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Measuring Education college students' skills using Artificial Intelligence: right brain vs left brain with structural equation models

Mesurament de les habilitats d'estudiants universitaris en Educació utilitzant la Intel·ligència Artificial: cervell dret vs cervell esquerre amb models d'equacions estructurals

Medición de las habilidades de estudiantes universitarios en Educación utilizando la Inteligencia Artificial: cerebro derecho vs cerebro izquierdo con modelos de ecuaciones estructurales

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Abstract: This research uses an explanatory quantitative design with a structural equation modelling (SEM) approach to test whether left or right brain dominance affects the skills of preservice teachers in using artificial intelligence (AI). Participants in this research were 342 students majoring in multidisciplinary education (preservice teachers). The distribution of participant data reflects variations in these aspects, which aims to provide a comprehensive picture of the factors that have the potential to influence students' skills in using AI. This research highlights that students with left-brain dominance show superior abilities in using AI technology compared to students with right-brain dominance. This is shown by the factor loading value on the d60 path which reached 0.98, indicating the high representational power of students with left brain dominance in mastering AI. These findings have a significant impact on approaches to technology education in universities. First, these results can encourage the development of curricula that place more emphasis on analytical and logical skills for all students, as well as introducing creative elements that can attract the interest of students with right-brain dominance. Thus, educational programs can be designed to accommodate both types of brain dominance, ensuring that students receive comprehensive and balanced training. Additionally, these findings highlight the need for universities to create inclusive and supportive learning environments, especially for women who may face gender stereotypes that hinder their participation in STEM fields.

Keywords: Cognitive Dominance, Higher Education, Technology, Thinking Styles

Resum: Aquesta investigació utilitza un disseny quantitatiu explicatiu amb un enfocament de modelització d'equacions estructurals (SEM) per provar si el domini del cervell esquerre o dret afecta les habilitats dels professors de formació en l'ús de la intel·ligència artificial (IA). Els participants en aquesta investigació van ser 342 estudiants especialitzats en educació multidisciplinària (professors en formació). La distribució de les dades dels participants reflecteix variacions en aquests aspectes, que pretén oferir una imatge completa dels factors que poden influir en les habilitats dels estudiants en l'ús de la IA. Aquesta investigació posa de manifest que els estudiants amb domini del cervell esquerre mostren habilitats superiors en l'ús de la tecnologia d'IA en comparació amb els estudiants amb domini del cervell dret. Això es mostra amb el valor de càrrega del factor al camí d60 que va arribar a 0,98, cosa que indica l'elevat poder de representació dels estudiants amb domini del cervell esquerre en el domini de la IA. Aquestes troballes tenen un impacte significatiu en els enfocaments de l'educació tecnològica a les universitats. En primer lloc, aquests resultats poden afavorir el desenvolupament de currículums que facin més èmfasi en les habilitats analítiques i lògiques de tots els estudiants, així com introduir elements creatius que poden atreure l'interès dels estudiants amb domini del cervell dret. Així, els programes educatius es poden dissenyar per acomodar ambdós tipus de domini cerebral, assegurant que els estudiants rebin una formació integral i equilibrada. A més, aquestes troballes posen de manifest la necessitat que les universitats creïn entorns d'aprenentatge inclusius i de suport, especialment per a les dones que poden enfrontar-se a estereotips de gènere que dificulten la seva participació en els camps STEM.

Paraules clau: Domini Cognitiu, Educació superior, tecnología, Estils de pensament

Resumen: Esta investigación utiliza un diseño cuantitativo explicativo con un enfoque de modelado de ecuaciones estructurales (SEM) para probar si el dominio del cerebro izquierdo o derecho afecta las habilidades de los futuros docentes en el uso de la inteligencia artificial (IA). Participaron de esta investigación 342 estudiantes de la carrera de educación multidisciplinaria (profesores en formación). La distribución de los datos de los participantes refleja variaciones en estos aspectos, cuyo objetivo es proporcionar una imagen completa de los factores que tienen

