

The Effect of Artificial Intelligence (AI) on Students' Learning

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Abstract: Various studies have been conducted to identify factors that contribute to student engagement, personalized learning experience, and student academic performance. The evolution of technology offers various benefits including in the education sector. To date, the use of Artificial Intelligence (AI) in education has been seen to provide various benefits. This study aims to identify the relationship between the usage of AI with student engagement, personalized learning experience, and student academic performance. Data was collected from 110 undergraduate students from the Faculty of Business and Management, UiTM Puncak Alam Campus using a questionnaire. 106 data were analyzed using SPSS version 29. The findings show that AI usage for study purposes significantly influences student's engagement and academic performance. On the other hand, the usage of AI and personalized learning experience show no significant influence. This study not only provides a deeper understanding of the context of AI usage for better student engagement and academic performance but also gives valuable insight for UiTM and faculty specifically to develop strategies and modules that enhance the implementation and usage of AI in their learning activities.

Keywords: *Artificial Intelligence (AI), Student's Engagement, Personalized Learning Experience, Academic Performance.*

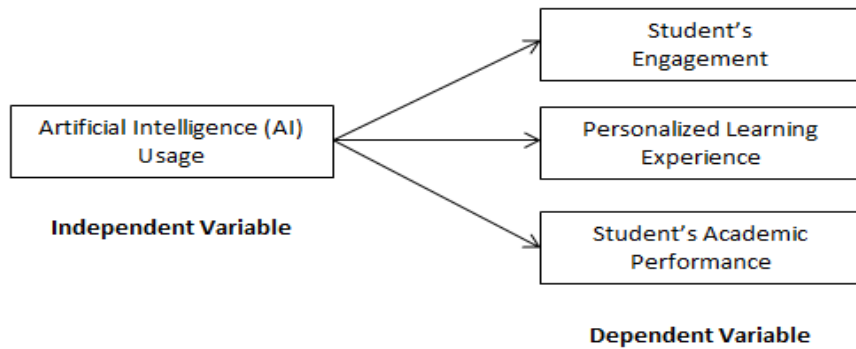
1. Introduction and Background

The 21st century has witnessed a rapid evolution of technology, particularly in Artificial Intelligence (AI), which refers to digital machines performing tasks akin to intelligent beings. This surge in AI has garnered global interest for its potential to revolutionize various societal aspects, including education. Nations are actively advancing their AI industries and exploring its implementation in education to enhance learning experiences (Chiu et al., 2023; Kang, 2023).

Contrary to common misconceptions, AI transcends mere replication of human intellect; it facilitates individualized learning, catering to each student's unique needs across diverse categories (Okunlaya et al., 2022). Research by Chiu et al. (2023) delves into AI technologies like chatbots, robots, and intelligent tutoring systems, emphasizing their role in providing adaptive learning experiences, aiding teachers in understanding student learning processes, and offering timely support anywhere, anytime. Due to continuous advancements in AI technologies, including learning, teaching, assessment, performance, engagement, and administration, AI's impact spans various educational domains (Kang, 2023). For instance, AI-powered university libraries leverage vast data to tailor resources, meeting individual student needs effectively (Okunlaya et al., 2022). This notion aligns with Cox et al.'s (2018) perspective, highlighting how AI-driven libraries can bolster learning through personalized strategies.

This study aims to investigate how AI influences student learning outcomes, such as engagement, personalized experiences, and academic performance. This underscores the pressure on students to compete effectively in higher education, leveraging technological advancements to maximize their potential (Huang et al., 2023). Notably, AI in education holds significant potential to enhance learning, teaching, assessment, and administrative processes, thereby reshaping educational methodologies (Chiu et al., 2023). In meeting these objectives, a conceptual framework as shown below has been developed:

Figure 1: Conceptual Framework



In conclusion, the integration of AI in education signifies a significant area of study, shaping the future of learning. Its potential to enhance student outcomes, foster personalized learning experiences, and optimize educational processes underscores its importance in contemporary education. As AI continues to evolve, its role in education is poised to grow, offering novel opportunities for learners and educators alike.

