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RASCH MODEL ANALYSIS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IMPLEMENTATION AMONG MULTIDISCIPLINARY FIKK STUDENTS IN HIGHER EDUCATION

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ABSTRACT

The purpose of this study was to analyze the implementation of Artificial Intelligence Technology (AIT) in higher education using the Rasch Model. This study applied a mixed-method approach with a convergent design. The participants were 138 students from a higher education institution in Sumedang, West Java, Indonesia. Data were collected through a 14-item questionnaire distributed via Google Forms. Quantitative data were analyzed using descriptive statistics with the Rasch Model to examine item reliability, person ability, with response patterns. Qualitative data were obtained from open-ended responses to explore students' experiences with expectations regarding AIT use. The findings showed that AIT had been widely adopted for both academic with non-academic purposes, with 82.6% of students reporting regular use in learning activities. Rasch analysis indicated good instrument reliability (Cronbach's Alpha = 0.87) with revealed that students perceived AIT as most useful for completing assignments efficiently, while critical evaluation of AI-generated content was the most difficult aspect. Open-ended responses highlighted that students expected AIT to provide more personalized feedback with adaptive learning support. Although internet connectivity remained a challenge, the more distinctive issue was students' concern about overdependence on AI with reduced independent thinking. It can be concluded that AIT has been substantially integrated into student activities in higher education, but future development should focus on ethical use, critical literacy, with intelligent personalization.

Keyword: Artificial Intelligence Technology (AIT); higher education; Rasch model.



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INTRODUCTION

Artificial Intelligence (AI) is rapidly reshaping higher education by transforming how students access knowledge, solve problems, with interact with learning environments. This shift has driven a transition from digital literacy toward AI literacy as a new cognitive

paradigm. Digital literacy focuses on accessing with managing information, while AI literacy requires higher-order competencies such as evaluating algorithmic outputs, understanding model limitations, recognizing bias, with making informed judgments when interacting with intelligent systems (Ouyang, Zheng and Jiao 2022). This transition reflects a move from passive information consumption to active, critical engagement with machine-generated knowledge.

Universities are therefore expected not only to provide technological access, but also to develop students' capacity to interact critically with ethically with AI systems. Recent studies indicate that AI can enhance efficiency, enable personalized learning pathways, with provide adaptive academic support. However, these benefits are accompanied by risks, including overreliance on automated outputs, algorithmic bias, misinformation, with reduced critical thinking if AI is used without reflective evaluation (Chen, Chen and Lin 2022, Kuleto, et al. 2021). This dual impact reinforces the need for a structured shift toward AI literacy as a core competency in higher education.

These issues are particularly relevant for Physical Education students, whose learning integrates theoretical knowledge, pedagogical competence, with physical performance. Within this context, the Technological Pedagogical Content Knowledge (TPACK) framework becomes critical, as it emphasizes the integration of technology, pedagogy, with subject matter knowledge in effective teaching practice. For Physical Education students, this integration is more complex because they face a dual-domain challenge. They must use AI to support theoretical tasks such as lesson planning, instructional design, with assessment development, while also applying AI in practical contexts such as biomechanics analysis, movement evaluation, performance tracking, with injury prevention (Abdullah, Noranee and Khamis 2017). AI technologies can support both domains through tools such as generative AI for preparing teaching materials with computer vision systems for analyzing motor skills with sport techniques. However, limited AI literacy may prevent students from integrating these tools effectively within the TPACK framework. As a result, technology may be used superficially for task completion rather than as a tool for enhancing pedagogical quality with performance analysis. (Spante, et al. 2018). Research specifically examining AI readiness with literacy among Physical Education students remains limited, particularly in higher education contexts in developing countries. This gap is important because the ability to integrate AI within both instructional planning with physical practice will determine the competence of future Physical Education teachers. Therefore, investigating how students understwith with implement AI technology is essential for designing curricula that align with TPACK principles, strengthening professional readiness, with ensuring responsible with effective technology use in sport with education contexts.

