

LINKING ARTIFICIAL INTELLIGENCE ADOPTION TO
EMPLOYABILITY SKILLS: A CROSS-SECTIONAL STUDY OF
FSR UiTM STUDENTS

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Abstract: Artificial intelligence (AI) adoption is increasingly shaping how university students learn and how graduates are expected to demonstrate employability skills in technology-rich labour markets. Accordingly, this study aims to determine the levels of artificial intelligence adoption and employability skills and to examine the extent to which artificial intelligence adoption predicts employability skills among students in the Faculty of Sports Science and Recreation (FSR), Universiti Teknologi MARA Shah Alam. Using a quantitative cross-sectional survey design, data were collected from 327 students through a structured questionnaire measuring AI adoption and employability skills. Descriptive statistics were employed to determine the overall levels of both constructs, while simple linear regression analysis was conducted to examine whether AI adoption predicts employability skills. The results indicate that students reported high levels of AI adoption and employability skills. The regression findings further reveal that AI adoption has a significant positive effect on employability skills, suggesting that students who engage more actively with AI tend to report stronger employability skills. These findings highlight the importance of structured and responsible AI integration in higher education to ensure that AI use supports skill development rather than merely accelerating task completion. The study provides practical insights for educators and faculty administrators to guide AI use in ways that reinforce workplace-relevant competencies and strengthen graduate readiness in increasingly technology-mediated labour markets.

Keywords: *Artificial intelligence adoption, employability skills, sports, higher education, graduate readiness.*

INTRODUCTION

Artificial intelligence (AI) has emerged as one of the most consequential technological developments of the twenty-first century, shaping how people learn, communicate, and work across diverse sectors. Since its early conceptualization and development, AI has evolved through advances in machine learning and deep learning, enabling computer systems to perform tasks that previously required human intelligence (Mijwil et al., 2022). AI is now widely recognized as one of the top ten essential competencies needed for the future workforce (World Economic Forum, 2023). This illustrates that AI is not merely a tool for productivity; it increasingly constitutes an infrastructure that reorganizes how knowledge is produced and applied. As this technological trend accelerates, higher education institutions face a strategic imperative to understand how students engage with AI and how such engagement may affect graduate readiness for the labour market.

In higher education, AI can streamline routine activities and provide adaptive feedback, thereby changing the learning experience and potentially shaping students' academic behaviours and competencies (Leow et al., 2026; Strielkowski et al., 2025). AI may support students in building analytical capacity, technological confidence, and adaptive problem-solving, particularly when learning tasks demand the interpretation of information, data-driven

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judgment, and iterative solution development (Suryanto et al., 2025). At the same time, concerns have been raised that increasing reliance on AI for academic tasks could reduce students' engagement in deep learning processes and independent cognitive work. This tension highlights the need for empirical research that does not assume AI adoption is inherently beneficial or harmful, but instead examines how students' use of AI relates to essential graduate attributes, especially employability skills.

Employability skills are widely recognised as a core outcome of higher education and a key determinant of graduates' career success. Employability is commonly conceptualised as an integration of skills, understandings, and personal attributes that improve the likelihood of securing employment and performing effectively in occupational roles (McHenry & Krishnan, 2022). Relatedly, employability is also described as a set of achievements and personal qualities that benefit graduates themselves, the workforce, the community, and the economy (Neroorkar, 2022). In increasingly dynamic job markets, these competencies function as signals of workforce readiness and as resources that support long-term employability across changing roles and contexts. Accordingly, the development of employability skills is not merely an employment-focused agenda but also reflects broader educational aims of producing graduates who can think critically, collaborate effectively, and respond constructively to complex and uncertain conditions.

