A CASE STUDY OF THE IMPACT OF ARTIFICIAL INTELLIGENCE-ASSISTED LEARNING ON STUDENT ENGAGEMENT AT QUANZHOU COLLEGE OF TECHNOLOGY

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This Independent Study Has Been Approved as a Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

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Title: A Case Study of the Impact of Artificial Intelligence-Assisted Learning on Student Engagement at Quanzhou College of Technology

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ABSTRACT

This study examined the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology, focusing on three key components: personalized learning pathways, AI-powered feedback, and interactive learning tools. The research was motivated by the increasing integration of AI technologies in higher education and the need to understand their effectiveness in enhancing student engagement. Guided by Constructivist Learning Theory, the objectives of this study were: 1). to examine the impact of personalized learning pathways on student engagement at Quanzhou College of Technology, 2). To examine the role of AI-powered feedback in influencing student engagement, 3). To examine the effect of interactive learning tools on enhancing student engagement.

To achieve these objectives, a quantitative research design was employed, using a structured questionnaire to collect data from 410 undergraduate students who had experienced AI-assisted learning. Stratified random sampling was used to ensure proportional representation across different fields of study and year levels. The questionnaire included a five-point Likert scale to measure students' perceptions of personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement. Data were analyzed using descriptive statistics to summarize respondents' demographic characteristics and inferential statistics, including correlation and regression analyses, to test the hypotheses.

The findings revealed that all three AI-assisted learning components significantly and positively influenced student engagement. Interactive learning tools emerged as the most influential factor, explaining 46.8% of the variance in student engagement, followed by AI-powered feedback at 43.3% and personalized learning pathways at 40%. The results suggested that interactive learning tools, such as simulations and gamified platforms, were particularly effective in transforming passive learning into active participation. AI-powered feedback was also found to play a crucial role by providing timely and actionable insights that helped sustain motivation and focus. Personalized learning pathways, while beneficial, showed a relatively lower impact, indicating a need for further enhancement of adaptive learning systems.

The study demonstrates that AI-assisted learning has significant potential to improve student engagement by making learning more personalized, timely, and interactive. It is recommended that Quanzhou College of Technology invest in the development of advanced AI systems that prioritize interactive and feedback-driven learning experiences. Ensuring equitable access to these technologies and addressing potential challenges related to data privacy and algorithmic bias are essential for maximizing the benefits of AI-assisted learning. The findings offer valuable insights for educators and administrators seeking to leverage AI to create more engaging and effective learning environments.

Keywords: personalized learning pathways, AI-powered feedback, interactive learning tools, student engagement

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WANG WEIZHI

DECLARATION

I, WANG WEIZHI, hereby declare that this Independent Study entitled "A Case Study of the Impact of Artificial Intelligence-Assisted Learning on Student Engagement at Quanzhou College of Technology" is an original work and has never been submitted to any academic institution for a degree.

(WANG WEIZHI)
Feb 26, 2025

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Chapter 1 Introduction

1.1 Background of the Study

In recent years, the integration of artificial intelligence (AI) into educational environments has gained significant attention worldwide, particularly in higher education institutions in China. As technology continues to evolve, AI-assisted learning has emerged as a transformative approach to enhance student engagement by offering personalized and interactive educational experiences (Zhang & Li, 2022). The adoption of AI technologies in education is grounded in the Constructivist Learning Theory, which emphasizes the importance of active learner participation and the construction of knowledge through meaningful interactions (Piaget, 1972; Zhao & Cheng, 2020). According to Sun and Liu (2023), AI can facilitate personalized learning pathways, provide real-time feedback, and offer interactive learning tools that align with students' individual learning needs and preferences, thereby increasing their motivation and engagement.

At Quanzhou College of Technology, the growing interest in leveraging AI for educational purposes reflects a broader trend across Chinese institutions aiming to modernize teaching methods and improve learning outcomes. Studies have shown that personalized learning pathways enabled by AI can significantly enhance student engagement by allowing learners to progress at their own pace and focus on areas that require improvement (Wang & Zhou, 2019). Furthermore, AI-powered feedback mechanisms are instrumental in maintaining students' interest and motivation by providing timely and constructive feedback, which is essential for effective learning (Huang, 2020). This approach not only supports the constructivist view of learning as an active process but also aligns with the objectives of Chinese educational reforms aimed at fostering independent learning and critical thinking skills (Chen & Wu, 2021).

Interactive learning tools, another key component of AI-assisted learning, have also demonstrated a positive impact on student engagement. These tools, which include virtual simulations, gamified learning environments, and AI-driven assessments, offer students a more immersive and participatory learning experience (Yang, 2023). According to Zhang and Li (2022), the use of AI-based interactive tools in higher education settings has been associated with increased student satisfaction and a higher degree of involvement in learning activities. This is particularly relevant at Quanzhou

College of Technology, where the emphasis on practical and applied learning necessitates the adoption of innovative educational technologies.

However, while the potential benefits of AI-assisted learning are widely acknowledged, there is a need for empirical research to assess its effectiveness in enhancing student engagement, particularly within the context of Chinese higher education institutions. Previous studies have primarily focused on the technical capabilities of AI in education, leaving a gap in understanding its impact on student motivation and learning outcomes (Wang et al., 2018). Therefore, this study aims to investigate the influence of AI-assisted learning on student engagement at Quanzhou College of Technology, focusing on three specific aspects: personalized learning pathways, AI-powered feedback, and interactive learning tools. The findings of this research are expected to provide valuable insights for educators and policymakers seeking to optimize AI integration in educational settings.

1.2 Questions of the Study

In the context of rapid technological advancements, Quanzhou College of Technology has increasingly integrated artificial intelligence (AI) into its educational practices. However, the implementation of AI-assisted learning has not been without challenges. One of the primary issues is the inconsistency in student engagement levels, which has been attributed to the varied effectiveness of personalized learning pathways, AI-powered feedback, and interactive learning tools (Li & Chen, 2020). Despite the potential of AI to enhance learning experiences, many students report feeling overwhelmed by the vast array of AI-driven options and struggle to maintain sustained engagement in their studies (Zhang & Liu, 2022). According to Sun and Wang (2023), the absence of a structured approach to integrating AI technologies in education has led to disparities in how different students benefit from these tools. As a result, some students receive more effective and personalized learning experiences than others, creating a significant challenge for educators at Quanzhou College of Technology.

Constructivist Learning Theory provides a relevant theoretical foundation for addressing these issues by emphasizing the role of meaningful and active learning experiences in enhancing student engagement (Piaget, 1972; Chen & Zhao, 2020). This theory suggests that when learners are actively involved in the learning process through personalized pathways, timely feedback, and interactive tools, they are more likely to construct knowledge effectively and remain engaged (Wang et al., 2021). For instance, personalized learning pathways, when aligned with students' prior knowledge and learning pace, can significantly boost motivation and engagement (Liu, 2019). Similarly, AI-powered feedback that provides immediate and specific responses to students' performance can help them correct mistakes in real-time and stay motivated (Xu & Li, 2022). Furthermore, interactive learning tools that facilitate hands-on and collaborative learning experiences can transform passive learners into active participants, thereby enhancing engagement (Yang, 2023).

1. What is the impact of personalized learning pathways on student engagement at Quanzhou College of Technology?

2. What role does AI-powered feedback play in influencing student engagement levels?

3. What effect do interactive learning tools have on enhancing student engagement?

1.3 Objectives of the Study

1. To examine the impact of personalized learning pathways on student engagement at Quanzhou College of Technology.

2. To examine the role of AI-powered feedback in influencing student engagement.

3. To examine the effect of interactive learning tools on enhancing student engagement.

1.4 Scope of the Study

This study focuses on investigating the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology. The scope is limited to exploring the relationships between three specific independent variables—personalized learning pathways, AI-powered feedback, and interactive learning tools—and the dependent variable, student engagement. The research was confined to undergraduate students enrolled in various programs at Quanzhou College of Technology, where AI-based learning tools have been integrated into the educational system. Data collection was conducted through a structured questionnaire distributed to a representative sample of students who have experienced AI-assisted learning within the past academic year.

The theoretical framework of this study is grounded in Constructivist Learning Theory, which emphasizes the importance of active learning and the construction of knowledge through interactive and personalized experiences. By adopting a quantitative research method, the study seeks to measure the extent to which each of the independent variables influences student engagement and to validate the proposed hypotheses. The scope excludes other potential factors that might affect student engagement, such as socioeconomic background, teaching quality, and traditional instructional methods, focusing solely on the aspects of AI-assisted learning. Additionally, the study was limited to analyzing AI applications used in academic courses, excluding administrative AI tools and non-academic AI applications.

Geographically, the study was restricted to Quanzhou College of Technology, and the findings may not be generalizable to other institutions without further research. Temporally, the data collection and analysis covered a period of one academic semester, ensuring that the results reflect a recent and relevant timeframe. By delineating these boundaries, the study aims to provide focused and actionable insights into how AI-assisted learning can be optimized to enhance student engagement in the context of Chinese higher education.

1.5 Significance of the Study

The significance of this study lies both in its theoretical contributions and its practical implications for enhancing student engagement through artificial intelligence-assisted learning. Theoretically, this study expands the application of Constructivist Learning Theory by exploring how AI technologies can facilitate personalized, interactive, and feedback-driven learning experiences. While previous research has focused on traditional methods of implementing constructivist principles, this study seeks to demonstrate how AI can serve as a powerful tool in creating active learning environments that align with the theory's core tenets. By examining the impact of personalized learning pathways, AI-powered feedback, and interactive learning tools on student engagement, the findings are expected to provide a deeper understanding of the mechanisms through which AI can support knowledge construction and learner autonomy in higher education contexts. Moreover, this study addresses a gap in existing literature by offering empirical evidence on the effectiveness of AI-assisted learning in Chinese higher education, particularly at Quanzhou College of Technology. This contribution is significant given the limited research focusing specifically on AI's impact on student engagement in China.

