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The Influence of Artificial Intelligence (Ai) Usage on The Development of Cognitive and Affective Skills among Students of The Faculty of Technical and Vocational (FTV), UPSI

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ABSTRACT

The use of artificial intelligence (AI) such as ChatGPT, Copilot and DeepSeek is increasingly widespread among higher education students as a learning support tool. However, the uncontrolled use of AI raises concerns about the development of students' cognitive and affective skills, especially in terms of dependency, motivation and engagement in learning. Therefore, this study aims to identify the level of use of artificial intelligence (AI) and analyze the relationship between the use of AI and the development of cognitive and affective skills of students at the Faculty of Technical and Vocational Education (FTV), Sultan Idris University of Education (UPSI). This study uses a quantitative design in the form of a descriptive and correlation survey involving 308 students as a study sample. Data were collected using a questionnaire and analyzed using SPSS software through descriptive analysis and Spearman correlation. The study findings show that the level of use of AI is at a very high level ($M = 4.471$, $SP = 0.330$). In addition, the development of cognitive skills ($M = 4.45$, $SP = 0.398$) and affective skills ($M = 4.51$, $SP = 0.323$) is also at a very high level. Correlation analysis showed that there was a significant positive relationship between AI use and cognitive skills ($r_s = 0.497$, $p < .001$) and affective skills ($r_s = 0.433$, $p < .001$). In conclusion, the use of AI has the potential to help improve student skill development if used in a controlled and ethical manner in the learning process.

1. Introduction

The development of digital technology has encouraged the use of artificial intelligence (AI) in higher education, especially through applications such as ChatGPT that can support self-learning, idea generation and immediate feedback [18]. In the context of Technical and Vocational Education

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(TVET), the integration of AI is important because this field requires mastery of knowledge, thinking skills and the formation of professional attitudes in line with industry needs [4].

Although AI has the potential to improve understanding and learning effectiveness [11,12], excessive use can lead to metacognitive laziness and cognitive offloading phenomena that affect students' cognitive development and motivation [25,36]. From an affective aspect, unbalanced use of AI can also have implications for self-confidence and academic integrity [8,24]. However, studies examining the relationship between the level of AI use and the development of cognitive and affective skills of TVET students in Malaysia are still limited. Therefore, this study was conducted to assess the level of AI use and its relationship with the cognitive and affective development of students at the Faculty of Technical and Vocational (FTV), UPSI. The specific objectives of this study are to identify the level of use of artificial intelligence (AI) among students of the Faculty of Technical and Vocational (FTV), Universiti Pendidikan Sultan Idris (UPSI) based on the type of AI, frequency of use, and purpose of use and to analyze the relationship between the level of use of artificial intelligence (AI) with the development of cognitive and affective skills of students of the Faculty of Technical and Vocational (FTV) in learning.

2. Literature Review

2.1 Artificial Intelligence (AI) in Education

In the era of 21st century education, the education system in Malaysia emphasizes holistic student development through higher-order thinking skills and the use of digital technology, including Artificial Intelligence (AI), as part of the 21st Century Learning (PAK-21) approach [19]. AI enables the creation of adaptive learning systems and smart tutors that tailor learning experiences according to student abilities, increase the effectiveness of PdPc and encourage self-directed and interactive learning [14]. In addition, AI facilitates continuous monitoring of student performance and allows for precise interventions to improve learning outcomes. Thus, the integration of AI opens up new opportunities for more personalized, interactive and effective learning, while emphasizing the need for further research on its long-term impact on students' cognitive and affective skills, especially in technical and vocational education.

2.2 The Use of Artificial Intelligence (AI) in Student Learning

Artificial Intelligence (AI) plays a key role in enhancing student learning by providing adaptive learning systems, smart tutors, virtual labs, and automated writing applications that support academic activities and practical training [28,32]. The use of AI allows students to tailor learning strategies to individual needs, improve the effectiveness of academic assignments, reflective skills, and digital literacy, as well as strengthen technical skills in the context of technical and vocational education [30,33]. In addition, AI also functions as a self-monitoring and feedback tool that allows students to assess their performance, identify weaknesses, and continuously improve their learning outcomes. Therefore, the integration of AI in learning not only improves students' academic and technical competence, but also builds students who are independent, innovative, and ready to face the challenges of the modern digital world.

