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Editorial

In this May/June 2025 JIRSEA Editorial: "Charting New Frontiers in Higher Education Research," 12 papers were accepted from the initial 49 submissions, of which 19 were rejected as they were not within JIRSEA's focus, and of the remaining 30 submissions which underwent the Preliminary Review, 16 submissions went through the Double-Blind Review for the Journal of Institutional Research South East Asia, May 2025 Issue. Higher education is at a transformative crossroads, with financial pressures, demographic shifts, and evolving stakeholder expectations prompting universities to rethink their structures, pedagogies and technological strategies. This special issue assembles twelve cutting-edge studies that collectively illuminate four critical domains of inquiry: institutional reform and quality assurance, curriculum alignment with employability, student motivation, self-regulation, and engagement, and the digital ecosystem reshaping learning and research.

1. ***Institutional Reform and Quality Assurance (3 articles)*** **–** Three articles examine how universities adapt their organizational DNA to deliver better performance, equity, and relevance. Lin et al. (Article 1) analyze Taiwan's first involuntary merger, National Kaohsiung University of Science and Technology (NKUST), showing that while campus proximity preserved stable undergraduate demographics, the fusion of distinct research cultures stimulated heterogeneity in research capacity and a robust uptick in industry-academia projects. Their call for longitudinal follow-up acknowledges that the benefits of mergers often crystallize only over a decade. Pandey, Bose, and Rathor (Article 2) shift the lens to India, examining whether ownership (public vs. private), campus size, and institutional age impact engineering institute ratings. Through Career360 data on 299 institutions, they dismantle the myth that public institutions necessarily underperform, revealing instead that legacy (age) and scale are the strongest predictors of perceived quality. Their findings equip policymakers and administrators with evidence to guide infrastructure investments and branding strategies. Zhang, Liu, and Jang (Article 3) map South Korea's three-stage internationalization journey (2001–2023) from quantitative expansion to quality management to integrated oversight, tracking growth to 181,842 international students while highlighting persistent imbalances in origin countries, disciplines, and regional spread. Their policy prescriptions to boost non-capital science and tech appeal and provide tailored support for Asian cohorts resonate across nations confronting demographic decline.

2. ***Curriculum Alignment and Employability (3 articles)*** **–** Ensuring that academic programs translate into marketable skills remains a universal imperative. Pham et al. (Article 4) examine 30 syllabi and survey 470 undergraduates at a Vietnamese university to uncover that employability skills, personal qualities, problem-solving, and communication are unevenly signaled: encoded in objectives but under-assessed in exams and thinly enacted in activities. They argue for practice-based syllabus redesign that aligns learning outcomes, pedagogical tasks and assessments to close the theory-practice gap. Wijaya, Mustakim, Sutadji, Isnandar and Widiyanti (Article 5) focus on vocational education, demonstrating through a 312-student survey that entrepreneurial experience most powerfully predicts entrepreneurial competency (EC), while structured business coaching both directly enhances EC and amplifies the training-experience nexus. Their

model highlights the importance of integrating adaptive coaching into hands-on modules to foster an entrepreneurial mindset. Meanwhile, Nguyen, Thong, Uyen and Thanh (Article 6) probe language pedagogy, using structural equation modeling on data from 80 Vietnamese English majors to show that students' perceptions of teacher immediacy drive willingness to communicate (WTC) both directly and via their "Ideal L2 Self," accounting for 51.7 percent of variance in WTC. Their work suggests that streamlined immediacy scales can help instructors deploy the most impactful behaviors to boost communicative readiness.

3. ***Student Motivation, Self-Regulation and Engagement (2 articles) – Two*** studies illuminate the psychological underpinnings of student performance and persistence. Poh, Cheow, Lim, Yap, and Pung (Article 7) employ PLS-SEM on 160 Malaysian undergraduates to validate a hierarchical goal model, which suggests that self-control reduces academic procrastination only through its positive effect on grit. This finding reframes self-control interventions as the foundation for nurturing the sustained effort that grit embodies, while Carpio, Ablan, Rivera, and Villarica (Article 10) examine the disruptive context of COVID-19, triangulating a 145-student procrastination survey with qualitative focus groups to identify emotional distress and comfort in delay as the primary triggers of higher procrastination in remote learning. Their integrated lens informs the design of mental health supports and time management scaffolds for online cohorts.

