E-ISSN: 2963-4946
Vol. 4 No. 04 January 2026
https://ajosh.org/

Asian Journal of Social and Humanities

Enhancing Digital Literacy and Speaking Skills of Students Based on Artificial Intelligence Through Deep Learning

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ARTICLE INFO

Keywords: Literacy; Digitization of Technology; Generation Z

ABSTRACT

The enhancement of AI-based digital literacy and speaking skills among students through deep learning represents a strategic realization of digital transformation across all sectors, including higher education. This development is examined through a structured framework comprising (1) introduction, (2) objectives, (3) implementation, (4) procedural steps, (5) materials, (6) references, and (7) assessment and final evaluation. The research subjects consisted of 840 students enrolled in the Indonesian Language course, distributed as follows: 71 from Public Health A, 63 from Public Health B, 76 from Public Health C, 235 from Undergraduate Medicine, 67 from Nutrition A, 64 from Nutrition B, 59 from Dentistry A, 46 from Dentistry B, 30 from Nursing A, 35 from Nursing B, 24 from Informatics A, 22 from Informatics B, 24 from Informatics C, 8 from Informatics D, and 16 from Informatics E. Data were collected via Google Forms. The results indicate that improvements in AI-based digital literacy and speaking skills through deep learning were executed with a balanced distribution across planning (38.93%), implementation (54.81%), and evaluation (45.45%). These findings demonstrate a significant equilibrium between knowledge and skills, as well as between theory and practice, in advancing students' AI-based digital literacy and oral communication competencies through deep learning.

INTRODUCTION

Literacy is a crucial foundation for accelerating science and technology, especially for the artificial intelligence-based generation in this digital era. In higher education, literacy has become a fundamental need that integrates all academic activities, from using conventional literature to operating digital systems for learning, evaluation, and administrative processes. The urgency of literacy is not only a mandatory standard in campus environments but also an instrument for developing individual competencies in the public sphere (Alhadi et al., 2022; Department of National Education, 2021; Jimmi Pindan Pute et al., 2023; Kominfo, 2021).

This study focuses on enhancing digital literacy and speaking skills of students based on artificial intelligence through deep learning at Muhammadiyah University of Semarang, specifically in the Indonesian Language course. This setting was deliberately chosen for several strategic reasons. First, Muhammadiyah University of Semarang represents a typical Indonesian higher education institution undergoing digital transformation, making it an ideal testbed for AI-based learning interventions. Second, the Indonesian Language course is a common foundational subject across all study programs (Health, Nutrition, Nursing, Medicine, Dentistry, and Informatics), providing a diverse yet comparable student population for comprehensive analysis. Third, this course inherently emphasizes communication competencies, making it particularly suitable for investigating the integration of deep learning

technologies to develop both digital literacy and speaking skills simultaneously. This contextual choice enables examination of how AI-based pedagogical approaches can be systematically implemented across multidisciplinary academic programs within a unified institutional framework (LeCun et al., 2015; Selwyn, 2020; Suherdi et al., 2021; Vaswani et al., 2017).

Improving digital literacy and students' speaking skills is an urgent need to realize quality education in the digital era (Yannier et al., 2021). Digital literacy plays an important role in enhancing academic understanding, critical and analytical thinking skills, and access to relevant, credible information. It also fosters independence, individual empowerment, social and political participation, increased economic productivity, and personal development. Amid rapid technological advancements, digital literacy helps reduce social and economic inequalities.

However, despite growing recognition of digital literacy's importance, empirical research on its integration with AI-based deep learning approaches in Indonesian higher education remains limited. Recent studies have explored digital literacy development among Generation Z students (Wardani et al., 2023; Prasanti & Indriani, 2020), yet few have specifically examined deep learning methodologies to enhance both digital literacy and oral communication skills simultaneously. Furthermore, while international research demonstrates the potential of AI literacy frameworks (Ng et al., 2021; Laupichler et al., 2022), context-specific implementations in Indonesian university settings remain underexplored. This gap is particularly significant given the unique cultural and pedagogical considerations of Indonesian language instruction across diverse health science and technology disciplines. Existing literature on AI in education (Haleem et al., 2022; UNESCO, 2023) primarily focuses on theoretical frameworks rather than practical, multidisciplinary implementations in non-Western educational contexts.

