



Digital Literacy and AI Awareness Among High School Students: Implications for Future Workforce Readiness

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Abstract. The rapid development of digital technology, particularly artificial intelligence (AI), has transformed the modern world of work, demanding new competencies from the future workforce. Although digital literacy is increasingly recognized as a critical 21st-century skill, attention to digital literacy and AI awareness among vocational students remains limited. This study measures digital literacy and AI awareness of vocational high school (SMK) students and examines their influence on workforce readiness in the digital era. A quantitative approach used a questionnaire distributed to 53 eleventh-grade students at SMK Plus AI Aitam Bandung, Indonesia, with multiple regression testing the influence of digital literacy and AI awareness on workforce readiness. Results show digital literacy is high (mean = 4.12), led by information literacy (4.32) and digital safety & ethics (4.26), while technological literacy (3.86) is lowest. AI awareness is also high (mean = 4.08), led by AI ethics & critical thinking (4.27) and AI application skills (4.24), while AI conceptual knowledge (3.81) needs strengthening. Overall workforce readiness is also high (mean = 4.06). Digital literacy and AI awareness jointly affect workforce readiness significantly ($F = 20.163$; $\text{sig.} = 0.000$), contributing 44.6% ($R^2 = 0.446$). Digital literacy alone has a positive, significant effect ($\beta = 0.460$; $\text{sig.} = 0.003$), while AI awareness shows a positive but non-significant effect ($\beta = 0.260$; $\text{sig.} = 0.084$), indicating an indirect influence mediated by other variables. These findings confirm the need to strengthen digital literacy as the foundation of workforce readiness while integrating AI concepts into the SMK curriculum.

Keywords: AI Awareness, Digital Literacy, Workforce Readiness.

1 Introduction

The rapid development of digital technology and artificial intelligence (AI) over the past two decades has brought fundamental changes to various aspects of human life, including education and employment. The era of Industrial Revolution 4.0 and Society 5.0 requires the younger generation to possess not only adequate academic ability but also comprehensive digital competence to face the challenges of the future job market. In this context, digital literacy and AI awareness become two crucial

competencies that every individual, particularly high school (SMA) students, needs to possess.

Digital literacy is defined as an individual's ability to use information and communication technology effectively, critically, and responsibly in daily life [1,2]. Meanwhile, AI awareness refers to an understanding of how artificial intelligence technology works, its applications, and its social and ethical implications [3]. These two competencies are interrelated and form an important foundation in preparing an adaptive and innovative future workforce. Evidence on the ground shows that the integration of AI technology into various industrial sectors is becoming increasingly massive. [4] projected that around 85 million jobs would be disrupted by automation and AI by 2025, while on the other hand, around 97 million new jobs requiring advanced digital skills would be created. This indicates that workforce readiness is no longer limited to mastering technical knowledge alone, but also includes the ability to adapt to AI technology and use it productively.

High school students are at a strategic developmental stage, as they will soon enter higher education or the workforce. At this stage, equipping them with digital literacy and an understanding of AI is essential so that they do not merely become passive technology users, but are able to think critically, creatively, and innovatively in using technology to solve various problems. However, research shows that the level of digital literacy and AI awareness among high school students still varies widely and is often inadequate [5, 6].

Based on this background, this study aims to examine the level of digital literacy and AI awareness among high school students and its implications for their readiness to enter the future workforce. This article is expected to provide a comprehensive picture of the condition of digital literacy and AI understanding among secondary-level students, as well as to recommend relevant educational strategies to improve the workforce readiness of the younger generation in facing the digital era.

2 Literature Review

2.1 Digital Literacy: Concept and Dimensions

The concept of digital literacy was first introduced by [1], who defined it as the ability to understand and use information from various digital sources. Since then, this concept has continued to develop alongside the rapid advancement of technology. [2] expanded this definition by emphasizing the importance of the ability to access, analyze, evaluate, and create content using digital media. Subsequently, [7] developed a digital literacy framework comprising five dimensions, namely photo-visual literacy, reproduction literacy, information literacy, branching literacy, and socio-emotional literacy.

