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AI-DRIVEN TEACHING AND THE DEVELOPMENT OF FUTURE-READY TALENT AMONG UNIVERSITY STUDENTS IN MALAYSIA: ALIGNING HIGHER EDUCATION WITH SUSTAINABLE DEVELOPMENT GOALS (SDG)

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Abstract: *The rapid advancement of Artificial Intelligence (AI), digital transformation, and Industry Revolution 5.0 has significantly reshaped higher education, requiring universities to develop graduates equipped with future-oriented competencies. This study investigates the influence of AI-driven teaching on the development of future-ready talent among university students in Malaysia. Grounded in Self-Determination Theory and Constructivist Learning Theory, the study proposes a conceptual framework examining the direct and indirect relationships between AI-driven teaching, student engagement, self-directed learning, and future-ready talent. AI-driven teaching is conceptualised as an innovative pedagogical approach that enhances learning through personalised instruction, intelligent learning systems, adaptive technologies, and automated feedback mechanisms. The study posits that AI-driven teaching positively influences student engagement, which subsequently enhances self-directed learning and contributes to the development of future-ready talent characterised by adaptability, critical thinking, digital literacy, creativity, collaboration, and problem-solving competencies. Furthermore, student engagement and self-directed learning are proposed as key mediating mechanisms explaining how AI-enhanced educational environments foster*

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graduate readiness for future employment landscapes. The study contributes to the theoretical advancement of AI-enhanced learning research by extending the application of Self-Determination Theory within higher education contexts. Practically, the findings are expected to provide valuable insights for educators, higher education institutions, and policymakers in designing sustainable AI-driven pedagogical strategies that strengthen graduate employability and workforce readiness. The study also supports the achievement of Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation and Infrastructure), by promoting inclusive digital learning, technological innovation, and sustainable talent development.

Keywords: *Artificial Intelligence (AI), AI-Driven Teaching, Higher Education, Future-Ready Talent, Sustainable Development Goals (SDGs), Digital Learning*

Introduction

The rapid advancement of Artificial Intelligence (AI), automation, and digital transformation has significantly reshaped higher education and workforce development globally. Higher education institutions are increasingly expected to develop graduates equipped with future-oriented competencies such as critical thinking, adaptability, creativity, collaboration, digital literacy, and problem-solving skills required in the evolving digital economy (Crompton & Burke, 2023). These competencies are widely associated with the concept of future-ready talent and are increasingly essential in Industry Revolution 5.0 (IR 5.0) and Education 5.0 ecosystems.

Driven teaching has emerged as an innovative pedagogical approach capable of enhancing teaching and learning processes through adaptive learning systems, intelligent tutoring technologies, predictive analytics, automated feedback systems, and personalised instruction (Bayaga, 2025). The increasing adoption of AI-enhanced educational technologies reflects the transition towards human-centric and innovation-driven learning environments that prioritise lifelong learning, digital transformation, and sustainable workforce development (Ahmad et al., 2023).

Recent studies indicate that AI-supported teaching environments positively influence student engagement, autonomous learning behaviours, academic motivation, and learning effectiveness within higher education contexts (Santia et al., 2025). Similarly, AI-powered learning applications have demonstrated positive effects on students' self-efficacy, empowerment, and engagement in technology-mediated educational environments (Yuan et al., 2025).

The implementation of AI-enhanced pedagogical practices strongly aligns with Sustainable Development Goal 4, particularly in promoting inclusive, equitable, technology-enhanced, and quality education systems. Furthermore, the increasing emphasis on graduate employability, workforce adaptability, and innovation capability reflects the objectives of Sustainable Development Goal 8, which advocates productive employment, decent work opportunities, and sustainable economic growth.

The integration of AI-driven educational ecosystems also supports Sustainable Development Goal 9 through technological innovation, digital transformation, and the enhancement of educational infrastructure within higher education institutions.

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Despite these developments, concerns remain regarding graduates' preparedness for future employment landscapes shaped by AI and digital transformation. Recent studies continue to report challenges related to students' critical thinking abilities, adaptability, self-directed learning capabilities, and employability readiness in AI-driven environments (Lijie et al., 2025). Traditional teacher-centred pedagogical approaches are often criticised for being insufficient in preparing students for dynamic and technology-oriented workplaces.

In this context, student engagement and self-directed learning have become increasingly important in supporting future-ready talent development. Kahu (2013) argued that student engagement significantly influences academic success, learning persistence, and educational outcomes. Similarly, self-directed learning enables learners to independently regulate, monitor, and evaluate their own learning processes, which is essential for adapting to rapidly evolving technological environments (Broadbent & Poon, 2015).

