The Impact of Using a Cloud-Based Learning Management System on Access and Quality of Education

Syamsu Rijal [1] ⓘ**, Guijiao Zou**[2] ⓘ**, Li Jie**[3] ⓘ**, Cai Jixiong**[4] ⓘ

[1]Universitas Negeri Makassar, Indonesia
[2]Public universities and colleges, Taiwan
[3]The University of Tokyo, Japan
[4]Universidad Central de Venezuela, Venezuela

ABSTRACT

Background. The use of a cloud-based learning management system is the use of cloud computing technology to manage and access the online education system. By using this technology, educational institutions can provide learning materials, manage courses, and interact with students digitally via the internet.

Purpose. This research was conducted with the aim of seeing how the use of a cloud-based learning management system can improve access and quality of education by creating an online learning management system that can be accessed anytime and anywhere, as well as making it easier to manage learning materials, course management and digital interaction with students.

Method. The method used in this research is quantitative methods. This method is a way of collecting data and numbers that can be tested. Data was collected through distributing questionnaires addressed to students. Furthermore, the data that has been collected from the results of distributing the questionnaire will be accessible in Excel format which can then be processed using SPSS.

Results. From the research results, it can be seen that the impact of using a cloud-based learning management system can improve access and quality of learning. Apart from that, the use of a Cloud-Based Learning Management System can also improve the competitive performance of teachers in schools.

Conclusion. From this research, researchers can conclude that the impact of using a cloud-based learning management system helps people acquire the skills needed to meet the demands of an ever-changing job market. However, LMS use must be done carefully and incorporated well into an institution's educational strategy to create an inclusive, adaptive, and sustainable learning experience.

KEYWORDS

Cloud, Education, Management

INTRODUCTION

Advances and developments in technology require that all activities can be accessed from anywhere and at any time. Technology can even help make all work activities that have previously been difficult become easier and faster(Hong et al., 2021). The high mobility required by people or groups without devices will create demands for large data usage and all applications that support these activities.(Singh et al., 2019). The existence of information

technology is an answer that is innovative, dynamic and has benefits from an economic perspective. Information technology also answers all solutions and challenges in the world of education(J. Liu et al., 2019). Cloud-base learning can provide information technology services, as a result, it will provide institutions with the advantage of obtaining information in education and science.

An education system that improves the quality of human resources is not only the responsibility of the government. The conventional education system also wants better education(S. Wang et al., 2019). A learning system that only depends on meetings between teaching staff and students will need complements along with changes in technology(Luo et al., 2020). The teaching and learning process in cloud-based learning management will be very beneficial for educators and students. With this technology, they can access various services and resources available wherever and whenever they need them(M. Liu et al., 2019). Because in cloud-based learning there are various tools, applications and services that are free and open, so it can improve the quality of education.

Management is the art and science of managing how to use resources, including human resources, effectively and efficiently to achieve certain goals. Management is often interpreted as a science, tips and work(Orazalin & Akhmetzhanov, 2019). Management is a system of human behavior that works together to carry out their duties and responsibilities with consistent guidance and rational action. Meanwhile, learning management is a managing process that includes planning, organizing, controlling (directing), and evaluating activities related to the student learning process.(Bacoup et al., 2018). This process involves various factors, but is intended to achieve educational goals and improve the quality of education. So that educational goals can be achieved well, learning management really needs to be paid attention to, this aims to ensure that the learning process can obtain more conducive learning outcomes.(Chau et al., 2021).

Educators are the main actors who are responsible in an educational institution and for organizing the class during learning. In practice, education is similar to football, there are adequate training facilities, unlimited funds, and great players, but without a responsible manager, the game will not run well(Garone et al., 2019). Likewise with education, thus, what is presented is a summary of the steps needed to achieve education through the use of a cloud-based learning management system.(Caruana et al., 2021). And in Cloud-based learning, the role of a teacher is very necessary, so that teachers can guide students, and continue to improve teacher skills in improving access and quality of education.

The impact of using a cloud-based learning management system is also related to access to education and quality of education. Access to education refers to the opportunities given to individuals or students and teaching staff to access education, both physically and financially(Jeppesen et al., 2019). Quality of education refers to the standards, performance and educational outcomes received by students. Access to education remains a difficult issue in Indonesia, with significant gaps between urban and rural areas(S. Chen et al., 2021). The quality of education is also an issue, with significant differences between urban and rural schools. Therefore, expanding access to high-quality education is critical to increasing equality of access and education for everyone.

