Original Research Article

Learning Management System Integrate Local Wisdom for Enhanced Chemistry Learning

ABSTRACT

Aims: to determine the response of students to the Integrated Learning Management System of Local Wisdom developed by the researcher.
Study design: descriptive quantitative study
Place and Duration of Study: The population of this study was all students of Senior High School who have implemented the independent curriculum. The sample was taken by random sampling, with 554 respondents participating.
Methodology: Data collection in this study was a survey using a perception questionnaire with valid cognitive, psychomotor and affective competency indicators, by including examples The results of data processing obtained that the percentage of responses strongly agreed that the LMS based on local wisdom had higher affective competency (41.24%) compared to cognitive competency (37.76%) and psychomotor competency (37.28%). According to several studies, cognitive, affective and psychomotor are interrelated in the student learning process. Based on the results of this study, the researcher suggests that teachers pay attention to the psychomotor development of students through chemistry learning.
Conclusion: This happens because the implementation of the curriculum is affective, while psychomotor competency is still not optimally developed.

Keywords: chemistry, independent curriculum, learning, LMS, local wisdom

Commented [MS1]: Abstract represents the content of the paper (objectives, methods, results, and impact)

1. INTRODUCTION

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- The introduction provides a thorough background on the importance of the LMS in learning in general and in chemistry learning in particular and why the LMS is integrated with local wisdom and its relevance in improving chemistry learning and is supported by various relevant and recent references.
- The end of the introduction contains research objectives
- Preferably use references that are in UN language and up-to-date
- Every reference used must be in the Bibliography (check every reference used)

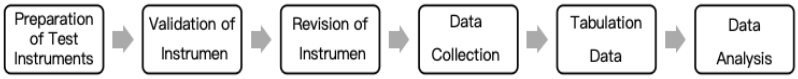
The industrial revolution 5.0 is a challenge for all stakeholders in the field of education. Quality education is one of th to achieve the goals of the Indonesian nation, as stated in the opening of the 1945 Constitution in paragraph four Thalib, 2019). Higher education as a formal institution is the center for improving the quality of competitive human re (Afandi & Rochman, 2015; Adriani, 2015). The world university ranking institution The Times Higher Educatio released THE Asia University Rankings 2021, the results obtained that Indonesia was ranked 194th in the Competitiveness in various aspects must be a concern for all education implementers at the higher education level (P 2018; Ahmad, 2018) especially in the field of Science and Technology (IPTEK) (Nasir, 2018; Purba, 2019; Minanlar 2021). The development of science and technology in the implementation of learning at the higher education level is supported by the availability of adequate facilities and infrastructure (Irawan, 2018). Procurement of adequate facilities and infrastructure needs to be planned properly (Indrawan, 2015) so that its use is effective and efficient (Sholihah, 2019; Agustin & Permana, 2020; Ng & Loosemore, 2007). The effectiveness of facilities & infrastructure in higher education to improve the quality of learning, research and community service (Cordiaz, 2017; Darari et al. 2019). The limited use of information technology in higher education is an obstacle to improving the quality of the tridharma (Umanailo, 2017). Learning as one part of the tridhama of higher education must be facilitated with good technology to create a pleasant learning climate (Rap & Bionder, 2017; Coudret & Dietrich, 2020). Each university has different technology needs (Indrayani, 2011), so it takes effort for education implementers in the university environment to evaluate and develop their learning technology (Sharpe et al. 2006; Oh & Park, 2009). In reality, there are still many campuses that have not evaluated and then developed the technology used for learning through the evaluation results, even though there are many steps that can be taken by universities to carry out these activities (Purba et al, 2021; Swastikasari et al, 2020). The development of a learning management system (LMS) model is a strategic step to answer the need for learning technology in universities. By referring to various studies that utilize LMS-based learning models (Raharja, 2011; Febriyani, 2018; Rohaeti et al. 2021), by paying

attention to local wisdom (Hernani & Mudzakir, 2012; Septiani et al. 2020). College students come from different regions so that they will help lecturers to enrich students' understanding of topics in various courses (Adiasih & Brahmana, 2015). A good learning management system model must be adaptable and flexible to support the learning process (García-Peñalvo & Alier Forment, 2014). Availability of tools that help teachers (Kautsar et al. 2013), students and administrative staff (Holmes & Prieto-Rodriguez, 2018), parents (Curtis, 2014), Chancellors or vice-chancellors (Ilyas, 2017) in planning, implementing, evaluating, documenting and socializing learning outcomes. Development of a learning management system model by accommodating the availability of virtual lab tools that facilitate practical materials in accordance with local wisdom in all provinces in Indonesia. The development of a learning management system model based on local wisdom in higher education is the basis for developing an effective and efficient LMS. Based on the background above, the aim of this study is to determine the effectiveness of the local wisdom-based learning management system (LMS) model developed for chemistry learning.