4. ***The Digital Ecosystem: Adoption, Frontiers and AI in Education (4 articles) –*** As digital technologies proliferate, educators and researchers are racing to understand and leverage their potential. Tran (Article 8) analyzes Scopus bibliometric data (2019–2023) to map emerging fronts in Digital Assessment, Blockchain, AI, Lifelong Learning, and Online Learning, introducing novel metrics (Growth Rate, ΔT, Emerging Factor) to highlight Digital Assessment and Blockchain as the most rapidly evolving fields. His global institutional mapping signals where collaborative research investments can be most fertile. Tan, Ayub, Hui, Yoke and Seng (Article 9) survey 200 Malaysian mathematics trainee teachers, finding that while attitudes and beliefs toward digital tools are broadly positive, actual usage is uneven due to access barriers and uneven professional training. Their data-driven call for improved infrastructure, attitude-building workshops and targeted development programs charts a path to strengthen digital pedagogy. Chu (Article 11) offers a timely thematic synthesis of 15 studies (2020–2024) on QuillBot in EFL academic writing. By extracting themes of emotional and behavioral impact, skill-building efficacy, user experience and accessibility, and ethical challenges, he paints a balanced portrait of AI-assisted writing: transformative for paraphrasing and motivation, yet fraught with risks of over-reliance and equity gaps, prompting a research agenda for longitudinal, cross-cultural, and ethical inquiry. Finally, Nguyen and Vo (Article 12) address the issue through a mixed-methods case study of third-year translation students in Vietnam, revealing that ChatGPT speeds up drafting and enhances translation quality, but also introduces concerns about dependency. Their recommendation to embed AI literacy and critical-use workshops into translation curricula presages a future in which human-AI co-authorship becomes the norm.

Collectively, these twelve articles traverse the spectrum from macro-level policy and structural change to micro-level classroom practice and student cognition, all undergirded by an imperative to align higher education more closely with societal, economic and technological demands. As universities navigate mergers, rating systems and demographic headwinds, and as faculty integrate employability skills, coach entrepreneurship, foster communication, and harness digital tools, these empirical studies and systematic analyses provide both a roadmap and a provocation: to continue interrogating how we organize, teach and learn in an ever-more complex world. We trust that this issue sparks new collaborations, fuels policy dialogues and inspires future research that bridges disciplines and geographies in the pursuit of educational excellence.

The key synopses of these 12 papers are as follows:

- **Article 1: Merging for Progress in Higher Education: The Case of NKUST from Taiwan** led by Szu-Yin Lin, Kuan-Li Chen, Wei-Chi Wu, and Chun-Hsien Kuo of National Kaohsiung University of Science and Technology (Taiwan), this study aimed to assess the early outcomes of Taiwan's first involuntary higher-education merger (February 2018) on undergraduate education. Employing a pre- and post-merger case study design, the authors first reviewed the legal and administrative processes underpinning the merger, then conducted a quantitative comparison of institutional and student-level data (enrollment figures, demographics, and industry–academia collaboration metrics) spanning 2017–2022. They found that, while student residential and workplace distributions remained stable due to campus proximity, the fusion of distinct research profiles significantly boosted NKUST's overall research output and the number and funding of industry-collaboration projects, indicating enhanced research capacity emerging from the merger.
- **Article 2: Institutional Age, Size, Ownership and Ratings: An Empirical Study of Indian Higher Education Institutions** by Jayesh Pandey (Institute of Rural Management Anand), Pallav Bose (KJ Somaiya Institute of Management, Mumbai), and Abhinav Shankar Rathor (Jaipuria Institute of Management, Indore) set out to determine whether engineering-institute ratings in India vary by ownership type and to evaluate the predictive roles of campus size and institutional age. Their methodology involved a preliminary qualitative audit (interviews with prospective students and an industry expert), followed by statistical analysis of secondary data from Career360.com covering 299 institutes. Ownership differences in ratings were examined using one-way ANOVA, and multiple regression analysis assessed the influence of campus size and age on ratings. The authors report no significant government-vs-private rating gap, but both larger campus size ($\beta \approx 0.32$, $p < .01$) and greater institutional age ($\beta \approx 0.27$, $p < .05$) emerged as significant positive predictors of higher ratings.
- **Article 3: Internationalization Policies in South Korean Higher Education: Attracting and Managing International Students** by Zhang Yuningjing (Sungkyunkwan University), Liu Ting (University of Suwon), and Jang Wan Ko (Sungkyunkwan University) investigated South Korea's higher-education internationalization policies from 2003 to 2023. Combining qualitative content analysis of government policy documents with descriptive analysis of Ministry of Education enrollment statistics, they segmented policy evolution into three phases: quantitative expansion (2001–2007), quality management (2008–2013), and integration management (2014–2023). The study revealed steady growth in international enrollment, reaching 181,842 by 2023. Still, persistent imbalances in student origins, fields of study, and institutional locations, prompting recommendations for targeted support for underrepresented cohorts and non-capital institutions.