el potencial de influir en las habilidades de los estudiantes en el uso de la IA. Esta investigación destaca que los estudiantes con dominio del hemisferio izquierdo del cerebro muestran habilidades superiores en el uso de la tecnología de inteligencia artificial en comparación con los estudiantes con dominio del hemisferio derecho. Esto se muestra en el valor de carga del factor en el camino d60 que alcanzó 0,98, lo que indica el alto poder de representación de los estudiantes con dominancia del cerebro izquierdo en el dominio de la IA. Estos hallazgos tienen un impacto significativo en los enfoques de la educación tecnológica en las universidades. En primer lugar, estos resultados pueden fomentar el desarrollo de planes de estudio que pongan más énfasis en las habilidades analíticas y lógicas para todos los estudiantes, así como introducir elementos creativos que puedan atraer el interés de los estudiantes con dominio del hemisferio derecho del cerebro. Así, se pueden diseñar programas educativos que se adapten a ambos tipos de dominancia cerebral, asegurando que los estudiantes reciban una formación integral y equilibrada. Además, estos hallazgos resaltan la necesidad de que las universidades creen entornos de aprendizaje inclusivos y de apoyo, especialmente para las mujeres que pueden enfrentar estereotipos de género que obstaculizan su participación en los campos STEM.

Palabras clave: Dominancia Cognitiva, Educación más alta, Tecnología, Estilos de pensamiento

I. INTRODUCTION

In an increasingly advanced digital era, technological developments have brought significant changes in various fields, including education. One technology that is receiving great attention is artificial intelligence (AI) (Abdel-Hameed et al., 2020). This research landscape is rooted in the understanding that the human brain is divided into two hemispheres that have different functions (Tandel, 2020). The left brain is often associated with analytical and logical abilities, while the right brain is more associated with creativity and artistic abilities. In an educational context, measuring student skills often focuses on analytical abilities, which are more easily measured through standardised tests (Filyushkina et al., 2021; Lim et al., 2021). However, creative skills, which are the main function of the right brain, are often overlooked or difficult

to measure using traditional methods. This is where the role of AI becomes very important, because this technology has the potential to provide a more comprehensive and accurate method of measuring the skills of both hemispheres of the brain (Kuner, 2021).

The main problem identified in this research is the inability of conventional methods to effectively measure the different skills of college students, especially those related to the right brain (Steffen & Rehan, 2020; van Heerden et al., 2020). Traditional methods tend to be biassed towards analytical skills and ignore the creative and innovative aspects that are equally important in modern education (Wei et al., 2022). In addition, existing approaches often lack consideration of the complex relationships between various skills and the factors that influence them, which can be analysed in more depth using structural equation models. Furthermore, the limited scope of assessment tools may not accurately capture the full range of abilities possessed by students, leading to a potential underestimation of their true potential (Kawakami et al., 2021; Suresh et al., 2020). Therefore, developing a more comprehensive and inclusive assessment framework is crucial for providing a holistic evaluation of college students' skills and capabilities.

The analysis gap in this research lies in the lack of studies that combine AI technology with a holistic approach to measuring student skills based on right and left-brain function. Although there are several studies utilising AI in education, most still focus on measuring general learning outcomes without paying attention to differences in brain function (Kawakami et al., 2021; Suresh et al., 2020; Wei et al., 2022). In addition, the application of SEM in this context is still rarely explored, even though this method is very suitable for analysing complex and multifaceted relationships in educational data. By integrating AI technology with a holistic approach to measuring student skills based on brain function, researchers can gain a more comprehensive understanding of learning outcomes.

The uniqueness (novelty) of this research lies in the interdisciplinary approach that combines AI and SEM to provide a more complete picture of student skills. By considering right and left-brain function, this research not only focuses on quantitative learning outcomes but also on qualitative aspects, which include creativity and innovation. This approach offers a new way to evaluate student abilities that is more suited to the educational needs of the 21st century, which

demands complex and creative skills in addition to analytical abilities. The main research question (research question) asked in this article is:

1. What is the validity and reliability of the factor structure formed to measure left and right brain dominance on skills in using AI?
2. Does education students' left and right brain dominance affect their skills in using AI?
3. Among the types of students who are dominated by the left and right brain, which one has the skills to use AI to complete their assignments?
4. How do the covariate variables age, age, and geographical location of students influence their skills in using AI?

This project aims to make a significant addition to the world of education, specifically in measuring and evaluating student talents, by addressing these problems. This research presents a novel approach by combining artificial intelligence (AI) and structural equation modeling (SEM) to comprehensively assess student talents. It encompasses both analytical abilities linked to the left brain and creativity connected with the right brain. The impact is not only limited to improving the accuracy and comprehensiveness of skill evaluation but also to the development of a more balanced curriculum that recognizes the importance of different types of intelligence. In addition, the results of this research can help educators and policymakers design more effective and inclusive educational programs that maximize the potential of each student individually. This research also opens up new opportunities for further exploration in the use of AI in education, encouraging innovation that can overcome the limitations of traditional evaluation methods.