The urgency of this research stems from the accelerating digital transformation in Indonesian higher education, where Generation Z students require both technical competencies and critical communication skills to navigate increasingly AI-mediated professional environments. As Indonesia moves toward Society 5.0, the ability to effectively utilize AI technologies while maintaining strong linguistic and interpersonal communication capabilities becomes essential for graduate employability and social participation. Moreover, the COVID-19 pandemic accelerated adoption of digital learning platforms, creating an immediate need for evidence-based approaches to digital literacy enhancement that can be scaled across diverse academic disciplines.

The novelty of this research lies in its comprehensive, multidisciplinary approach to examining AI-based digital literacy and speaking skills development within the specific context of Indonesian language instruction across six distinct study programs. Unlike previous studies that focus on single disciplines or theoretical frameworks, this research provides empirical evidence of deep learning implementation across health sciences and informatics programs, offering insights into cross-disciplinary applicability. Furthermore, this study uniquely combines digital literacy enhancement with oral communication skill development, recognizing that Generation Z students require integrated competencies rather than isolated technical skills. The research also contributes methodologically by developing a seven-aspect framework (introduction, objectives, implementation, steps, materials, references, assessment)

that can be adapted for AI-based literacy programs in similar educational contexts. Based on these conditions, a study is needed to address questions related to the planning, implementation, and evaluation of enhancing digital literacy and speaking skills of students based on artificial intelligence through deep learning.

The digitalization of technology and the presence of AI in education have significantly changed patterns of social interaction and learning processes. Communication barriers of space and time are diminishing, enabling faster and broader information exchange. Digitalization is the process of transforming data and systems from analog to digital formats to increase efficiency, productivity, and information accessibility. These processes include data transformation, process automation, ease of access and collaboration, service quality improvement, and innovation encouragement. In education, digitalization and AI not only facilitate information management but also support the development of students' speaking skills, making them more adaptive, communicative, and competent in navigating the dynamics of digital society.

The acceleration of artificial intelligence (AI) technology has shifted the paradigm of digital literacy from merely operating devices to interacting with complex algorithms. In this era of transformation, AI-based digital literacy is a crucial instrument for today's generation to understand how autonomous systems work and validate machine-generated information. This proficiency enables individuals to become not only consumers of technology but also critical users who can mitigate risks of disinformation from synthetic content.

The use of AI to improve digital literacy offers a more personalized and adaptive approach to learning. Through machine learning-based platforms, the education process can be tailored to each user's level of understanding and specific needs, from basic digital tool introductions to big data ethics. Intelligent tutoring systems provide real-time feedback, overcoming obstacles in mastering digital competencies more effectively and efficiently than conventional methods.

In higher education and the professional world, AI-based digital literacy is an imperative new competency standard. Using AI-based tools for research processes, scientific paper writing, and administrative data analysis requires deep understanding of data ethics and accuracy. Students and practitioners with strong AI literacy gain a competitive advantage in navigating automated digital ecosystems, where collaboration between human creativity and machine efficiency drives productivity.

While AI offers conveniences, improving literacy must include understanding cybersecurity and digital ethics. AI-based digital literacy raises awareness of data privacy issues, algorithmic bias, and potential manipulation through deepfake techniques. Thus, literacy strengthening focuses not only on technical skills but also on forming responsible digital character. With comprehensive understanding, society can harness AI's potential for scientific advancement without neglecting integrity and humanity.

Students' digital literacy improvement has entered a new chapter through deep learning, a subfield of artificial intelligence that mimics human neural processes to handle complex data. This technology enables students to view literacy not only as a technical ability but also as cognitive skills for evaluating algorithms that filter information in cyberspace. By understanding mechanisms behind Large Language Models, students can develop critical

attitudes toward content validity and gain greater control over interactions in fully automated digital ecosystems.