[8], through the DigComp 2.2 framework, identified five digital competence areas that digital citizens need to possess, namely: (1) information and data literacy, (2) communication and collaboration, (3) digital content creation, (4) digital safety, and (5) problem solving. This framework has been widely adopted in various educational

policies in Europe and serves as a reference for many countries in developing digital literacy curricula. In Indonesia itself, digital literacy has become one component of the Pancasila Student Profile launched through the Merdeka Curriculum [9].

Research on digital literacy among students shows varied results. [5], in their meta-analysis, found that gender, technology access, and socioeconomic environment significantly influence students' digital literacy levels. Meanwhile, [10] identified a digital divide not only in physical access to technology but also in the ability to use technology effectively and creatively, which they refer to as the "digital skills gap."

2.2 AI Awareness: Definition and Conceptual Framework

Along with the widespread use of AI technology in everyday life, there is a growing need for better public understanding of how AI works and its implications. [3] defined AI literacy as a set of competencies that enable a person to critically evaluate AI technology, communicate and collaborate effectively with AI, and use AI as a tool in personal and professional life. This framework comprises 17 competencies grouped into five dimensions: what is AI, what can AI do, how does AI work, how should AI be used, and how do people shape AI [6].

Developed the "Five Big Ideas in AI" framework, specifically designed for the K-12 education context. The five big ideas include: (1) perception (how AI perceives the world), (2) representation and reasoning (how AI represents and processes knowledge), (3) learning (how AI learns from data), (4) human-AI interaction, and (5) the societal impact of AI. This framework has become a reference in the development of AI literacy curricula in various countries, including the United States, China, and several European countries.

Recent research by [11] shows that although today's younger generation is growing up surrounded by AI technology, many of them hold misconceptions about how AI works. This study found that students tend to anthropomorphize AI, that is, to attribute human-like feelings and consciousness to AI. These findings underscore the importance of AI education that focuses not only on technical aspects but also includes a critical understanding of the limitations, biases, and ethical implications of AI systems.

2.3 Workforce Readiness in the Digital Era

The concept of workforce readiness in the context of the digital era has undergone a significant expansion in meaning. Whereas workforce readiness was previously associated mainly with technical and academic skills, its dimensions now extend to digital skills, the ability to adapt to new technologies, and cross-cultural competence in an increasingly global and virtual work environment [12]. [4], in its "Future of Jobs Report," identified analytical skills, creativity, cognitive flexibility, and technological literacy as the most critical skills needed in 2025 and beyond.

Research conducted by [13] through the "21st Century Skills" framework identified four essential skill groups that the younger generation needs to master, namely: (1) ways of thinking (creativity, critical thinking, problem solving), (2) ways of working (communication and collaboration), (3) tools for working (information

and ICT literacy), and (4) skills for living in the world (citizenship, career, and personal-social responsibility). In the context of the AI era, competence in the third dimension, particularly understanding of AI and data, is becoming increasingly important and strategic.

At the national level, various efforts have been made by the Indonesian government to improve workforce readiness for the digital era. The Indonesian National Strategy for Artificial Intelligence 2020-2045 [14] established the development of AI-literate human resources as one of its main priorities. Nevertheless, the gap between industry needs and the readiness of education graduates remains a major challenge that needs to be addressed through curriculum reform that is more adaptive and responsive to technological developments.

2.4 The Relationship Between Digital Literacy, AI Awareness, and Workforce Readiness

Several studies have examined the relationship between digital literacy, AI awareness, and workforce readiness among students. [15], in their study of high school students in the United States, found a significant positive correlation between the level of digital literacy and perceived workforce readiness. Meanwhile, [16] developed a digital literacy model based on four dimensions cognitive, technical, socio-emotional, and creative that was shown to influence individuals' readiness to face workplace challenges in the digital era.