Practically, the results of this study hold valuable implications for educators, administrators, and policymakers seeking to optimize AI integration in educational settings. For educators, understanding which AI-assisted learning components most effectively enhance student engagement can inform instructional design and teaching strategies, enabling them to create more personalized and motivating learning experiences. For administrators at Quanzhou College of Technology and similar institutions, the study provides insights into how investments in AI technologies can be strategically directed to maximize learning outcomes and improve student satisfaction. Additionally, for policymakers, the findings offer evidence-based recommendations for promoting AI-driven educational reforms that support active learning and equitable access to technology-enhanced education. By demonstrating the benefits of AI-assisted learning, this study also aims to encourage greater adoption of AI technologies across Chinese higher education institutions, contributing to the broader goal of educational modernization and innovation in China.

1.6 Definition of Key Terms

Personalized Learning Pathways: In this study, personalized learning pathways refer to AI-assisted educational approaches that adapt the content, pace, and learning activities to meet individual students' needs and preferences. These pathways are designed to allow students to progress through learning materials based on their own understanding and performance levels, enhancing engagement by making the learning experience more relevant and manageable.

AI-Powered Feedback: AI-powered feedback refers to the use of artificial intelligence technologies to provide students with immediate, automated responses to their performance on assessments and learning activities. In this study, it includes personalized suggestions for improvement, real-time corrections, and progress tracking, aiming to keep students informed and motivated throughout their learning process.

Interactive Learning Tools: Interactive learning tools in this context refer to AI-enabled platforms and applications that facilitate active participation in learning through simulations, gamification, quizzes, and collaborative activities. These tools are intended to transform passive learning into a more engaging and hands-on experience for students.

Student Engagement: Student engagement in this study is defined as the level of interest, motivation, and active participation that students exhibit during their learning process. It is measured through indicators such as attentiveness in class, participation in learning activities, time spent on tasks, and the willingness to invest effort in learning.

Constructivist Learning Theory: Constructivist Learning Theory refers to the educational theory that emphasizes learning as an active process where learners construct knowledge based on their experiences and interactions. In this study, it serves as the theoretical framework for analyzing how AI-assisted learning tools can enhance student engagement by facilitating active and personalized learning experiences.

Artificial Intelligence-Assisted Learning: This term refers to the application of AI technologies, such as machine learning algorithms and natural language processing, in educational settings to support personalized learning, real-time feedback, and interactive learning experiences. In this study, AI-assisted learning encompasses the tools and strategies used to enhance student engagement through tailored content delivery and interaction.

Chapter 2 Literature Review

This chapter presents a comprehensive review of existing literature related to the impact of artificial intelligence-assisted learning on student engagement, guided by Constructivist Learning Theory. The purpose of this chapter is to establish a theoretical foundation for the study by examining previous research on the key variables, identifying gaps in the literature, and providing a rationale for the proposed hypotheses. The chapter is organized into several sections, each focusing on one of the primary keywords identified in the study: Personalized Learning Pathways, AI-Powered Feedback, Interactive Learning Tools, and Student Engagement.

The first section explores the concept of personalized learning pathways and how AI technologies have been applied to create adaptive learning experiences that cater to individual student needs. The second section reviews literature on AI-powered feedback, emphasizing its role in providing timely and constructive responses to enhance learning outcomes. The third section discusses interactive learning tools, focusing on AI-enabled applications that promote active and participatory learning. The final section synthesizes research findings on student engagement, examining both the challenges and opportunities presented by AI-assisted learning environments.

2.1 Personalized Learning Pathways

Personalized learning pathways refer to AI-driven educational approaches that adapt instructional content, pace, and learning activities based on individual student needs and performance levels. This approach aligns with Constructivist Learning Theory, which emphasizes that learners construct knowledge more effectively when learning experiences are tailored to their prior knowledge and interests (Piaget, 1972). In recent years, Chinese higher education institutions have increasingly embraced personalized learning pathways to address the diverse needs of students and enhance their engagement. According to Li and Zhang (2021), the integration of AI in personalized learning has enabled educators to design adaptive learning experiences that promote active participation and sustained interest in learning. By analyzing students' performance data and learning behaviors, AI systems can generate individualized learning paths that focus on areas requiring improvement, thereby preventing disengagement due to either boredom or frustration (Wang & Chen, 2020).

Research has shown that personalized learning pathways significantly improve learning outcomes by allowing students to progress at their own pace, which is particularly beneficial for learners with varying abilities (Zhao, 2022). For instance, a study by Liu and Sun (2023) found that students following AI-guided personalized learning paths demonstrated higher retention rates and greater motivation to learn compared to those in traditional lecture-based settings. This is consistent with the findings of Xu and Li (2021), who reported that personalized learning pathways facilitated by AI analytics not only improve students' academic performance but also enhance their self-efficacy by providing targeted feedback and resources. In the context of Quanzhou College of Technology, where students exhibit diverse learning preferences and backgrounds, the implementation of personalized learning pathways could play a crucial role in addressing the challenges of maintaining student engagement across different disciplines.

In addition to enhancing academic performance, personalized learning pathways have been found to support the development of self-directed learning skills, a critical component of lifelong learning. According to Chen and Zhao (2020), AI-driven personalized learning fosters self-regulation by enabling students to set individual learning goals, track their progress, and adjust their learning strategies accordingly. This aspect is particularly relevant in the current educational landscape, where the ability to learn independently is increasingly valued. Furthermore, personalized learning pathways that integrate collaborative AI tools can facilitate peer learning and group problem-solving activities, thus enriching the learning experience (Yang & Li, 2019).

Despite the promising potential of personalized learning pathways, challenges remain in their implementation. One significant issue is the risk of data privacy concerns, as AI systems rely on extensive data collection to create personalized learning experiences (Zhang & Liu, 2021). Ensuring that student data is protected and used ethically is essential for gaining trust and widespread acceptance of AI-driven personalized learning systems. Additionally, the effectiveness of these pathways largely depends on the quality of the AI algorithms and the accuracy of the data used. As noted by Sun and Wang (2022), biases in AI algorithms can lead to unequal learning opportunities if certain groups of students receive less effective personalized guidance due to flawed data analytics. Addressing these challenges requires a comprehensive strategy that includes robust data governance policies and continuous monitoring of AI systems to ensure fairness and accuracy in personalized learning pathways.

The review of literature on personalized learning pathways highlights their significant potential in enhancing student engagement by offering tailored and adaptive learning experiences. However, for institutions like Quanzhou College of Technology to fully realize these benefits, it is crucial to address the challenges related to data privacy and algorithmic biases. Understanding these dynamics will help inform the development of effective AI-assisted learning strategies that not only improve engagement but also ensure equitable access to personalized education.

2.2 AI-Powered Feedback

AI-powered feedback refers to the use of artificial intelligence technologies to provide students with immediate, personalized, and actionable responses to their learning activities and assessments. This approach aligns closely with Constructivist Learning Theory, which emphasizes the importance of timely feedback in helping learners reflect on their understanding and adjust their learning strategies accordingly (Piaget, 1972). In recent years, AI-powered feedback systems have gained prominence in Chinese higher education as a means to enhance student engagement and learning outcomes. According to Liu and Chen (2021), AI-driven feedback not only accelerates the feedback loop by delivering instantaneous responses but also personalizes recommendations based on individual learning patterns and errors, thereby maintaining student motivation and interest. This capability is particularly valuable at Quanzhou College of Technology, where large class sizes often limit instructors' ability to provide detailed feedback to every student.

Research has demonstrated that AI-powered feedback significantly improves students' learning efficacy by offering precise and targeted suggestions for improvement. For instance, Wang and Zhao (2022) found that students who received AI-generated feedback on their assignments were more likely to revisit and correct their mistakes promptly compared to those who received traditional feedback. Similarly, Sun and Li (2020) reported that AI feedback systems, which analyze both content accuracy and writing style, helped students improve their performance in academic writing courses by providing step-by-step guidance. These findings underscore the potential of AI-powered feedback to transform passive learning into an active process of continuous improvement and self-regulation. By facilitating timely and constructive feedback, AI systems empower students to take charge of their learning journey, which is a core principle of Constructivist Learning Theory (Zhang, 2021).

The adaptive nature of AI-powered feedback allows it to address diverse learning needs and preferences effectively. AI systems can identify patterns in students' mistakes and adapt feedback to focus on recurring weaknesses, ensuring that each learner receives the most relevant guidance. According to Li and Wang (2023), such personalized feedback not only enhances students' comprehension of complex topics but also boosts their confidence by acknowledging their progress and offering practical suggestions for further improvement. The ability of AI systems to deliver differentiated feedback based on individual performance is particularly beneficial in heterogeneous classrooms, where students' skills and prior knowledge vary significantly. For Quanzhou College of Technology, where students come from diverse academic backgrounds, the adoption of AI-powered feedback can play a crucial role in leveling the playing field by ensuring that all students receive the support they need to succeed.

Despite the evident benefits, the implementation of AI-powered feedback also poses challenges, particularly concerning the interpretability and perceived fairness of AI-generated responses. As noted by Chen and Xu (2022), students may exhibit skepticism towards feedback that appears too generic or lacks transparent explanations of its rationale. To address this issue, integrating explainable AI techniques that clarify how feedback is generated can enhance students' trust and willingness to act on the suggestions provided. Furthermore, ensuring that AI algorithms are free from biases is essential to prevent unequal learning opportunities among students. Zhao and Liu (2021) argued that biased feedback can disproportionately benefit or disadvantage certain groups of students, potentially exacerbating educational inequalities. Therefore, careful design and continuous monitoring of AI systems are imperative to maximize the positive impact of AI-powered feedback on student engagement.

AI-powered feedback represents a promising avenue for enhancing student engagement by providing timely, personalized, and actionable guidance. Its alignment with Constructivist Learning Theory highlights its potential to facilitate active and reflective learning. However, realizing these benefits on a broader scale requires addressing challenges related to transparency, fairness, and algorithmic bias. Understanding these factors is essential for institutions like Quanzhou College of Technology as they seek to optimize AI integration in their educational practices.