2.3 Cognitive Development of Students through Artificial Intelligence (AI)

Cognitive development of students refers to the ability to acquire, store, process and use information to make decisions and solve problems [27]. Artificial Intelligence (AI), such as ChatGPT,

supports this development through interactive learning, step-by-step scaffolding and problem-based learning (PBL) that encourage critical thinking, analysis and problem solving [22,36]. However, excessive use of AI can lead to dependency, limiting students' creativity and self-effort [23]. Therefore, it needs to be combined with pedagogical approaches that encourage critical and reflective thinking. With controlled use, AI has the potential to enhance learning effectiveness and build students who are independent and ready to face the challenges of 21st century education.

2.4 Affective Development through Artificial Intelligence (AI)

Students' affective development encompasses emotions, attitudes, values, motivations and interests, which influence their engagement and ability in learning [5]. Artificial Intelligence (AI), such as ChatGPT, can support this development through personal interactions and feedback that stimulate intrinsic motivation and positive attitudes towards technology use [17]. Adapting AI to local language and cultural contexts also increases students' confidence and interest in academic tasks [35]. However, excessive use of AI can lead to dependency and reduce self-effort, and therefore it should be used as a complement to traditional pedagogical approaches with appropriate controls [1]. With a balanced approach, AI has the potential to strengthen students' affective development, build motivation, self-esteem and integrity, in line with the formation of holistic 21st century learners.

2.5 Conceptual Framework

Figure 1 shows the conceptual framework of the study based on the Social Constructivism Theory by Vygotsky (1978), which states that learning occurs through social interaction and the use of support tools such as technology. The concept of Zone of Proximal Development (ZPD) explains that students can improve their abilities through the help of external support, including artificial intelligence (AI), which acts as a learning support tool. In line with that, Cai *et al.*, [7] explained that AI acts as a digital scaffolding that helps students develop from the level of potential to the level of actual mastery. Therefore, this study places the use of artificial intelligence as the independent variable, while the development of cognitive and affective skills as the dependent variables to explain the relationship between the use of AI and student development.

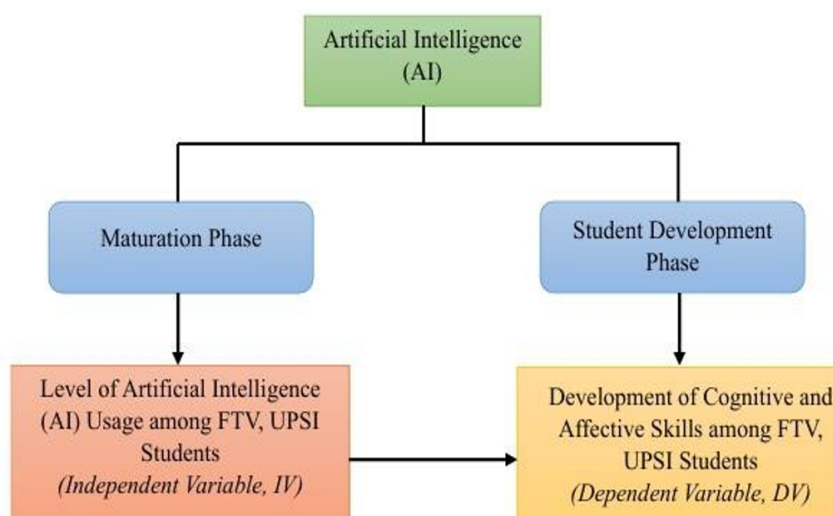


Fig. 1. Conceptual framework of the study

3. Methodology

3.1 Research Approach

This study employs a quantitative research design with descriptive-correlational approach to identify the level of use of artificial intelligence (AI) and analyze the relationship between the use of AI and the cognitive and psychomotor development of students at the Faculty of Technical and Vocational Education (FTV), Sultan Idris Education University (UPSI). A survey method through questionnaires was used to systematically collect data from FTV students, while statistical analysis was conducted without any manipulation of variables.

3.2 Population and Sample

The study population consisted of 721 students of the Faculty of Technical and Vocational Education (FTV), Sultan Idris Education University (UPSI) who were pursuing study programs such as Invention, Design and Technology, Agricultural Science, Agricultural Extension, and Home Economics, selected based on relevance to the study objectives on the use of artificial intelligence (AI) in learning. The study sample was determined using purposive sampling for students who had experience or knowledge of using AI, with a minimum recommended size of between 250 and 254 people according to the Krejcie and Morgan (1970) table as disseminated by Bukhari [6]. However, throughout the study, the total sample obtained was 308 students, exceeding the minimum size and ensuring that the data obtained was sufficient for statistical analysis and accurately representing the study population.