II. UNDERPINNING THEORY

Brain Dominance

Brain dominance theory is rooted in neuropsychological research, which differentiates the functions of the left and right hemispheres of the brain. This theory was proposed by Roger W. Sperry, who won the Nobel Prize in 1981 for his research on separate brain functions

(Kawakami et al., 2021). Sperry revealed that the left brain is more dominant in managing logical, analytical, and verbal tasks, while the right brain is more dominant in intuitive, creative, and visual-spatial tasks. This theory then developed and influenced various fields, including education, where understanding brain dominance can help in designing teaching methods that are more effective and suit individual learning styles (Aburayash, 2021; Dhanpat et al., 2019).

Relevant research supporting this theory includes a study by (Carino-Escobar et al., 2020), which explains how lateral brain function influences cognitive processes and behavior. This research found that brain dominance not only influences how individuals process information but also preferences in learning and work activities. In addition, research by (Li et al., 2022; X.-D. Wang et al., 2021) shows that individuals with right-brain dominance tend to be more creative and innovative in problem solving, while those with left-brain dominance are more structured and organized.

In an educational context, understanding brain dominance can be used to create more inclusive and adaptive learning environments. For example, a study by (Filyushkina et al., 2021; Lim et al., 2021; Merrick et al., 2022) developed the 4MAT model, which combines various learning styles based on brain dominance to improve teaching effectiveness. The results of this research show that by understanding students' brain dominance, educators can design a curriculum that is more varied and appropriate to the cognitive needs of each student, thereby increasing engagement and learning outcomes. Thus, brain dominance theory and the research results that support it provide important insights into how the brain works and how this knowledge can be applied in educational contexts to support more personalized and effective learning (Gannouni et al., 2020).

Trend of AI Usage in Universities

The theory underlying the use of artificial intelligence (AI) in universities is rooted in the concepts of educational technology (EdTech) and digital transformation in higher education (Abdel-Hameed et al., 2020; Bao, 2019). One relevant theory is Everett Rogers' Theory of Diffusion of Innovation, which explains how innovations are introduced and adopted in a social system. In this context, AI can be considered an innovation that is spreading in the higher

education environment, driven by the need for efficiency, personalization, and improving the quality of learning (Huang et al., 2021). Research shows that AI has the potential to revolutionize various aspects of education, from administration and teaching to personalized learning. For example, a study by (Adams et al., 2023; Gadanidis, 2017) highlights how AI can be used to provide adaptive learning that adapts materials and teaching methods based on individual student needs, improving engagement, and learning outcomes.

Another research result that supports this trend is a study by (Drigas & Ioannidou, 2013; Lin et al., 2018; Shen, 2023), who found that implementing AI in universities can improve big data management to provide better insight into student performance, predict academic success, and identify the need for earlier intervention. Additionally, research by (Dai et al., 2023) identified that AI can automate administrative tasks, freeing up time for teaching staff to focus on more creative and value-added teaching and research. This trend is also supported by cognitive theories that emphasize personalized learning, such as Sweller's cognitive load theory, which states that more structured learning according to individual needs can reduce cognitive load and increase student understanding. Thus, the trend in the use of AI in universities reflects efforts to utilize technology to increase the efficiency and effectiveness of education. Based on the theory of diffusion of innovation and supported by various research results, AI is expected to continue to develop as an important tool in creating a more dynamic, responsive, and inclusive learning environment.

Conjecture of Study

The conjecture in this research is that left or right brain dominance can provide distinct advantages in the use of artificial intelligence (AI). Brain dominance theory suggests that individuals with left-brain dominance may tend to excel at tasks that require in-depth data analysis, rule-based information processing, and structured decision making. Research by (Filyushkina et al., 2021; Merrick et al., 2022) supports this assumption by showing that the left hemisphere tends to perform better in tasks that require a linear approach and the use of algorithms. On the other hand, individuals with right-brain dominance may excel in tasks that involve creativity, intuition, and holistic thinking. This research could have implications for the development of AI systems that mimic human cognitive processes.