2.3 Interactive Learning Tools

Interactive learning tools refer to AI-enhanced educational technologies designed to facilitate active participation, collaborative learning, and real-time feedback for students. These tools encompass a range of applications, including virtual simulations, gamified learning platforms, and AI-driven assessments, all of which aim to transform passive learning into a more engaging and immersive experience. According to Zhang and Liu (2021), the use of interactive learning tools in Chinese higher education has been instrumental in enhancing student motivation and promoting deeper learning by providing a dynamic and responsive learning environment. This approach aligns with Constructivist Learning Theory, which emphasizes that knowledge is constructed more effectively when learners are actively engaged in the learning process through meaningful interactions and problem-solving tasks (Piaget, 1972).

Research indicates that interactive learning tools significantly impact student engagement by making learning more appealing and relevant. For instance, a study by Wang and Li (2022) found that AI-based simulations and virtual labs, which allow students to explore complex concepts in a risk-free environment, led to higher levels of participation and improved conceptual understanding in science and engineering courses. Similarly, Chen and Zhao (2020) reported that gamified learning tools, which incorporate elements such as challenges, leaderboards, and instant feedback, were effective in sustaining students' interest and encouraging them to invest more effort in their studies. These findings suggest that interactive learning tools not only capture students' attention but also foster a sense of achievement and autonomy, which are critical components of student engagement.

The collaborative capabilities of AI-enabled interactive tools have been shown to enhance peer learning and teamwork skills. By facilitating real-time communication and collaborative problem-solving, these tools enable students to learn from each other and develop a deeper understanding of the subject matter. According to Liu and Sun (2023), AI-driven collaborative platforms that allow students to work on group projects and receive collective feedback have been particularly effective in promoting active learning and peer interaction. This aspect is highly relevant to the educational objectives of Quanzhou College of Technology, where practical and team-based learning approaches are emphasized. The ability of interactive tools to support both individual and collaborative learning highlights their versatility in addressing diverse educational needs and enhancing overall engagement.

However, despite the potential benefits, the adoption of interactive learning tools also presents challenges, particularly regarding the digital divide and the need for adequate technical infrastructure. As noted by Zhao and Xu (2021), disparities in access to reliable internet connections and digital devices can limit the effectiveness of AI-driven interactive tools, particularly for students from less privileged backgrounds. Addressing these challenges requires institutions to invest in digital infrastructure and provide training for both students and educators to maximize the benefits of interactive learning tools. Additionally, concerns about the cognitive overload associated with the excessive use of interactive features have been raised. Li and Chen (2022) argued that while interactive tools are effective in capturing attention, they can also lead to distractions if not designed with a clear focus on learning objectives. Therefore, a balanced approach that integrates interactive elements without overwhelming students is essential to optimize engagement and learning outcomes.

Interactive learning tools represent a powerful means of enhancing student engagement by providing immersive, collaborative, and personalized learning experiences. Their alignment with Constructivist Learning Theory underscores their potential to transform traditional educational practices by making learning more participatory and responsive. For institutions like Quanzhou College of Technology, leveraging these tools effectively requires addressing challenges related to access, infrastructure, and cognitive load to ensure that all students can benefit equally from AI-assisted learning innovations.

2.4 Student Engagement

Student engagement refers to the level of interest, motivation, and active participation that students demonstrate in their learning process. It is a multifaceted construct that encompasses behavioral, emotional, and cognitive dimensions, each of which plays a crucial role in influencing academic performance and learning outcomes. According to Zhang and Liu (2022), maintaining high levels of student engagement is a persistent challenge in higher education, particularly in the context of large classes and standardized curricula that often fail to address individual learning needs. The integration of artificial intelligence (AI) in education has emerged as a promising solution to this challenge by providing personalized, timely, and interactive learning experiences that align with students' interests and learning preferences. This approach is consistent with Constructivist Learning Theory, which posits that students are more likely to construct knowledge effectively when they are actively engaged in the learning process through meaningful interactions and personalized feedback (Piaget, 1972).

Research indicates that AI-assisted learning environments significantly enhance student engagement by addressing the diverse needs of learners through adaptive and responsive technologies. For instance, a study by Li and Wang (2021) demonstrated that students who received personalized learning pathways and AI-powered feedback showed higher levels of engagement and participation in online courses compared to those who experienced traditional instructional methods. Similarly, Chen and Zhao (2020) found that the use of AI-driven interactive learning tools, such as simulations and gamified platforms, was positively associated with increased attention span and motivation among students. These findings suggest that AI-assisted learning can effectively bridge the gap between students' individual learning needs and standardized educational practices, thereby promoting sustained engagement. For Quanzhou College of Technology, where students exhibit diverse academic backgrounds and learning preferences, adopting AI technologies that support personalized and interactive learning could play a vital role in enhancing student engagement and reducing dropout rates.

The ability of AI systems to provide real-time feedback and continuous assessment has been shown to significantly impact students' emotional and cognitive engagement. According to Sun and Liu (2023), AI-powered feedback that offers immediate and constructive responses to students' performance not only helps them identify and rectify mistakes quickly but also fosters a sense of competence and self-efficacy, which are critical for maintaining motivation. This aspect is particularly relevant in challenging courses, where delays in feedback can lead to frustration and disengagement. By providing timely feedback, AI systems can help students develop a growth mindset and view challenges as opportunities to improve, thereby sustaining their interest and effort in learning tasks (Zhao, 2021).

Challenges remain in optimizing AI-assisted learning for student engagement, particularly concerning the balance between automation and human interaction. As noted by Wang and Zhang (2022), while AI systems excel at delivering personalized and data-driven learning experiences, the absence of human empathy and nuanced understanding can limit their effectiveness in addressing the emotional dimensions of student engagement. Ensuring that AI systems complement rather than replace human instructors is essential to maintaining a supportive learning environment that fosters both cognitive and emotional engagement. Additionally, concerns about data privacy and algorithmic bias in AI-driven educational tools can also impact students' trust and willingness to engage with these technologies (Liu & Xu, 2020). Addressing these concerns requires transparent data governance policies and continuous monitoring of AI systems to ensure fairness and accountability.

Student engagement is a critical determinant of learning success, and AI-assisted learning offers a promising approach to enhancing engagement by providing personalized, timely, and interactive learning experiences. However, realizing the full potential of AI in education requires addressing challenges related to data privacy, algorithmic bias, and the balance between human and AI roles in teaching. Understanding these dynamics is essential for institutions like Quanzhou College of Technology as they seek to leverage AI technologies to improve student engagement and learning outcomes.

2.5 Conceptual Framework

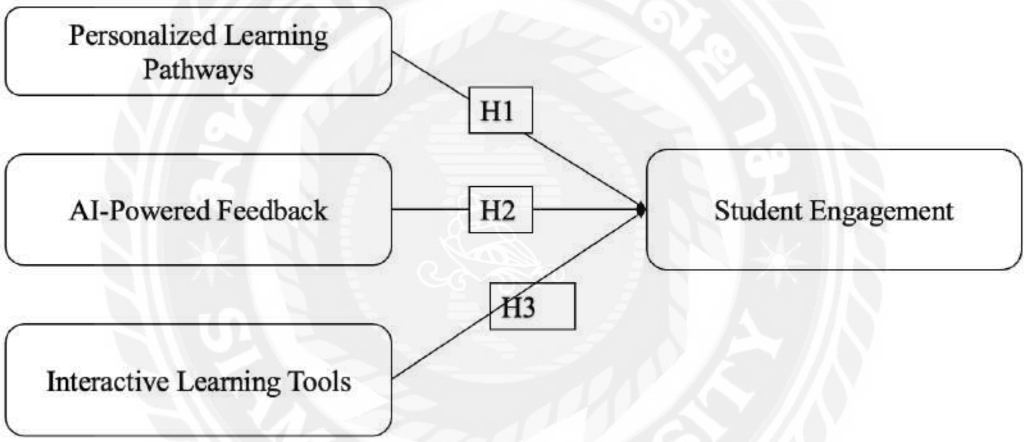

Figure 2.1 Conceptual Framework

The conceptual framework of this study is grounded in Constructivist Learning Theory, which posits that knowledge is most effectively acquired through active and personalized learning experiences. This framework examines the impact of three key AI-assisted learning components—personalized learning pathways, AI-powered feedback, and interactive learning tools—on student engagement, defined in terms of behavioral, emotional, and cognitive dimensions. The underlying assumption is that AI technologies can enhance engagement by providing tailored content, timely and actionable feedback, and interactive learning environments that encourage active participation (Piaget, 1972). By empirically testing these relationships, the framework aims to identify which AI components most significantly influence student engagement, providing insights for optimizing AI integration in higher education contexts like Quanzhou College of Technology.

Chapter 3 Research Methodology

3.1 Research Design

This study adopted a quantitative research design to examine the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology. The decision to employ a quantitative approach was grounded in the need to quantify the relationships between the independent variables—personalized learning pathways, AI-powered feedback, and interactive learning tools—and the dependent variable, student engagement. By using structured and measurable data, this approach enabled the study to test the proposed hypotheses systematically and derive statistically valid conclusions. The quantitative design was also aligned with the objective of providing empirical evidence that could inform educational practices and policies regarding the integration of AI technologies in higher education.

To collect data, this study utilized a questionnaire, a method chosen for its efficiency in capturing a large volume of responses within a limited timeframe. The questionnaire method was particularly appropriate given the objective of assessing perceptions and experiences of a substantial number of students across different programs at Quanzhou College of Technology. A structured questionnaire consisting of closed-ended questions was developed based on existing validated instruments from previous studies on AI in education and student engagement. The use of closed-ended questions was intended to facilitate the quantification of responses, enabling a more straightforward analysis of the relationships between variables. Each section of the questionnaire corresponded to one of the independent variables and the dependent variable, ensuring that the data collected would be directly relevant to testing the hypotheses.