For speaking skills, deep learning algorithms based on Recurrent Neural Networks (RNN) and Transformers contribute significantly through speech recognition and synthesis tools. Students can use AI-based applications to simulate presentations or debates independently, receiving instant feedback on intonation, pronunciation, and grammatical accuracy. This personalization helps identify articulation weaknesses via precise analytical data, which is difficult to obtain in conventional mass teaching methods.

Deep learning applications create adaptive learning environments, adjusting communication material difficulty based on students' real-time speaking performance. Through Natural Language Processing, AI analyzes the rhetorical structure and coherence of orally delivered arguments. This transformation builds student confidence by providing a safe, scalable practice space to hone speaking fluency before real academic audiences.

While deep learning offers great opportunities, improving digital literacy must address ethical risks, such as AI-based plagiarism and voice cloning. Comprehensive digital literacy equips students to distinguish between productivity-enhancing digital assistants and technology that violates academic integrity. Thus, mastering AI-based speaking skills through deep learning must align with character building and moral responsibility, ensuring technology supports human development rather than substituting students' intellectual essence.

METHOD

This study employed descriptive statistics as its method. The data analysis design was described in detail. This descriptive statistical method was used to present research results that addressed the problem formulations regarding each variable. It depicted the actual research conditions and simplified calculations through charts and tables.

The subjects were students enrolled in 840 Indonesian Language courses. Initially, they completed the instruments based on actual situations and facts. Data collection was conducted according to the sources, methods, and subject conditions. Data were gathered from various sources and adjusted to the research needs. Subject conditions were aligned with researcher requirements. Criteria for research subjects were based on lecture conditions (Ariyati et al., 2020). The research subjects are presented in the following table.

Table 1 Research Subjects

No	Name of the Study Group	Number of Students	Research Sample
1	Class A (S1 Kesmas)	82	71
2	Class B (S1 Kesmas)	79	63
3	Class C (S1 Kesmas)	80	76
4	Class (S1 Medicine)	256	235
5	Class A (S1 Nutrition)	75	67
6	Class B (S1 Nutrition)	77	74
7	Class A (S1 Dentistry)	62	59
8	Class B (S1 Dentistry)	61	46
9	Class A (D3 Nursing)	39	30
10	Class B (D3 Nursing)	43	35
11	Class A (S1 Informatics)	33	24

No	Name of the Study Group	Number of Students	Research Sample
12	Class B (S1 Informatics)	30	22
13	Class C (S1 Informatics)	33	24
14	Class D (S1 Informatics)	33	8
15	Class E (S1 Informatics)	31	16
	Total	1014	840

The instruments in this study include two parts. First, instruments consisting of planning, implementation, and evaluation. Second, the instrument in the form of interviews includes student comments on literacy enhancement. The explanation of each instrument is presented below.

The first instrument consists of several aspects, including (1) preliminary aspect; (2) objective aspects; (3) implementation aspects; (4) the aspect of steps; (5) material aspects; (6) reference aspects; (7) final assessment and evaluation aspects. The second instrument of this study is in the form of interviews with students in the form of written advice and dialogue with researchers online. The second instrument is intended to complement the data of the first instrument.

The steps taken in this study include eight stages, including the following.

1. The determination of the research subject is carried out during the lecture;
2. Preparation of instruments based on certain criteria in the form of improving student literacy;
3. Filling out student questionnaires is done using google forms;
4. Data processing from questionnaires/instruments using the percentage of each answer;
5. The results of questionnaire / instrument processing are interpreted into the final conclusion;
6. The final conclusion of the data processing results is interpreted;
7. Interpretation is carried out by confirming the results of the research to the research subject;
8. A thorough interpretation—including the percentage of truth and error of the research—into the results of the study.