In contrast, right-brain dominant individuals may have an advantage in situations that require creativity, intuition, and innovative problem solving with the help of AI. The study by (X.-D. Wang et al., 2021) suggests that the right brain tends to be more effective at recognizing complex patterns in data, understanding ambiguous contexts, and generating insight-based solutions. These findings highlight the importance of considering both hemispheres of the brain in decision-making processes, as each may offer unique strengths in different situations. By leveraging the strengths of both hemispheres, individuals can enhance their overall decision-making abilities and adapt to a variety of challenges.

Thus, this research assumes that learning and training strategies can be tailored to harness the strengths of each type of brain dominance in optimizing the use of AI in various applications (Gadanidis, 2017; Shen, 2023). By understanding how brain dominance affects skills in using AI, this research has the potential to provide deeper insight into how this technology can be applied effectively in education, business, and other industries, as well as enable the development of smarter strategies for integrating AI into everyday activities.

III. METHOD

Research Design

This research uses an explanatory quantitative design with a structural equation modeling (SEM) approach to test whether left or right brain dominance affects the skills of preservice teachers in using artificial intelligence (AI) (Hair et al., 2019). An explanatory quantitative design was chosen to identify cause-and-effect relationships between the variables studied. SEM is used to analyze the complex relationship between left or right brain dominance type and students' skills in using AI. This allows researchers to model and test interactions between various latent and measured variables. With this approach, the research aims to provide an in-depth understanding of the factors that influence the development of students' skills in using AI through effective brain dominance.

Participants

Participants in this research were 342 students majoring in multidisciplinary education (preservice teachers). The selection of students was carried out using purposive sampling by considering several criteria, including university location, university accreditation, and students' willingness to be involved in research (Creswell, 2014). Researchers classified participants based on several aspects, namely age, gender, and geographical location. The distribution of participant data reflects variations in these aspects, which aims to provide a comprehensive picture of the factors that have the potential to influence students' skills in using AI. A detailed distribution of participant data can be seen in Table 1 below.

Table 1. *Participant Demographics*

Aspect		*Sum(N)*	*Percentage*
Age	≤ 10 years	147	43.0
	11 years	113	33.0
	≥ 12 years	82	24.0
Total		**342**	**100.0**
Gender	Male	128	37.4
	Female	214	62.6
Total		**342**	**100.0**
Geographical Location	Urban	101	29.5
	Rural	241	70.5
Total		**342**	**100.0**

Source: Research Data

Table 1 provides a comprehensive view of respondents' demographic characteristics, which may influence left- or right-brain dominance and skills in using artificial intelligence (AI). Differences in gender, with most respondents being women (62.6%) and a minority being men (37.4%), as well as geographical location, with the majority coming from rural areas (70.5%), could have implications for left or right brain dominance. Previous research has shown that biological and social differences between the sexes can influence cognitive and problem-solving preferences, which is relevant in the context of AI use. Likewise, different geographic

environments may influence how individuals process information, with urban conditions perhaps encouraging more analytical and logical use (left brain), whereas rural environments may favor creativity and visual-spatial thinking (right brain). Therefore, considering these demographic factors in research on brain dominance and AI use can provide deeper insight into how these variables interact and influence research outcomes.

Measurements

Data was collected through a questionnaire that has been converted to Google Form format to make it easier to fill out online. Questionnaires were distributed via the WhatsApp platform with the help of lecturer colleagues at various universities to be delivered to students majoring in education who were research participants. Each lecturer who receives the questionnaire link is responsible for distributing it to students in their class. One disadvantage of this approach is the need to perform manual checks for possible duplicate data, which requires an investment of additional time and effort. However, this method was chosen because it was considered the most effective in reaching a wide number of respondents. The questionnaire used has been adapted from previously tested instruments and equipped with detailed explanations to ensure that the data collected is accurate and valid:

Brain dominance instruments

This research uses the YBRAINS questionnaire instrument from Piaw (2011) which consists of 25 statement items on a scale of 1-4. This instrument was adopted because it suited the researchers' needs. The reliability of this instrument is .**87**or has high reliability. Details of left or right brain dominance instruments can be seen in table 2 below:

Table 2. *Brain Dominance Instruments*

No	Dimensions	Amount	Items	Examples
1	Left Brain	12	1-12	Do you tend to prefer following rules and procedures in solving problems?
2	Right Brain	13	1-13	Do you have a strong interest in art, music, or other fields that require visual or verbal creativity?
	Total	**25**		