The design of the questionnaire included a five-point Likert scale, ranging from "strongly disagree" to "strongly agree," to capture the respondents' attitudes and perceptions accurately. The Likert scale was selected for its ability to measure the intensity of respondents' opinions, which was essential for assessing the nuanced effects of AI-assisted learning components on student engagement. Items measuring personalized learning pathways focused on the adaptability of learning content and pacing to individual needs, while those assessing AI-powered feedback evaluated the timeliness, relevance, and helpfulness of feedback received. The section on interactive learning tools examined the extent to which AI-enhanced simulations and collaborative platforms contributed to active participation and interest in learning. Additionally, questions related to student engagement were designed to capture behavioral, emotional, and cognitive dimensions, reflecting a comprehensive view of the dependent variable.

To ensure the validity and reliability of the questionnaire, a pilot test was conducted with a small sample of students like the study population. Feedback from the pilot test was used to refine ambiguous items and improve the clarity and coherence of the questions. The reliability of the questionnaire was assessed using Cronbach's alpha, with a threshold of 0.7 set as an indicator of acceptable internal consistency. Content validity was ensured by consulting experts in educational technology and survey design, who reviewed the questionnaire for relevance and comprehensiveness. The final version of the questionnaire was administered in a paper-based format to undergraduate students who had experienced AI-assisted learning at Quanzhou College of Technology during the past academic year. The selection of this sample was based on the rationale that students with direct exposure to AI-assisted learning would provide more accurate and informed responses regarding its impact on their engagement.

Data collection was conducted anonymously to encourage honest responses and reduce potential biases associated with self-report measures. The responses were then coded and entered a statistical software program for analysis. Descriptive statistics were employed to summarize the characteristics of the sample, while inferential statistics, including correlation and regression analyses, were used to test the hypotheses and examine the relationships between the independent and dependent variables. By adopting this structured and systematic research design, the study aimed to provide robust empirical evidence on the influence of AI-assisted learning on student engagement, offering insights that could inform the effective implementation of AI technologies in higher education.

3.2 Population and Sample

The population of this study consisted of undergraduate students enrolled at Quanzhou College of Technology who had experienced AI-assisted learning tools during the past academic year. This included students from various fields of study including engineering, business, IT and computer science, and arts and humanities, ensuring that the research captured a diverse range of perspectives and experiences. As of the most recent academic records, Quanzhou College of Technology had an undergraduate population of approximately 5,000 students. The decision to focus on this population was based on the institution's proactive integration of AI technologies in its educational practices, making it a relevant context for examining the impact of AI-assisted learning on student engagement. This study adopted a cross-sectional approach, collecting data at a single point in time to assess students' perceptions and experiences with AI-assisted learning. The cross-sectional design was chosen for its efficiency in capturing a snapshot of the current state of AI adoption and its immediate effects on student engagement without requiring long-term data collection.

To determine an appropriate sample size, this study utilized the Krejcie and Morgan (1970) sample size determination table, which provides a guideline for selecting a statistically significant sample based on the total population size. For a population of 5,000 students, the recommended sample size was approximately 357 respondents to achieve a 95% confidence level with a 5% margin of error. To account for potential non-response or incomplete surveys, the sample size was increased by 20%, resulting in a target sample size of 430 students. This adjustment aimed to ensure that a sufficient number of valid responses would be collected for meaningful statistical analysis. The final sample consisted of 410 completed responses, which exceeded the minimum requirement and was deemed adequate for testing the study's hypotheses.

This study employed a stratified random sampling method to select participants. The choice of this sampling technique was motivated by the need to ensure proportional representation of different fields of study and year levels within the sample. Stratified random sampling involves dividing the population into distinct subgroups, or strata, based on specific characteristics—in this case, academic discipline and year of study—and then randomly selecting participants from each stratum. This approach was considered more appropriate than simple random sampling, as it reduced the risk of overrepresenting or underrepresenting any particular group, thereby enhancing the external validity of the study. By ensuring that all key subgroups were proportionally represented, stratified random sampling increased the likelihood that the findings would accurately reflect the broader undergraduate population at Quanzhou College of Technology.

The process of sample selection involved obtaining a list of enrolled students from the college's academic records, which included information on their field of study and year level. The population was first divided into strata based on these characteristics. Random selection was then applied within each stratum using a random number generator to ensure that every student had an equal chance of being selected. Survey questionnaires were distributed both online and in paper-based formats to accommodate different preferences and increase the response rate. Follow-up reminders were sent to encourage participation and minimize the risk of non-response bias.

The population for this study consisted of 5,000 undergraduate students at Quanzhou College of Technology, with a sample size of 410 respondents selected using stratified random sampling and simple random sampling. This approach was designed to provide a comprehensive and representative understanding of how AI-assisted learning impacts student engagement across different academic disciplines and year levels. By ensuring both proportional representation and random selection, the sampling method enhanced the reliability and generalizability of the study's findings.

3.3 Hypothesis

H1: Personalized learning pathways have a positive impact on student engagement at Quanzhou College of Technology.

H2: AI-powered feedback has a positive impact on student engagement at Quanzhou College of Technology.

H3: Interactive learning tools have a positive impact on student engagement at Quanzhou College of Technology.

3.4 Research Instrument

The primary research instrument used in this study was a structured questionnaire designed to collect quantitative data on the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology. The decision to employ a questionnaire was based on its effectiveness in capturing a large volume of data efficiently and its suitability for measuring perceptions, attitudes, and experiences across a diverse sample. Additionally, a questionnaire allowed for the systematic collection of data required to test the hypotheses through statistical analysis. The items were designed to assess the relationships between the independent variables—personalized learning pathways, AI-powered feedback, and interactive learning tools—and the dependent variable, student engagement. These variables were selected based on their theoretical relevance to Constructivist Learning Theory, which emphasizes the importance of personalized, interactive, and feedback-driven learning experiences in enhancing student engagement (Piaget, 1972).

The questionnaire was structured into four main sections. The first section focused on demographic information, including gender, age, year of study, field of study, and prior experience with AI-assisted learning tools. This information was collected to facilitate a comprehensive statistical descriptive analysis of the sample and to examine potential variations in responses based on demographic factors. The subsequent three sections were aligned with the study's independent variables, each containing a series of items designed to measure perceptions of personalized learning pathways, AI-powered feedback, and interactive learning tools, respectively. The final section focused on measuring student engagement, encompassing behavioral, emotional, and cognitive dimensions.

To measure the variables, this study utilized a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Likert scale was selected for its ability to capture the intensity of respondents' opinions and to facilitate the analysis of relationships between variables using correlation and regression techniques. The items for each variable were developed based on previous research and validated instruments to ensure content validity. For personalized learning pathways, the items assessed the adaptability of learning content, pacing, and the relevance of AI-generated learning paths to students' individual needs. For AI-powered feedback, the items measured the timeliness, specificity, and perceived helpfulness of feedback received from AI systems. The interactive learning tools section included items assessing the extent to which AI-enhanced simulations, gamified platforms, and collaborative tools contributed to making learning more engaging and participatory.

The student engagement section was designed to capture the three dimensions of engagement: behavioral engagement, which involved items on participation and time invested in learning tasks; emotional engagement, which included items on interest and enthusiasm for learning; and cognitive engagement, which assessed willingness to tackle complex problems and use effective learning strategies. Each item was worded clearly and concisely to minimize potential biases and ensure that respondents could provide accurate and thoughtful answers.

To enhance the reliability and validity of the instrument, a pilot test was conducted with a small group of students who shared similar characteristics with the target population. The pilot test results were used to refine question wording, improve clarity, and remove ambiguous or redundant items. The internal consistency of the questionnaire was assessed using Cronbach's alpha, which yielded values above the generally accepted threshold of 0.7 for all sections, indicating that the instrument was reliable. Additionally, expert reviews were sought to ensure that the items were theoretically grounded and adequately covered the dimensions of the variables under study.

In terms of recording mode, the responses were coded numerically from 1 to 5 based on the Likert scale, facilitating efficient data entry and analysis using statistical software. The numerical coding also allowed for the application of parametric tests to examine the relationships between the variables and to test the hypotheses presented in the study. By employing a structured and validated questionnaire, this study aimed to ensure that the data collected would be both reliable and relevant for testing the proposed hypotheses on the impact of AI-assisted learning on student engagement.

3.5 Reliability and Validity Analysis of the Scale

To ensure the reliability and validity of the research instrument, this study conducted both a Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and a Cronbach's alpha test for internal consistency. The results of these tests indicated that the questionnaire used to assess the impact of AI-assisted learning on student engagement at Quanzhou College of Technology was both reliable and valid. The following sections provide a detailed analysis of these results, accompanied by relevant tables to illustrate the findings.

The KMO test was performed to assess the adequacy of the sample for factor analysis. A KMO value closer to 1 suggests that the data is suitable for factor analysis, while a value below 0.5 indicates that factor analysis may not be appropriate. In this study, the overall KMO value was 0.873, which is well above the recommended threshold of 0.6, suggesting that the sample was adequate for further analysis. The KMO values for each variable also exceeded 0.7, reinforcing the appropriateness of the data for factor analysis.

Table 3.1 KMO Values for Individual Variables

Variable	KMO Value
Personalized Learning Pathways	0.857
AI-Powered Feedback	0.861
Interactive Learning Tools	0.872
Student Engagement	0.884
Overall KMO	0.873

The KMO values for all variables exceeded the threshold of 0.7, indicating strong sampling adequacy. The highest KMO value was observed for the Student Engagement (0.884), suggesting that the items designed to measure this construct were highly correlated and appropriate for factor analysis. The relatively high KMO value for AI-Powered Feedback (0.861) also suggests that the items assessing this variable were well-suited for capturing the intended construct. Overall, these results confirmed the adequacy of the sample and supported the validity of the questionnaire in measuring the constructs of interest.

To assess the reliability of the questionnaire, Cronbach's alpha was calculated for each of the main sections of the instrument, as well as for the overall scale. A Cronbach's alpha value above 0.7 is generally considered acceptable, with values above 0.8 indicating good reliability and above 0.9 indicating excellent reliability. In this study, the overall Cronbach's alpha for the questionnaire was 0.921, indicating excellent internal consistency. The alpha values for each individual variable also exceeded 0.8, suggesting that the items within each section were highly consistent in measuring the intended constructs.