2. Literature Review

Student Engagement: Student engagement is the key to academic success and well-being, involving active participation and investment in learning. Engaged students are motivated, achieve academic success, and remain in school. Classroom interactions fostering collaboration, critical thinking, and practical knowledge application enhance engagement. Educators utilizing creative teaching methods, technology, and student-centered approaches facilitate active learning and sustained engagement (Lee & Hannafin 2016). Extracurricular activities and social interactions complement classroom engagement, strengthening students' sense of belonging and facilitating personal development (Kuh, 2009). Institutions emphasizing a comprehensive learning environment, diverse perspectives, and student agency will enhance overall engagement and achievement.

According to Moraes et al. (2023), technologies associated with Industry 4.0 have the potential to enhance learning processes for both students and educators by increasing engagement and interaction, enhancing soft skills, and promoting collaboration while also reducing costs and risks for universities. In the case of students, learning and striving can be optimally increased when help is provided in negotiating multiple comprehension strategies through various forms of interaction, incentives, assistance, and regular feedback (Bolliger & Martin, 2018). As regards students' engagement in collaborative online learning environments, they report that engaging in steering online discussions will add to the feeling of learning community among students (Shackelford & Maxwell, 2012; Zhang et al., 2018). This learner-instructor relationship will provide favorable results in relation to learners' gratification and performance as far as online learning is concerned (Andersen, 2013; Kang & Im, 2013; Walker, 2016).

Following a review of sixty-eight articles concerned with the effects of AI on students and their perceptions, researchers were struck by evidence suggesting that motivational and engagement aspects in the framework of student learning outcomes accounted for 34%. Multiple studies on the use of AI-enabled robots in enhancing student engagement in physical education, computer science, and mathematics in K-12, and higher educational institutions have been done in different contexts (Chiu et al., 2023; Xia et al., 2022; Ilić et al., 2021; Kuleto et al., 2021; Yang, Oh, & Wang, 2020). Furthermore, it was observed that students with lower academic achievements reported that engaging with AI Robots enhanced their feeling of safety and productivity, while also reducing their feeling of shame. Moreover, learners of language were also observed to have their engagement increased by autonomous scoring systems based on image and speech recognition technologies (Fu et al, 2020). AI-aided assessment incorporated active learning strategies since it was considered more reliable and students enjoyed the active feedback with no delays.

According to Kazu & Kuvvetli, 2023, virtual reality education incorporates the use of virtual reality technology to create engaging learning environments that improve involvement and learning outcomes. It has been established that, in virtual environments, AI can be employed to deliver tailored learning experiences for the students as well as give the students real-time assistance and feedback (Tiwari, 2023). Just like virtual education, educational AI games also use game-based integration to enhance involvement and learning outcomes and AI can be used to further target specific aspects within the games (Baker and Ryan 2019). Baker and Ryan (2019) further point out that AI technology can be employed to modify the difficulty of certain gameplay tasks, give professional guidance to players, and generate educational content that is relevant to the learners. Tiwari, 2023 points out the significance of such means in elevating the learning experience for students, however, it is imperative to study the limitations of AI systems in game development and virtual reality education. In addition, particular categories of risks should be investigated including ethical issues and societal issues related to AI employment in such areas. Furthermore, it is important to create AI policies that enhance student privacy, fairness and transparency (Tiwari, 2023).

Most of the AIED papers that were reviewed indicated that the use of AI technology would help enhance students' participation and preparedness for 21st-century skills. However, the merits were mainly reaped by the most skilled and dedicated students. This observation has two probable explanations: (i) AI technologies for student learning are inadequately conceived and developed, and (ii) teachers do not have the requisite pedagogical knowledge to use the technologies. More vulnerable students who required more help would have been turned off by the application of AI technologies because they encountered communication barriers with the AI agents and did not find the suggested learning resources useful. Hence, the application of AIED in its entirety or part may lead to or aggravate the existing digital divide and the continuing injustice of education. Future studies should concentrate on developing AI as an advanced learning context as well as developing AI algorithms for tailored learning interventions using a learning sciences perspective Luckin & Cukurova (2019). Hence the following hypothesis was proposed.

H1: There is a relationship between AI usage and student engagement.