The impact of using a cloud-based learning management system can provide data-based insights about student engagement, progress and performance. Thus, educators can analyze this data to find problems that students may face in adjusting teaching methods(Y. Song et al., 2022). Therefore, a cloud-based learning management system is one of the right solutions to use in today's technological developments. Educators must understand cloud technology and how to use it in learning(Guarda et al., 2021). Students must also be able to plan the use of evidence-based

technology in the classroom and apply digital skills to enable students to participate in learning activities. Educators must also be able to use technology in the teaching and learning process, such as recording and analyzing student attendance records, sharing assignments quickly, and providing appropriate feedback.(Xia et al., 2022).

The impact of using a cloud-based learning management system, allows students to interact actively with their classmates and teachers, exchange information, and support each other during the learning process(C. Song et al., 2022). If learning takes place online, students can take advantage of Cloud features such as discussion forums and other online communication tools(Rajendran et al., 2021). This collaboration enhances the learning community and enhances the overall learning experience. Cloud-based learning management allows educators to manage and update learning content effectively, enabling flexible and easy access to learning materials, collaboration-based learning, interactive evaluation, and the ability to track and monitor student learning progress(Hussain et al., 2018).

The type of method used in this research is a quantitative method. This method is used so that the final results of the data processing can be known clearly and precisely regarding the impact of using a cloud-based learning management system on access and quality of education. This research also aims to determine the advantages of the impact of using a cloud-based learning management system on access and quality of education, so that the learning process becomes varied. In this research, the researcher also used quantitative methods, the data obtained came from the results of the questionnaire that the researcher submitted. Furthermore, the researcher really hopes that the next researchers will research and study more deeply the impact of using a cloud-based learning management system on access and quality of education.

RESEARCH METHOD
Research design

This research uses a quantitative research design, which uses statistical processes to present data in the form of numbers. Researchers created twenty questions to collect information about the research to find out the results. Researchers will ask respondents to answer the questions asked, which will be presented in the form of tables and percentages. The purpose of processing this data with the SPSS application is to compare the results of respondents' answers. After this comparison, researchers can provide solutions to any information they get aboutthe impact of using a cloud-based learning management system on access and quality of education.

Research procedure

In this study, researchers investigatedthe impact of using a cloud-based learning management system on access and quality of education.The aim of the researcher is to investigate this matter so that the researcher can collect, analyze and provide understanding of the data that has been collected. In making questions, researchers used good language that was easy for respondents to understand. This aims to ensure that teachers and students who respond to questions asked by researchers can be answered quickly. That way, it will be easier for researchers to test the data being investigated regarding impactsuse of a cloud-based learning management system for access and quality of education.

Research subject

In researchingimpactUsing a cloud-based learning management system for access and quality of education, researchers of course determine the subject for their research. In this research, the subject of this research is aimed at students from various educational institutions. Before the questionnaire was distributed by the researcher, the researcher first asked for the willingness of the

respondents to spend their time filling out the questionnaire that the researcher would distribute. The questionnaire each contains 10 questions aboutimpactuse of a cloud-based learning management system for access and quality of education.

Research Ethics

After the researcher carried out several stages as previously explained, in conducting research, the researcher also paid close attention to ethics and manners in research. Researchers believe that ethics needs to be considered whenever and wherever, including in the research being conducted. This aims to gain trust and readiness from the respondents or those who are the objects of this research. Furthermore, in this research, the researcher also explains information related to the research, one of which is information in filling out the questionnaire. This information was explained by the researcher so that the respondents were ready and willing to voluntarily provide responses and answers to the questions asked by the researcher.