- **Article 4: Bridging the Gap: Integrating Employability Skills – From Course Syllabi to Classroom Instruction** by Hoa Pham, Luong D. Dinh, Cuong M. Nguyen, and Thao N.T. Nguyen of Nha Trang University examined how employability skills are embedded in course syllabi and perceived by students at a Vietnamese university. Using a convergent mixed-methods design, they performed qualitative content analysis on 30 syllabi and surveyed 470 students. Content analysis revealed frequent inclusion of personal qualities (43%) and problem-solving (47%) in learning objectives, but their rare appearance in assessments (4% and 20%, respectively). ANOVA revealed significant differences in engagement by year level ($F = 4.394$, $p = .013$), and correlation ($r = .503$, $p < .01$) confirmed a moderate alignment between syllabus design and career relevance. The authors conclude that syllabi require clearer practice-based design to align intended skills with assessment practices better.
- **Article 5: The Impact of Business Coaching on the Entrepreneurial Competencies of Vocational Students in Higher Education** by Robby Wijaya[1], Siti Salina Mustakim, Eddy Sutadji, Isnandar, and Widiyanti (Postgraduate School, Malang State University & University Putra Malaysia) explored how entrepreneurial mindset, experience, and business coaching influence vocational students' entrepreneurial competencies, and whether coaching moderates these relations. Through a quantitative explanatory survey of 312 students, hierarchical regression analyses demonstrated that entrepreneurial experience exerted the strongest direct effect on competency ($\beta = .45$), followed by mindset and coaching ($\beta = .21$). Moreover, coaching significantly strengthened the linkage between experience and competency, underscoring the need for adaptive coaching integrated into experiential entrepreneurship curricula.
- **Article 6: Exploring the Relationship of Students' Perceptions of Teacher Immediacy and Self-Motivation on Communicative Willingness among Vietnamese English Majors** by Nguyen Thi Diem Ha (Yersin University of Dalat), Nguyen Vi Thong, Nguyen Quynh Uyen, and Pham Thi Trang Thanh investigated how perceived teacher immediacy and the Ideal L2 Self influence willingness to communicate (WTC). Administering a self-report questionnaire to 80 English majors, they applied PLS-SEM to test direct and mediated effects. Their findings indicate a significant direct influence of immediacy on WTC ($\beta = .58$, $p < .001$) and an indirect effect via the Ideal L2 Self (mediated effect = .22), together accounting for 51.7% of the variance in WTC. The authors suggest focused immediacy strategies and item-reduced scales for targeted pedagogical interventions.
- **Article 7: Self-Control and Grit: How Do They Affect Academic Procrastination among Malaysian Undergraduates?** By Poh Chua Siah and colleagues (Universiti Tunku Abdul Rahman), it was tested whether self-control reduces academic procrastination directly or via grit. In an online survey of 160 undergraduates, PLS-SEM supported an indirect-only mediation model: self-control influenced procrastination entirely through grit (indirect effect = –.36, $p < .01$). These results highlight grit's pivotal role in long-term goal pursuit and suggest that interventions aiming to foster self-control should also cultivate sustained perseverance.
- **Article 8: Emerging Research Fronts in the Digital Educational Ecosystem: A Systematic Qualitative and Quantitative Analysis** by Tran Ai Cam (Nguyen Tat Thanh University, Vietnam) conducted a bibliometric study of Scopus records (2019–2023) to identify rapidly emerging topics in digital education. Introducing metrics Growth Rate (R), publication–citation gap (ΔT), and Emerging Factor (EF) the analysis pinpointed Digital Assessment ($R = 1.8$, $EF = 0.72$) and Blockchain ($R = 1.6$, $EF = 0.68$) as the fastest-emerging