More specific studies on the role of AI awareness in workforce readiness are beginning to develop alongside the growing implementation of AI in industry. [17] showed that educational interventions that integrate an early understanding of AI effectively increase students' interest and readiness to pursue careers in technology. On the other hand, [18] asserted that AI literacy is not only relevant for those who will pursue careers in technology, but has become a universal competency needed by all individuals across professions, given the increasingly deep penetration of AI into all industrial sectors.

Based on the literature review presented above, it is clear that digital literacy and AI awareness are two complementary competencies that both contribute to workforce readiness in the digital era. This study seeks to fill this literature gap by providing an empirical picture of the condition of these two competencies among high school students in Indonesia, as well as analyzing their implications for their readiness to enter a future workforce that is increasingly influenced by AI technology.

3 Methods

This study uses a quantitative approach. The choice of a quantitative approach in this study is based on the need to measure the level of digital literacy and artificial intelligence (AI) awareness in a measurable and objective manner, as well as to statistically test their influence on students' workforce readiness.

The type of research used is descriptive-explanatory survey research. Descriptive research aims to provide a systematic picture of students' levels of digital literacy and

AI awareness, while explanatory research aims to explain the causal relationships between the variables studied. The combination of these two types of research allows the researcher not only to describe the existing conditions but also to explain the factors that influence students' workforce readiness in the digital era.

This study was conducted at SMK Plus AI Aitam Bandung, a vocational high school located in the city of Bandung, West Java Province, Indonesia. The selection of this research location was based on several considerations, namely: (1) the relevance of student characteristics as members of the younger generation who will soon enter the digital workforce, (2) the representativeness of SMK students as prospective vocational workers, and (3) the accessibility of the researcher in conducting data collection.

The sample in this study consisted of 53 eleventh-grade students at SMK Plus AI Aitam Bandung. The sampling technique used was total sampling (saturated sampling), in which all members of the population were used as the research sample. This technique was chosen because the relatively small population size allowed all population members to be reached as respondents. This is consistent with the view of [19], who stated that if the population is fewer than 100 people, the entire population should be used as the research sample.

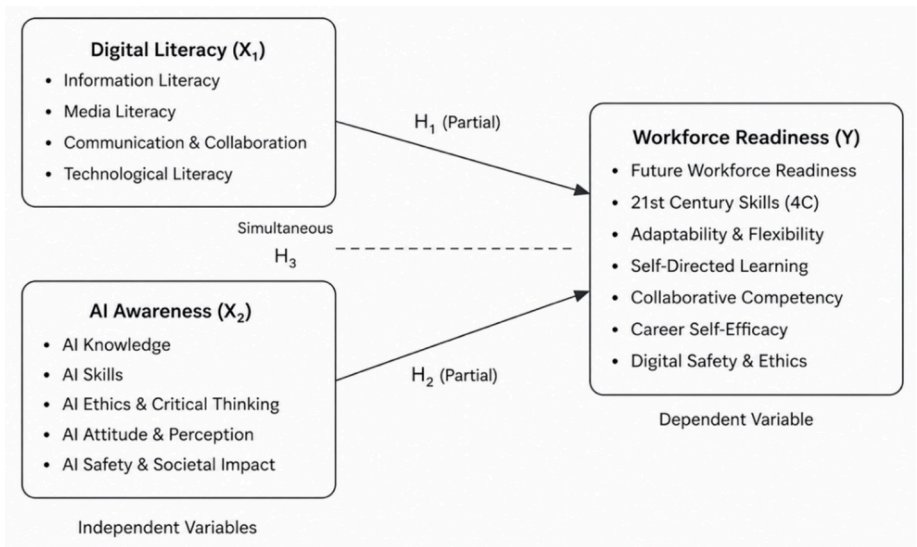


Fig.1. Research Model

4 Results and Discussion

Descriptive Analysis Results

Descriptive analysis was conducted to obtain a general picture of the level of each research variable based on respondents' perceptions. Assessment used a scale of 1 to 5, which was then categorized into the following five levels.