The relationship between AI and employability is increasingly salient because AI is transforming both the nature of work and the competencies required to participate effectively in modern workplaces. Essandoh et al. (2025) emphasized that rapid AI development is reshaping employment structures, skill requirements, and employability expectations across industries. In parallel, organizations and governments have noted that AI is becoming increasingly embedded in organizational operations (Alhosani & Alhashmi, 2024). As a result, employers are placing growing emphasis on employability skills such as critical thinking, problem-solving, adaptability, communication, and digital literacy alongside academic credentials. These labour market shifts generate direct pressure on higher education institutions to ensure students can perform effectively in today's AI-driven environment. From this perspective, students' adoption of AI may serve as a potential developmental pathway that enhances the competencies required in contemporary employment contexts. This highlights the need for context-specific empirical studies that examine how AI adoption relates to employability skills among students in particular disciplinary settings.

Within the Faculty of Sports Science and Recreation (FSR) at Universiti Teknologi MARA (UiTM) Shah Alam, this context suggests that students' AI adoption in academic tasks could potentially contribute to employability development. At the same time, if AI is used primarily to generate academic outputs with limited engagement in reasoning and collaboration, students may not develop core employability skills to the desired level. Despite the relevance of these issues, empirical evidence remains limited regarding how AI adoption among FSR students relates to perceived employability skills, particularly within the Malaysian higher education setting. This study therefore examines the impact of AI adoption on employability skills among FSR students at UiTM Shah Alam. By empirically assessing AI adoption and employability skills, the study aims to clarify the direction and magnitude of this relationship in a faculty-specific context.

The significance of this study lies in its potential to inform educational practice, curriculum planning, and student development strategies in an era of accelerating AI integration. If AI adoption positively impacts employability skills, higher education stakeholders may consider structured approaches to AI literacy and purposeful tool use that promote critical thinking, collaboration, and reflective learning rather than mere output generation. Ultimately, the rapid diffusion of AI into education and work makes it essential to understand how students' adoption of AI tools intersects with the development of employability skills. Within this context, the present study seeks to contribute empirical clarity by examining whether AI adoption among FSR UiTM Shah Alam students is associated with employability skill development, thereby supporting more evidence-based and responsible integration of AI within higher education.

LITERATURE REVIEW

Past Studies on Artificial Intelligence Adoption and Employability

Artificial intelligence (AI) has become a central driver of change in higher education and the workplace, prompting renewed attention to how students' technology practices shape their readiness for employment. Conceptually, AI

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refers to a set of algorithms and techniques that enable machines to learn from data and experience and to perform tasks that previously required human intelligence (Garg, 2021). As AI tools become increasingly accessible to students, their adoption extends beyond novelty use to routine academic support, including information search, drafting, feedback, and task organization. In parallel, employability has been widely framed as a multidimensional construct capturing achievements, skills, understandings, and personal attributes that make graduates more likely to obtain employment and succeed in chosen occupations (Nghia et al., 2022). Accordingly, there is a need to develop clear mechanisms through which students can build and deploy a wide range of skills, enhance academic learning, and strengthen their employability.

Within this broader framing, AI adoption in education is increasingly viewed as a potential contributor to employability because it may strengthen both cognitive and interpersonal competencies that employers value. The core argument in the literature is that AI-enabled learning environments can enhance the quality and efficiency of learning experiences, thereby supporting skill development that translates to workplace settings. Shahzad et al. (2025) report that AI tools such as virtual tutors, automated feedback systems, and learning analytics can strengthen critical thinking, adaptability, and problem-solving skills. These skills are frequently identified as key employability attributes in fast-changing labour markets because they enable graduates to navigate uncertainty, interpret information, and adjust strategies when contexts shift. Importantly, AI systems can also make learning more personalized and interactive, potentially increasing students' engagement with practice-based tasks and applied decision-making (Taranikanti & Vuthaluru, 2025).

Ruiz-Rojas et al. (2024) report that AI can promote reflective discussion and teamwork in higher education, supporting students' critical thinking and collaboration skills. This perspective is significant because it frames AI not only as a productivity tool but also as a catalyst for interaction and reflection when embedded appropriately in learning design. This suggests that AI adoption may strengthen transferable competencies when students use AI outputs as inputs for critique, debate, and improvement, rather than as final answers. Such a use pattern aligns with employability development, which depends on interactive learning, feedback use, and adaptive communication in real-world contexts.