fronts. Geographic mapping revealed leadership from institutions in the U.S., China, and Europe, providing strategic insights for prioritizing future research.

- **Article 9: Assessing Digital Technology Adoption in Mathematics Teaching: Attitudes, Beliefs and Usage among Training Teachers** by Tan Tong Hock*[1], Ahmad Fauzi Mohd Ayub[2], Kee Boon Hui[1], Chin Wan Yoke[1], and Sim Hong Seng[3] (Tunku Abdul Rahman University & Universiti Putra Malaysia) surveyed 200 mathematics trainee teachers to examine how attitudes and beliefs shape digital-tool usage. Employing descriptive statistics and one-way ANOVA with Tukey HSD post-hoc tests, they found generally positive attitudes and beliefs. Still, significant variation in actual usage ($F = 5.12$, $p = .002$), driven by access barriers and uneven training. The authors recommend bolstering infrastructure and tailored professional development to enhance integration.
- **Article 10: Investigating the Triggers and Outcomes of Academic Procrastination in Online Learning Environment amid the COVID-19 Pandemic** by Cherry Lyn M. Carpio*[1], Alliana M. Ablan[2], Ralph Randel R. Rivera[3], and Mia V. Villarica[4] (National University & Laguna State Polytechnic University, Philippines) combined an online survey (N=145) using Busko's Procrastination Scale with focus-group discussions (N=16). Through the triangulation of quantitative and qualitative data, they identified emotional distress and the comfort of delaying tasks as the principal triggers of procrastination, noting elevated procrastination levels during pandemic-induced remote learning and recommending supportive strategies for student well-being and time management skills.
- **Article 11: Integrating QuillBot to Enhance the Students' Academic Writing: Opportunities and Challenges** by Chu Wenxuan (Universiti Malaya) performed a thematic qualitative review of 15 peer-reviewed studies (2020–2024) on QuillBot's use by EFL learners. Thematic analysis yielded four domains: emotional and behavioral impact, skill-building effectiveness, user experience and accessibility, and ethical challenges. The analysis concluded that while QuillBot improves paraphrasing, grammar correction, and student confidence, over-reliance, loss of creativity, and access inequities necessitate AI literacy training and longitudinal, cross-cultural research.
- **Article 12: The Application of ChatGPT in Translation Learning: A Case Study in Vietnam** by Nguyen Thi Thu Huong* and Vo Thi Kim Anh (University of Foreign Language Studies, University of Da Nang) employed a mixed-methods design, comprising a questionnaire survey of 119 third-year translation students, followed by workshops with 15 participants, to examine the impact of ChatGPT on translation learning. Their findings reveal that ChatGPT accelerates drafting and enhances text quality, but raises concerns about dependency, leading to recommendations for embedding AI-critical thinking modules and structured ChatGPT training into translation curricula.