3.3 Research Instrument

The research instrument used was a structured questionnaire developed based on the conceptual framework of the study to measure the level of use of artificial intelligence (AI) as well as the development of cognitive and affective skills of students of the Faculty of Technical and Vocational Education (FTV). This questionnaire consisted of four parts, namely Section A: Respondent demographic information (4 items), Section B: Level of use of AI in learning (5 items), Section C: Students' Cognitive Skill Development (8 items) and Section D: Students' Affective Skill Development (8 items). All items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), allowing quantitative data to be systematically analyzed, and this questionnaire was randomly distributed to respondents via Google Form.

3.4 Data Analysis Method

The study data were analyzed using Statistical Package for the Social Sciences (SPSS) version 26, with descriptive analysis to describe the respondent profile as well as the level of AI use and the development of cognitive and affective skills through frequency, percentage, mean, and standard deviation. The relationship between the level of AI use and the development of cognitive and affective skills was assessed using Spearman correlation because the data did not meet the assumption of normality, with the interpretation of the strength of the relationship based on the correlation coefficient in the statistical literature and the significance level set at $p < 0.05$.

4. Analysis and Discussion

4.1 Instrument Reliability

A pilot study was conducted on 30 students of the Faculty of Technical and Vocational Education, UPSI to assess the suitability of the items in the instrument to analyze the relationship between the level of AI use of Faculty of Technical and Vocational Education (FTV) students with the development of their cognitive and affective skills. The data was analyzed using SPSS version 27.0, while the reliability of the instrument was confirmed through Cronbach's Alpha analysis. Table 1 present the Cronbach's Alpha values for all sections of the instrument. Section B recoded a Cronbach's Alpha value of 0.744, indicating good reliability. Meanwhile, Section C and Section D demonstrated Cronbach's Alpha values of 0.913 and 0.890, respectively which indicate excellent reliability. These findings confirm that the instrument has good to excellent internal consistency and is suitable for the actual study.

Table 1

Cronbach's Alpha values for all sections of the instrument

Section	Construct	Cronbach's Alpha (α)	Numbers Of Item	Realibility Interpretation
B	Level of use of AI in learning	0.744	5	Good
C	Students' Cognitive Skill Development	0.913	8	Excellent
D	Students' Affective Skill Development	0.890	8	Excellent

4.2 Respondents' Demographics

Table 2 presents the demographic profile of 308 students from the Faculty of Technical and Vocational (FTV), Universiti Pendidikan Sultan Idris (UPSI) participated as respondents. Of these, respondents, 185 (60.1%) were female and 123 (39.9%) were male. With regard, to study program, the largest group came from the Bachelor of Education (Agricultural Science) with Honors program (90 students, 29.2%), followed by Bachelor of Education (Design and Technology) with Honors (71 students, 23.1%), Bachelor of Education (Home Economics) with Honors (55 students, 17.9%), Bachelor of Agricultural Science (Agricultural Extension) with Education (50 students, 16.2%) and Bachelor of Education (Invention) with Honours (42 students, 13.6%). In the term of year of study, respondents were fairly distributed across all levels, with Year 2 students comprising 93 (30.2%), Year 3 students 81 (26.3%) Year 1 students 68 (22.1%) and Year 4 students 66 (21.4%). Regarding the use of AI applications, ChatGPT was the most used, with 278 students (90.3%) reporting its use, followed by Copilot (12, 3.9%), Gemini (10, 3.2%) DeepSeek (7, 2.3%) and Perplexities (1, 0.3%) while none of the respondents reported using Socratic (0 %). Overall, these findings provide a clear and comprehensive overview of the demographic characteristics and AI usage patterns among FTV UPSI students.

