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# RSST013 - ADVANCING AI-READY TEACHER EDUCATION: INTEGRATION OF GENERATIVE AI

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## ABSTRACT

The integration of Generative Artificial Intelligence (GenAI) into teacher education holds significant potential to enhance academic outcomes, foster engagement, and strengthen communication between educators and learners. This study examines the perceptions of trainee teachers on the integration of Generative AI at the Institute of Teacher Education, Technical Education Campus (IPGKPT). Anchored within global and national policy frameworks including the OECD Learning Compass 2030, UN Sustainable Development Goal 4, Malaysia's Digital Education Policy 2023–2030, and Malaysia TVET Policy 2030 as the research positions GenAI as a catalyst for educational transformation. Employing a descriptive quantitative design, data were collected from a stratified cohort of Bachelor of Teaching (PISMP) trainee teachers via a structured questionnaire adapted from validated instruments and demonstrating high reliability (Cronbach's  $\alpha > 0.90$ ). Descriptive statistical analyses revealed strong positive perceptions of improvement and engagement ( $M = 3.59$ ,  $SD = 1.18$ ), barriers and challenges ( $M = 3.37$ ,  $SD = 1.03$ ) and communication and independence ( $M = 3.12$ ,  $SD = 1.02$ ). Nonetheless, notable concerns were identified, including ethical issues, fairness in assessment, infrastructural limitations, and the risk of diminishing the teacher's role. These findings highlight the need for targeted professional development, clear institutional guidelines, and equitable access to resources to ensure responsible GenAI integration. The study contributes empirical evidence to the growing discourse on AI readiness in teacher education, offering strategic recommendations aligned with Malaysia's national digital and TVET priorities.

**Keywords – Generative AI, TVET, Trainee Teachers**

## INTRODUCTION

The integration of Generative AI (GenAI) into teacher education represents a transformative opportunity to enhance the pedagogical landscape. As educational institutions increasingly recognize the potential of AI technologies, there is a pressing need to prepare educators who are not only proficient in utilizing these tools but also equipped to navigate the ethical and practical challenges they present (Jain & Singh, 2023). By advancing AI-ready teacher education, we can foster a generation of educators capable of leveraging GenAI to create personalized learning experiences, promote student engagement, and facilitate innovative teaching practices. This integration requires a multifaceted approach, encompassing professional development, AI literacy, and the

establishment of supportive frameworks that empower teachers to harness the full potential of Generative AI in their classrooms (Merino-Campos, 2025).

The integration of Generative AI into teacher education offers significant opportunities for improvement and engagement by personalizing learning experiences and enhancing student motivation through tailored content (Nazaretsky et al., 2022). However, this integration is not without barriers and challenges, including the need for adequate training, ethical concerns regarding data privacy and algorithmic bias, and the risk of depersonalization in learning (Owoseni et al., 2024). Effective communication among stakeholders is essential to navigate these complexities, as it fosters collaboration and the sharing of best practices. Additionally, promoting independence among educators in utilizing AI tools empowers them to adapt these technologies to their unique teaching contexts, ultimately leading to innovative instructional strategies. Balancing these constructs is crucial for maximizing the benefits of Generative AI while addressing its challenges in teacher education (Zhang & Miao, 2024).

## **OBJECTIVE**

The specific objective of this study is to examine the perceptions of trainee teachers at the Institute of Teacher Education, Technical Education Campus (IPGKPT) on the integration of Generative Artificial Intelligence (GenAI) tools into teacher education. The insights gained are crucial for identifying gaps in AI-related competencies, informing the development of targeted professional development programs, clear institutional guidelines, and equitable access to resources that align with technical and pedagogical needs. Furthermore, the findings will be valuable to policymakers, program designers, and lecturers in formulating strategies that support AI readiness in teacher education in line with national and global policy frameworks. In order to achieve the above objective, this paper attempts to answer the following research questions:

- i. What is the level of improvement and engagement for GenAI tools in teacher education among trainee teachers at IPGKPT?
- ii. What is the level of barriers and challenges for GenAI tools in teacher education among trainee teachers at IPGKPT?
- iii. What is the level of communication and independence for GenAI tools in teacher education among trainee teachers at IPGKPT?

## **METHODOLOGY**

This study employed a quantitative descriptive survey to examine the integration of Generative AI among 61 pre-service teachers from the Bachelor of Teaching Degree Program (PISMP), June 2022 intake, specialising in Design and Technology at the Institute of Teacher Education, Technical Education Campus (IPGKPT). The sample was determined using the Krejcie and Morgan (1970) framework and selected via simple random sampling. Data were collected through a structured, expert-validated questionnaire comprising 15 items across three constructs namely improvement and engagement, barriers and challenges, and communication and independence were administered via Google Forms for efficiency and data integrity. Pilot-tested with 30 respondents, the instrument demonstrated high reliability (Cronbach's  $\alpha = 0.86\text{--}0.92$ ) and strong content validity. A 5-point Likert scale was used, with mean score interpretation following Tschannen-Moran and Gareis (2004). Data were analysed using descriptive

statistics (mean, SD) in SPSS v30. The systematic design, including pilot testing, expert review, and robust reliability assessment, ensured accurate, consistent, and contextually relevant findings to address the research objectives.