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Merging for Progress in Higher Education: The Case of NKUST from Taiwan

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ABSTRACT

Since the 1960s, mergers in higher education have become increasingly common globally, driven by goals such as enhancing efficiency, improving educational quality, and reducing public expenditure. Australia, the United States, and several European nations have witnessed numerous mergers in the higher education sector. In Taiwan, a significant merger occurred in February 2018 when the National Kaohsiung University of Science and Technology (NKUST) was formed by merging three national universities in Kaohsiung. This merger, initiated by the Ministry of Education under Article 7 of the University Law and approved by the Executive Yuan, marks Taiwan's first case of an involuntary university merger. This study aims to conduct a case analysis of the NKUST merger, with a primary focus on the outcomes for undergraduate education**.** We first review the merger process, followed by an examination and comparison of institutional data before and after the merger, with a focus on undergraduate student data from 2017 to 2022. The results indicate that, due to the geographical proximity of the three universities, there is a similarity in the student demographics regarding their residential locations and the distribution of their workplaces within five years after graduation. In terms of research capacity and industry-academia collaboration, the integration of the long-term research strengths and resources of the three original institutions introduces heterogeneity, breaking previous similarities and gradually enhancing the research capabilities of the merged university. There has also been a positive growth trend in the number and funding of industry-academia collaboration projects. Overall, this study utilizes historical data to evaluate the potential benefits of the merger for talent development. However, given that NKUST is still in the early stages of its merger, longitudinal research is necessary to gain a more comprehensive understanding of the outcomes of higher education mergers.

Keywords: Mergers, Higher Education, Institutional Research, Enrollment, Admission.

1. Introduction

Over the past four decades, Taiwan's higher education landscape has shown transformative changes, evolving from rapid expansion to confronting new challenges and adapting through significant reforms. This journey began in the 1980s, marked by a substantial increase in the number of higher education institutions, which was highlighted by the establishment of numerous universities and the upgrade of technical colleges into universities of science and technology. Such expansion, driven by the amendment and implementation of the University Law in January 1994, not only enhanced diversity and autonomy within the sector but also led to a considerable rise in the gross enrollment rate, indicating a shift from elite to mass and then to universal education systems (Trow, 1970, 2000). In 1988, the gross enrollment rate surpassed 15%, signifying a shift to a mass education system as classified by Trow (Trow, 1970, 2000). By 1997, the gross enrollment rate had exceeded 50%. Of the 1,601,471 individuals aged 18-21, 807,567 were enrolled in higher education institutions, indicating Taiwan's transition to a stage of universal education.

The peak of this expansion occurred in 2007, when the number of higher education institutions reached a record high of 164. However, this phase of expansion soon encountered demographic and competitive pressures, especially due to Taiwan's declining fertility rate, which has significantly impacted higher education, resulting in the termination of certain departments or even entire universities. Also, the increased international competition in various fields highlighted the need to address issues of resource allocation and the quality of higher education. In response, the Taiwanese government has prioritized quality enhancement in higher education. To support this goal, policies have been introduced to encourage national universities to collaborate and share resources. These initiatives include forming alliances, establishing research centers, and integrating resources through mergers or regional cooperation.

Taiwan's situation described above echoes the global trends, that higher education mergers and alliances have been a common strategy since the 1960s to attain economic advantages and enhance research productivity (Patterson, 2001; Ahmed et al., 2015; Lu et al., 2022). There have been numerous mergers in higher education in Australia, the USA, and several European countries, aimed at achieving greater efficiency, higher quality, and reducing public budgets (Skodvin, 1999). Mergers in higher education play a significant role in reshaping institutional landscapes and have implications for system diversity, academic excellence, and societal relevance (Cai & Yang, 2016; Frølich & Stensaker, 2021). They are seen as strategic tools to enhance efficiency, quality, and relevance within the higher education sector. Mergers can lead to the creation of more academically solid and societally relevant institutions, as well as contribute to organizational redesign and the integration of different institutional cultures. Taiwan also experienced a wave of mergers and reforms in the 2000s. The pivotal moment fell on January 10, 2011, when the Legislative Yuan passed the amendment on Article 7 of the University Law. It stipulated that the Ministry of Education (MOE) might lead and propose merger plans between public universities, and the merger plan approved by the Executive Yuan shall be implemented by such relevant national universities. The amendment would then influence higher education reform in Taiwan. Furthermore, in 2015, the MOE project proposed to the Legislative Yuan that public universities would be prioritized for merger based on two criteria: having fewer than 10,000 students and being located in a municipality with more than two public universities.

