- [51] DEVI K., and LAKSHMI V. Moodle – An effective learning management system for 21st century learners. *Alochana Chakra Journal*, 2020, IX(VI): 4474.
- [52] REICH S. M., YAU J.C., XU Y., MUSKAT T., UVALLE J., and CANNATA D. Digital or print? A comparison of preschoolers' comprehension, vocabulary, and engagement from a print book and an e-book. *AERA Open*, 2019, 5(3): 1-16. <https://doi.org/10.1177/2332858419878389>
- [53] SHUKLA V.K., and VERMA A. Enhancing LMS experience through AIML base and retrieval base chatbot using R language. In: *2019 International Conference on Automation, Computational and Technology Management*. 2019: 561-567. <https://bit.ly/36pluhn>
- [54] SIMANULLANG N.H.S., and RAJAGUKGUK J. Learning Management System (LMS) Based on Moodle to Improve Students Learning Activity. *Journal of Physics: Conference Series*, 2020, 1462: 012067
- [55] TURNBULL D., CHUGH R. and LUCK J. Learning management systems: An overview. In: *Encyclopedia of Education and Information Technologies*, Springer Nature. 2020: 1052-1058. DOI: 10.1007/978-3-319-60013-0_248-1
- [56] WANG J. Retrieving critical design factor of ebook for older people in Taiwan. *Telematics and Informatics*, 2018, 35(7): 2016-2027. <https://doi.org/10.1016/j.tele.2018.07.005>
- [57] ILMI Z., DARMA D.C., and AZIS M. Independence in learning, education management, and Industry 4.0: Habitat Indonesia during COVID-19. *Journal of Anthropology of Sport and Physical Education*, 2020, 4(4): 63-66.

參考文:

- [1] ABAR C.A.A.P. 和 DE MORAES C.U. 翻轉課堂和模塊化面向對象的動態學習環境：支持數學教學的數字技術。油 菜 花 教 學 法 ， 2019 ， 12(2)： 209-216 。 <https://doi.org/10.24193/adn.12.2.16>
- [2] ABULOUM, A.、 FARAH A.、 KASKALOGLU E. 和 YAAKUB A. 大學生對印刷和電子教科書的使用和偏好。國際新興技術學習雜誌， 2019 ， 14(7)： 80-97. <https://doi.org/10.3991/ijet.v14i07.9871>
- [3] ADEYINKA T.、 DARE O.、 ADEBISI O. 和 LAWAL A. 尼日利亞選定大學圖書館和信息科學專業學生對電子書的感知和使用模式。圖書情報學報， 2018 ， 38(2)： 132-140. <http://doi.org/10.14429/djlit.38.2.11111>
- [4] AL-FRAIHAT D.、 JOY M.、 MASA'DEH R. 和 SINCLAIR J. 評估電子學習系統的成功：一項實證研究。人類行為中的計算機， 2020 ， 102(1)： 67-86。 DOI: 10.1016/j.chb.2019.08.004
- [5] ALFIRAS M. 和 BOJIAH J. 印刷教科書與電子教科書：巴林王國海灣大學學生偏好研究。國際新興學習技術雜誌， 2020 年 ， 15(18)。
- [6] ALGAYRES M. 和 TRIANTAFYLLOU E. 翻轉課堂中的學習分析：範圍界定審查。電子學習電子雜誌， 2020 ， 18(5)： 397-409. <https://doi.org/10.34190/JEL.18.5.003>
- [7] ALJARAIDEH Y. 大規模開放式在線學習的好處和挑戰：約旦背景下的案例研究。國際教學雜誌， 2019 ， 12(4)：

65-78. <https://doi.org/10.29333/iji.2019.1245a>

[8] ALKHASAWNH S. 和 ALQAHTANI M.A.M. 通過使用學習管理系統來促進學生的自我調節學習，以提高比沙大學的學業成績。透射電鏡學報, 2019, 8(2): 662-669. DOI: 10.18421/TEM82-47

[9] ALZHRANI A.A. 遠程學習交付方法對學生表現和感知的影響。國際教育研究雜誌, 2019 年, 43(1): 12. <https://bit.ly/32bUuyq>

[10] AMITI F. 同步和異步電子學習。歐洲開放教育和電子學習研究雜誌, 2020 年, 5(2)。

[11] BERESTOK O.V. 同步和異步電子學習模式：策略、方法、目標。工程與教育技術, 2021, 9(1): 19-27.