Data Collection and Analysis

Data collected by researchers in researchingimpactThe use of a cloud-based learning management system for access and quality of education will be processed into the SPSS application. Then the data that has been obtained will be presented by researchers in the form of tables and diagrams. The purpose of presenting it in table and diagram form is to be able to see a comparison of the research results that have been carried out by researchers regardingimpactuse of a cloud-based learning management system for access and quality of education. Next, the obtained data results are converted into percentages or averages. Then the data results will be tested again using the T-test.
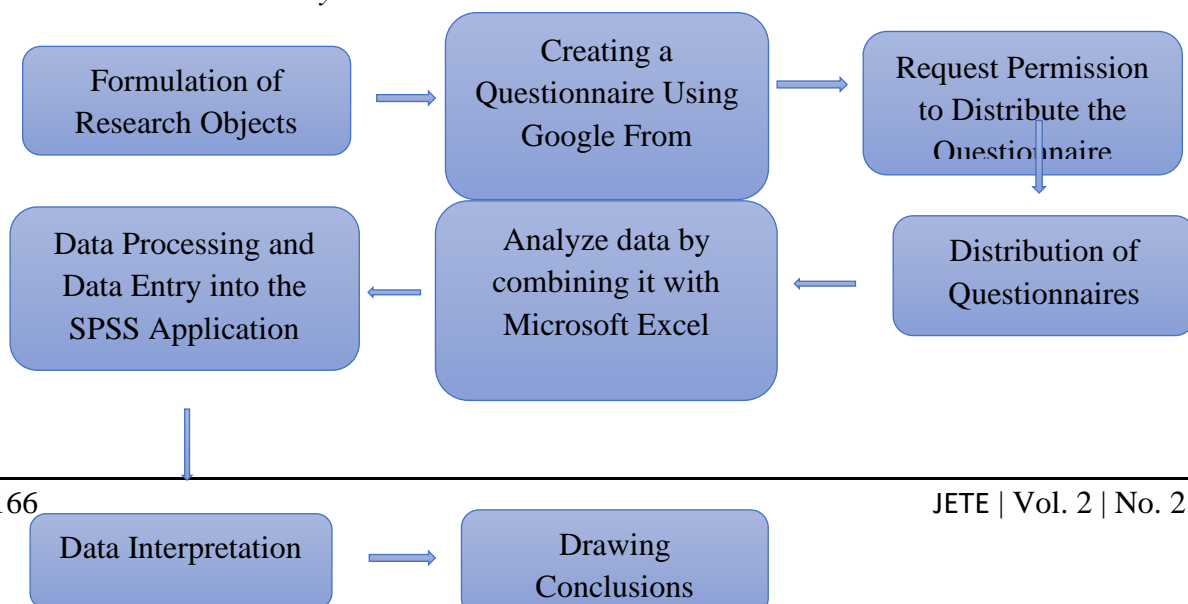
Table 1

Categories of the Impact of Using a Cloud-Based Learning Management System on Access and Quality of Education

No	Earning Category	Level of education	Percentage (%)
1	Strongly agree	Student	>90%
2	Agree	Student	45-89%
3	Disagree	Student	16-45%
4	Don't agree	Student	5-15%

Figure 1

Data Collection and Analysis Flow

RESULTS

Impact of Using a Cloud-Based Learning Management System

Use system management learning based clouds give impact significant to access And quality education.Technology clouds possible institution education access And manage data with more effective And efficient. System management based clouds we provide access easy to various source Power education, including Material, material, And information education. Matter This increase access student to source Power This. Besides That, technology clouds Also possible integration Which more Good between system education And technology, for example use blockchain For increase security And transparency in system education. By Because That, use system management learning based clouds can increase quality education with increase access student to source Power education And increase efficiency management data.

Table 2

Summary of Percentage Results from Respondents' Answers

No.	Question	Strongly agree	Agree	Disagree	Don't agree
1	The use of a cloud-based learning management system allows students to access learning materials from anywhere and at any time	26%	20%	40%	14%
2	Cloud-based learning management systems can increase educational accessibility for students in remote or marginalized areas	35%	25%	0%	40%
3	The online access capabilities provided by cloud-based learning management systems help students to overcome geographical barriers in education	15%	20%	35%	30%
4	With a cloud-based learning management system, students can access digital learning materials that are more affordable and easy to access	40%	30%	20%	10%
5	The use of a cloud-based learning management system opens up opportunities for students to learn independently and collaborate online	55%	33%	10%	2%
6	Cloud-based learning management systems can increase interaction between students and teachers, which in turn improves the quality of learning	50%	43%	7%	0%
7	Access to a variety of learning resources provided by cloud systems can enrich students' learning experience	28%	52%	10%	10%
8	The use of cloud-based learning management systems can help identify and	30%	44%	15%	11%

No.	Question				
	address gaps in educational access between student groups				
9	With the adoption of a cloud-based learning management system, students have faster and easier access to the latest information in their field of study	85%	5%	10 %	0%
10	Cloud-based learning management systems enable teachers to more efficiently provide feedback and support to students online	50%	%15	20%	15%

Table 2 above shows the distribution of questionnaires that have been carried out by researchers. This questionnaire contains ten questions about the impact of using a cloud-based learning management system on access and quality of education. In addition, during the distribution of the questionnaire, the researcher presented a percentage of each response from the respondents. Therefore, respondents can choose to answer the researcher's questions by providing options such as strongly agree, agree, disagree, or disagree. And it can also be seen from the first question asked by the researcher regardingThe use of a cloud-based learning management system allows students to access learning materials from anywhere and at any timegot the highest score of 40% less agree option.

The second question is aboutCloud-based learning management systems can increase educational accessibility for students in remote or marginalized areas, getting a percentage result of 35% strongly agree. Third question aboutThe online access capabilities provided by cloud-based learning management systems help students to overcome geographical barriers in education, got a score of 35% less agree. Fourth questionWith a cloud-based learning management system, students can access digital learning materials that are more affordable and easy to access, getting a percentage gain of 40% strongly agree. Next is the fifth questionThe use of a cloud-based learning management system opens up opportunities for students to learn independently and collaborate online, there were as many as 55% of the strongly agree option choices. Next is the sixthCloud-based learning management systems can increase interaction between students and teachers, which in turn improves the quality of learning, as many as 50% strongly agree.