RESULT AND DISCUSSION

Improving digital literacy and AI-based student speaking skills through deep learning is carried out in study programs that are currently taking Indonesian courses including the Nutrition study program, Public Health study program, Nursing study program, Medicine study program, Dentistry and Informatics study program through filling in instruments equipped with interviews to obtain maximum data. The conceptual framework employed in this study draws upon established theories of digital literacy development (Bawden & Robinson, 2022), Generation Z learning characteristics (Christiani & Ikasari, 2020; Wardani et al., 2023), and AI-enhanced pedagogical approaches (Ng et al., 2021; Laupichler et al., 2022). These theoretical foundations informed the design of our seven-aspect evaluation framework and guided our interpretation of student engagement patterns across diverse disciplinary contexts.

The research with the topic "Improving Digital Literacy and Artificial Intelligence-Based Student Speaking Ability through Deep Learning" in the Nutrition, Health, Nursing, Dentistry, Medicine, and Informatics study programs of the University of Muhammadiyah Semarang

provided results described in aspects including (1) introduction; (2) objectives; (3) implementation; (4) steps; (5) materials; (6) references; (7) final assessment and evaluation. The seven aspects are explained as follows.

a. Preliminary Aspects

The introductory aspect contains an introduction that explains information related to improving digital literacy and speaking skills of students based on Artificial Intelligence through Deep Learning, making all students obliged to improve digital literacy and speaking skills of students based on Artificial Intelligence through Deep Learning based on the following provisions.

Table 2 Preliminary Aspects of Improving Digital Literacy and Artificial Intelligence-Based Student Speaking Skills Through Deep Learning

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
1	Improving Digital Literacy and AI-Based Student Speaking Skills through *Deep Learning*, in Indonesian Learning	(b) As supporting materials in accordance with the needs and agreements	540 Respond 64,3%	Improving digital literacy and AI-based speaking skills of students through *deep learning* according to the agreed needs and topics
2	Improving Digital Literacy and AI-Based Student Speaking Ability through *Deep Learning,* in Indonesian learning with the following provisions.	(c) Students convey ideas to lecturers to improve digital literacy and AI-based speaking skills	222 Respond 26,4%	
	Percentage		45,35 %	

b. Objective Aspects

The objective aspect contains themes and objectives related to improving digital literacy and AI-based student speaking skills through deep learning are carried out periodically based on the themes and objectives in the following table.

Table 3 Aspects of the Goal of Improving Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through Deep Learning

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
3	Improving Digital Literacy and AI-Based Student Speaking Ability through *Deep Learning*, in Indonesian learning delivered to students (your Study Program) should be based on the following options.	(b) Students of your study program need to improve their digital literacy and speaking skills through *deep learning*	206 Respond 24,5%	Improving digital literacy and AI-based student speaking skills through deep learning is carried out periodically with certain themes based on the objectives of each study program
4	Improving digital literacy and AI-based student speaking skills through *deep learning* is understood by all students of your study program with the aim of	(a) Improving students' understanding of improving digital literacy and speaking ability so as not to misunderstand	340 Respond 40,5%	
	Percentage		32,5 %	

c. Implementation Aspects

The implementation aspect contains learning plans, learning implementation, and inter-course relationships related to improving digital literacy and AI-based student speaking skills through deep learning

Table 4 Aspects of Implementation of Improving Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through Deep Learning

Questions	Statements/Indicators Questions	Most Answer Alternatives	Percentage Voter 840	Analysis
5.	Improving digital literacy and AI-based student speaking skills through *deep learning is taught conditionally, with consideration....*	(a) taught based on the curriculum in courses that allow	407 Respond 48,5%	Improving digital literacy and student speaking ability in Nutrition, Health, Nursing, Medicine, Dentistry, and Informatics students is carried out based on RPS with E-book/PPT/PPT, e-learning and other literacy facilities balanced between theory and practice related to study programs/departments
6	The ranking of digital literacy and AI-based student speaking skills through deep learning needs to be understood by students of your study program is done using	(a) Learning is facilitated by modules/PPT, balanced theory and practice	613 Respond 73%	
7.	Improving digital literacy and AI-based student speaking skills through deep learning should be equipped with images with the following criteria.	(a) Relate to learning materials	467 Respond 55,6%	
	Percentage		59,03%	

d. Steps Aspect

Aspects of steps to improve digital literacy and AI-based student speaking skills through *deep learning* are supported by personality skills, basic skills, and togetherness between lecturers and students in accordance with the principles and vision and mission of the study program/department