In summary, the literature supports an overall proposition that AI adoption can positively influence employability skills and supporting interpersonal and professional competencies. Recent work also suggests that generative AI may enhance reflective discussion and teamwork mechanisms that are closely linked to employability (Ruiz-Rojas et al., 2024). Together, these strands of evidence justify examining AI adoption as a potential predictor of employability skills and support the conceptual assumption that increased exposure to and use of AI technologies may strengthen students' readiness for the evolving job market. Accordingly, this study tests the hypothesis that AI adoption has a significant positive impact on students' employability skills.

Theoretical Foundation

Human Capital Theory (HCT), originally advanced by Schultz (1961) and later formalised by Becker (1964) and Mincer (1974), posits that individuals who invest in education, training, and skill development enhance their productive capacity, thereby improving their labour market outcomes and employability. The theory treats knowledge and skills as a form of capital that depreciates over time and must be continuously renewed through learning and upskilling. In the context of artificial intelligence adoption, HCT provides a robust theoretical lens which examines how workers' human capital investments shape their ability to remain employable in AI-transformed workplaces. As AI technologies increasingly automate routine tasks (Autor et al., 2003), the theory implies that individuals who proactively invest in AI-complementary competencies such as critical thinking, digital literacy, and socio-emotional skills are better positioned to sustain and enhance their employability (Acemoglu & Restrepo, 2019).

Building on this premise, HCT further suggests that the returns to human capital investment are heterogeneous and contingent on the degree to which an individual's skills complement, rather than substitute for, AI capabilities (Erik et al., 2023). Workers whose existing human capital aligns with AI-driven task demands are likely to experience amplified productivity and stronger employability outcomes, while those with substitutable skills face heightened displacement risk (World Economic Forum, 2023). Therefore, this study adopts HCT as its theoretical foundation, arguing that AI adoption acts as a moderating factor that reshapes the value of human capital, making

continuous investment in AI-relevant skills a critical determinant of individual employability in the digital economy.

Conceptual Model

Figure 1

Conceptual Model

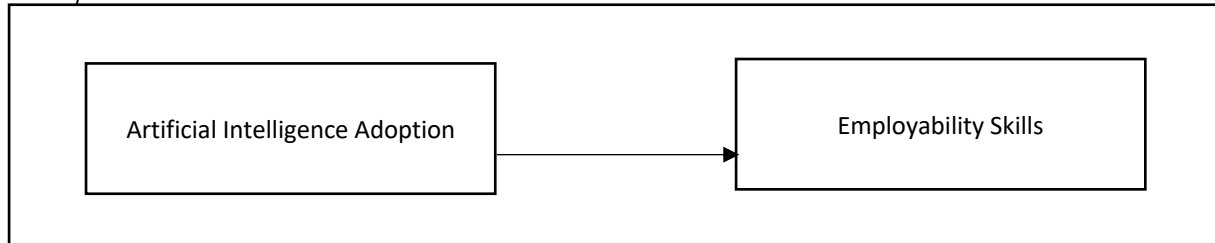


Figure 1 presents the conceptual model underpinning this study, illustrating the proposed directional impact of artificial intelligence adoption on employability skills. This model is grounded in Human Capital Theory (Becker, 1964; Schultz, 1961), which posits that purposive investment in technology-mediated learning constitutes a form of human capital accumulation that enhances individuals' productive capacities and labour market readiness. The simplicity of the model reflects the study's focused objective of empirically establishing whether students' engagement with AI tools significantly predicts their perceived employability competencies, providing a clear theoretical and analytical framework from which the research hypotheses are derived.

METHODOLOGY

Participants

This study employed a quantitative cross-sectional survey design to examine the impact of Artificial Intelligence (AI) adoption on employability skills. The research was conducted at the Faculty of Sports Science and Recreation (FSR), Universiti Teknologi MARA (UiTM) Shah Alam. A total of 327 respondents were selected using simple random sampling comprising active FSR undergraduate students who were enrolled during the data collection period and had experience using at least one AI tool.

Instruments

Data were collected using a structured self-administered questionnaire consisting of three sections. All items were measured on a 5-point Likert scale unless stated otherwise, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The use of Likert scaling was appropriate to capture respondents' perceptions and subsequent parametric analysis.