The seventh question is thatAccess to a variety of learning resources provided by cloud systems can enrich students' learning experience, getting a percentage result of 52% choosing the agree option. On the eighth questionThe use of cloud-based learning management systems can help identify and address gaps in educational access between student groups, also found in the agree option as much as 44%. Ninth question aboutWith the adoption of a cloud-based learning management system, students have faster and easier access to the latest information in their field of study, obtained a percentage result of 85% who strongly agreed. For the last questionCloud-based learning management systems enable teachers to more efficiently provide feedback and support to students onlineget a percentage gain of 50% on the strongly agree option.

Table 3

Summary of Percentage Results from Respondents' Answers

No.	Question	Strongly agree	Agree	Disagree	Don't agree

1	Through analysis of data obtained from cloud-based learning management systems, educators can adjust learning approaches to improve student learning outcomes	33%	59%	3%	5 %
2	Using a cloud-based learning management system can reduce the administrative costs associated with providing education	56%	34%	5%	5%
3	By adopting a cloud system, schools can increase efficiency in storing and managing student and curriculum data	35%	50%	15%	0%
4	Cloud-based learning management systems can facilitate project-based and collaborative learning among students	60%	13%	20%	7%
5	Easy access to learning materials provided by cloud systems can increase student engagement in learning	10%	25%	50%	15%
6	The use of a cloud-based learning management system can expand students' access to additional training and professional development	46%	14%	25%	15%
7	Through cloud platforms, students with special needs can more easily access the resources and support they need	15%	25%	55%	5%
8	Technology integration in learning driven by cloud systems can improve the quality of student learning experiences	60%	25%	15%	0%
9	Cloud-based learning management systems enable inclusive education by providing better accessibility for all students	45%	25%	30%	0%
10	Adoption of a cloud-based learning management system can help improve the quality and relevance of educational curricula according to the demands of ever-changing times	35%	35%	24%	6%

In the statement in table 3 above, the researcher has also created ten questions. Which can be seen from the first question regardingThrough analysis of data obtained from cloud-based learning management systems, educators can adjust learning approaches to improve student learning outcomes, getting a percentage result of 59% of the agree options. Next question number two aboutUsing a cloud-based learning management system can reduce the administrative costs associated with providing education, getting a percentage score of 56% on the strongly agree option. Third questionBy adopting a cloud system, schools can increase efficiency in storing and managing student and curriculum data, get a percentage score of 50% agree.

The fourth question is aboutCloud-based learning management systems can facilitate project-based and collaborative learning among students, getting as much as 60% percentage score on the strongly agree option. The fifth question is aboutEasy access to learning materials provided

by cloud systems can increase student engagement in learning, getting as many as 50% of the options disagree. Sixth questionThe use of a cloud-based learning management system can expand students' access to additional training and professional development, also got the same percentage gain of 46% on the strongly agree option.