Table 5 Aspects of Steps to Improve Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through *Deep Learning*

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
8	Measures to improve digital literacy and AI-based student speaking skills through *deep learning* are based on....	(d) the ability to explain the purpose and objectives that students want to achieve	496 Answer 59%	Improving digital literacy and AI-based student speaking skills through *deep learning* based on personality steps according to the development of the study program by formulating problems based on basic skills and Togetherness between lecturers and students according to the principles of the vision and mission of the study program
9	In an effort to improve digital literacy and AI-based student speaking skills through *deep learning*, students have basic skills....	(c) Understanding the linguistic rules in literacy and speaking skills	478 Respond 56,9%	

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
10	Steps to improve digital literacy and speaking skills can be done based on the following.	(d) Literacy-simple-purpose-language-attractive-complementary picture format	368 Respond 43,8%	
	Percentage		53,23%	

e. Material Aspects

The material aspects of improving digital literacy and AI-based student speaking skills through *deep learning* Studying Planned Materials refers to standard texts with certain characteristics according to the study program. The results of data collection on the material aspect can be described as follows.

Table 6 Aspects of Material for Improving Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through *Deep Learning*

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
11	Digital literacy materials and good speaking skills meet the following criteria!	(a) The material is based on literacy needs and goals.	486 Respond 57,9%	Improving students' digital literacy and speaking skills based on a balance between knowledge and skills
12	Improving digital literacy and speaking skills through *deep learning* for students should refer to standard text characteristics....	(a) easy to understand, not double-meaning, as intended by the creator of the material	491 Respond 58,5%	
	Percentage		58,2 %	

f. Reference Aspects

The reference aspect of improving digital literacy, Artificial Intelligence-based student speaking skills through *Deep Learning* is learning the materials designed in the curriculum referring to standard texts with certain characteristics according to the study program. The results of data collection from the reference aspect can be described as follows.

Table 7 Reference Aspects of Improving Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through *Deep Learning*

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
13	Content references and speaking skills for your study program should....	(a) in accordance with the standard of reference requirements	426 Respond 50,7%	Improving digital literacy and AI-based student speaking skills through *deep learning* using references as needed and books published in the last 2 years
14	References to content and language with deep learning content should be in the form of....	(c) based on linguistic principles	371 Respond 44,2%	
	Percentage		47,45 %	

g. Final Assessment and Evaluation Aspects

The final assessment and evaluation aspect of improving digital literacy and AI-based student speaking ability through *deep learning* with a campus evaluation system is designed in the curriculum in each study program of the University of Muhammadiyah Semarang. The

results of data collection from the final assessment and evaluation aspects can be described as follows.

Table 8 Final Assessment and Evaluation Aspects of Improving Digital Literacy and Speaking Ability of Students Based on Artificial Intelligence Through *Deep Learning*

Questions	Question Statements/Indicators	Most Answer Alternatives	Percentage Voter 840	Analysis
15	The assessment and evaluation of literacy content and language with deep learning content should be carried out by....	(d) lecturers who are researching the content and language of literacy through deep learning	414 Respond 49,3%	Improving digital literacy and AI-based student speaking skills through *deep learning* using a campus evaluation system and based on outcame
16	Content and language in digital literacy and speaking skills are declared successful or successful if	(c) There are new ideas for digital literacy patterns and speaking skills so as not to harm students	366 Respond 43,6%	
	Percentage		46,45 %	

From the interview instruments, suggestions and student inputs were obtained which can be presented in the following table 9.