Table 1. Descriptive Analysis Category

Score Range	Category
1.00 - 1.80	Very Low
1.81 - 2.60	Low
2.61 - 3.40	Moderate
3.41 - 4.20	High
4.21 - 5.00	Very High

Digital Literacy

The Digital Literacy variable obtained an average score of 4.12, which falls into the “High” category. This indicates that respondents generally have good digital literacy skills. The dimension with the highest score was Information Literacy (4.32), followed by Digital Safety & Ethics (4.26), while the Technological Literacy dimension obtained the lowest score (3.86), although it still falls into the high category.

Table 2. Descriptive Analysis of the Digital Literacy Variable

Dimension	Average	Category
Information Literacy	4.32	High
Media Literacy	4.08	High
Communication & Collaboration Literacy	4.10	High
Technological Literacy	3.86	High
Digital Safety & Ethics	4.26	High
Variable Average	4.12	High

AI Awareness

The AI Awareness variable obtained an average score of 4.08, which falls into the “High” category. The AI Ethics & Critical Thinking dimension recorded the highest score (4.27), indicating respondents’ strong awareness of ethical aspects in AI use. Meanwhile, the AI Conceptual Knowledge dimension obtained the lowest score (3.81), indicating room for improvement in conceptual understanding of AI.

Table 3. Descriptive Analysis of AI Awareness

Dimension	Average	Category
AI Conceptual Knowledge	3.81	High
AI Application Skills	4.24	High

AI Ethics & Critical Thinking	4.27	High
AI Attitude & Perception	3.95	High
AI Safety & Societal Impact	4.13	High
Variable Average	4.08	High

Future Workforce Readiness

The Future Workforce Readiness variable obtained an average score of 4.06, which falls into the “High” category. The Collaborative Competency dimension showed the highest score (4.14), while Career Self-Efficacy obtained the lowest score (3.91). In general, these results indicate that respondents perceive themselves as reasonably ready to face the demands of the future workforce.

Table 4. Descriptive Analysis of the Future Workforce Readiness Variable

Dimension	Average	Category
21st Century Skills (4C)	4.11	High
Adaptability & Flexibility	4.11	High
Self-Directed Learning	4.02	High
Collaborative Competency	4.14	High
Career Self-Efficacy	3.91	High
Variable Average	4.06	High

Regression Analysis Results: Influence Test

Multiple linear regression analysis was used to test the influence of Digital Literacy and AI Awareness on Future Workforce Readiness. The model testing results are presented step by step below.

Table 5. Model Fit Test (Model Summary)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.668	0.446	0.424	0.30955

The R Square value of 0.446 indicates that Digital Literacy and AI Awareness together are able to explain 44.6% of the variation in Future Workforce Readiness, while the remaining 55.4% is explained by other factors outside this research model.

Table 6. Simultaneous Test (F Test / ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
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Regression	3.864	2	1.932	20.163	0.000
Residual	4.791	50	0.096	-	-
Total	8.655	52	-	-	-

The ANOVA test results show an F value of 20.163 with a significance level of 0.000 ($p < 0.05$). This proves that Digital Literacy and AI Awareness simultaneously have a significant effect on Future Workforce Readiness, so the regression model used is considered fit for predicting the dependent variable.

Table 7. Partial Test (t Test)

Model	B	Std. Error	Beta	t	Sig.
(Constant)	1.209	0.456	-	2.652	0.011
Digital Literacy	0.436	0.140	0.460	3.114	0.003
AI Awareness	0.257	0.146	0.260	1.760	0.084

Based on the coefficient table above, the following conclusions can be drawn:

1. Digital Literacy has a positive and significant effect on Future Workforce Readiness, with a beta coefficient of 0.460 and a significance of 0.003 ($p < 0.05$). This means that the higher a person's level of digital literacy, the higher their readiness to face the future workforce.
2. AI Awareness shows a positive but not significant effect on Future Workforce Readiness, with a beta coefficient of 0.260 and a significance of 0.084 ($p > 0.05$). This indicates that, in this study, AI awareness has not yet made a statistically significant contribution to future workforce readiness, although the direction of its effect remains positive.