2. MATERIAL AND METHODS

This research is a quantitative descriptive study using a survey method (Nardi, 2018). This research was carried out in stages starting from the development to evaluation of local wisdom-based LMS from August 2023 to August 2024. The population in this study were all high school (SMA) students who had implemented the independent curriculum. The sample was taken by random sampling (Sumoargo, 2020) with a target of ≥500 students. The research procedure generally follows the stages in Figure 1 below:

Fig 1. Research Procedures



The data collection technique in this study was by using a student response questionnaire to the local wisdom-based LMS reviewed from 3 dimensions as presented in table 1 below:

Table 1. Research Instrument Grid

Dimension	Item Number Statement
Cognitive Competence	1, 2, 3, 4, 5
Affective Competence	6, 7, 8, 9, 10
Psychomotor Competence	11, 12, 13, 14, 15

The instrument with the distribution of statements in each dimension above is arranged according to the Likert scale (Munandar et al. 2019), namely strongly agree (SS), agree (S), undecided (R), disagree (TS), strongly disagree (STS). The above instrument was validated (Widiana et al. 2023) by an expert validator to make it suitable for use in this study. Validated instruments are presented in a google form to facilitate the distribution of questionnaires.

The data obtained through the distribution of questionnaire links that attach the local wisdom-based LMS design are generally presented in a pie chart and in detail for each dimension will be presented in a respondent hystogram (Sulisti et al. 2024), to provide information on the percentage of responses that strongly agree to strongly disagree with each statement in each dimension. Data analysis in the study is descriptive analysis, which is a data analysis technique by describing the data collected in the form of an average without intending to generalize conclusions. This analysis is used to determine the number of respondents who will be divided according to dimensions, namely cognitive, affective and psychomotor competency dimensions.

3. RESULTS AND DISCUSSION

The appearance of the Learning Management System Integrated Local Wisdom which was developed and then presented on the data collection instrument related to user perception is presented in Figure 2a, 2b, 2c and 2d below.

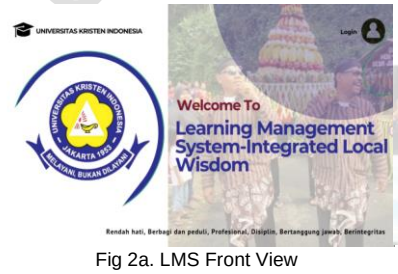


Fig 2a. LMS Front View

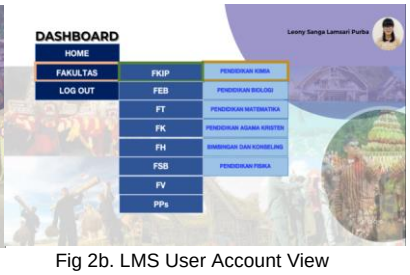


Fig 2b. LMS User Account View

Commented [MS3]: Methods:
give reasons for selecting the sample
- give a step by step description of how the designed LMS integrated with local wisdom is organized and implemented.
- explain in detail how the data was collected to avoid potential bias or limitations in data collection.
- include each indicator of the dimensions measured (cognitive, affective, and psychomotor).

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Commented [MS5]: Check the writing of each appointment (SS); (S); (R); (TS); and (STS)

Commented [MS6]: Check the writing of references

Commented [MS7]: •Results :
Presentation of data and its interpretation is an answer to the problem or hypothesis.
•The data presented is too simple, should be equipped with supporting data

Discussion :
- Provide insights or descriptions of why the research results are so (why the LMS integrated with local wisdom helps in learning (cognitive, affective, and psychomotor) and compare with the latest and most trusted references).

Fig 2c. Advanced Dashboard View Fig 2d. Local Wisdom Selection Display

One example of local wisdom presented in the questionnaire is Tape. Tape is one of Indonesia's local wisdoms known by its basic ingredients and different names in several regions. In Java it is generally known as tapai or peuyeum, one type of which is peuyeum ketan, because the basic ingredient is sticky rice (Cempaka, 2021). In North Sumatra it is known as tape gadong (gadong is the Batak language, one of the tribes in North Sumatra, which means cassava), because it is made from cassava (Syafitri et al 2022).

The use of local wisdom of tapai in the chemistry learning process can be used in several topics such as learning chemical formulas, chemical reactions and reaction kinetics. The catalyst sub-topic in the reaction kinetics topic can be taught by interpreting the role of yeast as a catalyst in the fermentation process of sticky rice or cassava (Mueedin, 2021; Purnomo et al. 2023). The following Figure 3 is a fermentation reaction using the catalyst "Yeast".