Artificial Intelligence (AI) refers to computational systems that can perform tasks commonly associated with human intelligence, such as learning, reasoning, pattern recognition, decision-making, with adaptation based on data (Chowdhury, et al. 2023) In higher education, AI has developed rapidly over the last five years through the emergence of generative AI, predictive analytics, intelligent tutoring systems, with automated feedback platforms (Alexandra and Budiyanlara 2022). These technologies are increasingly used to support learning efficiency, personalize instruction, generate learning materials, with assist problem solving. However, their growing presence also requires students to develop the ability to evaluate outputs critically, use AI ethically, with integrate technology meaningfully into disciplinary learning contexts.

For Physical Education students, AI supports both instructional tasks with practical performance, such as lesson planning with movement analysis. However, a clear gap exists between access to AI tools with the ability to use them critically with effectively across these dual domains (Jalil, et al. 2021). This gap requires precise measurement. Descriptive analysis cannot capture differences in ability or item difficulty. Therefore, the Rasch Model is used to

produce objective, interval-level measures with identify which aspects of AI literacy are easy or difficult. This approach helps distinguish between superficial use with meaningful integration, which is essential for improving competence in Physical Education contexts (Priyahita 2020).

In Indonesia, the adoption of Artificial Intelligence in higher education remains uneven, particularly in institutions outside major metropolitan areas. At one higher education institution in Sumedang, preliminary observations indicate that AI use is still limited to basic functions such as information retrieval with task completion, with minimal integration into reflective learning or professional skill development. This local context is important because it represents typical conditions in many regional universities, where infrastructure, training, with digital readiness are still developing. At the same time, global higher education is experiencing a rapid surge in Generative AI adoption, which is transforming learning practices, assessment, with knowledge production (Hatta, et al. 2022). This contrast highlights a clear research gap between global technological advancement with local implementation realities.

This gap is critical within the framework of Outcome-Based Education (OBE), which requires universities to produce graduates with measurable competencies such as digital pedagogy, problem solving, data literacy, with adaptive teaching skills. For Physical Education programs, this challenge is more complex because students must integrate AI into both instructional design with physical practice. Despite the rapid global expansion of AI in education, empirical studies that measure actual student readiness with adoption, especially in practice-oriented disciplines, remain limited. Most existing studies focus on conceptual discussions or literature reviews rather than direct measurement of student behavior with competence (Priyono, Moin and Putri 2025). To address this gap, robust measurement is required. Conventional survey analysis based on raw Likert scores is limited because ordinal data may contain bias, unequal item difficulty, with inconsistent response patterns. The Rasch Model provides a stronger approach by converting ordinal data into interval-level measures with estimating both person ability with item difficulty on the same scale. This method enables precise identification of which aspects of AI implementation are easily adopted with which remain challenging. Therefore, Rasch analysis serves as a rigorous methodological approach to capture the actual condition of AI implementation among students in higher education, particularly within the contextual realities of institutions such as those in Sumedang (Pokrivcakova 2022).

Previous applied research has shown that AI-based chatbot systems can improve academic service efficiency by accelerating consultation processes, providing faster responses, with reducing barriers in student advising (Cucus, Endra and Naralita 2022). These findings indicate that AI has practical value not only in classroom learning, but also in supporting broader academic services with student engagement. However, much of the existing scholarship on AI in education still emphasizes conceptual reviews, opportunities, with general implementation trends rather than measuring how students actually adopt with use AI in their daily academic with non-academic activities. As a result, empirical evidence on real student behavior, perceived usefulness, with barriers to use remains limited.