Table 9 Comments/ Inputs/ Suggestions

Comments/ Feedback/ Suggestions	Comment Types
Conduct periodic evaluations to ensure the effectiveness of the programs implemented.	Positive Comments
A little input, so that in each course a modern digitization method is used.	
Improving digital literacy and AI-based student speaking skills through *deep learning* is needed to support student learning to be optimal	
Nicess	
With the increase in digital literacy and student speaking ability in the campus environment, it is hoped that students will be able to use this facility well.	
Keep the Spirit Alive	
It can be useful both in the educational and social realms when you graduate.	
It's good and good	
I think that's enough, Thank you	
It is hoped that students can improve their digital literacy and speaking skills	
It meets the criteria	
It's already very good	
The introduction of digital technology and speaking skills is indeed important because students do need to improve their ability to apply technology and digitalization, because in the future we all must follow the development of the times that will be increasingly developed	
Good, make students think critically	
Very good	
Improving digital literacy and speaking skills is also good for adding references that we need if they are not in the written book	
Excellent	
Both because, digital literacy will make it easier for individuals to access education-related information flexibly by using devices that have been connected to the internet network.	
It can be upgraded in the form of learning through digital and technology, besides that you must be able to find ideas/creativity so that in the process Learning looks interesting and not boring	
Learning Indonesian using digital learning is needed because there are many references obtained.	
Hopefully learning with digital mentode can be developed properly and used properly.	
Students can apply and work on course assignments in accordance with the applicable curriculum	

Comments/ Feedback/ Suggestions	Comment Types
Improving AI-based digital literacy through *deep learning* is supported by lecturers, students and campuses	
Improving digital literacy and student speaking ability is adjusted to student abilities and campus provisions so that development is created as needed, especially for the students themselves	
Very good, hopefully it will help and become a learning for students now	
Amazing, thank you	
Digital literacy is quite effective	
It is recommended that the assessment and evaluation of improving students' digital literacy and speaking ability must be in accordance with the new principles that apply and according to what targets are to be implemented so that they run	
Digital technology must be used in a positive direction so that it can affect the learning system. In addition, it is mandatory to record the material that is given back so that the importance of recording and writing is not lost to digital technology	**Objective Comment**
Hopefully it will be even better	
It is recommended that lectures use a learning system that uses technology so that students can develop according to the times	
It is recommended that the assessment and evaluation of improving students' digital literacy and speaking ability must be in accordance with the new principles that apply and according to what targets are to be implemented so that they run	
Digital literacy and AI-based student speaking skills through *deep learning* are urgently needed as an effort to improve digital literacy among students through educational approaches, community strengthening, and policies that support the development of critical skills and the wise use of digital technology.	
Pretty good and easy to understand	
Study harder and enter on time	
It's important to remember that engaging in the digital world, balances offline and online life.	
Towards development, students are expected to maintain and improve critical thinking and ethical skills to encourage their education.	
It would be better for digital literacy to be balanced with non-digital literacy.	
As learning develops more deeply about technology and practice and not just theory	
Maybe in the next 5 or 10 years everything will be technology-based, with this research it will make students more enthusiastic in facing competition, especially in the world of work	
Students apply digital literacy skills in accordance with the majors they take such as nutrition and public health, and other majors	
It can ensure the integration of digital literacy into the formal education curriculum. This includes teaching skills such as media understanding, critical analysis, and digital security.	
Hopefully the lectures can run well and smoothly	
Students have a better understanding of improving digital literacy and students' speaking skills	
Indonesian language courses can contain help to prepare a thesis later, hopefully it can be more advanced	
The role of educators in the era of society 5.0 is able to have digital skills and think creatively.	
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In my opinion, literacy-based learning and digitalization are urgently needed today to support *up-to-date* learning and insight into today's life.	
In my personal opinion, lecture learning must be done with the presentation of material from lecturers so that learning can be understood and understood.	
Increasing digital literacy and AI-based student abilities through *deep learning* makes all students obliged to improve digital literacy	
Improving digital literacy and speaking skills of students is good for students' future,	
There is more balance and cooperation between lecturers and students, to be able to improve literacy and digitalization of technology.	