Personalized Learning Experience: Personalized learning, as described by Hutchins (2017), involves tailoring educational content to meet the unique needs of individual students, allowing customization in pace and knowledge level. This approach, traditionally associated with K-12 education, has expanded into higher education, with institutions like Ohio State University piloting adaptive programs targeting a 20% implementation rate by 2019 (Hutchins, 2017). The integration of gamification elements, such as leaderboards and points, is explored to enhance the quality of education by recording student progress and addressing the challenge of balancing learning speeds (Hutchins, 2017).

The popularity of personalized learning is attributed not only to educational demand but also to companies seeking to sell software (Hutchins, 2017). The emergence of AI-enabled robotics in education, discussed by Linert and Kopacek (2016) provides child-friendly interfaces and hands-on experiences for teaching programming, robotics, mathematics, and biology. An example like Cubelets, a kit of modular robot blocks, which demonstrates the diversity of capabilities achievable through combinations (Linert & Kopacek, 2016). However, concerns about AI robots replacing teachers and impacting social mechanisms are raised, with a focus on addressing diverse learning curves and potential challenges in handling behavioral or psychological issues (Hutchins, 2017). Notably, developments like the NAO robot, designed by Aldebaran Robotics for children with autism, contribute to understanding the Uncanny Valley and guide the creation of robots that avoid triggering negative reactions (Hutchins, 2017; Linert & Kopacek, 2016).

The importance of digital technology is undeniable, it influences the way we access information, interact with others, and even behave in our daily lives. This digital revolution has profoundly impacted the educational landscape, leading to the integration of digital culture into an increasing number of educational programs worldwide. In France, for instance, internet technology courses are now offered at the primary school level, and high school students are required to demonstrate computer proficiency through standardized exams. Furthermore, it is common for educational institutions to use Learning Management Systems (LMS) which facilitate students' access to and engagement with learning materials. In recent years, interactive instructional technologies have gained significant traction. Tablets are replacing traditional textbooks, and educators are increasingly incorporating diverse learning tools such as Google Classroom, Edmodo, PowerSchool, and Moodle

into their teaching practices [Chassignol et al., 2018].

Though AI has a lot of prospects within education, questions regarding its impact on students, and their potential to attend to AI systems and instructors remain a dilemma. Students, for example, might view the process of gathering and analyzing data through AI as monopolization and a breach of their privacy, particularly given such incidents as the Cambridge Analytica experience (Chan, 2019; Luckin, 2017). In addition, the use of an AI system without addressing the issues of data and algorithmic bias can reinforce discrimination and ethical issues (Crawford & Calo, 2016; Murphy, 2019). On the flip side, the teachers are also skeptical that extreme incorporation of AI systems will impede the improvement of necessary skills like independent learning, creative problem-solving, and critical thinking (Wogu et al., 2018). It, therefore, follows that both student's and instructors' views and apprehensions regarding the role of AI systems in virtual learning spaces must be investigated and comprehended exceedingly well (Cruz-Benito et al., 2019). It will be vital to address these problems in advance to shape trust towards AI systems and make sure AI is integrated into the education sector, most ethically.

Within the AIED community, understanding the role of AI systems in online education is becoming a new hot topic. Roll and Wylie (2016) have even called for more AI systems to be deployed to improve student-instructor interfaces and learning experiences outside the constraints of the classroom or the school environment. Nevertheless, Zawacki-Richter et al. (2019) presented a systematic mapping of AIED publications from 2007 to 2018 and identified one of the shortcomings of this period a lack of discussion about ethical issues and risks AI systems entail for the interaction of learners and instructors. Likewise, Popenici and Kerr (2017) researched the education process considering AI systems but also delineated the places where conflicts between students and teachers could arise. This includes invasion of privacy, the rise of power imbalance, and disproportionate control among others. All these studies pointed towards conducting further studies to comprehend well the processes with AI systems and concern interaction between students and tutors in particular. A more refined knowledge such as this will be crucial in finding and correcting any existing gaps, challenges, or barriers to the maximization of AI in education.