Part A: Demographic Profile. Part A included respondent characteristics relevant for describing the sample and contextualizing interpretation of findings. The respondent profile captured demographic and academic characteristics (e.g., gender, year of study, programme).

Part B: Artificial Intelligence Adoption. Part B consisted of seven items measuring AI adoption, adapted from Wijayati et al. (2022). These items captured students' use of AI tools to support academic tasks and learning processes. Responses were recorded on a 5-point Likert scale.

Part C: Employability. In Part C, the questionnaire on employability was adapted from Roxas (2022), which comprises 29 items. All the items used a five-point Likert scale format.

Pilot Testing and Instrument Refinement

Before the main data collection, a pilot test was conducted among 30 respondents. The pilot served to evaluate preliminary internal consistency of the scales. Feedback from the pilot was used to refine item wording, reduce redundancy, and ensure that the final instrument reflected a coherent representation of each construct. The findings

indicated that all items in Parts B and C had reliability coefficients above 0.8, which is considered good and acceptable for use (Konting et al., 2009).

Statistical Analysis

Descriptive statistics were computed to summarise the characteristics of the respondents and the overall distribution of the study variables. Means and standard deviations were calculated for AI adoption and employability skills to determine the general level of each construct among respondents. These descriptive results provided an empirical overview of students' engagement with AI and their perceived employability competencies. Additionally, a simple linear regression analysis was performed to examine the impact of AI adoption on employability skills. This analysis aimed to determine whether variations in AI adoption significantly explain variations in employability skill levels.

RESULTS & DISCUSSION

Table 1

Demographic Profile of Respondents

		Frequency (n)	Percent (%)
Gender	Male	194	59.3
	Female	133	40.7
	Total	327	100.0

Table 1 presents the demographic profile of respondents based on gender. The results indicate that out of the total 327 respondents, 194 were male, representing 59.3% of the sample, while 133 were female, accounting for 40.7%. This distribution shows that male students constituted the majority of participants in the study.

Table 2

Mean Score Interpretation

Mean Score	Interpretation
4.21 – 5.00	Very high
3.21 – 4.20	High
2.61 – 3.20	Medium
1.81 – 2.60	Low
1.00 – 1.80	Very Low

Descriptive statistics were computed to determine the levels of AI adoption and employability skills. Table 2 above shows the interpretation of mean scores following the guideline proposed by Moidunny (2009), where mean values of 4.21–5.00 indicate very high, 3.21–4.20 indicate a high level, 2.61–3.20 indicate medium, 1.81–2.60 indicate low, and 1.00–1.80 indicate very low.

Table 3

Descriptive Statistics on the level of Artificial Intelligence Adoption

	Mean	Std. Deviation (SD)
Artificial Intelligence Adoption	3.35	.605

As shown in Table 3, the overall level of AI adoption was high ($M = 3.35$, $SD = 0.605$), indicating that respondents generally reported a strong tendency to adopt and use AI for relevant academic tasks. This finding suggests that AI technologies have become embedded in students' day-to-day learning practices and are commonly used to support activities such as completing assignments, preparing presentations, conducting academic searches, and refining written work. The high mean score therefore reflects not only frequent exposure to AI tools but also a normalization of AI-assisted learning routines among the respondents.

Within the educational context, AI systems assist students in generating ideas, organizing information, improving writing quality, analyzing data, and enhancing productivity. The high adoption level observed in this study indicates that students perceive AI tools as useful, efficient, and supportive in completing academic tasks. This finding aligns with Algerafi et al (2023), who reported that perceived usefulness strongly influences students' willingness to adopt AI tools in academic environments. Similarly, Almassaad et al. (2024) found that university students demonstrated high levels of agreement regarding AI usefulness for enhancing learning efficiency. Rahman et al. (2025) further observed strong willingness among higher education students to adopt AI chatbots to improve online learning effectiveness. Thus, the present study supports previous research indicating that students have positive attitudes toward AI. The frequent use of AI tools may reflect both accessibility and increasing normalization of AI technologies in higher education.