[12] BOTICKI I.、AKÇAPINAR G. 和 OGATA H. 通過學習分析進行電子書用戶建模：學習者參與和閱讀風格的案例。交互式學習環境, 2019 年, 27(5-6): 754-765. <https://doi.org/10.1080/1049482>

[13] COMAN C.、ŞÛÈRU L.G.、MESEŞAN-SCHMITZ L.、STANCIU C. 和 BULARCA M.C. 冠狀病毒大流行期間高等教育的在線教學：學生的觀點。可持續性（瑞士），2020，12（24）：1-22。 <https://doi.org/10.3390/su122410367>

[14] DADA E.G.、ALKALI A.H. 和 OYEWOLA D.O. 國家開放大學邁杜古里中心異步和同步電子學習模式對學生學業成績影響的調查。國際現代教育與計算機科學雜誌, 2019, 11(5)。

[15] DAYAKAR G. 在高等教育中使用電子資源：優點和關注點。應用與高級研究雜誌, 2018, 3(1): 17-19. <https://doi.org/10.21839/jaar.2018.v3is1.160>

[16] DURANTE P. 同步和異步在線學習交付在發展口語交流能力方面的有效性。南佛羅里達州發展雜誌, 2022 年, 3: 3529-3536. 10.46932/sfjdv3n3-039.

[17] ENGBRECHT J.R. 數字教科書與印刷教科書。教師發展的最終項目。2018. https://repository.stcloudstate.edu/ed_etds/35。

[18] EGOROV E.E.、PROKHOROVA M.P.、LEBEDEVA T.E.、MINEEVA O.A. 和 TSVETKOVA S.Y. 模塊化面向對象的動態學習環境學習管理系統：在高等教育機構中使用遠程教育的積極和消極方面。目的和陳述, 2021 年, 9(2): e1104。

[19] FLORJANCIC V. 和 WIECHETEK L. 在高等教育中使用模塊化面向對象的動態學習環境和多發性硬化症團隊——一項比較研究。國際創新與學習雜誌, 2022 年, 31: 264-286。

[20] FRANCISCO C.D.C. 和 BARCELONA M.C. 在線課堂對靈活學習的有效性。國際學術多學科研究雜誌, 2020, 4(8): 100-107.

[21] FRISKA Y. 印度尼西亞英語作為外語學生對同步和異步電子學習的看法。英語語言教育雜誌, 2021, 6(1): 44-55.

[22] GIATMAN M.、SISWAT, S. 和 BASRI I.Y. 印度尼西亞大流行 新冠肺炎 時代的在線學習質量控制。非正規教育雜誌, 2020, 6（2）：168-175。 <https://journal.unnes.ac.id/nju/index.php/jne>

[23] GUNAWAN G.、SAHIDU H.、SUSILAWATI S.、HARJONO A. 和 HERAYANTI L. 使用模塊化面向對象的動態學習環境學習管理系統以提高候選物理教師的創造力。物理學雜誌：系列會議, 2019 年, 1417(1): 1-6. <https://doi.org/10.1088/1742-6596/1417/1/012078>

[24] HABIBI M. 家長對幼兒教育的期盼 新冠肺炎 大流行：以印度尼西亞西努沙登加拉省西龍日島攝政區古農薩里分區為例。南佛羅里達州發展雜誌, 2022, 3(2): 1733-1737。

[25] HADULLO K.、OBOKO R. 和 OMWENGA E. 發展中國家大學環境中影響異步電子學習質量的因素。使用信息通信技術的國際教育與發展雜誌, 2018 年, 14(1)。

[26] HERSKOWITZ N. 高德納將微軟評為統一通信即服務和會議解決方案的領導者。微軟 365, 2021. <https://www.microsoft.com/en-us/microsoft-365/blog/2021/10/25/gartner-recognizes-microsoft-as-leader-in-unified-communications-as-a>

-服務和會議解決方案/

[27] IRONSI C.S. 谷歌會議作為 新冠肺炎 大流行期間用於緊急在線遠程學習的同步語言學習工具：語言教師和職前教師的看法。高等教育應用研究雜誌, 2022, 14: 640-659.