Although AI systems offer potential benefits for instructional communication, several concerns warrant attention as outlined by Seo et al. (2021). First, students express concerns about accountability, particularly when AI systems generate unreliable or inexplicable responses that lead to negative outcomes. Second, although AI systems can facilitate personalized learning experiences, there is a risk of over-standardization. If AI dictates the "correct" responses of behaviors for engaged students, it could stifle creativity and individual learning styles. Third, while AI can enhance the perceived connection between students and instructors, the use of technologies like facial expression analysis or eye tracking raises privacy concerns. Students may feel uncomfortable with the assessment of their unconscious behavior perceiving it as intrusive monitoring. Therefore, the hypothesis is formulated as follows:

H2: There is a relationship between AI usage and student's personalized learning experience.

Student's Academic Performance: The assessment of a student's, teacher's, or institution's degree of success in meeting their learning objectives is known as academic performance or achievement. Determining a student's standing in a university requires evaluating their academic performance. Throughout a semester, this procedure helps decision-makers, academic staff, and educational administrators to accurately assess students in a variety of courses. It also serves as a warning to students to evaluate their performance and take the required actions to get better (Al Husaini & Shukor, 2022). Academically gifted students typically have high self-esteem and confidence, low anxiety and despair, sociable tendencies, and are less prone to substance abuse, such as alcohol. Academic performance is said to be influenced by several individual and family factors in addition to the quality of the institution, including socioeconomic status, English language ability, attendance, job, high school grades, and academic self-efficacy. Additionally, there is a relationship between academic accomplishment and variables including parental involvement, family size, study hours, and competencies of a teacher (Tadese et al., 2022).

Due to the last decade's technological advances in areas such as social media, sensors, mobile devices, and online learning environments (e.g. MOOC, LMS, and intelligent tutoring systems), educational psychologists today have improved access to large data. This situation has resulted in the availability of more diverse and

complicated data sets such as, but not limited to, student personal information, physiological information, academic records, learning history, and others (Daniel, 2015). Learning analytics and machine learning in combination with big data technologies have been reported to be effective in predicting school performance (Huang et al., 2020). However, very few studies have investigated learning analytics programs and AI applications in education systems. According to Liu et. al, (2020) on the other hand, recent studies have reported encouraging results in relation to increasing students' academic success and retention and helping teachers in instructional design and teaching strategy improvement.

The enormous potential to change education systems has seen a strong response from stakeholders as the world is currently investing a lot of efforts in research and development as well as infrastructure building. A case in point is the United States where institutions are being incentivized, and organizations are being funded to create AI-driven individualized learning systems. Such systems are designed to foster higher student performance through better cognitive engagement as well as address educational disparities by providing disadvantaged populations with support that is tailored to their needs (Boninger et al., 2020; Williamson & Eynon, 2020). These efforts also underline the increasing acknowledgment of AIED as an important field of research that is capable of revolutionizing the learning paradigms in the future (Holmes et al., 2021). The attention triggered by artificial intelligence is broad and encompasses the entire domain of education: learning, teaching and assessment, and even institutional management (Gonzalez-Calatayud et al., 2021; Luckin, 2017). The keenness with which the OECD responds to such recommendations was well captured by Kuhl et al. (2019) who quote the Organization as saying that AI-based research should not only be activity-based. The OECD promotes the application of learning analytics and big data technologies to enhance educational activities.

In terms of academic achievement as a learning outcome, the role of AI was mentioned in 29% of the articles published and reviewed. Most of the researches indicate that in the context of AI technologies academic performance increases (Chiu et al., 2023), and out of the two studies that did not indicate such significant performance improvement, it was stated that there was an enhancement of students' interest and confidence in learning (Topal et al., 2021). The research, which focused on the role of artificial intelligence in enhancing learning outcomes, reported that AI did not only enhance the performance of the mainstream but also the performance of special needs students (Chiu et al., 2023), for instance, an Artificial Intelligence based braille instructor was made for teaching the visually impaired students and it was observed that when teachers used the AI tutor, the pupils responded significantly quicker and more accurately.