Next the seventh hitsThrough cloud platforms, students with special needs can more easily access the resources and support they need, got a percentage score of 55% less agree. Eighth question aboutTechnology integration in learning driven by cloud systems can improve the quality of student learning experiences, getting a percentage gain of 60% strongly agree. In question number nine thatCloud-based learning management systems enable inclusive education by providing better accessibility for all students, also found in the options with the most strongly agree at 45%. Last question aboutAdoption of a cloud-based learning management system can help improve the quality and relevance of educational curricula according to the demands of ever-changing times, getting as much as 35% on the strongly agree and agree options.
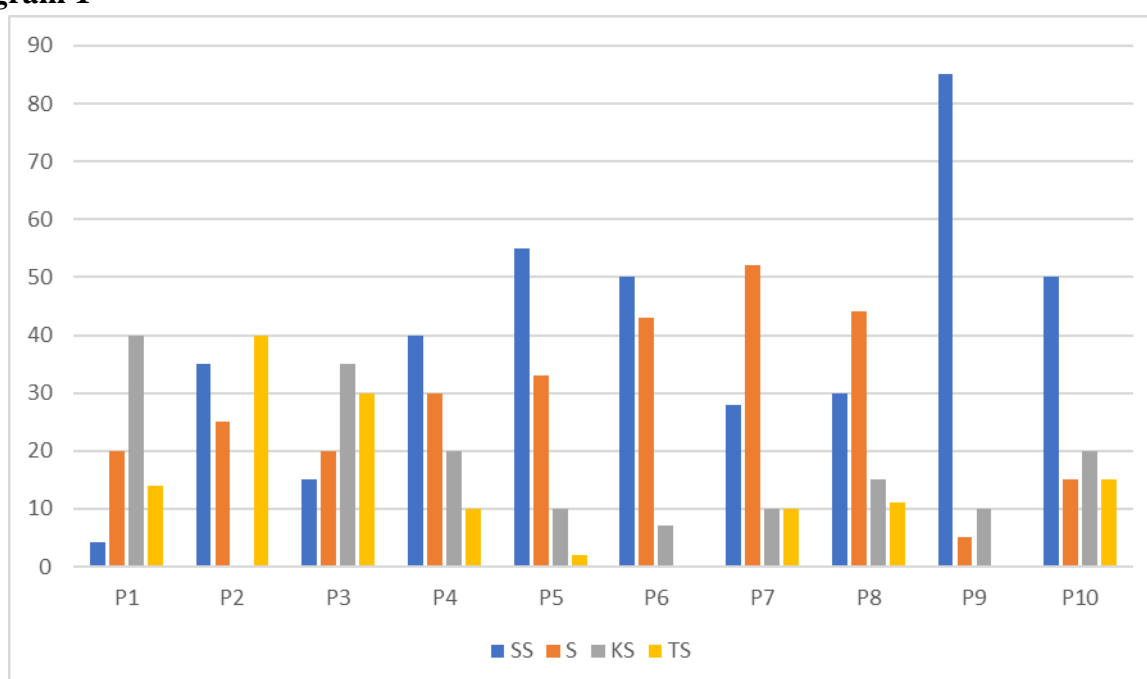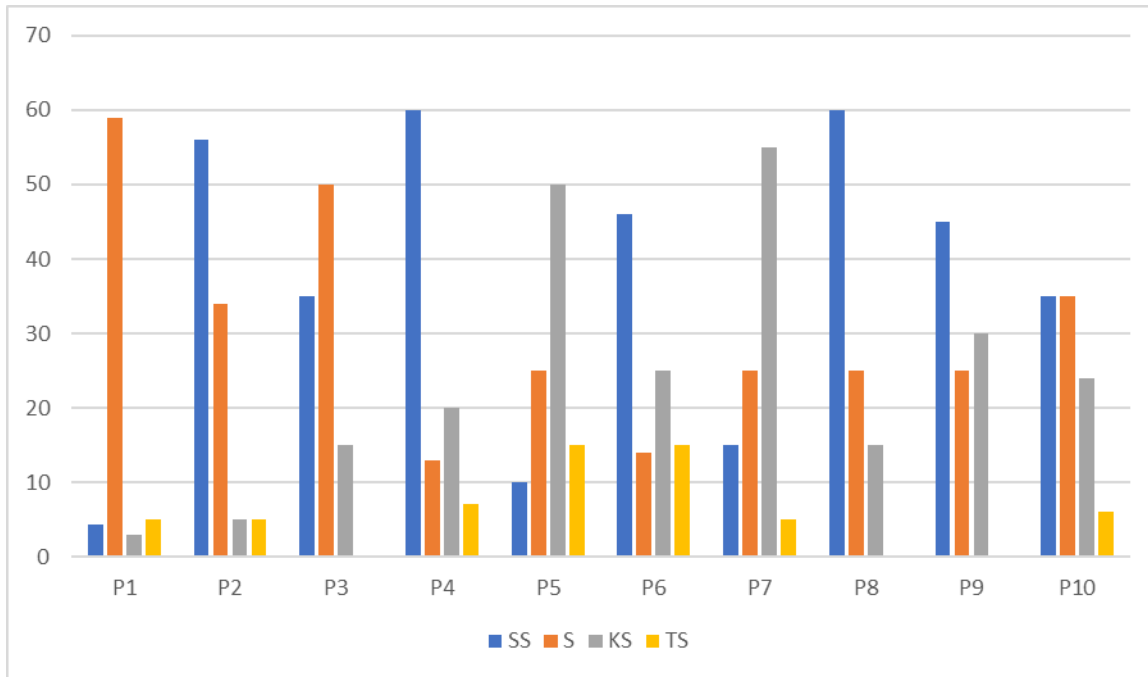
Diagram 1

Diagram 2

Table 3

T-test ConcerningThe Impact of Using a Cloud-Based Learning Management System on Access and Quality of Education

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE TEST	40.4500	20	18.17597	4.06427
	POST TEST	29,6000	20	14.24744	3.18582

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PRE TEST & POST TEST	20	-.332	,152

Paired Samples Test

	Paired Differences				
				95% Confidence Interval of th	
			Std. Error	Difference	
	Mean	Std. Deviation	Mean	Lower	Upper
Pair 1 PRE TEST - POST TEST	10.85000	26.56130	5.93929	-1.58107	23.28107

Based on the results of table 3 above, it is a T-test using the SPSS application. From the research results, the researcher can conclude that the T-test in the first output section explains the mean as the average. In the Pre Test the average number produced was 40.4500, while in the Post Test the result was 29.6000. Based on these results, it can be formulated that there are differences in the results of the respondents' answers. Next, in the Paired Samples Correlations section, we obtained a correlation of -.332, and the sign was .152. Next, in the Paired Samples Test section, we obtained a result of 26.56130 in the Std section. Deviation, while in the Std. Error Mean obtained a result of 5.93929. Based on these results, the impact of using a cloud-based learning management system on access and quality of education.