[28] JOAQUIN J.J. B.、BIANA H.T. 和 DACELA M.A. 新冠肺炎 時期的菲律賓高等教育部門。教育前沿, 2020 年, 5. <https://doi.org/10.3389/feduc.2020.576371>

[29] JUNG S. 和 HUH J.H. 高效的学习管理系统平台及其測試平台。電子學, 2019, 8(2): 154. <https://www.mdpi.com/2079-9292/8/2/154/html>

[30] KARABATZAKI Z.、STATHOPOULOU A.、KOKKALIA G.、DIMITRIOU E.、LOUKERI P.、ECONOMOU A. 和 DRIGAS A. 面向中等教育學生的移動應用工具：一項評估研究。國際交互式移動技術雜誌, 2018, 12(2): 142-161. <https://doi.org/10.3991/ijim.v12i2.8158>。

[31] KEHRWALD B.A. 和 PARKER B. 實施在線學習：實地案例。大學教學實踐學報, 2019, 16(1). <https://bit.ly/2BQ5fvq>

[32] KIMMONS R.、HUNSAKER E.W.、JONES, J.E. 和 STAUFFER M. 美國 12 學校網站的全國格局。開放和分佈式學習研究國際評論, 2019, 20(3). <https://bit.ly/2MSgDgM>

[33] KROUSKA A.、TROUSSAS, C. 和 VIRVOU M. 比較學習管理系統和內容管理系統平台支持高等教育中的社交電子學習。在：2017 年第 8 屆信息、智能、系統和應用國際會議。2017. DOI: 10.1109/IISA.2017.8316408

[34] LEONARD A. 和 SNYMAN M. 電子書：是或否？納米比亞大學本科生案例研究。收藏與策展, 2019, 38(3): 78-88. <https://doi.org/10.1108/cc-08-2018-0018>

[35] LUK C.-H.、NG K.-K. 和 LAM W.-M. 香港高等教育接受使用開源學習平台進行學習。在：國際教育技術會議：教育技術。創新解決方案和實踐, 2018: 249-257. https://doi.org/10.1007/978-981-13-0008-0_23

[36] MAKRUFI I.、RIFAI A.A. 和 TRIANA Y. 高等教育中基於模塊化面向對象的動態學習環境的在線學習管理。國際教學雜誌, 2022, 15(1): 135-152. <https://doi.org/10.29333/iji.2022.1518a>

[37] MAKWANYA C. 和 ONI O. 基於學生看法的電子書與印刷書的偏好比較：以黑爾堡大學學生為例。國際交互式移動技術雜誌, 2019, 13(12): 236-245. <https://doi.org/10.3991/ijim.v13i12.10840>

[38] MANTASIAH R. 在 新冠肺炎 大流行時代評估教師在家上學期間的口頭積極強化。國際教學雜誌, 2021, 14(2): 1037-1050。

[39] MERZIFONLUOGLU A. 和 GONULAL A. 數字語言

學習和教學回顧：研究、理論和實踐。語言學習和技術。2018, 22(1): 65-68.