Comments/ Feedback/ Suggestions	Comment Types
Ensure a robust technology infrastructure, focus on data security, and encourage cross-sector collaboration to drive the development of digitalization 5.0.	
Hopefully students can further improve reading literacy, because in the current era there are still many who are very lacking in reading literacy even including students	
It is indeed necessary to increase literacy and digitalization of technology, but it is necessary to look at the existing basic skills and early habituation	
Students can use or apply improving digital literacy and skills in the realm of education	
None	**Negative Comments**
It is better for this digital era that lecturers and students are able to work together to be better and advanced.	
Minimizing the role of learning material providers so that educators become an inspiration for the growth of students' creativity	
Hopefully in the future it can be even better	
Digital learning is further improved	
Students can delve deeper into improving digital literacy and students' speaking skills	
The need to increase AI-based digital literacy through *deep learning* because nowadays many interest in reading is lost due to the development of technology. It should be given a way to increase literacy in the current era.	
Sorry there is no and thank you	
Hopefully it will get better in terms of learning	
Starting from the way of teaching and interaction in the classroom, it may be possible to improve it so that lectures are not boring and seem interesting.	
Increase literacy	
For the input, hopefully it can be applied even better so that students are familiar with the digitalization of the society 5.0 era	
Education must be revolutionized and oriented towards more modern learning, such as integrating technology in education and the introduction of digital literacy. Universities must take a role in preparing their graduates to be competent and able to enter the jobs that the world needs today.	
It is better to improve digital literacy and students' speaking skills more	
None	
None	
Literacy needs to be improved for students	

Based on the results of research and data analysis described in these tables, the seven aspects can be interpreted as follows.

Planning of Digital Literacy and Student Speaking Skills Standards

Standard planning for improving digital literacy and student speaking ability consists of (1) improving student literacy in each course must be carried out and discussing topics in accordance with the conditions that are in the lecture. This means that the improvement of digital literacy and student speaking ability in students who are taking Indonesian language at the University of Muhammadiyah Semarang will continue according to the schedule and continue to follow the topics that are currently around students so that they can keep up with developments and changes; (2) improving student literacy at the Faculty of Health, Fikkes, Faculty of Medicine, Faculty of Dentistry and Informatics, University of Muhammadiyah Semarang has an aspect of the goal of improving students' academic abilities by reading, understanding, and analyzing references by increasing student knowledge. The goal of self-development is to get the main priority supported during lectures by following the changes that

occur. In this planning, the topic is in line with the objective aspect, the standard of student literacy ability is an effective force in the early stage of research.

Implementation of Improving Digital Literacy and Speaking Ability of Students

The implementation of improving digital literacy and student speaking ability consists of implementation, steps, materials, and references. The four aspects are implemented, including (1) Implementation aspects.

This aspect reached 52.96 percent carried out by students with the guidance of lecturers according to the course. Improving students' digital literacy and speaking skills is carried out by implementing an independent campus. Learning uses ppt material with a balanced weight between theory and practice. This is done based on literacy needs to improve academic abilities. The implementation aspect has been carried out at a maximum of more than 50% but still needs improvement so that the implementation of improving students' literacy skills reaches the optimal point.

a. Aspects of the steps

This aspect reached 53.23 percent was carried out supported by students' communication skills; students' ability to formulate problems that are occurring, and the togetherness between lecturers and students in improving literacy. With the improvement of students' literacy skills, the ability to formulate surrounding problems and a commitment to improve literacy, the aspects of steps can be fulfilled. By constantly improving the literacy skills of students, it is marked by an increasing percentage.

b. Material aspects

This aspect reached 58.2 percent with the orientation of materials to improve students' digital literacy based on the university curriculum containing entrepreneurial and internship characteristics. The material is based on an independent campus and refers to standard texts for student self-development oriented to management and accounting students' abilities.

c. Reference aspect

This aspect reached 47.45 percent with reference to improving students' digital literacy skills based on the standards of graduate needs and using the latest published books in the last two years. The standard of needs is based on the academic framework by paying attention to the peculiarities of the study program. This means that the reference aspect is growing and increasing in percentage.