The present study is underpinned by Self-Determination Theory, which emphasises autonomy, competence, and relatedness as fundamental psychological needs that enhance intrinsic motivation, engagement, and independent learning behaviours (Deci & Ryan, 2000). AI-driven teaching environments that support personalised and autonomous learning may therefore contribute significantly to student engagement, self-directed learning, and future-ready talent formation.

Although previous studies have examined AI adoption and digital learning in higher education, empirical research investigating the relationship between AI-driven teaching and future-ready talent development remains limited, particularly within the Malaysian higher education context. Therefore, this study seeks to investigate the influence of AI-driven teaching on future-ready talent among university students in Malaysia, with student engagement and self-directed learning functioning as mediating variables while supporting the achievement of SDG 4, SDG 8, and SDG 9.

Problem Statement

The rapid integration of AI technologies into higher education institutions has transformed teaching and learning practices globally. However, concerns remain regarding the effectiveness of these technological innovations in preparing graduates for future workforce demands and sustainable employability.

Existing studies have primarily focused on technology acceptance, online learning effectiveness, and AI adoption readiness rather than examining how AI-driven teaching contributes to the development of future-ready talent (Crompton & Burke, 2023). Consequently, there remains insufficient empirical evidence explaining the mechanisms through which AI-enhanced pedagogical practices influence graduate readiness for future employment and sustainable workforce participation.

Furthermore, employers continue to express concerns regarding graduates' lack of employability competencies and workplace readiness. According to Succi and Canovi (2020), many graduates demonstrate inadequate soft skills, adaptability, and problem-solving abilities required in modern workplaces. Recent evidence also suggests that university students continue to face difficulties in developing critical thinking dispositions, digital adaptability, and innovation capability within AI-mediated educational environments (Lijie et al., 2025).

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These issues directly challenge the aspirations of Sustainable Development Goal 4 and Sustainable Development Goal 8, particularly in ensuring that graduates acquire relevant future-oriented competencies required for sustainable employment and lifelong learning.

Additionally, student engagement remains a critical issue in technology-mediated learning environments. Henrie et al. (2015) found that student engagement significantly affects learning effectiveness in digital education settings. Recent studies further demonstrate that AI-supported teaching environments positively influence student engagement and motivation; however, their effectiveness depends heavily on pedagogical implementation and students' autonomous learning capabilities (Santia et al., 2025).

Self-directed learning has also become increasingly important in Education 5.0 ecosystems where students are expected to independently regulate, monitor, and adapt their learning processes in response to rapid technological changes (Ahmad et al., 2023). Hutasuhut et al. (2023) found that guided learning approaches significantly enhance self-directed learning among university students within higher education environments.

Moreover, the integration of AI-driven teaching aligns with Sustainable Development Goal 9 through the promotion of technological innovation, educational digitalisation, and AI-enhanced learning infrastructure. Nevertheless, limited studies have empirically investigated how AI-driven teaching contributes to sustainable future-ready talent development within Malaysian higher education institutions.

Although previous studies have separately examined AI-driven teaching, student engagement, and self-directed learning, limited research has integrated these variables into a comprehensive empirical framework explaining future-ready talent development within the context of sustainable education and workforce readiness.

Therefore, this study aims to address these gaps by developing and empirically testing a conceptual framework that examines the relationships between AI-driven teaching, student engagement, self-directed learning, and future-ready talent among university students in Malaysia while contributing to the global SDG agenda.

Research Objectives

General Objective

To investigate the influence of AI-driven teaching on the development of future-ready talent among university students in Malaysia.

Specific Objectives

1. To examine the relationship between AI-driven teaching and future-ready talent.
2. To investigate the relationship between AI-driven teaching and student engagement.
3. To determine the relationship between student engagement and self-directed learning.
4. To examine the influence of self-directed learning on future-ready talent.
5. To investigate the mediating roles of student engagement and self-directed learning.

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Research Questions

1. Does AI-driven teaching influence future-ready talent?
2. How does AI-driven teaching affect student engagement?
3. Does student engagement enhance self-directed learning?
4. Does self-directed learning influence future-ready talent?
5. Do student engagement and self-directed learning mediate the relationship between AI-driven teaching and future-ready talent?