Table 4*Descriptive Statistics on the level of Employability Skills*

	Mean	Std. Deviation (SD)
Employability Skills	3.49	.617

As shown in Table 4, the overall level of employability skills among students at FSR UiTM was high ($M = 3.49$, $SD = 0.617$), suggesting that respondents perceived themselves as having strong employability skills. The high mean score observed in this study suggests that students perceive themselves as well-prepared for workforce participation. According to Kolb's (1984) experiential learning theory, learning occurs through the transformation of experience. FSR students engage in practical sessions, fieldwork, event organization, and applied training, which likely strengthen their interpersonal, leadership, and adaptability skills.

The present findings are consistent with Rasul et al. (2013), who reported that Malaysian university students demonstrated strong employability competencies, particularly in problem-solving, communication, and teamwork. Robles (2012) similarly found that students rated themselves highly in soft skills valued by employers, such as integrity, responsibility, and communication. Therefore, the high level of employability skills among FSR students may reflect both curriculum design and experiential exposure. It also suggests that students possess confidence in their workplace-relevant abilities, although self-reported measures should be interpreted cautiously.

Table 5*Simple Linear Regression Analysis*

	Unstandardized B	Std. Error	Standardized Beta	T	Significant
Constant	1.529	.157			
Artificial Intelligence Adoption	.586	.046	.575	12.655	
R ²	.330				
F	160.144				
Significant	<.001				

Additionally, a simple linear regression analysis was also conducted to examine whether artificial intelligence (AI) adoption predicts employability skills among students at FSR UiTM Shah Alam. The overall regression model in Table 4 was statistically significant, $F = 160.144$, $p < .001$, indicating that AI adoption explained a significant proportion of variance in employability skills. The model accounted for 33.0% of the variance in employability skills, $R^2 = .330$. This demonstrates that AI adoption significantly and positively predicted employability skills, $B = 0.586$, $SE = 0.046$, $\beta = .575$, $t = 12.655$, $p < .001$. This suggests that students who adopt AI more actively tend to report stronger employability competencies.

This finding is theoretically and empirically meaningful. Grounded in Human Capital Theory (HCT), the result carries significance beyond mere statistical confirmation. Becker (1964) and Schultz (1961) argue that purposive investment in knowledge and skills enhances individuals' productive capacity and labour market readiness. From

this perspective, students' active engagement with AI tools may be understood as a form of human capital investment, whereby repeated interaction with AI in academic settings accumulates cognitive and practical competencies that are transferable to employment contexts. Digital technology integration has been shown to enhance students' higher-order thinking and collaboration skills. Warneri et al. (2025) indicate that integrating digital technologies into instruction significantly improves critical thinking, communication, and teamwork competencies. Since AI represents an advanced form of digital technology, its interactive and problem-based features may further strengthen these skills. Similarly, Asad and Anwar (2025) demonstrated that AI positively affects students' career readiness and transferable skills. Students who engage with AI-related tools and knowledge are better prepared to meet workplace demands, particularly those requiring technological competence and innovative thinking.

The present study reinforces these findings by demonstrating that AI adoption is not merely a technological behavior but a developmental factor associated with the growth of employability. With AI, students may enhance decision-making, data interpretation, problem-solving, and digital literacy. These competencies align closely with the employability constructs measured in this research. When students engage with AI tools, they must formulate precise queries, critically evaluate AI-generated outputs, identify limitations, and refine their approach accordingly. This process mirrors the kind of analytical reasoning and adaptive problem-solving that employers consistently identify as essential graduate attributes. As AI is used collaboratively in group-based academic tasks, it may serve as a shared object for discussion and critique, thereby reinforcing communication and teamwork skills that are central to employability.