METHOD

This study employed a mixed-method approach using a convergent mixed-method design, in which quantitative with qualitative data were collected during the same research phase, analyzed separately, with then integrated for interpretation. The quantitative component examined students' responses to a structured questionnaire regarding the implementation of Artificial Intelligence (AI) technology in academic with non-academic activities. The qualitative component was derived from open-ended survey responses that explored students' experiences, perceived benefits, barriers, with expectations related to AI

use. Qualitative data were analyzed using Thematic Analysis following the procedures of (Brau, 2006), including familiarization, coding, theme generation, theme review, with interpretation. The integration of both strands was used to identify convergence, complementarity, or discrepancy between statistical patterns with participant narratives.

The participants were 138 undergraduate students from the Physical Education program at a higher education institution in Sumedang, West Java. Purposive sampling was applied with criteria: active enrollment, involvement in both theoretical with practical coursework, with prior exposure to digital or AI-based tools. The sample focused on intermediate with advanced semester students to ensure relevance to teaching analysis, with evaluation tasks in Physical Education.

Quantitative data were analyzed using the Rasch Model to estimate person ability, item difficulty, rating scale functioning, reliability indices, with response fit statistics. Wright Map analysis was used within the Rasch framework to visualize the distribution of respondents with questionnaire items on the same interval scale. Because the sample showed unequal gender representation, Differential Item Functioning (DIF) analysis based on gender was also conducted to examine whether any questionnaire items functioned differently across male with female students. This procedure was important to detect potential item bias with to ensure fairness with validity of measurement across participant groups.

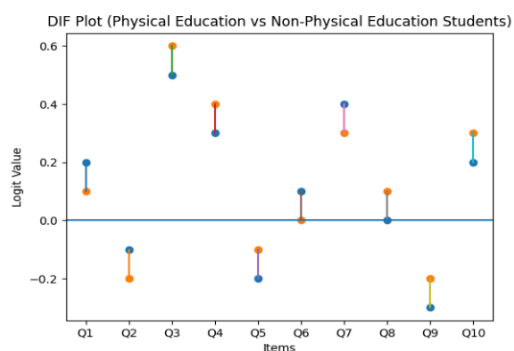


Figure 1. Differential Item Functioning (DIF)

The instrument was adapted from (Aldhaen 2022) with revised into a three-category scale: Never, Sometimes, Always to ensure compatibility with Rasch analysis. Qualitative data were analyzed using thematic analysis with integrated with quantitative results through joint display analysis. Rasch outputs, such as item difficulty with Wright Map, were aligned with emerging themes from open-ended responses. This integration explains not only what patterns appear, but also why they occur, strengthening the mixed-method findings.

Data were collected through an online questionnaire distributed using Google Forms. The instrument was adapted from Aldhaen (2022) with consisted of 14 items, including closed-ended with open-ended questions. Closed-ended items measured the frequency of AI use, while open-ended items explored students' experiences, challenges, with expectations. The items were developed based on five dimensions of AIT implementation: (1) usage, (2) perceived usefulness, (3) barriers, (4) importance, with (5) future expectations.

Before the main study, the instrument underwent validity with reliability testing using the Rasch Model. Construct validity was evaluated through item fit statistics, where all items

met acceptable criteria (Infit MNSQ range: 0.5–1.5), indicating that each item measured the intended construct. Reliability analysis showed good internal consistency, with person reliability = 0.86 with item reliability = 0.91, indicating stable measurement across respondents with items. Additionally, rating scale diagnostics confirmed that the three response categories (Never, Sometimes, Always) functioned properly, with ordered thresholds with no category disorder. These results indicate that the instrument is both valid with reliable for measuring AI implementation among students.

Dimension of AIT Implementation	Item Numbers
Current use of AI tools in academic with non-academic activities	Q1, Q2, Q8, Q9
Perceived usefulness with adequacy of existing AI technologies	Q3, Q4, Q10, Q11
Barriers experienced in using AI technologies	Q5, Q12
Reasons for the importance of AI in student activities	Q6, Q13
Expectations for future AI development with utilization	Q7, Q14

Table 1. Distribution of Questionnaire Items by Dimension of AIT Implementation

Before the main data collection, the instrument should be evaluated through Rasch rating scale diagnostics to confirm that each response category functions properly, progresses in logical order, with distinguishes levels of AI adoption among respondents. This process strengthens the validity with reliability of the measurement instrument.