- [40] MILLER T.、MACLAREN K. 和 XU H. 在線學習：實踐、認知和技術。加拿大學習與技術雜誌，2020年，46(1)。https://doi.org/10.21432/cjlt27894
- [41] MLOTSHWA N.、TUNJERA N. 和 CHIGONA A. 將模塊化面向對象的動態學習環境 融入課堂，以更好地理解數學中的函數概念。南非教育雜誌，2020, 40(3): 1-14。https://doi.org/10.15700/saje.v40n3a1570
- [42] NAGY J.T. 在線視頻使用和學習滿意度的評估：技術接受模型的擴展。開放和分佈式學習研究國際評論，2018, 19(1)。
- [43] NASH, S.S. 和 RICE W. 模塊化面向對象的動態學習環境 電子學習課程開發。第 4 版。包出版社，英國伯明翰，2018年。
- [44] NAZ T. 和 KHAN M. 學習管理系統設計中的功能差距。國際高級計算機科學與應用雜誌，2018, 9(11): 371-374。https://doi.org/10.14569/ijacsa.2018.091152
- [45] OGBONNA C.G.、IBEZIM N.E. 和 OBI C.A. 文字處理教學中的同步與異步電子學習：一種實驗方法。南非教育雜誌，2019, 39(2): 1-15。
- [46] OXKERT D. 使用平板電腦進行英語作為外語積極自我審查：增加基於自我決定理論的學習動機。卡利多雜誌，2018年，35(2)：1-18。https://doi.org/10.1558/cj.32185
- [47] QUINN R. 和 GRAY G. 使用來自繼續教育環境的模塊化面向對象的動態學習環境 數據預測學生學習成績。愛爾蘭技術強化學習雜誌，2020年，5(1): 1-19。取自https://journal.ilta.ie/index.php/telji/article/view/57
- [48] RADU M.-C.、SCHNAKOVSKY C.、HERGHELEGIU E.、CIUBOTARIU V.-A. 和 CRISTEA I. 新冠肺炎大流行對教育過程質量的影響：一項學生調查。國際環境研究與公共衛生雜誌，2020年，17(21): 7770。https://doi.org/10.3390/ijerph17217770
- [49] RAKIC S.、TASIC N.、MARJANOVIC U.、SOFTIC S.、LÜFTENEGGER E. 和 TURCIN I. 學生在電子學習平台上的表現：混合方法。國際新興學習技術雜誌，2020年，15(02)：187。https://doi.org/10.3991/ijet.v15i02.11646
- [50] RAMLLAH R. 和 NURKHIN A. 影響使用電子學習的行為意向的因素分析使用接受和使用技術方法的統一理論。載於：2019年經濟、商業與經濟教育國際會議，2020: 1005-1025。https://doi.org/10.18502/kss.v4i6.6658
- [51] DEVI K. 和 LAKSHMI V. 模塊化面向對象的動態學習環境——面向 21 世紀學習者的有效學習管理系統。思想脈輪雜誌，2020, IX(VI): 4474。
- [52] REICH S.M.、YAU J.C.、XU Y.、MUSKAT T.、UVALLE J. 和 CANNATA D. 數字版還是印刷版？紙質書和電子書對學齡前兒童的理解力、詞彙量和參與度的比較。美國教育研究協會公開賽，2019年，5(3): 1-16。https://doi.org/10.1177/2332858419878389
- [53] SHUKLA V.K. 和 VERMA A. 使用 R 語言通過人工智能標記語言庫和檢索庫聊天機器人增強學習管理系統體驗。在：2019年自動化、計算和技術管理國際會議。2019: 561-567。https://bit.ly/36pluhn
- [54] SIMANULLANG N.H.S. 和 RAJAGUKGUK J. 基於模塊化面向對象的動態學習環境的學習管理系統以改善

學生的學習活動。物理學雜誌：系列會議，2020年，1462: 012067

- [55] TURNBULL D.、CHUGH R. 和 LUCK J. 學習管理系統：概述。載於：教育和信息技術百科全書，施普林格自然。2020: 1052-1058。DOI: 10.1007/978-3-319-60013-0_248-1
- [56] WANG J. 台灣老年人電子書關鍵設計因素檢索。遠程信息處理與信息學，2018, 35(7): 2016-2027。https://doi.org/10.1016/j.tele.2018.07.005
- [57] ILMIZ.、DARMA D.C. 和 AZIS M. 學習、教育管理和工業 4.0 的獨立性：新冠肺炎 期間的印度尼西亞人居。體育人類學雜誌，2020, 4 (4)：63-66。