Table 4

T-test ConcerningThe Impact of Using a Cloud-Based Learning Management System on Access and Quality of Education

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE TEST	20,4500	20	15.12222	3.38143
	POST TEST	9,5000	20	10.38977	2.32322

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PRE TEST & POST TEST	20	,078	,743

Paired Samples Test

		Paired Differences				
					95% Confidence Interval of th	
				Std. Error	Difference	
		Mean	Std. Deviation	Mean	Lower	Upper
Pair 1	PRE TEST - POST TEST	10.95000	17.66494	3.95000	2.68255	19.21745

Furthermore, in table 4, there are also the results of research using the T-test. It can be seen in the first output section that the Pre Test results were 20.4500, and the Post Test results were 9.5000. In the Paired Samples Correlations section, we obtained a correlation of .078, with a sign result of .743. Meanwhile, in the Paired Samples Test section, the results were 17.66494 in the Std section. Diviation, and Std. The mean error is 3.95,000. Based on the results of this research, it can be seen between each question asked by researchers regarding the impact of using a cloud-based learning management system on access and quality of education.

DISCUSSION

Cloud-based learning management systems (LMS) have greatly changed the world of Education(Asghari et al., 2020). With more accessible learning materials, students and educators can connect and interact anytime and anywhere, eliminating time and geographic barriers. The collaborative nature of a cloud-based LMS allows students to work together on group projects and share ideas, which encourages collaborative learning(YS Chen et al., 2018). Through tracking and reporting features, teachers can better monitor student learning progress, enable quick feedback and support students who need help(Della Corte & Rubino, 2022). In addition, digital storage of learning materials in the cloud makes it easier to manage and update content and provides flexibility to adapt the curriculum to changes or new developments.

The use of a cloud computing-based learning management system greatly increases the ease and efficiency of education management(Scerbakov et al., 2015). Educational institutions can save money and increase accessibility to educational resources with cloud technology. In addition to facilitating better teaching and learning community interactions, this system allows teachers and students to access materials and information from anywhere and at any time(Tseng et al., 2016). The use of cloud computing in education can also improve the overall quality of education and increase students' ability to access information(Botta et al., 2016). Reducing infrastructure costs, increasing teachers' ability to manage data, and increasing students' ability to access information online are additional effects.

Cloud computing-based learning has brought major changes in terms of educational quality and accessibility(Lin & Chen, 2012). Educational institutions can save money and increase accessibility to educational resources with cloud technology. The use of cloud computing in education can reduce infrastructure costs, improve teachers' management capabilities, and increase students' ability to access information from anywhere and at any time.(Darwish et al., 2019). In addition, this system allows teachers and students to interact from anywhere and at any time, and facilitates more effective teaching and learning community interactions. Cloud-based learning has changed the world of education, improving the quality of learning and increasing accessibility(Hayes, 2008).

Students can now access richer and more diverse educational resources through cloud infrastructure, which has improved the quality of their learning. With learning materials stored in the cloud, teachers can access high-quality content from a variety of sources and present it in a way that is more engaging and relevant to students(Pillen & Eckard, 2023). The cloud-based platform's collaborative features also enrich the learning experience by allowing students and teachers to interact with each other, allowing for more discussion and better understanding(Gufan et al., 2016). Cloud-based learning has brought positive changes in expanding access to education and improving the quality of learning for all, despite problems related to uneven internet access and data security issues.

The use of a cloud computing-based learning management system has a significant impact on increasing access and quality of education(Muniz Junior et al., 2017). Educational institutions can save money and increase their access to educational resources. Cloud computing allows teachers and students to access materials from anywhere and at any time, which increases the interaction of teaching and learning communities(Zhan et al., 2015). In addition, the use of cloud computing in education can help students more easily obtain information and improve the overall quality of education(X. Wang et al., 2015). Reducing infrastructure costs, increasing teachers' ability to manage data, and increasing students' ability to access information online are additional effects.