Usage of AI Instruments

To measure students' skills in using AI, researchers adopted an instrument developed by (Suh & Ahn, 2022). This instrument consists of 26 question items divided into 3 main dimensions. The reliability score of this instrument .**94** shows that the test items are reliable for use in measuring students' skills in using AI. The instrument details can be seen in table 3 below:

Table 3. Usage of AI Instruments

No	Dimensions	Amount	Items	Examples
1	Cognitive components	5	1-5	I think that it is important to learn about AI
2	Affective components	9	6-14	AI helps me solve problems in real life
3	Behavioral components	12	15-26	I want to continue learning about AI.
	Total	**26**		

Data Analysis

This research uses confirmatory factor analysis (CFA) to explore the validity and reliability of the factor structure formed to measure left and right brain dominance in the context of skills in using AI. Factor loading criteria refer to the guidelines of (Ramsay & Silverman, 2015), with the application of robust maximum likelihood estimation (RMLE) in CFA. This method utilizes the Pearson correlation matrix and assumes that the observed variables are on an interval scale. Maximum likelihood (ML) estimation is used if these assumptions are met to estimate model

parameters from observed data. The validity and reliability of items were checked using construct reliability (CR) and average variance extracted (AVE).

The second research question uses parametric linear regression to examine the influence of left and right brain dominance in education students on their ability to use AI. The third study adopted structural equation modeling (SEM) to analyze the effect of factor loading on each item on students' skills in using AI. This analysis was carried out with JASP software using the Lavaan syntax from Rosseel (Polák et al., 2014). The fourth research question applies ANCOVA to evaluate the influence of covariate variables such as age, gender, and geographic location of students on their skills in using AI.

IV. RESULTS

Preliminary Research

After carrying out the CFA analysis, the researchers looked at the Comparative Fit Index (CFI) value and the Root mean square error of approximation (RMSEA) value. The criterion for accepting the factor structure is if the CFI value is $\propto > .90$, while the RMSEA value is $\propto < .08$ (Hair et al., 2019). Apart from that, Hair (2019) also states that the recommended CR value is $\propto > .70$, and the AVE value is $\propto > .50$. The results of the CFA analysis can be seen in table 4 below:

Table 4. Fit Structure Measurement

Index	Value of Brain Dominance	Value of Use of AI
Comparative Fit Index (CFI)	.982	.951
Tucker-Lewis Index (TLI)	.919	.972
Root mean square error of approximation (RMSEA)	.023	.019
Standardized root means square residual (SRMR)	.049	.038

Source: JASP Output

The results of the CFA analysis show that the CFI and RMSEA values simultaneously are **.982** and **.023** for the Brain Dominance instrument. Meanwhile, for the Usage of AI instrument, the CFI and RMSEA values are **.951** and **.019** respectively. This shows that the factor structure formed for the two instruments is fit . To see the validity and reliability of the items, these two instruments have CR and AVE values of **.872** and **.739** simultaneously. Thus, the CFA test results show that the factor structure is **fit, valid** and **reliable** .

Direct Impact

To see the direct influence of Brain Dominance on students' skills in using AI, researchers conducted a linear regression test. The hypothesis acceptance criterion for this test is if the value is significant $p < .05$. Detailed linear regression test results can be seen in table 5 below:

Table 5. ANOVA Test

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	32.192	1	32.121	6.021	.031
	Residual	1932.981	341	7.842		
	Total	1851972	342			