Nevertheless, some studies provide evidence that not all kids benefit from these AI technologies since these are mostly or only high achievers or those who have the will to do so. For instance, among kindergarten children, only those who had average-level handwriting skills were able to outperform the head of beginner-level learners in AI learning (Bonneton-Botte et al 2020). Only the most accomplished students in schools had great dealing with chatbots (Chiu et al. 2023). Less accomplished students appreciated the use of the system whereas more accomplished ones got bored with it (Nabiyev et al, 2013). Most of the researchers however claim that AI has the capacity to boost the students' achievements but only when the participation of the teachers in the teaching and learning activities is there. Moreover, apart from improving the quality of students' learning in the classroom, there is a possibility that the use of Artificial Intelligence technologies would reduce the level of students' indifference to a great extent. They have been able to establish the learning state of the students, assist program officers or teachers in academic intervention, and eventually reduce students' dropping out (Tsai et al, 2020; Villegas-Ch et al, 2021). Hence, it is hypothesized that:

H3: There is a relationship between the AI usage and student's academic performance.

Artificial Intelligence Usage: AI has emerged as an integral part of several sectors, altering the way businesses and personnel engage with technology. In medicine, artificial intelligence assists with the analysis of medical images, develops new drugs, and incorporates customized treatment plans, thus improving the processes of diagnosis significantly (Topol, 2019). Moreover, in the finance area, AI-based techniques are employed in the areas of fraud detection, risk, and automated trading, allowing for the swift assessment and execution of trades (Paramesha, 2024). Customers do not lag as such foremost AI is utilized through chatbots employing natural language processing to assist users and respond to queries more effectively and rapidly, thus enhancing the customer experience (Mohanty, 2023).

In addition, the manufacturing industry is also undergoing evolution with the introduction of smart factories which are powered with a variety of AI technologies. For example, these smart factories are integrated with tools that assist in automating processes, predictive maintenance, and implementing quality assurance systems to improve efficiency and minimize operational idle time (Davenport & Ronanki, 2018). One more significant application is the implementation of AI in self-driving cars where AI systems are designed to take input signals from the sensors and make timely decisions creating efficient and safer transport systems (Garikapati & Shetiya 2024).

In the area of education, Artificial intelligence (AI) systems assist effectively in online learning and teaching, automating instructors' mundane activities; personalizing learning for students; and adaptive evaluation (Seo et al, 2021). Would it be wise to pursue Artificial intelligence-based solutions in the educational domain? The use of artificial intelligence (AI) has made visible changes in educational processes and management in the last few years. This progression enables the educational model to be more multidimensional in terms of human, non-human, and their presence on the web. The potential offered by AI technologies has been proven in various domains, including intelligent buildings (Martínez-Comesanã et al., 2023; Troncoso-Pastoriza et al., 2022) as well as learning spaces (Martínez-Comesanã et al., 2023).

AI has been advancing rapidly in the field of education as it has the algorithmic ability to provide recommendations, forecasts, and make decisions in addition to the ability to adapt to different circumstances (Chen et al., 2022). The intent of AI in Education (AIEd) is to assist educators in discharging their responsibilities more easily and productively. As of now, around 40 % of the teaching time spent on some activities that can be automated shows great prospects for AIEd (Alam, 2021). In general, AI's application in education can significantly enhance numerous components or tools, including but not limited to individualized instruction; flexible testing; smart tutoring; automatic assessment; virtual reality for education; data mining for educational performance forecasting; learning a foreign language; and focus on accessibility and inclusiveness (Beaulac & Rosenthal, 2019; Xu et al., 2019).

3. Research Methodology

A correlation study was conducted to identify the influence of AI usage on student engagement, personalized learning experience, and student's academic performance among undergraduate students at UiTM Puncak Alam campus. The population of this study consists of students from Bachelor of Business Administration (Hons) Human Resource Management with a total number of 155 students from semester 5. The questionnaire survey was used as the instrument for data collection utilizing the 5-point Likert Scale for dependent variable (DV) and independent variable (IV) sections. Questionnaire items for Artificial Intelligence Usage were adopted from Von Garrel, J., & Mayer, J. (2023). As for the dependent variables sections, the items were adopted from Xu et al.(2023) for the Student Engagement variable. Items for Personalized Learning Experience were adopted from Cheng, L. et al. (2023), and items for Student's Academic Performance variable were adopted from Pacheco-Mendoza et al. (2023). A total of 110 questionnaires were distributed to respondents. After three weeks of the collection period, 96.36% of the return rate was achieved and a total of 106 questionnaires were analyzed using SPSS version 29. The analyses carried out for this research are descriptive demographic analysis, correlation, and regression analysis.