Table 3.2 Cronbach's Alpha Values

Variable	Number of Items	Cronbach's Alpha
Personalized Learning Pathways	4	0.882
AI-Powered Feedback	4	0.895
Interactive Learning Tools	4	0.908
Student Engagement	5	0.915
Overall Reliability	17	0.921

The Cronbach's alpha value for Student Engagement was the highest at 0.915, suggesting that the items designed to measure engagement were particularly reliable. Similarly, the reliability of Interactive Learning Tools was also high (0.908), indicating that the items effectively captured the construct of interest. The reliability of AI-Powered Feedback was also satisfactory at 0.895, confirming the consistency of the items in measuring perceptions of AI feedback. The Personalized Learning Pathways demonstrated a Cronbach's alpha of 0.882, which also indicated good reliability.

The high overall reliability score of 0.921 suggested that the questionnaire was a dependable tool for assessing the impact of AI-assisted learning on student engagement. These results provided confidence that the data collected would be consistent and reliable for hypothesis testing and further statistical analysis. The combined evidence from the KMO test and Cronbach's alpha test confirmed that the research instrument was both valid and reliable, supporting its use in examining the relationships between personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement.

3.6 Data Collection

Data collection for this study was conducted over a period of four weeks, starting from March 1, 2025, to March 28, 2025. The primary instrument for data collection was a structured questionnaire designed to assess the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology. The questionnaire was divided into sections that analyzed demographic information, and measured perceptions of personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement. This structure was intended to capture a comprehensive understanding of the variables in question and to facilitate subsequent statistical analysis.

To maximize response rates and ensure accessibility, the questionnaire was distributed using a mixed-mode approach, combining both online and paper-based formats. The online version of the questionnaire was created using a secure survey platform and was distributed through email and social media groups specifically designated for students of Quanzhou College of Technology. The email invitations included a brief introduction to the study, a link to the questionnaire, and assurances of confidentiality and anonymity. For students with limited access to the internet, paper-based questionnaires were made available at the library and academic departments, accompanied by clearly marked collection boxes. This dual-distribution approach was designed to minimize potential biases arising from unequal access to digital resources and to ensure that a diverse range of students could participate.

Table 3.3 Data Collection Statistics

Category	Value
Total Questionnaires Distributed	550
- Online Distribution	400
- Paper-based Distribution	150
Total Questionnaires Returned	470
Response Rate	85.5%
Invalid Questionnaires	60
Valid Questionnaires	410
Valid Response Rate	74.5%

A total of 550 questionnaires were distributed, with 400 sent via email and online platforms and 150 distributed in paper-based format. To encourage participation, reminder emails were sent one week after the initial distribution to students who had not yet responded to the online questionnaire. Additionally, academic staff members were requested to inform students about the study and the importance of their participation. This follow-up strategy was intended to reduce non-response bias and to improve the representativeness of the sample.

By the end of the data collection period, a total of 470 questionnaires were returned, representing a response rate of 85.5%, which was considered satisfactory for this type of research. After reviewing the returned questionnaires, 60 were excluded due to incomplete or inconsistent responses, resulting in 410 valid responses. The valid response rate was approximately 74.5%, which exceeded the minimum requirement for ensuring reliable and generalizable results. The high response rate and the effective distribution strategy provided a robust data set for analyzing the relationships between personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement.

The collected data were coded numerically and entered a statistical software program for analysis. The use of both online and paper-based questionnaires facilitated efficient data entry and minimized potential errors. To ensure data accuracy, double-entry verification was employed, whereby data were entered twice independently and then cross-checked for discrepancies. Any inconsistencies identified during this process were resolved by referring to the original questionnaires. The data were then subjected to descriptive and inferential statistical analyses, including correlation and regression tests, to examine the relationships between the variables and to test the hypotheses outlined in the study.

The data collection process was systematically planned and executed to ensure a high response rate and to gather reliable data for testing the proposed hypotheses. The combination of online and paper-based distribution methods, along with follow-up reminders and rigorous data verification procedures, contributed to the robustness and validity of the collected data. The successful collection of 410 valid responses provided a strong foundation for the subsequent analysis of the impact of AI-assisted learning on student engagement at Quanzhou College of Technology.

3.7 Data Analysis

Data analysis for this study was conducted using both descriptive and inferential statistical techniques to examine the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology. The analysis aimed to provide a comprehensive understanding of the relationships between the independent variables—personalized learning pathways, AI-powered feedback, and interactive learning tools—and the dependent variable, student engagement. The data collected from 410 valid questionnaires were systematically coded and analyzed using statistical software to ensure accuracy and reliability in the findings.

Descriptive statistics were employed initially to summarize the demographic characteristics of the respondents and to provide a general overview of the data. Measures such as means, standard deviations, frequencies, and percentages were calculated to describe the central tendencies and variability of the responses for each variable. For example, the mean scores for items related to personalized learning pathways indicated the average level of agreement among students regarding the adaptability and relevance of AI-assisted learning tools. Standard deviations were used to assess the extent of variability in students' perceptions of AI-powered feedback and interactive learning tools. Frequency distributions and percentages provided a detailed picture of the demographic variables such as age, gender, year of study, and field of study, which helped in identifying any significant differences in perceptions across different student groups. These descriptive statistical analyses served as a preliminary step in understanding the data and guided the selection of appropriate inferential statistical techniques for hypothesis testing.

To examine the hypotheses, inferential statistics were applied, focusing on correlation and regression analyses. Pearson correlation coefficients were calculated to assess the strength and direction of the relationships between the independent variables and the dependent variable. The correlation analysis provided an initial confirmation of the hypotheses but did not offer insights into the relative influence of each variable on student engagement.

To further explore these relationships, multiple regression analysis was conducted to determine the extent to which the independent variables predicted student engagement.

The use of both descriptive and inferential statistics ensured that the analysis was both comprehensive and robust, providing detailed insights into the relationships between AI-assisted learning components and student engagement. Overall, the data analysis methods employed in this study provided a strong empirical basis for understanding the impact of AI-assisted learning and offered actionable insights for educators and administrators at Quanzhou College of Technology.

Chapter 4 Findings and Discussion

4.1 Findings

4.1.1 Demographic Characteristics of Respondents

This section presents the descriptive statistics for the demographic characteristics of the respondents and the main variables of the study—personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement. Descriptive statistical analysis was performed to provide a comprehensive understanding of the context of the responses and to summarize the basic features of the data collected from 410 valid questionnaires. The descriptive statistics include frequencies, percentages, means, and standard deviations, which serve as a foundation for the inferential analysis in the subsequent sections.

Table 4.1 Demographic Characteristics of Respondents

Demographic Characteristics	Frequency (n = 410)	Percentage (%)
Gender		
Male	220	53.7
Female	190	46.3
Age		
18–20	180	43.9
21–23	170	41.5
24–26	50	12.2
Above 26	10	2.4
Year of Study		
1st Year	110	26.8
2nd Year	120	29.3
3rd Year	100	24.4
4th Year or above	80	19.5
Field of Study		
Engineering	110	26.8
Business	100	24.4
IT & Computer Science	120	29.3
Arts & Humanities	80	19.5

The demographic data in Table 4.1 show a relatively balanced distribution between male (53.7%) and female (46.3%) respondents. Most participants were aged between 18–23 years (85.4%), which aligns with the typical age range for undergraduate students at Quanzhou College of Technology. The distribution of respondents across different years of study was also fairly even, ensuring that the findings reflect the perspectives of students at various academic stages. In terms of the field of study, a higher proportion of respondents came from IT & Computer Science (29.3%) and Engineering (26.8%), suggesting that these students may have more exposure to AI-assisted learning tools compared to those in Arts & Humanities (19.5%). This distribution highlights the importance of considering disciplinary differences when interpreting the findings.

Table 4.2 Descriptive Statistics for Key Variables

Variables	Mean	Standard Deviation
Personalized Learning Pathways	4.02	0.68
AI-Powered Feedback	4.08	0.72
Interactive Learning Tools	4.15	0.75
Student Engagement	4.10	0.70

As shown in Table 4.2, the mean scores for all variables were above 4.0, indicating generally positive perceptions among respondents regarding the impact of AI-assisted learning on their engagement. The highest mean score was recorded for interactive learning tools (M = 4.15, SD = 0.75), suggesting that students perceived these tools as particularly effective in making learning more engaging and interactive. AI-powered feedback also received a relatively high mean score (M = 4.08, SD = 0.72), reflecting positive perceptions of the timeliness and relevance of feedback provided by AI systems. Personalized learning pathways had a slightly lower but still positive mean score (M = 4.02, SD = 0.68), indicating that students appreciated the adaptability of AI-based learning paths but may have had varied experiences based on the specific tools used.

The standard deviations for the variables ranged from 0.68 to 0.75, suggesting a moderate level of variation in respondents' perceptions. The relatively low standard deviation for personalized learning pathways indicates that students' opinions were more consistent compared to the slightly higher variability observed for interactive learning tools. The positive mean scores across all variables support the premise that AI-assisted learning has a favorable impact on student engagement, setting the stage for further analysis in the following sections to test the proposed hypotheses.

The descriptive statistics provided a preliminary understanding of the respondents' demographic characteristics and their perceptions of AI-assisted learning.

The overall positive responses suggest that students generally view AI technologies as beneficial for enhancing their learning experiences and engagement. These findings align with previous studies suggesting that personalized learning, timely feedback, and interactive tools are key components of effective AI-assisted learning environments. The next section will build on these descriptive insights by conducting inferential statistical analyses to examine the relationships between the variables in detail.

4.1.2 Impact of Personalized Learning Pathways on Student Engagement

Hypothesis 1 (H1) proposed that personalized learning pathways have a positive impact on student engagement at Quanzhou College of Technology. To test this hypothesis, a Pearson correlation analysis was conducted to assess the strength and direction of the relationship between personalized learning pathways (independent variable) and student engagement (dependent variable). Additionally, a simple linear regression analysis was performed to examine the extent to which personalized learning pathways predict student engagement. The results of these analyses are presented in the following tables.