CONCLUSION

This study examined the level of artificial intelligence (AI) adoption, the level of employability skills, and the extent to which AI adoption predicts employability skills among FSR UiTM Shah Alam students. The findings indicate that students generally demonstrate high engagement with AI in academic contexts and report strong employability competencies, suggesting that AI has become embedded in everyday learning practices. Students also perceive themselves as well-prepared with transferable skills. Importantly, the analysis shows that AI adoption has a significant positive influence on employability skills, supporting the view that AI use can function as more than a productivity aid and may contribute to the development of workplace-relevant capabilities such as problem-solving, adaptability, communication, and digital confidence when used purposefully. This research contributes to the existing body of knowledge by offering context-specific empirical evidence from a sports science and recreation faculty. This is an area that remains underrepresented in AI and employability research, and by linking AI adoption to employability outcomes in a measurable way. However, given the cross-sectional and self-reported nature of the data and the focus on a single institution, future studies should adopt longitudinal and mixed-method approaches, expand sampling across faculties and universities to clarify how and under what conditions AI adoption strengthens employability skills. From a theoretical perspective, the study extends digital learning and employability frameworks by situating AI as a developmental tool rather than merely a productivity enhancer. It suggests that AI integration into academic activities may foster transferable skills essential for workforce readiness. Practically, these findings carry practical implications for curriculum design and institutional policy. At the curriculum level, the results suggest that FSR programmes would benefit from moving beyond passive AI exposure toward structured AI pedagogy. AI integration guidelines should acknowledge the importance of applied, relational, and embodied learning alongside digital competencies. At the policy level, the Ministry of Higher Education may consider incorporating AI literacy benchmarks into Malaysia's Graduate Employability Framework to ensure that technology-mediated skill development is formally recognised as part of graduate readiness criteria, thereby providing institutions with a structured mandate to embed responsible AI use within teaching and learning practice. Consequently, properly integrated AI tools into curricula may complement experiential learning and enhance both hard and soft skills.

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REFERENCES

- Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives*, 33(2), 3-30.
- Algerafi, M. A., Zhou, Y., Alfadda, H., & Wijaya, T. T. (2023). Understanding the factors influencing higher education students' intention to adopt artificial intelligence-based robots. *IEEE Access*, 11, 99752-99764.
- Alhosani, K., & Alhashmi, S. M. (2024). Opportunities, challenges, and benefits of AI innovation in government services: a review. *Discover Artificial Intelligence*, 4(1), 18.
- Almassaad, A., Alajlan, H., & Alebaikan, R. (2024). Student perceptions of generative artificial intelligence: Investigating utilization, benefits, and challenges in higher education. *Systems*, 12(10), 385.
- Asad, M. M., & Anwar, K. (2025). Influence of artificial intelligence on students' career competencies and career resources: A global perspective. *The International Journal of Information and Learning Technology*, 42(4), 366-391. <https://doi.org/10.1108/IJILT-05-2024-0091>
- Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118(4), 1279-1333.
- Becker, G. S. (1989). *Human capital: a theoretical and empirical analysis, with special reference to education*. University of Chicago Press.
- Erik, B., Danielle, L., & Raymond Lindsey, R. (2023). Generative AI at work. *NBER Working Paper*, 31161.
- Essandoh, S., Sakyi, J. K., Ibrahim, A. K., Okafor, C. M., & Wedraogo, L. (2025). Artificial intelligence and the future of work: Impacts on employment and job roles. *International Journal of Multidisciplinary Futuristic Development*, 6(1), 31-41. <https://doi.org/10.54660/IJMF.D.2025.6.1.31-41>
- Garg, P. K. (2021). Overview of artificial intelligence. In *Artificial intelligence* (pp. 3-18). Chapman and Hall/CRC.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Prentice-Hall.
- Konting, M. M., Kamaruddin, N., & Man, N. A. (2009). Quality assurance in higher education institutions: Exist survey among Universiti Putra Malaysia graduating students. *International Education Studies*, 2(1). <https://doi.org/10.5539/ies.v2n1p25>
- Leow, M. H., Hassan, N., Mohamad Marzaini, A. F., Susilawati, L., Hestiana, S., Saprudin, & Sya'ban, M. S. (2026). The synergy of AI and non-AI tools in higher education self-directed ESL/EFL: A systematic literature review. *Journal of Teaching and Learning*, 20(3). <https://doi.org/10.22329/jtl.v20i3.10231>
- McHenry, R., & Krishnan, S. (2022). A conceptual professional practice framework for embedding employability skills development in engineering education programmes. *European Journal of Engineering Education*, 47(6), 1296-1314.
- Mijwil, M. M., Aggarwal, K., Sonia, S., Al-Mistarehi, A. H., Alomari, S., Gök, M., ... & Abdulrhman, S. H. (2022). Has the future started? The current growth of artificial intelligence, machine learning, and deep learning. *Iraqi Journal for Computer Science and Mathematics*, 3(1), 13.
- Mincer, J. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research; Columbia University Press.
- Moidunny, K. (2009). *The effectiveness of the National Professional Qualification for Educational Leaders (NPQEL)* [Doctoral dissertation, Universiti Kebangsaan Malaysia].
- Neroorkar, S. (2022). A systematic review of measures of employability. *Education+ Training*, 64(6), 844-867.
- Nghia, T. L. H., Bui, B. C., Singh, J. K. N., & Lu, V. N. (2022). From employability to employment outcomes and career advancement: A literature review. *Graduate Employability Across Contexts: Perspectives, Initiatives and Outcomes*, 21-45.
- Rahman, M. K., Ismail, N. A., Hossain, M. A., & Hossen, M. S. (2025). Students' mindset to adopt AI chatbots for effectiveness of online learning in higher education. *Future Business Journal*, 11(1), 30.
- Rasul, M. S., Ismail, M. Y., Rajuddin, M. R., & Rauf, R. A. A. (2013). Employability skills in TVET curriculum in Malaysia: A review of current practices. *Procedia - Social and Behavioral Sciences*, 93, 1467-1472.
- Robles, M.M. (2012). Executive perceptions of the top 10 soft skills needed in today's workplace. *Business Communication Quarterly*, 75(4), 453-465. <https://doi.org/10.1177/1080569912460400>.
- Roxas, M. J. (2022). Senior high school students' self-assessment of employability skills proficiency: An exploratory study. *International Journal of Research Studies in Education*, 11, 7-14.
- Ruiz-Rojas, L. I., Salvador-Ullauri, L., & Acosta-Vargas, P. (2024). Collaborative working and critical thinking: Adoption of generative artificial intelligence tools in higher education. *Sustainability*, 16(13), 5367.