Table 2

Demographic profile

Characteristic	Frequency	Percentage (%)
Gender		
Male	123	39.9
Female	185	60.1
Study Program		
Bachelor of Education (Agricultural Science) with Honours	90	29.2

Bachelor of Education (Design and Technology) with Honours	71	23.1
Bachelor of Education (Invention) with Honours	42	13.6
Bachelor of Education (Home Economics) with Honours	55	17.9
Bachelor of Agricultural Science (Agricultural Extension) with Education	50	162
Year Of Study		
Year 1	68	22.1
Year 2	93	30.2
Year 3	81	26.3
Year 4	66	21.4
AI Application Usage		
ChatGPT	278	90.3
Copilot	12	3.9
DeepSeek	7	2.3
Gemini	10	3.2
Socratic	0	0
Perplexities	1	0.3

4.3 Level of Artificial Intelligence (AI) Usage in Learning

Table 3 shows a descriptive analysis involving mean values and standard deviations to identify the level of AI use in learning for FTV students. The results of the descriptive analysis are described as follows:

Table 3

Descriptive statistics section B

Item	Question	Mean (M)	Standard Deviation (SD)	Interpretation
B1	I have used AI applications in the learning process.	4.53	0.500	Very high
B2	I use AI applications frequently in my daily learning.	4.41	0.678	Very high
B3	I feel skilled and confident in using AI for learning purposes.	4.44	0.620	Very high
B4	I use AI applications as one of the main sources for my learning.	4.44	0.689	Very high
B5	The use of AI in learning is essential	4.54	0.605	Very high

Descriptive analysis of Section B showed that item B5 recorded the highest mean ($M = 4.54$, $SD = 0.605$), indicating that students strongly agreed on the importance of AI in learning. This finding is in line with Baharin *et al.*, [4], who found that TVET students have a positive perception of generative AI because it increases efficiency, creativity, and problem-solving skills, as well as being influenced by performance expectations and facility support. Items B1 ($M = 4.53$, $SD = 0.500$), B3 ($M = 4.44$, $SD = 0.620$), and B4 ($M = 4.44$, $SD = 0.689$) also recorded high means, indicating that students' level of acceptance and confidence in AI as a primary learning resource was very satisfactory. On the other hand, item B2 recorded the lowest mean ($M = 4.41$, $SD = 0.678$), indicating variations in the frequency of use of AI. This finding is in line with Vieriu and Petrea [34] who reported that the majority of students use AI weekly rather than daily, as well as Moradi [26] who emphasized that students who

are accustomed to using AI tend to use it more consistently in learning, indicating that daily AI use does not apply absolutely to all individuals.

4.4 Students' Cognitive Skill Development

Table 4 shows a descriptive analysis involving mean values and standard deviations to identify the level of cognitive skill development of FTV students. The results of the descriptive analysis are described as follows:

Table 4

Descriptive statistics section C

Item	Question	Mean (M)	Standard Deviation (SD)	Interpretation
C1	AI helps me understand difficult concepts more quickly.	4.57	0.534	Very high
C2	AI helps me improve my problem- solving skills.	4.40	0.684	Very high
C3	AI helps develop critical and creative thinking in learning	4.35	0.795	Very high
C4	AI helps me analyze information and make better decisions.	4.39	0.725	Very high
C5	AI helps me remember and apply information more effectively.	4.37	0.698	Very high
C6	AI increases my ability to generate new ideas while completing assignments.	4.49	0.617	Very high
C7	AI assists me in reflectively evaluating my answers or work results.	4.51	0.590	Very high
C8	I can think critically and independently even when using AI as a learning aid.	4.53	0.601	Very high

Based on the descriptive analysis of Section C, item C1 recorded the highest mean ($M = 4.57$, $SD = 0.534$), indicating that AI is effective in facilitating students' understanding of complex learning concepts, in line with the findings of Ab Hamid *et al.*, [1] which stated that TVET students accept the use of AI because it increases their understanding of concepts and engagement. For items with medium means, namely C2 ($M = 4.40$, $SD = 0.684$), C4 ($M = 4.39$, $SD = 0.725$), C5 ($M = 4.37$, $SD = 0.698$), C6 ($M = 4.49$, $SD = 0.617$), C7 ($M = 4.51$, $SD = 0.590$), and C8 ($M = 4.53$, $SD = 0.601$), the findings show that AI consistently supports students' cognitive and critical thinking skills. The lowest mean was recorded by C3 ($M = 4.35$, $SD = 0.795$), indicating little variation in students' perceptions of the development of critical and creative thinking, in line with Rienovita *et al.*, [29] who emphasized the role of AI-based educational chatbots in improving critical skills through dialogic interactions and reflective exercises. Overall, the mean score of Section C was 4.45 ($SD = 0.398$), indicating that the level of students' cognitive skills was at a very high level with the support of AI. This finding is not entirely in line with the problem statement that students' dependence on AI can lead to the phenomenon of metacognitive laziness [36], because the use of GenAI also increases cognitive engagement and higher-order thinking skills such as problem solving and self-reflection [20], thus supporting the conclusion that AI has a positive impact on the development of students' cognitive skills.