Research Hypotheses

H1: AI-driven teaching has a positive relationship with future-ready talent.
H2: AI-driven teaching has a positive relationship with student engagement.
H3: Student engagement has a positive relationship with self-directed learning.
H4: Self-directed learning has a positive relationship with future-ready talent.
H5: Student engagement mediates the relationship between AI-driven teaching and future-ready talent.
H6: Self-directed learning mediates the relationship between student engagement and future-ready talent.

Theoretical Foundation

Self-Determination Theory

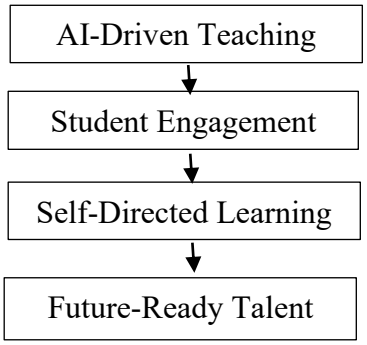
Self-Determination Theory developed by Deci and Ryan (2000) explains human motivation through three fundamental psychological needs:
* autonomy,
* competence,
* relatedness.

According to Ryan and Deci (2020), individuals who experience higher levels of autonomy and competence demonstrate stronger intrinsic motivation, learning engagement, and independent learning behaviours. AI-driven teaching environments that provide personalised learning experiences and adaptive educational support may therefore enhance student engagement and self-directed learning, ultimately contributing to future-ready talent development.

Constructivism

Constructivist learning theory posits that learners actively construct knowledge through meaningful interactions and experiences. AI-enhanced learning technologies support collaborative, interactive, and experiential learning environments that encourage deeper knowledge construction and competency development.

Conceptual Framework



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Significance of the Study

Theoretical Contribution

This study extends the application of Self-Determination Theory within AI-enhanced educational environments by explaining how AI-driven teaching influences student engagement, self-directed learning, and future-ready talent development.

Practical Contribution

The findings may assist higher education institutions in developing AI-enhanced pedagogical strategies that strengthen graduate employability, digital adaptability, innovation capability, and future workforce readiness.

The study also provides valuable insights for educators and policymakers in designing sustainable teaching and learning ecosystems aligned with Education 5.0 and IR 5.0 agendas.

Contribution to Sustainable Development Goals (SDGs)

This study contributes directly to several Sustainable Development Goals established by United Nations.

Sustainable Development Goal 4

The study supports SDG 4 by promoting innovative AI-driven teaching practices that enhance students' digital competencies, self-directed learning capabilities, lifelong learning readiness, and future-oriented skills required for quality education.

Sustainable Development Goal 8

The study contributes to SDG 8 through the development of graduate employability, workforce adaptability, and sustainable future talent readiness for employment landscapes influenced by AI and digital transformation.

Sustainable Development Goal 9

The integration of AI-enhanced pedagogical approaches aligns with SDG 9 by fostering educational innovation, technological advancement, and digital transformation within higher education institutions.

Conclusion

In conclusion, this study highlights the significant role of AI-driven teaching in developing future-ready talent among university students in Malaysia. The rapid advancement of Artificial Intelligence (AI), digital transformation, and Education 5.0 has reshaped the expectations placed upon higher education institutions to produce graduates who are adaptable, digitally competent, innovative, and capable of thriving in technology-oriented work environments. The proposed conceptual framework demonstrates that AI-driven teaching can positively enhance future-ready talent both directly and indirectly through the mediating roles of student engagement and self-directed learning.

Grounded in Self-Determination Theory and Constructivist Learning Theory, the study emphasises that AI-enhanced learning environments support autonomy, competence, personalised learning, and active knowledge construction, which are essential factors in strengthening students' intrinsic motivation, engagement, and independent learning behaviours. The integration of AI technologies in teaching and learning processes may therefore improve

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students' critical thinking, adaptability, problem-solving abilities, and lifelong learning readiness required in Industry Revolution 5.0 ecosystems.

Furthermore, the study contributes theoretically by extending the application of Self-Determination Theory within AI-enhanced higher education contexts and empirically explaining the relationships between AI-driven teaching, student engagement, self-directed learning, and future-ready talent. Practically, the findings are expected to provide valuable insights for universities, educators, and policymakers in designing sustainable AI-enhanced pedagogical strategies that strengthen graduate employability and workforce readiness.

Importantly, this study also supports the achievement of Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure), by promoting inclusive digital learning, sustainable employability, technological innovation, and educational transformation within Malaysian higher education institutions.

Overall, the study suggests that effective implementation of AI-driven teaching has the potential to become a strategic mechanism for preparing future-ready graduates who are capable of contributing meaningfully to sustainable economic development and the evolving digital society.

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