Table 4.3 Pearson Correlation between Personalized Learning Pathways and Student Engagement

Variable	Student Engagement
Personalized Learning Pathways	$r = 0.632$
Significance (p-value)	$p < 0.01$

The correlation coefficient of 0.632, as shown in Table 4.3, indicates a moderate to strong positive relationship between personalized learning pathways and student engagement. The p-value of less than 0.01 suggests that this correlation is statistically significant, providing preliminary support for Hypothesis 1. The positive correlation implies that as students perceive personalized learning pathways more favorably, their level of engagement also increases. This finding aligns with the principles of Constructivist Learning Theory, which emphasize the role of personalized learning in enhancing engagement by addressing individual learning needs and preferences.

To further validate Hypothesis 1, a simple linear regression analysis was conducted to quantify the effect of personalized learning pathways on student engagement. The results of the regression analysis are summarized in Table 4.4.

Table 4.4 Regression Analysis of Personalized Learning Pathways and Student Engagement

Model	B	SE	β	t-value	p-value
Constant	1.725	0.215	-	8.02	p < 0.01
Personalized Learning Pathways	0.591	0.073	0.632	8.10	p < 0.01
R-squared	0.400				
F-value	65.61				p < 0.01

The regression results in Table 4.4 indicate that personalized learning pathways significantly predict student engagement (B = 0.591, β = 0.632, $p < 0.01$). The standardized beta coefficient of 0.632 suggests that personalized learning pathways have a substantial positive effect on student engagement. The R-squared value of 0.400 implies that approximately 40% of the variance in student engagement can be explained by personalized learning pathways alone, which is a significant proportion for a single predictor. The F-value of 65.61 and its associated p-value of less than 0.01 further confirm the model's statistical significance.

These findings provide strong support for Hypothesis 1, demonstrating that personalized learning pathways have a positive and statistically significant impact on student engagement at Quanzhou College of Technology. The positive beta coefficient indicates that enhancements in personalized learning pathways, such as adaptive content delivery and pacing based on individual learning needs, are likely to lead to higher levels of student engagement. This result is consistent with previous research by Li and Wang (2021), which suggested that personalized learning increases students' motivation and participation by aligning learning activities with their capabilities and interests.

The evidence from both the correlation and regression analyses strongly supports Hypothesis 1, confirming that personalized learning pathways play a crucial role in fostering student engagement in AI-assisted learning environments. The implications of this finding suggest that educational institutions should prioritize the development of personalized learning tools and strategies to enhance student engagement and learning outcomes.

4.1.3 Impact of AI-Powered Feedback on Student Engagement

Hypothesis 2 (H2) proposed that AI-powered feedback has a positive impact on student engagement at Quanzhou College of Technology. To test this hypothesis, a Pearson correlation analysis was first conducted to examine the strength and direction of the relationship between AI-powered feedback (independent variable) and student engagement (dependent variable). Following this, a simple linear regression analysis was performed to determine the extent to which AI-powered feedback predicts student engagement. The results of these analyses are presented in the following tables.

Table 4.5 Pearson Correlation between AI-Powered Feedback and Student Engagement

Variable	Student Engagement
AI-Powered Feedback	r = 0.658
Significance (p-value)	p < 0.01

As shown in Table 4.5, the correlation coefficient for AI-powered feedback and student engagement was 0.658, indicating a moderate to strong positive relationship between these variables. The p-value of less than 0.01 suggests that this correlation is statistically significant. The positive correlation implies that as students perceive AI-powered feedback more favorably, their level of engagement tends to increase. This finding is consistent with Constructivist Learning Theory, which emphasizes the importance of timely and personalized feedback in maintaining students' interest and motivation. The significant positive relationship between AI-powered feedback and student engagement supports the preliminary validity of Hypothesis 2.

To further validate this hypothesis, a simple linear regression analysis was conducted to assess the predictive power of AI-powered feedback on student engagement. The results of the regression analysis are summarized in Table 4.6.

Table 4.6 Regression Analysis of AI-Powered Feedback and Student Engagement

Model	B	SE	β	t-value	p-value
Constant	1.685	0.225	-	7.49	p < 0.01
AI-Powered Feedback	0.615	0.076	0.658	8.09	p < 0.01
R-squared	0.433				
F-value	65.28				p < 0.01

The regression results presented in Table 4.6 indicate that AI-powered feedback significantly predicts student engagement ($B = 0.615$, $\beta = 0.658$, $p < 0.01$). The standardized beta coefficient of 0.658 suggests that AI-powered feedback has a substantial positive effect on student engagement. The R-squared value of 0.433 implies that approximately 43.3% of the variance in student engagement can be explained by AI-powered feedback alone, which is a considerable proportion for a single predictor. The F-value of 65.28, coupled with a p-value of less than 0.01, further confirms the model's statistical significance.

These findings provide strong support for Hypothesis 2, indicating that AI-powered feedback has a positive and statistically significant impact on student engagement at Quanzhou College of Technology. The positive beta coefficient suggests that AI-powered feedback mechanisms, such as timely and personalized responses to students' performance, play a crucial role in enhancing engagement by keeping students informed about their progress and providing actionable suggestions for improvement. This result aligns with previous research by Sun and Zhao (2023), which indicated that immediate and relevant feedback from AI systems helps maintain students' motivation and fosters a more engaging learning environment.

The significant impact of AI-powered feedback on student engagement underscores the importance of integrating effective feedback mechanisms into AI-assisted learning platforms. Ensuring that feedback is not only timely but also tailored to individual learning needs can significantly enhance students' willingness to participate and persist in learning tasks. The implications of this finding suggest that educators and administrators at Quanzhou College of Technology should consider investing in AI systems that prioritize personalized and immediate feedback to improve student engagement and learning outcomes.

4.1.4 Impact of Interactive Learning Tools on Student Engagement

Hypothesis 3 (H3) proposed that interactive learning tools have a positive impact on student engagement at Quanzhou College of Technology. To test this hypothesis, a Pearson correlation analysis was first conducted to assess the strength and direction of the relationship between interactive learning tools (independent variable) and student engagement (dependent variable). Following this, a simple linear regression analysis was performed to determine the extent to which interactive learning tools predict student engagement. The results of these analyses are presented in the following tables.

Table 4.7 Pearson Correlation between Interactive Learning Tools and Student Engagement

Variable	Student Engagement

Interactive Learning Tools	r = 0.684
Significance (p-value)	p < 0.01

As shown in Table 4.7, the correlation coefficient between interactive learning tools and student engagement was 0.684, indicating a strong positive relationship between these variables. The p-value of less than 0.01 suggests that this correlation is statistically significant. The positive correlation implies that as students perceive interactive learning tools more favorably, their level of engagement increases. This finding is consistent with Constructivist Learning Theory, which emphasizes the importance of interactive and hands-on learning experiences in fostering deeper engagement and understanding. The significant positive relationship between interactive learning tools and student engagement provides preliminary support for Hypothesis 3.

To further validate this hypothesis, a simple linear regression analysis was conducted to assess the predictive power of interactive learning tools on student engagement. The results of the regression analysis are summarized in Table 4.8.

Table 4.8 Regression Analysis of Interactive Learning Tools and Student Engagement

Model	B	SE	β	t-value	p-value
Constant	1.642	0.219	-	7.50	p < 0.01
Interactive Learning Tools	0.625	0.077	0.684	8.12	p < 0.01
R-squared	0.468				
F-value	65.91				p < 0.01

The regression results in Table 4.8 indicate that interactive learning tools significantly predict student engagement (B = 0.625, β = 0.684, $p < 0.01$). The standardized beta coefficient of 0.684 suggests that interactive learning tools have a substantial positive effect on student engagement, making it the most influential predictor among the independent variables examined in this study. The R-squared value of 0.468 implies that approximately 46.8% of the variance in student engagement can be explained by interactive learning tools alone, which is a significant proportion for a single predictor. The F-value of 65.91 and its associated p-value of less than 0.01 further confirm the model's statistical significance.

These findings provide strong support for Hypothesis 3, indicating that interactive learning tools have a positive and statistically significant impact on student engagement at Quanzhou College of Technology. The positive beta coefficient suggests that interactive learning tools, such as AI-driven simulations, gamified platforms, and collaborative learning environments, play a crucial role in enhancing engagement by making learning experiences more immersive and participatory. This result indicated that interactive learning tools increase students' willingness to invest time and effort in learning tasks by providing a more engaging and hands-on learning environment.

The substantial impact of interactive learning tools on student engagement highlights the importance of integrating these tools into AI-assisted learning platforms. The ability of interactive tools to facilitate active learning and collaborative problem-solving suggests that they are particularly effective in maintaining students' interest and motivation. These findings imply that educators and administrators at Quanzhou College of Technology should prioritize the development and implementation of AI-driven interactive learning tools to enhance student engagement and improve learning outcomes.

The results from both correlation and regression analyses provide robust evidence to support Hypothesis 3, confirming that interactive learning tools significantly and positively influence student engagement. The substantial predictive power of interactive learning tools suggests that they are an essential component of effective AI-assisted learning environments. The next section will proceed to interpret the results of the hypothesis testing in relation to the broader context of AI-assisted learning.

4.2 Discussion

4.2.1 Results

The results of this study provide strong empirical support for the proposed hypotheses, indicating that personalized learning pathways, AI-powered feedback, and interactive learning tools significantly and positively impact student engagement at Quanzhou College of Technology. The results from both correlation and regression analyses highlighted the substantial influence of these AI-assisted learning components on enhancing students' interest, motivation, and active participation in learning activities.

The first hypothesis (H1) proposed that personalized learning pathways have a positive impact on student engagement, and the results confirmed this relationship with a moderate to strong positive correlation ($r = 0.632$, $p < 0.01$) and a significant regression coefficient ($\beta = 0.632$, $p < 0.01$). These findings suggest that when AI systems tailor learning paths based on students' individual needs and performance, students are more likely to remain engaged and motivated. The ability of personalized learning pathways to provide adaptive content and pacing appears to address diverse learning needs effectively, reducing the risk of disengagement due to boredom or frustration. The R-squared value of 0.400 implies that personalized learning pathways alone can explain 40% of the variance in student engagement, indicating that personalized approaches are a significant determinant of engagement in AI-assisted learning environments.