4.5 Students' Affective Skill Development

Table 5 shows a descriptive analysis involving mean values and standard deviations to identify the level of development of affective skills of FTV students. The results of the descriptive analysis are described as follows:

Table 5
Descriptive statistics section D

Item	Question	Mean (M)	Standard Deviation (SD)	Interpretation
D1	I show interest and willingness to use AI in learning because i am aware of its benefits.	4.53	0.537	Very high
D2	I provide active feedback, such as asking questions, discussing, and sharing ideas after using AI in learning.	4.42	0.617	Very high
D3	I value perseverance by continuing to strive and not giving up easily when facing difficult tasks, even with the assistance of AI.	4.49	0.607	Very high
D4	I practice responsibility and discipline when using AI.	4.46	0.589	Very high
D5	I manage my emotions and stress positively by using AI while facing tasks.	4.51	0.617	Very high
D6	I demonstrate commitment to self- directed learning by consistently using AI to improve my academic performance.	4.53	0.556	Very high
D7	I practice honesty and academic ethics by ensuring my work remains original, even with the assistance of AI.	4.54	0.578	Very high
D8	I maintain my interest and motivation in learning even without using AI.	4.63	0.535	Very high
Average value	4.51	0.323	Very high	Average value

Based on the descriptive analysis of Section D, item D8 recorded the highest mean ($M = 4.63$, $SD = 0.535$), indicating that students maintain high motivation and interest in learning even though they do not fully rely on AI, in line with the findings of Hanayanti *et al.*, [15] which emphasizes the role of intrinsic motivation in ensuring the effectiveness of learning and academic achievement. For items with medium means, namely D1 ($M = 4.53$, $SD = 0.537$), D3 ($M = 4.49$, $SD = 0.607$), D4 ($M = 4.46$, $SD = 0.589$), D5 ($M = 4.51$, $SD = 0.617$), D6 ($M = 4.53$, $SD = 0.556$), and D7 ($M = 4.54$, $SD = 0.578$), the findings show that AI consistently supports students' interest, readiness, commitment, emotional management, as well as ethical values, discipline, and perseverance. The lowest mean was recorded by D2 ($M = 4.42$, $SD = 0.617$), indicating that the level of active student engagement in terms of providing feedback such as asking questions, discussing, and sharing ideas was still slightly lower than other items, but still at a very high level, in line with Ezeoguine and Eteng-Uket (2024) who emphasized that the use of AI increases student engagement in the affective dimension of learning. Overall, the mean score of Section D was 4.512 ($SD = 0.323$), indicating that students' affective skills were at a very high level with AI support. This finding is not entirely consistent with the problem

statement but Huang *et al.*'s [16] study supports this finding by showing that the use of chatbot-type AI increases motivation, autonomy, self-efficacy, and positive attitudes towards learning, thus proving that AI acts as an effective affective support tool.

4.6 Correlation Analysis of The Relationship between The Level of Artificial Intelligence (AI) Usage and The Development of Cognitive and Affective Skills among Students of The Faculty of Technical and Vocational (FTV), UPSI.

Table 6 shows the results of inference analysis using Spearman correlation to assess the relationship between the level of AI use on the development of cognitive and affective skills of FTV students. The results of the inference analysis are described as follows:

Table 6
Results of Spearman correlation analysis

		Level of AI Usage In Learning	Students' Cognitive Skill Development	Students' Affective Skill Development
Level of AI Usage In Learning	Spearman Correlation	1	.497**	.433**
	Sig (2- tailed)	.	<.001	<.001
Students' Cognitive Skill Development	Spearman Correlation	.497**	1	.598**
	Sig (2- tailed)	<.001	.	<.001
Students' Affective Skill Development	Spearman Correlation	.433**	.598**	1
	Sig (2-tailed)	<.001	<.001	.