REFERENCES

Asghari, A., Sohrabi, M. K., & Yaghmaee, F. (2020). A cloud resource management framework for multiple online scientific workflows using cooperative reinforcement learning agents. Computer Networks, 179, 107340.https://doi.org/10.1016/j.comnet.2020.107340

Bacoup, P., Michel, C., Habchi, G., & Pralus, M. (2018). From a Quality Management System (QMS) to a Lean Quality Management System (LQMS). The TQM Journal, 30(1), 20–42.https://doi.org/10.1108/TQM-06-2016-0053

Botta, A., De Donato, W., Persico, V., & Pescapé, A. (2016). Integration of Cloud computing and Internet of Things: A survey. Future Generation Computer Systems, 56, 684–700.https://doi.org/10.1016/j.future.2015.09.021

Caruana, M., West, L.M., & Cordina, M. (2021). Current Asthma Management Practices by Primary School Teaching Staff: A Systematic Review. Journal of School Health, 91(3), 227–238.https://doi.org/10.1111/josh.12992

Chau, K.-Y., Tang, Y.M., Liu, X., Ip, Y.-K., & Tao, Y. (2021). Investigation of critical success factors for improving supply chain quality management in manufacturing. Enterprise Information Systems, 15(10), 1418–1437.https://doi.org/10.1080/17517575.2021.1880642

Chen, S., Zhang, Z., Zhong, R., Zhang, L., Ma, H., & Liu, L. (2021). A Dense Feature Pyramid Network-Based Deep Learning Model for Road Marking Instance Segmentation Using MLS Point Clouds. IEEE Transactions on Geoscience and Remote Sensing, 59(1), 784–800.https://doi.org/10.1109/TGRS.2020.2996617

Chen, YS, Wu, CH, Chuang, HM, Wang, LC, & Lin, CK (2018). The benefits of information technology strategy and management for cloud-based CRM systems using the interactive qualitative analysis approach. International Journal of Technology, Policy and Management, 18(1), 25.https://doi.org/10.1504/IJTPM.2018.088441

Darwish, A., Hassanien, A.E., Elhoseny, M., Sangaiah, A.K., & Muhammad, K. (2019). The impact of the hybrid platform of internet of things and cloud computing on healthcare systems: Opportunities, challenges, and open problems. Journal of Ambient Intelligence and Humanized Computing, 10(10), 4151–4166.https://doi.org/10.1007/s12652-017-0659-1

Della Corte, A., & Rubino, AS (2022). Reporting surgical outcomes of left-sided endocarditis: Can patient features and analysis methods matter more than prosthesis type? European Journal of Cardio-Thoracic Surgery, 62(2), ezac152.https://doi.org/10.1093/ejcts/ezac152

Garone, A., Pynoo, B., Tondeur, J., Cocquyt, C., Vanslambrouck, S., Bruggeman, B., & Struyven, K. (2019). Clustering university teaching staff through UTAUT: Implications for the acceptance of a new learning management system. British Journal of Educational Technology, 50(5), 2466–2483.https://doi.org/10.1111/bjet.12867

Guarda, A. F. R., Rodrigues, N. M. M., & Pereira, F. (2021). Adaptive Deep Learning-Based Point Cloud Geometry Coding. IEEE Journal of Selected Topics in Signal Processing, 15(2), 415–430.https://doi.org/10.1109/JSTSP.2020.3047520

Gufan, A., Lehahn, Y., Fredj, E., Price, C., Kurchin, R., & Koren, I. (2016). Segmentation and Tracking of Marine Cellular Clouds observed by Geostationary Satellites. International Journal of Remote Sensing, 37(5), 1055–1068.https://doi.org/10.1080/2150704X.2016.1142681

Hayes, B. (2008). Cloud computing. Communications of the ACM, 51(7), 9–11.https://doi.org/10.1145/1364782.1364786

Hong, T., Yin, J.-Y., Nie, S.-P., & Xie, M.-Y. (2021). Applications of infrared spectroscopy in polysaccharide structural analysis: Progress, challenges and perspectives. Food Chemistry: X, 12, 100168.https://doi.org/10.1016/j.fochx.2021.100168

Hussain, W., Hussain, F.K., Saberi, M., Hussain, OK, & Chang, E. (2018). Comparing time series with machine learning-based prediction approaches for violation management in cloud SLAs. Future Generation Computer Systems, 89, 464–477.https://doi.org/10.1016/j.future.2018.06.041

Jeppesen, J. H., Jacobsen, R. H., Inceoglu, F., & Toftegaard, T. S. (2019). A cloud detection algorithm for satellite imagery based on deep learning. Remote Sensing of Environment, 229, 247–259.https://doi.org/10.1016/j.rse.2019.03.039

Lin, A., & Chen, N.-C. (2012). Cloud computing as an innovation: Perception, attitude, and adoption. International Journal of Information Management, 32(6), 533–540.https://doi.org/10.1016/j.ijinfomgt.2012.04.001