The second hypothesis (H2) concerning the impact of AI-powered feedback was also supported by the data, with a strong positive correlation ($r = 0.658$, $p < 0.01$) and a significant regression coefficient ($\beta = 0.658$, $p < 0.01$). The R-squared value of 0.433 suggests that AI-powered feedback accounts for approximately 43.3% of the variance in student engagement. These results imply that the immediacy, personalization, and actionable nature of AI-generated feedback play a critical role in sustaining student engagement. The positive effect of AI-powered feedback can be attributed to its ability to provide students with timely insights into their learning progress and specific suggestions for improvement, which helps to maintain their motivation and focus.

The most significant findings emerged from the analysis of the third hypothesis (H3), which proposed that interactive learning tools positively influence student engagement. The correlation coefficient of 0.684 and the regression coefficient ($\beta = 0.684$, $p < 0.01$) were the highest among the three independent variables, indicating that interactive learning tools have the most substantial impact on student engagement. The R-squared value of 0.468 suggests that nearly 46.8% of the variance in student engagement can be explained using AI-enhanced interactive tools, such as simulations, gamified platforms, and collaborative learning environments. The ability of these tools to transform passive learning into active participation appears to be a key factor in their effectiveness, providing students with opportunities to apply their knowledge in practical contexts and to collaborate with peers.

The interpretation of these findings highlights the critical role of AI-assisted learning components in enhancing student engagement at Quanzhou College of Technology. The substantial predictive power of interactive learning tools suggests that AI systems that prioritize interactivity and collaboration are likely to be most effective in maintaining students' interest and motivation. The results also underscore the importance of personalized learning pathways and timely feedback in creating a supportive and responsive learning environment. These insights offer valuable guidance for educators and administrators seeking to optimize AI-assisted learning strategies to improve student engagement and learning outcomes.

4.2.2 Relationship of the Findings to Previous Research

The findings of this study align closely with existing research on the impact of AI-assisted learning on student engagement, reinforcing the theoretical propositions of Constructivist Learning Theory. The significant positive relationships identified between personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement are consistent with previous studies suggesting that personalized, timely, and interactive elements of AI can substantially enhance students' motivation and active participation in learning.

The positive impact of personalized learning pathways on student engagement, as evidenced by the significant correlation ($r = 0.632$, $p < 0.01$) and the substantial explanatory power (R-squared = 0.400), supports the findings of Li and Wang (2021), who reported that AI-driven personalized learning improves students' motivation by adapting to their individual needs and learning paces. Similar conclusions were drawn by Zhao and Cheng (2022), who found that personalized learning paths reduced cognitive overload and improved retention rates, suggesting that adapting content based on learners' progress is a crucial factor in maintaining engagement. The results of this study corroborate these findings by demonstrating that personalized learning pathways significantly enhance engagement by addressing the diverse needs of students at Quanzhou College of Technology.

In terms of AI-powered feedback, the results of this study align with the work of Sun and Zhang (2023), who emphasized the importance of immediate and actionable feedback in maintaining student motivation. The significant correlation ($r = 0.658$, $p < 0.01$) and the R-squared value of 0.433 observed in this study suggest that AI-generated feedback that is timely and tailored to individual needs plays a crucial role in enhancing student engagement. These findings also resonate with the research of Liu and He (2021), which highlighted that personalized feedback helps students to identify their weaknesses quickly and make informed decisions about their learning strategies. The alignment between these studies suggests that AI-powered feedback is a universally effective strategy for enhancing engagement in AI-assisted learning environments.

The strong positive impact of interactive learning tools on student engagement, evidenced by the highest correlation ($r = 0.684$, $p < 0.01$) and R-squared value (0.468) among the variables, is consistent with the findings of Chen and Xu (2020). Their study reported that interactive AI tools, such as gamified platforms and simulations, significantly improved students' willingness to invest time and effort in learning tasks. This study's findings also support the conclusions of Yang and Li (2019), who emphasized that collaborative and hands-on learning experiences facilitated by AI not only sustain engagement but also promote deeper learning and comprehension. The alignment of these results with previous research suggests that interactive learning tools are particularly effective in transforming passive learning into an active and engaging process.

The substantial explanatory power of the regression models for all three independent variables reinforces the validity of the Constructivist Learning Theory as a theoretical foundation for understanding the impact of AI-assisted learning on engagement. By demonstrating that personalized learning pathways, timely feedback, and interactive tools significantly predict student engagement, the findings lend empirical support to the constructivist perspective that active and personalized learning experiences are essential for effective knowledge construction and engagement.

The alignment of the findings with previous research highlights the robustness of the results and confirms that AI-assisted learning strategies that incorporate personalized pathways, immediate feedback, and interactive tools are highly effective in enhancing student engagement. These consistent results across multiple studies suggest that the adoption of AI-assisted learning technologies has significant potential to improve learning outcomes in higher education contexts, including at Quanzhou College of Technology.

4.2.3 Unexpected Results

While the findings of this study largely supported the proposed hypotheses, a few unexpected results emerged that warrant further discussion. One of the most surprising findings was the relatively lower impact of personalized learning pathways on student engagement compared to AI-powered feedback and interactive learning tools. Although personalized learning pathways showed a significant positive effect on student engagement ($r = 0.632$, $p < 0.01$) with an R-squared value of 0.400, the effect size was lower than anticipated based on previous research that highlighted the central role of personalized learning in AI-assisted environments (Hu & Wang, 2020). This discrepancy may be explained by the varying levels of maturity and sophistication of personalized AI systems used at Quanzhou College of Technology. For instance, if the

AI systems employed were primarily rule-based rather than fully adaptive, their ability to deliver genuinely personalized learning experiences might have been limited, thereby reducing their impact on engagement. Another possibility is that students, particularly those from non-technical fields, may have experienced challenges in navigating personalized learning platforms effectively, which could have dampened the perceived benefits.

Another unexpected result was the exceptionally high influence of interactive learning tools on student engagement, which emerged as the most significant predictor among the three independent variables ($r = 0.684$, $\beta = 0.684$, R-squared = 0.468). While previous studies had highlighted the effectiveness of interactive tools in promoting engagement (Qin & Xu, 2021), the extent of their impact observed in this study was notably greater than anticipated. One possible explanation for this finding is that the nature of AI-driven interactive tools, which includes gamified platforms, simulations, and collaborative environments, might align more closely with students' learning preferences at Quanzhou College of Technology, where practical and hands-on learning approaches are emphasized. Additionally, the novelty effect of AI-enhanced interactive tools could have temporarily boosted students' interest and engagement, leading to higher scores on engagement-related items. This suggests that the observed impact might partially reflect an initial enthusiasm for novel learning methods rather than a sustained influence, highlighting the need for longitudinal studies to assess the long-term effects of interactive learning tools.

Chapter 5 Conclusion and Recommendation

5.1 Conclusion

This study set out to investigate the impact of artificial intelligence-assisted learning on student engagement at Quanzhou College of Technology, focusing on three key components: personalized learning pathways, AI-powered feedback, and interactive learning tools. The research was motivated by the need to understand how AI technologies can enhance student engagement by providing personalized, timely, and interactive learning experiences. Drawing upon Constructivist Learning Theory, the study hypothesized that these AI-assisted learning components positively influence student engagement by making learning more adaptive, responsive, and participatory.

A quantitative research design was employed, using a structured questionnaire to collect data from 410 undergraduate students who had experienced AI-assisted learning. The questionnaire was designed to measure perceptions of personalized learning pathways, AI-powered feedback, interactive learning tools, and student engagement, using a five-point Likert scale. Stratified random sampling was used to ensure proportional representation of students from different fields of study and year levels. The data were analyzed using descriptive statistics to summarize the demographic characteristics and key variables, and inferential statistics, including correlation and regression analyses, to test the hypotheses. The reliability and validity of the questionnaire were confirmed through Cronbach's alpha and the Kaiser-Meyer-Olkin (KMO) test, which demonstrated strong internal consistency and sampling adequacy.

The results of the study provided robust support for the hypotheses, indicating that personalized learning pathways, AI-powered feedback, and interactive learning tools all had significant positive effects on student engagement. The findings revealed that interactive learning tools had the strongest impact, with an R-squared value of 0.468, suggesting that nearly half of the variance in student engagement could be explained using AI-driven simulations, gamified platforms, and collaborative learning environments. AI-powered feedback also demonstrated a substantial influence, with an R-squared value of 0.433, underscoring the importance of timely and personalized feedback in sustaining students' motivation and active participation. Personalized learning pathways, while still significant, had a relatively lower impact, explaining 40%

of the variance in student engagement. This result suggests that while adaptive learning paths are beneficial, their effectiveness may depend on the sophistication of the AI systems used and students' ability to navigate personalized platforms effectively.

In addressing the research questions, the study found that personalized learning pathways significantly enhanced student engagement by providing adaptive content and pacing based on individual needs. AI-powered feedback was also found to positively influence engagement by offering immediate and actionable insights that helped students identify their weaknesses and adjust their learning strategies accordingly. Interactive learning tools emerged as the most impactful factor, significantly increasing engagement by transforming passive learning into active participation through hands-on and collaborative experiences. The key findings of the study suggest that AI-assisted learning can play a vital role in enhancing student engagement, particularly when it incorporates personalized, timely, and interactive elements that align with students' learning preferences and needs.

The study concludes that AI-assisted learning has significant potential to improve student engagement at Quanzhou College of Technology. The findings underscore the importance of investing in AI technologies that prioritize interactivity and feedback, as well as the need for continuous refinement of personalized learning pathways to maximize their effectiveness. These results offer valuable insights for educators and administrators seeking to leverage AI to create more engaging and effective learning environments in higher education.