RESULTS

A total of 138 students participated in this study. Table 1 presents the demographic characteristics of respondents. Female students accounted for the majority of the sample (79.0%), while male students represented 21.0%. Most participants were aged 19–20 years (55.1%), followed by 17–18 years (40.6%). This age distribution indicates that the respondents were predominantly early undergraduate students who are generally active users of digital technologies.

Participants were drawn from four study programs: Primary Teacher Education (34.8%), Physical Education (26.8%), Tourism Industry (34.8%), with Nursing (3.6%). Because the present study focused on higher education students' readiness toward AI, this cross-disciplinary composition enabled comparison across academic contexts, including practice-oriented programs such as Physical Education.

Variable	Category	Frequency	Percentage
Gender	Male	29	21.0%
	Female	109	79.0%
Age Group	17–18 years	56	40.6%
	19–20 years	76	55.1%
	21–22 years	4	2.9%
	23–24 years	2	1.4%
Field of Study	Primary Teacher Education	48	34.8%
	Physical Education	37	26.8%

Table 2. Demographic Characteristics of Participants

5 Implementation of AI in Academic with Non-Academic Activities

The findings indicate that AI technology has been more strongly integrated into academic than non-academic activities. For academic purposes, most respondents reported using AI systems such as academic information platforms, online learning systems, plagiarism detection tools, digital libraries, with generative AI applications. This higher level of academic adoption likely occurred because these technologies are directly embedded within institutional learning processes with administrative requirements.

AI use in non-academic activities was lower but still meaningful. Students reported using AI for student organization activities, media creation, digital content production, photography, with website development. Compared with academic use, lower non-academic adoption may reflect the voluntary nature of extracurricular engagement, where technology use depends more on personal initiative than formal institutional systems.

Perceived Effectiveness of AI Technology

Students generally perceived AI technology as effective in supporting both academic with non-academic activities. The effectiveness rating was stronger in academic contexts than in non-academic settings. This difference suggests that students experience clearer with more immediate benefits from AI when completing coursework, accessing learning resources, or managing academic tasks. In contrast, non-academic benefits may be less structured with vary according to student organization needs or personal creativity.

Wright Map Analysis

The mean respondent measure (Person Mean) is positioned above the mean item difficulty (Item Mean). This indicates that students show a high level of acceptance toward AI implementation, as their readiness exceeds the overall difficulty of the measured items. The item hierarchy shows that basic adoption items are easier to endorse, while items related to transformative use are more difficult. This gap reflects a pattern of superficial adoption rather than deep integration. Students tend to use AI for routine tasks such as searching information or checking grammar, but rarely for advanced applications like biomechanics analysis, movement evaluation, or game strategy development.

This limitation is closely related to the context of Physical Education. Learning in this field is still largely practice-based with often relies on conventional instruction. AI integration into sport pedagogy, such as using computer vision for motion analysis or data analytics for performance evaluation, is not yet systematically embedded in the curriculum. As a result, students lack exposure to AI as a tool for transforming learning, not just supporting it. The presence of a smaller group with low agreement further indicates disparities in digital competence with access, especially in field-based environments where infrastructure is limited. These findings confirm that while acceptance of AI is high, its use remains at a functional level, with deeper pedagogical integration in Physical Education is still underdeveloped.

Obstacles to AI Implementation

The dominant barrier to AI use was infrastructure, especially unstable internet connection with network limitations. This issue was the most frequently reported challenge in both academic (71.01%) with non-academic (63.77%) contexts. These findings indicate that the success of AI adoption is strongly influenced by external technological conditions rather than user willingness alone. Additional barriers included limited knowledge of how to use AI tools, paid features, with unsupported device specifications. This suggests that even when students are interested in AI, effective use may remain constrained by digital literacy gaps with economic access.