Fig 3. Fermentation Reaction of Cassava Using Yeast

The fermentation reaction in making tape is carried out by yeast. Glucose ($C_6H_{12}O_6$) is the simplest sugar, then when fermented it can produce ethanol ($2C_2H_5OH$). The microorganism in this chemical reaction is Saccharomyces cerevisiae which is a fungus that has the ability to convert carbohydrates (fructose and glucose) into alcohol and carbon dioxide. Making tape using cassava as the main ingredient undergoes a fermentation process. This process makes the texture of cassava different from before. The texture becomes soft and mushy with a sour taste. In addition to the influence of microorganisms to break down the components of cassava substances. Another indicator of chemical changes in cassava is the change in smell and color. Temperature greatly influences the fermentation process. If cassava tape is fermented at cold temperatures, the process will take longer, but the resulting tape will be better. However, if fermented at hot temperatures, the process of becoming cassava tape is also faster (Indasah & Muhith, 2020)

Presentation of information related to the use of tape in chemistry learning using LMS provides an overview for respondents who respond to its usefulness in learning. Respondents who filled out the questionnaire on the need for a local wisdom-based learning management system (LMS) model to support chemistry learning, which was distributed via Google Form, were 554 students. Interpretation of the research data is presented in Table 2:

Table 2. Average Score of the Needs Dimension of the Local Wisdom-Based LMS Model

Dimension	Average Percentage of Respondents				
	SS	S	R	TS	STS
Cognitive	37.76	30.08	26.48	5.68	0
Afective	41.24	29.12	23.38	6.26	0
Psychomotor	37.28	31.42	25.12	6.18	0

Based on the table above, it is concluded that the percentage of responses strongly agree and agree that LMS based on local wisdom is effective for cognitive, affective and psychomotor competencies in chemistry learning. The affective competency dimension obtained a higher percentage of strongly agree responses followed by the cognitive competency dimension and the last is the psychomotor competency dimension. In detail, the results of the responses to

each dimension provide a general picture of the effectiveness of Chemistry Learning using LMS integrated with Local Wisdom.

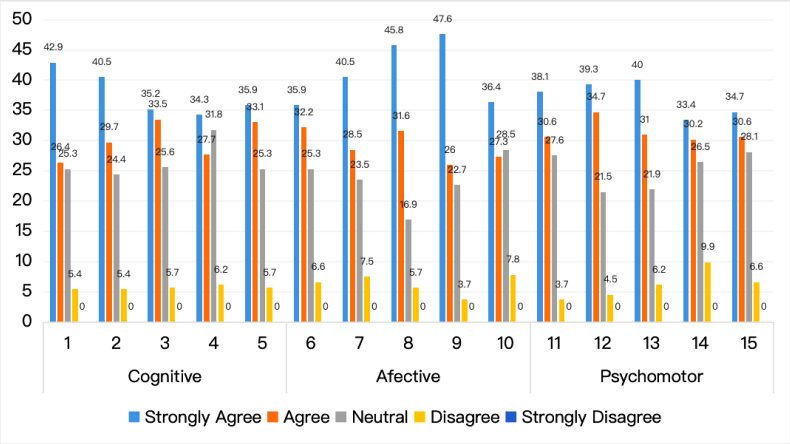

Fig 4. Student Response About Effectiveness of Chemistry Learning using LMS integrated with Local Wisdom

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The students' responses stated that they strongly agreed that Chemistry Learning using LMS integrated with Local Wisdom effectively improves students' learning achievement in line with the research results. The implementation of LMS in chemistry learning can improve students' learning achievement (Nazika, 2021; Sari & Sapri, 2021). The use of local wisdom in chemistry learning can improve students' competence (Amini, 2020) both in cognitive (Hikmawati & Syahidi, 2022), affective (Mulatsih & First, 2023; Ridho et al 2021) and psychomotor (Khery et al 2025) aspects of students. The combination of LMS utilization by involving local wisdom maximizes students' learning achievement.

Learning outcomes in cognitive, affective and psychomotor aspects will be achieved if they are interrelated or closely related to each other in the student learning process (Parwati et al 2023; Putri, 2023), so that the results of this study show no significant difference in the responses of students who strongly agree with the effectiveness of learning using LMS integrated with local wisdom when viewed from Learning outcomes in cognitive, affective and psychomotor aspects. Sedikit lebih tinggi pada aspek afektif dibandingkan kognitif dan psikomotorik merupakan salah satu fakta teori belajar yang pertama kali muncul adalah teori behaviouristik (Khodijah & Setiawan, 2023; Muhajirah, 2020). Through the results of this study, the researcher suggests that chemistry teachers use LMS by involving local wisdom in learning to improve student competencies as a whole, starting from abilities in the affective aspect, then cognitive and building good psychomotor abilities, so that Indonesia has a competitive generation.

4. CONCLUSION

The response of students to about Learning Management System integrated wisdom-based in chemistry learning tends to be positive, this is evidenced by the percentage of strongly agreeing to improve more dominant competencies. In affective competencies, the percentage of strongly agreeing is higher compared to cognitive competencies and psychomotor competencies.

Commented [MS9]: Conclusion:
- Conclusion answers the problem clearly

Conclude with a brief statement emphasizing the importance of your study findings for advancing theoretical understanding and practical applications in chemistry education.

Acknowledge any limitations of the study, such as sample size constraints, specific contextual factors, or methodological limitations.

Propose directions for future research to address these limitations or to explore pertinent aspects not covered in this study (e.g., long-term effects).

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Commented [MS10]: Reference:
- Ensure that citations come from credible and up-to-date sources, follow the specified citation style, and are enriched with references from Scopus-indexed journals.
- Every citation used must be listed in the References section
Avoid using references written in Indonesian; it is preferable to use references in UN languages.

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