** . Correlation is significant at the 0.01 level (2-tailed).

Based on Spearman correlation analysis, the findings show that the strongest relationship is between the development of students' cognitive and affective skills with $r_s = 0.598$, $p < .001$, indicating that both domains are closely related to each other in learning. In the context of TVET students, high cognitive levels are related to good affective, such as attitude and motivation, which also has a positive impact on learning performance, in line with Li *et al.*, [21] who emphasized the close relationship between cognitive and affective. The relationship between the level of AI use and cognitive skills recorded $r_s = 0.497$, $p < .001$, at a moderate to strong level, indicating that the use of AI is related to increased conceptual understanding, critical thinking, and the ability to analyze information, in line with the findings of Amdan *et al.*, [3] who emphasized the role of adaptive learning and intelligent tutoring systems in strengthening TVET students' conceptual understanding and higher-order thinking. For the relationship between the use of AI and affective skills, the $r_s = 0.433$, $p < .001$ indicates a moderate to strong level, indicating that AI also supports student interest, motivation, attitude, and engagement, in line with Dewi *et al.*, [10] who stated that the use of AI such as ChatGPT increases students' emotional engagement and motivation.

4.7 Objective 1: Level of Use AI among Students of The Faculty of Technical and Vocational (FTV), UPSI Based on The Type of AI, Frequency of Use and Purpose of Use

Descriptive analysis shows that the level of use of artificial intelligence (AI) among students of the Faculty of Technical and Vocational Education (FTV), Sultan Idris University of Education (UPSI) is at a very high level ($M = 4.47$, $SD = 0.330$). This finding indicates that students frequently use AI to support learning, especially in understanding content and completing assignments, in line with the findings of Sousa and Cardoso [32] who emphasized the use of AI among students in higher education institutions to support assignments, generate ideas, and improve academic understanding. Based on frequency analysis, ChatGPT is the most dominant AI application used by students, with 278 out of 308 respondents (90.3%) choosing it over other applications. ChatGPT's popularity is believed to be due to early exposure, ease of access, user-friendly interface, and generative functions relevant to academic assignments, making it the top choice among students, in line with the findings of Al-Mashagbeh et al. (2025).

4.8 Objective 2: The Relationship between The Level of Use of Artificial Intelligence (AI) with The Development of Cognitive and Affective Skills of Students of The Faculty of Technical and Vocational (FTV) In Learning

Based on Table 6, the results of the analysis show a moderate to strong and significant relationship between the level of artificial intelligence (AI) use and the development of cognitive skills ($r_s = 0.497$, $p < .001$) and affective skills ($r_s = 0.433$, $p < .001$). This finding confirms that the use of AI is directly related to the improvement of students' cognitive and affective abilities. This phenomenon can be explained through Vygotsky's (1978) Social Constructivism Theory developed by Cai *et al.*, [7], where AI functions as a mediating tool that provides support or scaffolding in the Zone of Proximal Development (ZPD) through immediate feedback, conceptual explanation, and step-by-step guidance. This support not only strengthens cognitive mastery such as conceptual understanding and critical thinking, but also stimulates students' motivation, self-confidence, and positive attitudes. This study is in line with Cai *et al.*'s [7] ZPD framework, which emphasizes that AI helps students move from initial potential levels to higher levels of mastery, and remains relevant as a source of reference and self-reinforcement. Overall, the findings confirm that the second objective is achieved, where the Null Hypothesis is rejected and the Alternative Hypothesis is accepted, showing that the use of AI has a significant relationship with the development of cognitive and affective skills of FTV UPSI students.

5. Conclusion

This study emphasizes the importance of artificial intelligence (AI) as a significant learning support element in influencing the development of cognitive and affective skills of students at the Faculty of Technical and Vocational Education (FTV), Sultan Idris University of Education (UPSI). The integration of artificial intelligence (AI) is seen as a necessity in the era of higher education driven by digital technology to help students understand complex concepts, improve thinking skills and maintain motivation and engagement in learning.

The findings of this study contribute to the understanding of the relationship between the use of artificial intelligence (AI) and the development of students' cognitive and affective skills. The significant relationship obtained shows that an effective learning process not only involves the mastery of knowledge, but also involves affective aspects such as students' interests, emotions and

attitudes. Therefore, this study provides a clear picture of the role of artificial intelligence (AI) in supporting student development holistically in line with the learning needs of the 21st century, especially in the context of TVET education.

In addition, this study can also be used as a reference for educators, educational institutions, policy makers and stakeholders in planning and implementing more systematic, ethical and effective teaching and learning strategies using artificial intelligence (AI). It is hoped that this study can encourage further research that is broader and deeper regarding the use of artificial intelligence (AI) in education.

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