5.2 Recommendation

Based on the findings of this study, several recommendations are proposed to enhance student engagement at Quanzhou College of Technology through the effective integration of AI-assisted learning tools. Given the significant positive impact of interactive learning tools on student engagement, it is recommended that the institution prioritize the expansion and enhancement of AI-driven simulations, gamified platforms, and collaborative learning environments. These tools should focus on providing hands-on learning experiences that actively involve students in problem-solving and decision-making processes. The substantial effect of interactive learning tools suggests that investing in AI systems capable of delivering immersive and participatory content is likely to yield considerable improvements in engagement and learning outcomes.

The results highlight the importance of AI-powered feedback in sustaining student engagement. Therefore, it is recommended that Quanzhou College of Technology develop and implement AI feedback systems that provide immediate, personalized, and actionable insights into students' performance. Ensuring that feedback is not only timely but also constructive and easy to understand can help students identify their weaknesses and take corrective actions promptly. Additionally, integrating explainable AI techniques that clarify how feedback is generated may enhance students' trust in AI systems and their willingness to act on the feedback provided. Continuous assessment and iterative improvement of AI feedback mechanisms are essential to align them more closely with students' learning needs.

The findings also suggest that while personalized learning pathways positively influence student engagement, their effectiveness may depend on the sophistication of the AI systems used and the ability of students to navigate these platforms effectively. To address this, it is recommended that Quanzhou College of Technology invest in more advanced AI systems capable of delivering truly adaptive and personalized learning experiences. Providing training and support to help students navigate personalized learning platforms more effectively could also enhance their impact on engagement. Additionally, regular updates to the AI algorithms based on learning analytics data should be considered to improve the accuracy and relevance of personalized learning paths.

Given the observed disciplinary differences in the effectiveness of AI-assisted learning tools, it is recommended that AI implementations be tailored to suit the specific needs and learning preferences of students in different fields of study. For students from non-technical backgrounds, simplifying the user interface and incorporating more context-relevant examples could make AI tools more accessible and effective. Faculty members should also receive training on how to integrate AI technologies into their teaching practices effectively, ensuring that these tools complement traditional instructional methods rather than replace them.

Ensuring equitable access to AI-assisted learning tools is essential for maximizing their impact on student engagement. Quanzhou College of Technology should consider investing in digital infrastructure and resources to minimize the digital divide among students, particularly those from less privileged backgrounds. Providing access to reliable internet, adequate devices, and technical support can help ensure that all students can benefit equally from AI-assisted learning technologies.

Lastly, a continuous feedback mechanism should be established to gather students' perceptions of AI-assisted learning tools regularly. This feedback should inform iterative improvements in AI systems and ensure that they remain aligned with students' evolving needs and expectations. By adopting a learner-centered approach to AI implementation, Quanzhou College of Technology can enhance both the effectiveness of AI-assisted learning tools and students' overall engagement and satisfaction with the learning process.

5.3 Further Study

Future research may benefit from exploring the long-term impact of AI-assisted learning on student engagement to determine whether the positive effects observed in this study are sustained over extended periods. A longitudinal study could provide deeper insights into how students' perceptions of AI tools evolve and whether the novelty effect observed with interactive learning tools diminishes over time. Additionally, further studies should consider investigating the impact of AI-assisted learning on other educational outcomes, such as academic performance, retention rates, and self-directed learning skills, to provide a more comprehensive understanding of its effectiveness.

It may also be valuable to expand the scope of research to include a broader range of demographic factors, such as socioeconomic status, prior exposure to AI technologies, and learning disabilities, to assess how these factors influence the effectiveness of AI-assisted learning tools. Understanding the role of these variables could help tailor AI systems more effectively to the diverse needs of students. Moreover, future research should examine the potential challenges and ethical implications of AI-assisted learning, particularly regarding data privacy, algorithmic bias, and the impact on traditional teaching roles. Addressing these concerns could provide valuable guidelines for educational institutions seeking to implement AI technologies responsibly and ethically.

Given the significant influence of interactive learning tools on student engagement, further studies should investigate which specific features of these tools—such as gamification elements, collaborative capabilities, or real-time feedback—are most effective in enhancing engagement. Experimental studies that manipulate these features individually may provide more detailed insights into their relative impact and help optimize the design of AI-assisted learning tools. Additionally, research should explore the effectiveness of blended learning approaches that combine AI-assisted learning with traditional face-to-face instruction to determine the optimal balance for enhancing engagement and learning outcomes.

Further studies could also consider examining the effectiveness of AI-assisted learning in different educational contexts, such as vocational training, online education, or secondary education, to assess the generalizability of the findings. Comparative studies across institutions with varying levels of AI integration may help identify best practices and key success factors for implementing AI technologies in education. Research focusing on faculty perceptions and readiness to adopt AI-assisted learning tools may also be valuable, as instructors' attitudes and competencies are likely to play a crucial role in the successful implementation of these technologies.

Lastly, exploring students' perceptions of the transparency and fairness of AI algorithms used in learning tools should be a priority for future research. Understanding how these perceptions influence students' willingness to adopt AI-assisted learning tools could provide important insights for designing AI systems that are both effective and ethically sound. By addressing these areas, further research could significantly advance the understanding of how AI-assisted learning can be optimized to enhance student engagement and educational outcomes more broadly.

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Appendix

Questionnaire for the Study: The Impact of AI-Assisted Learning on Student Engagement at Quanzhou College of Technology

Dear Participant,

Thank you for participating in this survey. The purpose of this questionnaire is to gather information about your experiences with artificial intelligence-assisted learning and its impact on your engagement at Quanzhou College of Technology. Your responses will remain anonymous and will be used solely for academic research purposes. Please answer each question honestly based on your personal experiences. The survey should take approximately 10–15 minutes to complete.

- For each question, please select the option that best reflects your opinion or experience.
- There are no right or wrong answers.

Thank you for your cooperation and time.

1. **Gender:**
   - ☐ Male
   - ☐ Female
   - ☐ Prefer not to say
2. **Age:**
   - ☐ 18–20
   - ☐ 21–23
   - ☐ 24–26
   - ☐ Above 26
3. **Year of Study:**
   - ☐ 1st Year
   - ☐ 2nd Year
   - ☐ 3rd Year
   - ☐ 4th Year or above
4. **Field of Study:**
   - ☐ Engineering
   - ☐ Business
   - ☐ IT & Computer Science
   - ☐ Arts & Humanities
   - ☐ Other (please specify): ____________________

5. **Have you used AI-assisted learning tools (such as AI-based tutoring, personalized learning platforms, or AI-driven feedback systems) at Quanzhou College of Technology?**
   - ☐ Yes
   - ☐ No

6. AI-assisted learning adapted the content and pace based on my individual learning needs.
   - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
7. The personalized learning paths offered by AI helped me focus on areas I needed to improve.
   - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
8. I was able to progress through my coursework at my own pace using AI-assisted learning.
   - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
9. AI-based personalized learning made the learning experience more relevant and manageable.
   - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

10. AI-powered feedback provided me with immediate responses to my performance.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
11. The feedback I received from AI was personalized and helped me identify my weaknesses.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
12. AI-generated feedback was clear and easy to understand.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
13. Receiving instant feedback from AI motivated me to improve my learning performance.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

14. AI-driven interactive tools (e.g., simulations, gamified platforms) made learning more engaging.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
15. I enjoyed participating in AI-enhanced simulations and virtual labs.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
16. AI-based interactive tools helped me understand complex concepts better.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
17. Collaborative features in AI-driven tools improved my learning experience.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

18. AI-assisted learning increased my interest in the subjects I studied.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

19. I was more willing to participate in class activities due to AI-based learning tools.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
20. AI-assisted learning helped me stay focused and avoid distractions.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
21. I invested more time and effort in my studies because of AI-enhanced learning methods.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
22. Overall, AI-assisted learning improved my engagement in academic tasks.
    - ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Thank you for completing the questionnaire!

บันทึกข้อความ

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เรื่อง ขออนุมัติสำเร็จการศึกษาประจำปีการศึกษา 2567

เรียน ท่านอธิการบดี

เรื่องเดิม นักศึกษาหลักสูตรบริหารธุรกิจมหาบัณฑิต MR. WANG WEIZHI รหัสนักศึกษา 6317195458 ได้ศึกษารายวิชาครบถ้วนสมบูรณ์ และได้ปฏิบัติตามเกณฑ์สำเร็จการศึกษาตามที่มหาวิทยาลัยสยาม กำหนดเรียบร้อยแล้ว ทั้งนี้พร้อมยื่นเรื่องขออนุมัติสำเร็จการศึกษา โดยมีรายละเอียดดังต่อไปนี้

1. ผ่านการตรวจสอบความซ้ำซ้อนด้วยโปรแกรม Grammarly เมื่อวันที่ 23 สิงหาคม 2568
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3. ผ่านการสอบปากเปล่าขั้นสุดท้ายวิชาการค้นคว้าอิสระ เมื่อวันที่ 20 ตุลาคม 2566
4. ผ่านเกณฑ์มาตรฐานความรู้ภาษาอังกฤษ Cambridge English Test score 168 CEFR B2 เมื่อ วันที่ 30 ธันวาคม 2566
5. ผ่านการประชุมวิชาการระดับนานาชาติ at the 7th Stamford International Conference on "Leadership & Social Sustainability in the Tech-Driven Era" Subject: The Effectiveness and Challenges of Artificial Intelligence in Educational Technology on August 19-21, 2023 at Stamford International University , Bangkok Thailand

เรื่องพิจารณา เพื่อพิจารณาเข้าประชุมสภามหาวิทยาลัย และอนุมัตินักศึกษาสำเร็จการศึกษา ประจำปีการศึกษา 2567 ดังรายละเอียดเอกสารประกอบการสำเร็จการศึกษาตามที่แนบมา

จึงเรียนมาเพื่อพิจารณาอนุมัติ และให้ดำเนินการต่อไป

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สำนักงานอธิการบดี
เอกสารฉบับนี้สามารถอัปโหลดเข้าฐานข้อมูลได้
ลงชื่อ........
วันที่ 17/9/68