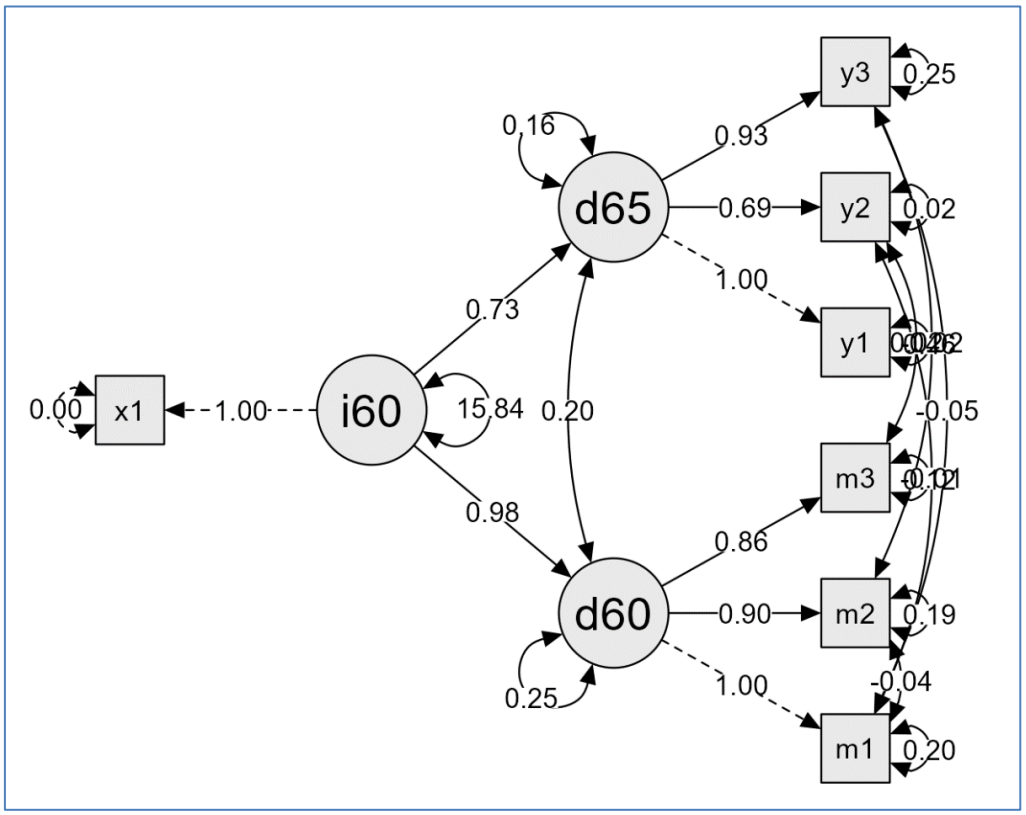
Note. The intercept model is omitted, as no meaningful information can be shown.

Table 5 shows that the significance value p is $.\mathbf{031}$or value $\alpha < .05$. This shows Brain Dominance in students' skills in using AI significantly. Because the F value is positive, the two variables have a **positive or unidirectional influence**. If Brain Dominance has a positive value, then students' skills in using AI also have a positive value, and vice versa.

SEM Analysis

To determine the best Brain Dominance or influence students' skills in using AI, researchers used SEM analysis. This analysis allows researchers to see which factor is the strongest among other factors on the latent variable. An acceptable factor structure is if the factor loading value on each path has a value of $0 \leq \alpha \leq 1$. In this case, students' skills in using AI become a latent variable with code **i60.** For students who have left brain dominance, it is represented by code **d60**, and right brain dominance is represented by code **d65**. The results of SEM analysis can be seen in Figure 1 below:

Figure 1. SEM Analysis Results



Source: JASP Output

Figure 1 shows that the factor loading value on the **d60 path** is . **98**and for the **d65 factor** it has a value of . **73**. From these two factors, the highest factor loading is on the **d60 path** which represents **students who are left brain dominated**. This shows that students who dominate left-brain thinking can use AI better than students who dominate right-brain thinking. For the indicator from **d60**, the one that has the most influence is **m1** with the factor loading value 1.00. **The m1** indicator represents the **logical, analytical and thinking indicator systematic** .

Covariate Variable

To answer the last research question, researchers tested the influence of the covariate variables age, gender, and geographical location on students majoring in education. The significance criteria for covariate variables are $Sig. < .05$. The influence of covariate variables can be seen in table 6 below:

Table 6. *ANCOVA Test*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1519.338a	342	12.314	1.332	.245
Intercept	14452.912	1	12392.652	948.845	.000
Age	1.319	1	1.167	.034	.651
Gender	11.153	1	10.255	.943	.014
Geographical	7.852	1	6.612	.664	.432

a. R Squared = .621 (Adjusted R Squared = .059)

Source: SPSS Data

Table 6 shows the influence of covariate variables on the skills of students majoring in education in using AI. From the results of the covariate analysis, it was found that the values of the covariate variables age, gender and geographical location were $.651, .\mathbf{014}$, and $.432$ simultaneously. Only the **gender variable** is in the value $\alpha < .05$ so it can be concluded that only the gender variable influences the skills of students majoring in Education in using AI.