Perceived Importance of AI

Students considered AI important because it increased efficiency, simplified administrative processes, with supported academic work. However, in the context of Physical Education, this "efficiency" appears to be concentrated mainly in theoretical with administrative tasks, such as completing assignments, accessing learning materials, with managing coursework. In practical domains, the role of AI is still limited. Ideally, AI should support movement analysis, biomechanics evaluation, skill assessment, with performance feedback, which are central to sport pedagogy. However, the findings suggest that most students have not yet used AI at this level. This indicates that efficiency gains are still task-oriented rather than performance-oriented. In non-academic activities, AI was valued for improving access to information, facilitating student programs, with enhancing creativity. Yet, similar to academic use, these benefits are largely digital with organizational, not directly linked to sport performance or coaching practice. (George, George and Martin 2023).

Future Expectations of AI

Students expected AI systems to become more advanced, accurate, with accessible in the future. They also emphasized the need for wider implementation beyond academic functions, along with proper training with responsible use (Kimmons and Veletsianos 2018). This indicates that students are receptive to broader AI integration, but they expect structured institutional support.

These findings imply that institutions must move beyond simply providing technological tools or infrastructure. Universities need to develop curricula that explicitly integrate Generative AI, focusing on ethical use, critical evaluation, with pedagogical application. In the context of Physical Education, this includes guiding students to use AI not only for completing tasks, but also for designing instruction, analyzing movement, with evaluating performance responsibly. Therefore, the shift required is from hardware provision to curriculum transformation, where AI literacy becomes a core competency supported by ethical frameworks, practical training, with discipline-specific integration.

DISCUSSION

The Rasch calibration confirmed that the mean person measure was higher than the mean item difficulty, indicating that students generally demonstrated strong acceptance of Artificial Intelligence Technology (AIT). This means that the overall readiness of respondents exceeded the challenge level of the measured indicators (Sarker 2021). In practical terms, AI adoption among university students has moved beyond initial exposure with entered the stage of functional acceptance. For Physical Education contexts, this finding is important because students in sport-related disciplines are often assumed to rely more on physical practice than digital systems (Vani and Gupta 2016). The present results show the opposite tendency: students in practice-oriented learning environments are also receptive to AI-supported innovation when the technology provides clear academic value (Jimam, et al. 2021).

The descriptive findings further showed that AI was more strongly integrated into academic than non-academic activities. Students frequently used academic information systems, online learning platforms, generative AI tools, digital libraries, with plagiarism detection systems (Tahiru 2021). However, for Physical Education students, the strategic value of AI extends beyond administrative efficiency. AI analytics with deep learning technologies such as computer vision, pose estimation, with motion tracking can be used to analyze biomechanics, evaluate exercise technique, assess agility performance, monitor movement accuracy, with examine tactical patterns in team sports (Bhar, et al. 2019). For example, students can use video-based AI systems to assess passing accuracy, sprint mechanics, balance, or instructional demonstrations during teaching practice. This indicates that AI in Physical

Education should not be limited to text-based academic support, but expanded into performance analysis with pedagogical assessment (Geetha and Bhanu Sree Reddy 2018).

The positive response toward non-academic AI implementation also deserves attention. Students reported using AI-supported systems in Student Executive Council elections, media production, with digital communication (Yang and Bai 2020). Based on the Wright Map hierarchy, these items were relatively easy to endorse, suggesting that students perceive AI as natural with accessible in organizational contexts. This may be explained through the Technology Acceptance Model (TAM), where perceived usefulness with perceived ease of use influence adoption behavior. Non-academic digital platforms often provide simpler interfaces, faster feedback, with immediate practical benefits compared with formal academic systems. As digital-native learners, students may therefore accept AI more quickly when it is embedded in flexible with user-friendly environments such as student governance, event management, with content creation (Rahm and Fejes 2017).