## RESULTS AND DISCUSSION

### Academic Improvement and Engagement for GenAI Tools in Teacher Education

Table 1 demonstrates the mean value and level of academic improvement and engagement for Gen AI Tools in teacher education at Institute of Teacher Education, Technical Education Campus (IPGKPT) is at a high level ( $M=3.59$ ,  $SD=1.18$ ). Based on Table 1 as shown below, the descriptive analysis found that the overall mean of academic improvement and engagement for Gen AI Tools in teacher education is at a high level.

Table 1: Academic Improvement and Engagement for GenAI Tools in Teacher Education

|     | Item                                                                                                                                                   | Mean        | SD          | Level       |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|
| B01 | I believe that the use of Generative AI tools can significantly enhance students' academic performance and assessment outcomes.                        | 3.33        | 1.29        | Average     |
| B02 | Generative AI tools have the potential to make teaching and learning processes more engaging, interactive, and enjoyable for both tutors and students. | 3.98        | 0.90        | High        |
| B03 | The integration of Generative AI tools in teaching can positively influence students' motivation to participate actively in learning activities.       | 3.48        | 1.22        | High        |
| B04 | Generative AI tools can support the facilitation of challenging lessons by providing adaptive explanations, examples, and scaffolding.                 | 3.60        | 1.24        | High        |
| B05 | The use of Generative AI tools enables tutors to effectively address diverse learners' needs and learning styles within the classroom.                 | 3.60        | 1.20        | High        |
| B06 | Integrating Generative AI tools into teaching practice can expand tutors' subject-matter knowledge and pedagogical resources.                          | 3.56        | 1.22        | High        |
|     |                                                                                                                                                        | <b>3.59</b> | <b>1.18</b> | <b>High</b> |

### Barriers and Challenges for GenAI Tools in Teacher Education

Table 2 demonstrates the mean value and level of barriers and challenges for Gen AI Tools in teacher education at Institute of Teacher Education, Technical Education Campus (IPGKPT) is at a high level ( $M=3.37$ ,  $SD=1.03$ ). Based on Table 2 as shown below, the descriptive analysis found that the overall mean of barriers and challenges for Gen AI Tools in teacher education is at a high level.

Table 2: Barriers and Challenges for GenAI Tools in Teacher Education

|     | Item                                                                                                                                                            | Mean        | SD          | Level       |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|
| C07 | My limited knowledge of the ethical implications of Generative AI use in education discourages me from integrating it into my teaching practice.                | 3.24        | 1.05        | Average     |
| C08 | The lack of adequate technological infrastructure and resources limits my ability to effectively use Generative AI tools in teaching                            | 3.23        | 1.05        | Average     |
| C09 | The use of Generative AI tools may result in uniformity in student assessment, making it challenging to evaluate students fairly and accurately.                | 3.44        | 1.04        | High        |
| C10 | The integration of Generative AI tools into teaching requires clear guidelines and institutional support to address fairness, ethics, and assessment integrity. | 3.68        | 0.99        | High        |
| C11 | The increasing independence of students using Generative AI tools may reduce their reliance on and appreciation for the tutor's expertise.                      | 3.52        | 0.99        | High        |
| C12 | Generative AI tools can facilitate new modes of interaction and communication between tutors and students, potentially enhancing engagement and collaboration.  | 3.11        | 1.07        | Average     |
|     |                                                                                                                                                                 | <b>3.37</b> | <b>1.03</b> | <b>High</b> |

### Communication and Independence of using GenAI Tools in Teacher Education

Table 3 demonstrates the mean value and level of communication and independence of using Gen AI Tools in teacher education at Institute of Teacher Education, Technical Education Campus (IPGKPT) is at a high level ( $M=3.37$ ,  $SD=1.03$ ). Based on Table 3 as shown below, the descriptive analysis found that the overall mean of communication and independence of using Gen AI Tools in teacher education is at a average level.

Table 3: Communication and Independence of using GenAI Tool in Teacher Education

|     | Item                                                                                                                                                                                  | Mean        | SD          | Level          |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|----------------|
| D13 | Generative AI tools can facilitate new forms of interaction and communication between tutors and students, enhancing engagement and collaboration in the learning process.            | 3.24        | 1.03        | Average        |
| D14 | Tutors require targeted professional development to learn how to use Generative AI tools effectively and integrate them into the curriculum in alignment with pedagogical objectives. | 3.08        | 1.04        | Average        |
| D15 | The integration of Generative AI tools into teaching practices may alter or reduce the use of traditional instructional approaches that are valuable for student learning.            | 3.03        | 0.99        | Average        |
|     |                                                                                                                                                                                       | <b>3.12</b> | <b>1.02</b> | <b>Average</b> |

## CONCLUSION

In conclusion, the successful integration of Generative AI tools in teacher education hinges on a careful balance between leveraging their potential for enhancing engagement and learning outcomes while addressing the inherent barriers and challenges. By fostering effective communication among educators, administrators, and technology developers, and promoting independence in the use of AI tools, the educational landscape can be transformed to support innovative teaching practices. As educators navigate this evolving

terrain, it is essential to remain vigilant about ethical considerations and the need for ongoing professional development, ensuring that the benefits of Generative AI are realized without compromising the quality and personalization of the educational experience. Ultimately, embracing these advancements can lead to a more dynamic and responsive educational environment that meets the diverse needs of all learners.

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