This paper focuses on a landmark case in this evolving scenario: the February 2018 merger that formed the National Kaohsiung University of Science and Technology (NKUST) from three national universities. This incident is not only the first case in Taiwan's higher education being initiated involuntarily by the Ministry of Education, but also marks a significant turn in policy and practice. According to Harman (2000), proposed mergers in Australia are often viewed as a threat to the country's unique institutional strengths and traditions. On the other hand, the potential benefits include a larger and more diverse institution, stronger academic programs, increased efficiency and cost savings, as well as improved student services

and infrastructure. Major organizational upheavals and reorganization efforts may occur following the merger. This paper examines the dynamics of higher education institutions (HEIs) mergers using the NKUST merger as a case study. This study aims to explore the broader implications of such transformative moves within Taiwan's distinctive educational landscape, taking into account both the potential benefits and the organizational challenges observed in similar global instances.

This study aims to evaluate the primary functions of universities, which include teaching, research, and service (Slade et al., 2022), through the lens of these three fundamental institutional functions, which serve as key criteria for assessing the success of mergers (Boyer, 2015; Olo et al., 2021). It examines the impact of institutional mergers on these functions, highlighting both the disruptions and the potential positive outcomes, such as the enhancement of academic programs and research capacities (Harman and Harman, 2003, 2008). To address the aim of evaluating the impact of the NKUST university merger on its core undergraduate functions, this study is guided by the following research objectives:

1. To review the context and process of the NKUST merger, with a focus on how the integration of three institutions influenced undergraduate-level governance and strategy.
2. To evaluate changes in teaching performance, using indicators such as enrollment patterns, freshman retention, and graduate employment rates.
3. To assess the evolution of research capacity, particularly in terms of research output, international collaboration, and citation performance.
4. To analyze service-oriented outcomes, including trends in industry-academia collaboration projects and applied research funding.
5. To synthesize the findings across these domains to determine how the merger has supported or challenged NKUST's ability to fulfill its undergraduate education mission.

These objectives are sequenced to build a comprehensive understanding of the merger's impact, starting from institutional transformation to functional outcomes. Given the scope and data availability, this study focuses specifically on the undergraduate level of NKUST. The three pre-merger institutions all had comparable structures and data systems at the undergraduate level, allowing for consistent longitudinal analysis. While NKUST comprises graduate and doctoral programs, the present study does not aim to generalize findings to those levels. Instead, it offers insights into how institutional mergers may impact undergraduate education, which is a critical dimension of university performance and policy in Taiwan. The subsequent sections will delve into the specifics of the NKUST merger, analyzing key metrics and drawing comparisons to understand the broader implications of such organizational changes in the realm of higher education.

2. Research Background and Literature Review

2.1 The Merger Process of NKUST

NKUST is established and merged from three public technical universities in Kaohsiung: the National Kaohsiung University of Applied Sciences (KUAS), the National Kaohsiung First University of Science and Technology (NKFUST), and the National Kaohsiung Marine University (NKMU). The merger plan dated back to 2013, when two universities, NKFUST and NKMU, initiated a merger plan, and KUAS proposed joining in. However, different stakeholders at these universities had varying opinions about the merger. Therefore, in June 2015, the university assembly vetoed joining the merger. After NKFUST and NKMU presented their merger plan to the Executive Yuan for approval in May 2017, KUAS agreed to merge with the other two universities following extensive discussion and consideration. The Executive Yuan supported the merger of the three universities, and two months later, the MOE took an active role in the merger process, in accordance with the University Law, Article 7, section 2. A Merger Initiative

Committee was established, and NKUST was founded in February 2018, with a total of five campuses across Kaohsiung City. It became the largest university of science and technology in Taiwan.

Although the newly established university has been introduced to the public, it still takes time for the academic departments and administrative units from the previous three universities to amalgamate. In June 2018, the General Education Committee and Educational Centers were merged and integrated. The new organizational regulations of NKUST were approved in February 2019, and subsequently, the administrative units were reorganized. As for academic departments, it has transitioned from 10 colleges and 49 departments in 2017 to 11 colleges and 51 departments in 2023. The student population has increased from 27,320 to 28,069 during this period.