Thus, of the two independent variables tested, Digital Literacy is the most dominant and significant predictor in shaping Future Workforce Readiness, while AI Awareness serves as a supporting factor whose effect has not yet reached statistical significance in this study.

The F test results show that digital literacy (X_1) and AI awareness (X_2) simultaneously have a significant effect on students' workforce readiness (Future Workforce Readiness), with an F value of 20.163 and a significance of 0.000 ($p < 0.05$). The coefficient of determination (R^2) of 0.446 indicates that these two independent variables together are able to explain 44.6% of the variation in students' workforce readiness, while the remaining 55.4% is explained by other variables outside this research model.

These findings are consistent with various previous studies that assert digital competence is collectively a strong predictor of readiness to enter the workforce. [20] stated that digital literacy is now viewed as a key prerequisite for employability and innovative work behavior in the digital economy era. Furthermore, a study by [21] of pilot vocational high school (SMK) students showed that digital literacy influences readiness to face the digital economy, both directly and through mediators such as

entrepreneurial agility and digital entrepreneurship education. Thus, the combination of digital literacy and AI awareness forms a complementary competency foundation in preparing vocational students for the demands of the 21st-century workforce.

Based on the t-test results, digital literacy is proven to have a positive and significant effect on students' workforce readiness, with a beta coefficient (β) of 0.460, $t = 3.114$, and a significance of 0.003 ($p < 0.05$). This means that for every one-unit increase in digital literacy score, workforce readiness increases by 0.436 units, assuming other variables remain constant. Digital literacy is the most dominant predictor in this research model, confirming the proposed H_1 .

These findings are consistent with the results of [22], who found that digital literacy significantly influences the workforce readiness of office administration students ($t = 2.526$; $p < 0.05$). Similarly, [23], in a study of students at SMK Batik 2 Surakarta, found that digital literacy ability has a positive and significant effect on workforce readiness, with a combined contribution alongside internship experience of 67% ($R^2 = 0.670$). A cross-country study by [20] also confirmed that digital literacy is a prerequisite for employability and innovative work behavior, particularly because this competency encompasses information management, digital collaboration, cybersecurity, and technology use ethics, all of which are relevant to the demands of modern workplaces.

From a theoretical perspective, the dominant influence of digital literacy can be explained through the 21st-century competency framework, which positions digital literacy as an enabling competency, that is, a competency that allows individuals to access, evaluate, and utilize digital resources effectively in the workplace [24,25]. In the context of SMK students who are directly prepared to enter the workforce, the practical ability to operate digital technology, understand information security, and collaborate online becomes a fundamental competency that can be directly applied, making its effect on workforce readiness more measurable and statistically significant.

Unlike digital literacy, AI awareness shows a positive but partially non-significant effect on workforce readiness, with $\beta = 0.260$, $t = 1.760$, and a significance of 0.084 ($p > 0.05$). Although the direction of the effect remains positive—indicating that students with higher AI awareness tend to have better workforce readiness—this effect is not yet strong enough to reach statistical significance at the $\alpha = 0.05$ level.

These results can be understood from several perspectives. First, AI awareness is essentially a perceptual and conceptual construct, so its effect on workforce readiness is not always direct, but tends to be mediated by intervening variables such as self-efficacy, self-efficacy toward AI technology, or learning motivation. A study by [26] in the context of healthcare workers in Saudi Arabia found that AI perception alone did not have a significant effect on performance ($\beta = -0.006$; $p = 0.315$), but became significant when moderated by technology readiness ($\beta = 0.251$; $p = 0.021$). This suggests that AI awareness requires supporting variables for its effect to be fully realized.