Table 1: Questionnaire Design

| Variable | No of items | Adopted from |
|---|-------------|-------------------------------------|
| Artificial Intelligence in Education (IV) | 9 | Von Garrel, J., & Mayer, J. (2023). |
| Student's Engagement (DV1) | 6 | Xu et al.(2023) |
| Personalized Learning Experience (DV2) | 6 | Cheng, L. et al. (2023). |
| Student's Academic Performance (DV3) | 9 | Pacheco-Mendoza et al. (2023). |

4. Results

The outcome of the data analysis is presented in this section. This includes the discussion of the demographic profile of respondents, as well as the results for reliability, correlation, and regression analysis.

Profile of Respondents: Table 2 displays a summary of the demographic profile of respondents. Frequency analysis was used to examine respondent's demographic characteristics which include gender, age, classes, current CGPA, and frequency of AI usage for study purposes. Based on the analysis, the majority of the respondents were female which represented 72.6% (n=77), followed by males (29.4%, n=29). Most of the respondents were between 21-23 years old (78.3%, n=83), while 20 respondents (18.9%) were between 24-26 years old. Meanwhile, the lowest frequency of age group was 3 respondents (2.8%) between 18-20 years old. In term classes, 27 respondents (25.5%) were from group BA2435C, while 25 respondents (23.6%) were from BA2435E. The total numbers of students from BA2435B, BA2435D, and BA2435A were 21 (19.8%), 18 (17%), and 15 (14.2) respectively. In terms of AI usage for study purposes, the majority of respondents (n=60, 56.6%) agree that they always use AI for study purposes. The remaining 40 respondents (37.7%) use AI occasionally and 6 respondents (5.7%) rarely use AI for study purposes.

Table 2: Demographic Profile

| VARIABLE | FREQUENCY | PERCENTAGE |
|---|------------|-------------|
| GENDER | | |
| Males | 29 | 27.4% |
| Females | 77 | 72.6% |
| Total | 106 | 100% |
| AGE | | |
| 18-20 | 3 | 2.8% |
| 21-23 | 83 | 78.3% |
| 24-26 | 20 | 18.9% |
| Total | 106 | 100% |
| CLASS | | |
| BA2435A | 15 | 14.2% |
| BA2435B | 21 | 19.8% |
| BA2435C | 27 | 22.5% |
| BA2435D | 18 | 17% |
| BA2435E | 25 | 23.6% |
| Total | 106 | 100% |
| CURRENT CGPA | | |
| 1.00-2.00 | - | - |
| 2.01-3.00 | 12 | 11.3% |
| 3.01-4.00 | 94 | 88.7% |
| Total | 106 | 100% |
| FREQUENCY OF AI USAGE FOR STUDY PURPOSES | | |
| Rarely | 6 | 5.7% |
| Occasionally | 40 | 37.7% |
| Always | 60 | 56.6% |
| Total | 106 | 100% |

Reliability Analysis: Reliability analysis was conducted to measure the consistency of the items used in this study. According to Salkind (2009), Cronbach's Alpha value higher than 0.6 indicates a strong association. Based on Table 3, it is shown that Cronbach's Alpha value for AI usage is 0.881 indicating the items used to measure this variable are strongly reliable. The alpha value for student engagement also showed a strong reliability of 0.882. As for personalized learning experience, 3 items have been removed from the analysis to get the alpha value of 0.870. Similarly, 2 items were removed from the analysis for the student's academic performance variable which leads to an alpha value of 0.880.

Table 3: Result of Correlation and Reliability Analysis

| No | Variables | Mean | SD | 1 | 2 | 3 | 4 |
|----|----------------------------------|-------|-------|---------|---------|---------|---------|
| 1. | AI Usage | 4.019 | 0.712 | (0.881) | | | |
| 2. | Student's Engagement | 3.907 | 0.735 | 0.614* | (0.882) | | |
| 3. | Personalized Learning Experience | 3.068 | 0.389 | 0.188 | 0.255** | (0.870) | |
| 4. | Student's Academic Performance | 4.017 | 0.573 | 0.605** | 0.583** | 0.115 | (0.880) |

Notes: **significant at the 0.01 level (2-tailed); Cronbach's alpha values are shown in the parentheses.