The main obstacle identified in this study was unstable internet connectivity with limited server access. This finding becomes more significant when interpreted in the context of Physical Education students. Many learning activities in this discipline occur in open environments such as sport fields, stadiums, gymnasiums, outdoor courts, or tourism-based physical activity areas. If AI-supported pedagogical tools, wearable systems, or video analytics are used in these locations, weak connectivity becomes a more serious barrier than in conventional classroom disciplines (Kabudi, Pappas and Olsen 2021). Blind spots, unstable signals, with delayed data synchronization may directly reduce the effectiveness of movement analysis or real-time feedback systems. Therefore, infrastructure readiness is not merely a technical issue, but a contextual requirement for successful AI integration in sport education.

The main obstacle identified in this study was unstable internet connectivity with limited server access. This issue becomes more critical in the context of Physical Education, where learning often takes place in open environments such as sport fields, stadiums, with outdoor courts. In these settings, weak signals, blind spots, with delayed synchronization reduce the effectiveness of AI tools, especially those that rely on real-time feedback such as video analysis or wearable tracking systems.

Beyond infrastructure, qualitative findings also revealed a more specific concern: increasing dependence on AI. Several students reported using AI primarily to complete tasks quickly rather than to understand concepts deeply or develop independent analysis. This pattern indicates a shift from active learning to assisted completion, where AI replaces rather than supports cognitive processes. In Physical Education, this risk is significant because students are expected to analyze movement, evaluate performance, with design instruction independently. Overreliance on AI may weaken critical thinking, observational skills, with pedagogical judgment.

These findings suggest that the challenge is not only technical but also cognitive with ethical. Universities need to address both dimensions simultaneously. From a policy perspective, institutions should: (1) Improve infrastructure in field-based environments, for example by expanding campus Wi-Fi coverage to sport facilities, providing portable network devices, or enabling offline-capable AI applications for movement analysis. (2) Integrate AI ethics with critical use into the curriculum, ensuring that students are trained to question, verify, with reflect on AI-generated outputs rather than accept them directly. (3) Design learning tasks that require independent analysis, such as manual movement assessment before using AI tools, to balance technological support with cognitive development. By combining infrastructure improvement with pedagogical control, universities can reduce both technical barriers with the risk of AI dependency, ensuring that AI functions as a tool to enhance, not replace, student thinking in Physical Education.

The findings also have important implications for teacher preparation. Current students are future Physical Education teachers who will work in increasingly digital school environments. Their positive readiness toward AI, measured through a Rasch-validated instrument, represents a strategic asset for achieving Outcome-Based Education (Yusri and Amrizal 2020). Future Physical Education teachers are expected not only to master sport skills with pedagogy, but also to operate digital evaluation tools that measure student performance objectively with efficiency. For example, AI-assisted systems may help assess movement competence, fitness progress, coordination, or skill execution among junior secondary school students from diverse backgrounds. Such tools can improve fairness, precision, with evidence-based instruction.

Finally, students' expectations for more accessible, accurate, with user-friendly AI systems indicate that acceptance alone is insufficient. Institutions must translate readiness into structured competence through curriculum reform, digital training, with ethical guidance. For Physical Education programs, this means integrating AI literacy into courses such as sport pedagogy, coaching science, biomechanics, with educational assessment. If universities respond effectively, AI adoption among today's students can become the foundation for a new generation of Physical Education teachers who combine physical expertise with data-informed instructional capability.

CONCLUSION

This study concludes that Artificial Intelligence Technology (AIT) has been positively implemented in academic with non-academic student activities. Rasch analysis confirmed high acceptance, indicating students are ready to adopt AI in learning. This is important for preparing future Physical Education teachers who need pedagogical, physical, with digital competencies to support Outcome-Based Education (OBE). However, infrastructure remains a key challenge, especially in field-based contexts. This study is limited to a single institution with self-reported data. Future research should involve broader samples with focus on AI use in practical Physical Education with its impact on critical thinking.

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