Second, a systematic review by [27] revealed that AI awareness interacts in complex ways with work-behavior variables; under certain conditions, high awareness of AI can actually trigger job-displacement anxiety and resistance to

change, thereby dampening its positive effect on workforce readiness. This phenomenon is consistent with the findings of this study, in which students may be aware of the existence of AI but do not yet have sufficient practical capacity to integrate it into their workforce readiness.

Third, from a methodological standpoint, the lack of partial significance of AI awareness may also be caused by partial multicollinearity between digital literacy and AI awareness (both of which are positively correlated within the context of digital competence). When entered together in a single model, the unique contribution of AI awareness to the variance in workforce readiness becomes smaller, as some of its variance has already been explained by the more dominant digital literacy variable. This also explains why, although both variables are jointly significant in the simultaneous test, AI awareness does not reach the required level of significance in the partial test.

Nevertheless, the positive beta value ($\beta = 0.260$) and the significance level close to the critical threshold ($p = 0.084$) indicate that AI awareness has the potential to become a significant predictor if supported by: (a) an increase in sample size, (b) the strengthening of more structured AI-based learning programs within the SMK curriculum, and (c) the development of students' AI self-efficacy through hands-on practice using AI-based tools. This is consistent with the recommendations of [28], which emphasize the importance of a supportive learning context so that AI awareness can genuinely enhance the digital competence of vocational students.

Theoretically, this study reinforces the concept of a digital competence hierarchy in the context of vocational workforce readiness, in which digital literacy serves as the primary foundation with a direct and measurable effect, while AI awareness functions as an advanced competency whose effect is more indirect and contextual. These findings contribute to the development of an integrated digital competence model for SMK students in the era of digital transformation.

Practically, these findings have several important implications. For educators and schools, the first priority is to strengthen the digital literacy curriculum to cover practical technology skills, information security, and digital collaboration, as these dimensions contribute the most to workforce readiness. At the same time, conceptual understanding of AI needs to be integrated into project-based learning so that students possess not only awareness but also the capability to apply AI. For policymakers, these findings underscore the need for a systematic update of the SMK curriculum that integrates basic digital competencies while incorporating AI literacy modules as a mandatory component of vocational productive subjects.

5 Conclusion

The research results show that the overall level of digital literacy among eleventh-grade students at SMK Plus Al Aitam Bandung falls into the high category, with an average score of 4.12. The information literacy (4.32) and digital safety & ethics (4.26) dimensions showed the best performance, in the very high category, reflecting students' good ability to access digital information as well as ethical

awareness in technology use. Meanwhile, the technological literacy dimension obtained the lowest score (3.86), indicating that mastery of more complex technological tools and devices still needs further development.

Students' level of AI awareness is also in the high category, with an average score of 4.08. The AI ethics & critical thinking (4.27) and AI application skills (4.24) dimensions reached the very high category, showing that students are not only able to use AI practically but also possess good ethical sensitivity toward the technology. However, the AI conceptual knowledge dimension obtained the lowest score (3.81), indicating that theoretical understanding and the scientific foundations of how artificial intelligence works remain a gap that needs attention in the development of the vocational curriculum.

Students' workforce readiness in the digital era (future workforce readiness) falls into the high category, with an average score of 4.06. The collaborative competency dimension ranked highest (4.14), followed by 21st century skills and adaptability & flexibility, each at 4.11. This reflects that students possess promising collaboration and adaptation abilities as capital for entering the workforce. On the other hand, the career self-efficacy dimension obtained the lowest score (3.91), indicating the need to strengthen career self-confidence through more intensive exposure to the world of work.

Simultaneously, both digital literacy and AI awareness are proven to have a positive and significant effect on students' workforce readiness, both partially and jointly. These findings confirm that improving digital competence and AI understanding are important predictors of the readiness of the younger vocational generation to face the demands of the digital economy. Therefore, integrating AI literacy and advanced digital skills into the SMK curriculum is an urgent agenda that needs to be realized in order to close the gap between the competencies students possess and the competencies required by industry.

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