Correlation Analysis: Referring to Table 3, the result of the correlation analysis indicated a significant association between AI usage and student engagement. The result showed a moderate association with $r=0.614$ ($p<0.01$). Similarly, there is also a significant association between AI usage and students' academic performance that indicated with moderate association between the variables ($r=0.605$, $p<0.01$). However, the result revealed that there is no significant association between AI usage and personalized learning experience with the value of $r=0.188$ ($p>0.01$).

Table 4: Model Summary of Regression Analysis

| Dependent Variable | Summary | | ANOVA | |
|----------------------------------|----------------|-------------------------|--------|-------|
| | R ² | Adjusted R ² | F | Sig. |
| Student's Engagement | 0.376 | 0.370 | 62.783 | <.001 |
| Personalized Learning Experience | 0.035 | 0.026 | 3.792 | .054 |
| Student's Academic Performance | 0.366 | 0.360 | 60.004 | <.001 |

Independent variable: Artificial Intelligence (AI) Usage

Regression Analysis: Three separate regression analyses were conducted to identify the relationship between the independent variable (AI usage) and dependent variables (student's engagement, personalized learning experience, and student's academic performance). Based on the results in Table 4, the R² value score for AI usage and student engagement is R²=0.376. This result indicated that the independent variable influenced 37.6% of the dependent variable and the remaining 62.4% of the variance that attributed to the dependent variable came from other factors. As for the relationship between AI usage and personalized learning experience, the R² score (R²=0.035) indicated that AI usage only contributes 3.5% towards personalized learning experience. The remaining 96.5% variances come from other factors that were not investigated in this study. Moreover, the R² value of 0.366 derived from AI usage and students' academic performance explained that AI usage among students contributes to 36.6% of student's academic performance. The remaining 63.4% come from other factors that are not included in this study.

Table 5: Regression Coefficient Analysis

| Variables | Standardized Coefficients Beta |
|----------------------------------|--------------------------------|
| Student's Engagement | .614* |
| Personalized Learning Experience | .188 |
| Student's Academic Performance | .605* |

Independent variable: Artificial Intelligence (AI) Usage

The regression result in Table 5 shows two results show a significant relationship between the variables. There is a positive relationship between AI usage and student engagement with the value of $\beta=0.614$ with $p<0.05$. Other than that, AI usage also significantly influences student's academic performance as shown by the value of $\beta=0.605$ with $p<0.05$. However, AI usage does not show any significant relationship with personalized learning experiences among students.

Discussion: The findings from the demographic profile show that more than half of the respondents in this study utilize AI for study purposes. As for the relationship between variables, this study revealed that only H1 and H3 were accepted, while H2 was rejected. The findings explained that AI usage for study purposes among students does significantly improve student engagement and student's academic performance. Overall, this finding indicates that the usage of AI for education has become a trend among students, which is used to facilitate student's engagement in learning sessions and exploration of knowledge. Furthermore, AI also

enables students for information searching which supports better comprehension and thus improves their academic performance compared to traditional methods.

5. Managerial Implications and Recommendations

This study expands our understanding of how AI usage for study purposes influences students' engagement, personalized learning experience, and student's academic performance among undergraduate students. This study provides evidence that increased use of AI will improve student's engagement and academic performance. Due to this fact, it is crucial for the faculty specifically to facilitate the use of AI in classroom sessions so that the potential of AI in learning settings can be explored and used ethically by students. Proper strategies and modules can be developed to embed AI elements in delivery and assessment methods. Although the usage of AI does not significantly influence students' personalized learning experience in this study, it is worth future research to explore more on these variables as to what condition AI can facilitate self-learning among students.

Conclusion: In conclusion, the evolution of AI especially in the education sector cannot be denied as there is evidence of its increasing adaptation by students to enhance their learning experiences. AI has the potential to significantly improve learning effectiveness thus leading to better learning performance. This study suggested that AI usage for study purposes influences student's engagement and academic performance. Thus, it is crucial for higher education institutions to actively promote and integrate AI into their pedagogical practices. Developing comprehensive strategies and modules that seamlessly embed AI within the teaching and learning context will be paramount. This study contributed to a better understanding about condition under which AI usage can effectively foster student's engagement and enhance academic performance.

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