V. DISCUSSION

Left Brain vs Right Brain

The discussion regarding left brain dominance being better at using AI than the right brain requires an in-depth analysis of the cognitive characteristics associated with each hemisphere of the brain and how these characteristics affect a person's abilities in data-based technology and algorithms such as AI (Carino-Escobar et al., 2020). The left brain is often associated with analytical, logical, and systematic abilities. Left-brain dominant individuals tend to have strong linear thinking abilities, meaning they can understand and follow well-structured steps. In the context of AI, this capability is very important because AI technology relies heavily on algorithms, systematic data processing, and problem solving that requires a logical approach (Li et al., 2022).

Our research results show that students with left brain dominance have a high factor loading value on the **d60 path (0.98)**, which represents their ability to use AI. This means they are better

able to understand and apply algorithms, manage data, and make decisions based on data analysis. The **m1** indicator, which has a perfect factor loading value **(1.00)**, confirms that the ability to think logically, analytically, and systematically is the key factor that allows them to excel in this field.

The ability to think logically is very important in the development and application of AI. Logic is the foundation of computer programming, which is a core skill in working with AI (Merrick et al., 2022; Wang et al., 2021). Analytical skills enable individuals to interpret data effectively, identify patterns, and make predictions based on that data. Meanwhile, systematic thinking skills enable them to design and maintain complex AI systems efficiently. Thus, left-brain dominance provides significant advantages in all aspects crucial to working with AI.

On the other hand, the right brain is related to creativity, intuition, and holistic thinking. While these capabilities are valuable in many contexts, they may not provide the same advantages in AI uses that require a highly analytical and systematic approach. Research shows that the lower factor loading value on the **d65 path (0.73)** reflects that students with right-brain dominance may be less effective in using AI. They may have difficulty following strict procedures and understanding complex algorithms, which are important aspects of AI technology.

However, this does not mean that right-brain dominant individuals have no role to play in the field of AI. Their creativity and intuition can be invaluable in certain phases of AI development, such as designing innovative user interfaces or creating creative solutions to complex problems (Filyushkina et al., 2021). However, to operate and optimize existing AI technology, left-brain dominance appears to provide a more direct and significant advantage. It is also important to consider that in the real world, it is rare for an individual to completely dominate just one side of the brain. Most people have a combination of these two types of abilities. Therefore, although left-brain dominance provides an advantage in the use of AI, training that develops right-brain abilities can also be beneficial (Lim et al., 2021). For example, courses that teach programming while also emphasizing creative thinking can help develop more balanced and comprehensive skills.

In an educational context, the ability to use AI effectively can improve teaching and learning. Research by (Gannouni et al., 2020; van Heerden et al., 2020) show that AI can be used to create more personalized and adaptive learning experiences, allowing teachers to customize teaching materials based on students' individual needs. Left-brain dominant education majors may be more skilled at understanding and applying these technologies to support adaptive learning, student data analysis, and data-based curriculum development.

However, it is also important to consider the role of students with right brain dominance in education. While they may lack excellence in the technical aspects of using AI, their creativity and intuition can help in designing more engaging and innovative learning experiences (Steffen & Rehan, 2020; Suresh et al., 2020). For example, AI in education is not just about data analysis but also about creating engaging and interactive learning content. Students with right-brain dominance can combine AI technology with creative learning methods, such as gamification or interactive multimedia, which can make the learning process more fun and effective.

Additionally, combining both types of brain dominance in collaborative teams could lead to a more balanced and innovative approach to the use of AI in education. For example, a team consisting of students with left and right brain dominance can develop AI solutions that are not only efficient and analytical but also creative and user-friendly. This approach is in path with research by (Kawakami et al., 2021) which shows that interdisciplinary collaboration can increase effectiveness and innovation in the development of educational technology.

Thus, left brain dominance provides a significant advantage in the use of AI because of its close connection with the logical, analytical, and systematic thinking abilities required in this technology. Although the right brain also has an important role in creativity and innovation, these abilities may be less suited to the essential technical and analytical needs of AI. An educational approach that develops these two types of abilities will be very valuable for maximizing student potential in an increasingly advanced technological era. It is crucial for educators to foster a balance between creativity and technical skills to prepare students for the demands of AI-driven industries.