Final Assessment and Evaluation of Improving Digital Literacy and Speaking Ability of Students

The final assessment and evaluation aspect of improving students' digital literacy skills and speaking skills reached 62.3 percent. This final assessment and evaluation is carried out by the teaching lecturer by paying attention to the specified evaluation system. Increasing literacy is declared successful if students can apply academic abilities in the academic realm and social skills by participating in 8 activities according to the program. The final assessment and evaluation are carried out based on the characteristics of the Health, Nutrition, Nursing, Medicine study program and the final evaluation assessment is based on the characteristics of the study program. With the achievement of 62.3 percent of the assessment and final evaluation of improving students' digital literacy and speaking skills, it needs to be constantly improved

to really support the uniqueness of the study program. The final assessment and evaluation of student literacy improvement pays attention to the evaluation system, the method of evaluation, the basis of evaluation, and the evaluation time.

The evaluation system for improving the literacy of students of the Faculty of Health, Nutrition, Nursing, Dentistry, Medicine, and Informatics of the University of Muhammadiyah Semarang is carried out by Indonesian lecturers by paying attention to the evaluation system.

One of the ways to evaluate the improvement of digital literacy and speaking ability of students at the Faculty of Health, Nutrition, Nursing, Medicine, and Informatics of the University of Muhammadiyah Semarang is by recording student assignments and activities during lectures. This record is what validly provides the data.

The basis for evaluating the improvement of digital literacy and speaking ability of students of the Faculty of Health, Nutrition, Nursing, Medicine and Informatics on the tasks and responsibilities carried out by students during lectures in the semester in question.

The evaluation time for improving the literacy of students of the Faculty of Health, Nutrition, Nursing, Medicine, and Informatics of the University of Muhammadiyah Semarang is carried out every time the assignment is completed. This is intended so that there is an alignment between values and the real situation. In addition, students anticipate completing assignments with the help of other parties.

1. Discussion of Interview Data

From the interview questionnaire, students were divided into three groups, namely the positive comment group, the objective comment group, and the negative comment group. The positive comment group considered that improving students' digital literacy and speaking skills was very beneficial. Improving literacy skills is also to increase knowledge. Improving digital literacy skills and students' speaking skills are diverse and in accordance with the curriculum which makes students' knowledge increasingly develop.

The objective comment group said that students are invited to increase awareness of the importance of literacy in the scope of lectures. Students are always enthusiastic about adding knowledge for the future, students are always improving their literacy skills wherever they are for their future development. Students also constantly improve their literacy skills to be applied at the next stage to be able to apply to academic and social situations.

The negative comment group said that the increase in digital literacy was carried out by students who were interested. Improving literacy skills only provides understanding for graduation provisions. In addition, increasing literacy is applied to students with a relaxed method.

CONCLUSION

This study concludes that the AI-based enhancement of digital literacy and speaking skills through deep learning was successfully implemented across health sciences and informatics programs at Muhammadiyah University of Semarang, demonstrating strong planning, execution, and evaluation within a seven-aspect framework—particularly effective in implementation (54.81%)—while balancing theory and practice to foster integrated competencies for Generation Z students in AI-mediated environments. Student feedback affirmed its utility, relevance, and support for adaptive learning, equipping participants with

technical proficiency and critical communication skills for academic and professional success. For future research, longitudinal studies are recommended to evaluate long-term impacts on employability and lifelong learning, alongside development of granular assessment tools for cognitive, metacognitive, ethical, and creative gains, with comparative analyses across institutions, cultures, and disciplines to improve framework generalizability.

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