- Schultz, T. W. (1961). Investment in human capital. *The American economic review*, 51(1), 1-17.
- Shahzad, S. A., Raza, M. M., Malhi, S. D., ul Ain, Q., & Malhi, D. K. (2025). Integrating artificial intelligence to foster critical thinking and problem-solving in 21st-century classrooms. *Research Journal for Social Affairs*, 3(5), 635-648.
- Strielkowski, W., Grebennikova, V., Lisovskiy, A., Rakhimova, G., & Vasileva, T. (2025). AI-driven adaptive learning for sustainable educational transformation. *Sustainable Development*, 33(2), 1921-1947.
- Suryanto, A. F., Wajdi, M., Sahoo, P. K., Wu, Q., Yusof, N. M., & Chan, Y. F. (2025). The impact of artificial intelligence on logic skills, critical thinking, and student creativity. *Journal of Language, Literature, Social and Cultural Studies*, 3(3), 283-299.
- Taranikanti, V., & Vuthaluru, S. (2025). Problem-based learning and artificial intelligence. In *Mastering Problem-Based Learning in Health Profession Programs: Principles, Procedures, and Best Practices* (pp. 219-249). Springer Nature Switzerland.
- Warneri, B. M. N. F., Dewa, D. M. R. T., & Wibowo, S. B. (2025). Transforming education in the twenty-first century: integrating digital competence, analytical thinking, and cooperative learning. *Journal of Hunan University Natural Sciences*, 52(4).
- Wijayati, D. T., Rahman, Z., Rahman, M. F. W., Arifah, I. D. C., & Kautsar, A. (2022). A study of artificial intelligence on employee performance and work engagement: The moderating role of change leadership. *International Journal of Manpower*, 43(2), 486-512.
- World Economic Forum. (2023). *The future of jobs report 2023*. World Economic Forum.