Liu, J., Chen, C., & Zhao, Y. (2019). Progress and Prospects of Graphodyne-Based Materials in Biomedical Applications. Advanced Materials, 31(42), 1804386.https://doi.org/10.1002/adma.201804386

Liu, M., Yu, F.R., Teng, Y., Leung, VCM, & Song, M. (2019). Distributed Resource Allocation in Blockchain-Based Video Streaming Systems With Mobile Edge Computing. IEEE Transactions on Wireless Communications, 18(1), 695–708.https://doi.org/10.1109/TWC.2018.2885266

Luo, L., Wu, Z., Gu, W., Huang, H., Gao, S., & Han, J. (2020). Coordinated allocation of distributed generation resources and electric vehicle charging stations in distribution systems with vehicle-to-grid interaction. Energy, 192, 116631.https://doi.org/10.1016/j.energy.2019.116631

Muniz Junior, J., Rodrigues, JDS, Assis, A., Oliveira, FCDP, Franco, BC, & Maciel, FG (2017). Increasing students' skills in operations management classes: Cumbuca Method as teaching-learning strategy. Gestão & Produção, 24(4), 680–689.https://doi.org/10.1590/0104-530x1172-15

Orazalin, N., & Akhmetzhanov, R. (2019). Earnings management, audit quality, and cost of debt: Evidence from a Central Asian economy. Managerial Auditing Journal, 34(6), 696–721.https://doi.org/10.1108/MAJ-12-2017-1730

Pillen, D., & Eckard, M. (2023). The impact of the shift to cloud computing on digital recordkeeping practices at the University of Michigan Bentley historical library. Archival Science, 23(1), 65–80.https://doi.org/10.1007/s10502-022-09395-2

Rajendran, S., Obeid, J.S., Binol, H., D`Agostino, R., Foley, K., Zhang, W., Austin, P., Brakefield, J., Gurcan, M.N., & Topaloglu, U. (2021). Cloud-Based Federated Learning Implementation Across Medical Centers. JCO Clinical Cancer Informatics, 5, 1–11.https://doi.org/10.1200/CCI.20.00060

Scerbakov, A., Ebner, M., & Scerbakov, N. (2015). Using Cloud Services in a Modern Learning Management System. Journal of Computing and Information Technology, 23(1), 75.https://doi.org/10.2498/cit.1002517

Singh, P., Srivastava, S., & Singh, S. K. (2019). Nanosilica: Recent Progress in Synthesis, Functionalization, Biocompatibility, and Biomedical Applications. ACS Biomaterials Science & Engineering, 5(10), 4882–4898.https://doi.org/10.1021/acsbiomaterials.9b00464

Song, C., Han, G., & Zeng, P. (2022). Cloud Computing Based Demand Response Management Using Deep Reinforcement Learning. IEEE Transactions on Cloud Computing, 10(1), 72–81.https://doi.org/10.1109/TCC.2021.3117604

Song, Y., He, F., Duan, Y., Liang, Y., & Yan, X. (2022). A Kernel Correlation-Based Approach to Adaptively Acquire Local Features for Learning 3D Point Clouds. Computer-Aided Design, 146, 103196.https://doi.org/10.1016/j.cad.2022.103196

Tseng, Y.-C., Lee, D., Lin, C.-F., & Chang, C.-Y. (2016). The Energy Savings and Environmental Benefits for Small and Medium Enterprises by Cloud Energy Management System. Sustainability, 8(6), 531.https://doi.org/10.3390/su8060531

Wang, S., Tuor, T., Salonidis, T., Leung, K. K., Makaya, C., He, T., & Chan, K. (2019). Adaptive Federated Learning in Resource Constrained Edge Computing Systems. IEEE Journal on Selected Areas in Communications, 37(6), 1205–1221.https://doi.org/10.1109/JSAC.2019.2904348

Wang, X., Cao, J., & Xiang, Y. (2015). Dynamic cloud service selection using an adaptive learning mechanism in multi-cloud computing. Journal of Systems and Software, 100, 195–210.https://doi.org/10.1016/j.jss.2014.10.047

Xia, T., Yang, J., & Chen, L. (2022). Automated semantic segmentation of bridge point clouds based on local descriptors and machine learning. Automation in Construction, 133, 103992.https://doi.org/10.1016/j.autcon.2021.103992

Zhan, Z.-H., Liu, X.-F., Gong, Y.-J., Zhang, J., Chung, H.S.-H., & Li, Y. (2015). Cloud Computing Resource Scheduling and a Survey of Its Evolutionary Approaches. ACM Computing Surveys, 47(4), 1–33.https://doi.org/10.1145/2788397