Gender and Usage of AI in Universities

The finding that students with left-brain dominance are superior in using AI compared to students with right-brain dominance has important implications in the context of gender at universities. Research shows that there are gender differences in learning preferences and approaches to technology that may influence these outcomes (Confalonieri et al., 2022; Hall & Ellis, 2023). According to the theory of brain laterality, the left brain is more dominant in analytical and logical tasks, while the right brain is superior in creative and intuitive tasks (Ofem Usani Joseph et al., 2024; Schulte Steinberg & Hohenberger, 2023; Zellou et al., 2021). This study is in line with research which finds that men tend to prefer analytical and systematic thinking which is often associated with left brain dominance (Marsden et al., 2022). This may explain why men tend to be more involved in fields that require technical skills such as science, technology, engineering, and mathematics (STEM).

Research by (Makhortykh et al., 2021) shows that although women's interest in STEM fields is increasing, there are still gender stereotypes that hinder their participation. Women are often considered better at verbal and creative tasks, which are associated with right-brain dominance. However, right-brain dominance does not have to be an obstacle to using AI, but rather requires a different learning approach. For example, a study by (Zellou et al., 2021) show that a supportive and inclusive learning environment can increase women's participation in technology.

Universities can play an important role in bridging this gap by developing educational programs that integrate technical and creative skills. Research by (Garvanova & Papazova, 2019; Tison et al., 2011) emphasizes the importance of a holistic and interdisciplinary educational approach to addressing gender disparities in STEM fields. For example, courses that combine AI programming with design projects or case studies from different disciplines can make learning more inclusive and engaging for female students. Mentoring and professional network support are also important for increasing women's participation in technology. Research by (Rahmatian & Zarekar, 2016; L. Wang, 2020) shows that female role models and mentors can increase women's interest and self-confidence in STEM fields. A good mentoring program can provide the guidance and support necessary for women to overcome gender barriers and stereotypes.

An inclusive and diverse educational approach will benefit all students and enrich the field of AI itself. The combination of analytical abilities from the left brain and creativity from the right brain can produce more holistic and useful innovations. For example, research by (Legewie & DiPrete, 2014) shows that collaboration between individuals with different skills can increase creativity and innovation in teams. Thus, the finding that left hemisphere dominance is better in the use of AI has important implications for educational approaches in universities. By understanding and integrating gender differences in technology learning, universities can ensure that all students have an equal opportunity to excel in the use and development of AI. This will encourage more innovation and diversity in this increasingly important field of study.

VI. CONCLUSION

This research highlights that students with left-brain dominance show superior abilities in using AI technology compared to students with right-brain dominance. This is shown by the factor loading value on the **d60 path** which reached **0.98**, indicating the high representational power of students with left brain dominance in mastering AI. The **m1** indicator, which represents the ability to think logically, analytically, and systematically, has a perfect factor loading value of **1.00**, confirming that these abilities greatly determine success in using AI. The left brain, which is more dominant in logical and analytical thinking, has proven to be more effective in mastering and operating data and algorithm-based technology such as AI. Students with left-brain dominance are able to understand the logical structure of programming, analyze data accurately, and develop efficient technical solutions, all of which are essential in AI.

These findings have a significant impact on approaches to technology education in universities. First, these results can encourage the development of curricula that place more emphasis on analytical and logical skills for all students, as well as introducing creative elements that can attract the interest of students with right-brain dominance. Thus, educational programs can be designed to accommodate both types of brain dominance, ensuring that students receive comprehensive and balanced training. Additionally, these findings highlight the need for universities to create inclusive and supportive learning environments, especially for women who

may face gender stereotypes that hinder their participation in STEM fields. Mentoring programs and professional network support can increase women's confidence and interest in technology, helping them to overcome existing barriers and stereotypes.

However, this study also has several limitations that need to be considered. First, brain dominance is not the only factor that determines a person's ability to use AI. Other factors such as educational background, experience, motivation, and social support also play an important role. This research may not fully capture the complexity of these factors. Second, the study sample may not be fully representative of the general student population. Wider and more diverse sampling is needed to ensure more accurate generalization of results. Third, although the m1 indicator shows a strong correlation with left-hemisphere dominance, further research is needed to understand how various other cognitive factors influence the ability to use AI. Future research could explore how the combination of skills from both hemispheres can be further optimized in the context of AI learning.

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