2.2 Challenges for HEI mergers

The merger of two or more universities presents significant challenges for all stakeholders, including students, faculty members, administrative staff, alumni, parents, and partner institutions. Although such mergers are often pursued with the intention of enhancing research productivity and institutional effectiveness, they can also result in considerable challenges and unintended consequences, necessitating meticulous management and strategic planning. Extensive studies on university mergers across various countries indicate that the outcomes are not only influenced by the characteristics of the institutions prior to the merger but are also closely tied to broader social, cultural, and educational systems. For instance, Slade et al. (2022) observed that a merger between two disparate institutions can have a significant sociocultural impact on faculty research productivity, with a notable decline, particularly in the fifth year following the merger. The establishment of a unified academic culture following a merger remains a primary challenge for higher education institutions (HEIs) (Ripoll-Soler et al., 2013).

An analysis of both the immediate and long-term effects of HEI mergers on institutional performance offers valuable insights into the challenges faced by merged institutions. Ripoll-Soler et al. (2013) referenced various HEI mergers involving universities and specialized institutions across Europe, revealing variability in institutional effectiveness post-merger. These findings highlight the complexity of factors influencing merger success, including institutional context and post-merger strategies. However, an examination of comparative performance in international academic rankings at different time points generally supports the view that mergers often result in improved standings for world-class universities. Conversely, Frølich and Stensaker (2021) note that mergers can reshape institutional missions and the dynamics of the higher education system. In Norway, for example, universities often merge to enhance social relevance rather than academic excellence, reflecting the country's emphasis on equality and social responsibility. Such mergers present the challenge of balancing academic excellence with societal relevance, as institutions often need to adjust their missions and strategies in response to the merger.

In the context of Asia, Cai and Yang (2016) examined mergers of Chinese higher education institutions, focusing on indices such as economies of scale, academic capacity, and performance enhancement, as well as organizational integration and staff integration. Despite China's unique political culture, the factors affecting merger outcomes are generally consistent with those in other countries, including the composition of the original universities, governance policies, cultural differences, academic goals, and financial issues. This study is particularly insightful as it outlines complex criteria for classifying mergers, which resonate with the situation of NKUST and the three pre-merger universities. For instance, the merger of NKUST, which was conducted under the jurisdiction of Taiwan's Ministry of Education, encountered significant challenges in proposing mutual goals and benefits for members from the three pre-merger schools.

Prior studies collectively highlight that institutional mergers often face challenges, including cultural integration, administrative restructuring, and identity realignment. In the context of NKUST, we focus specifically on how these challenges manifest in undergraduate education through enrollment patterns, student demographics, and academic restructuring, all of which are influenced by pre-merger similarities

in institutional missions and student populations (Cai & Yang, 2016; Slade et al., 2022). One notable example is the challenge of institutional identity: the naming of the post-merger university posed symbolic and practical difficulties, as NKUST adopted an entirely new name rather than building on the legacy of its predecessors (Cai & Yang, 2016). Given that the pursuit of higher academic performance did not drive NKUST's merger, this research provides an opportunity to reconsider the concept of social relevance within the local context and how the existing characteristics of the pre-merger universities have influenced the policies, missions, and identity of the newly merged institution. It also echoes the call for adopting a long-term perspective to gain a comprehensive understanding of institutional trajectories (Fumasoli, Pinheiro & Stensaker, 2015).

2.3 HEI merger success

University mergers are a global trend driven by competitiveness and government policies (Harman, 2000; Cai & Yang, 2016). Though often challenging, mergers can result in larger institutions that excel internationally (Harman, 2000). Success hinges on historical context, economics, power dynamics, and human relations (Eastman & Lang, 2001). However, the impact on curricula is frequently neglected (Jansen, 2003). To better understand mergers, it is essential to consider environmental factors, evaluation criteria, and organizational influences (Cai & Yang, 2016). These insights can guide future merger strategies and research in higher education. While mergers are often seen as a strategy for institutional expansion and efficiency, their long-term success depends on how well they enhance universities' ability to fulfill their core functions.

University mergers are complex processes driven by multiple motives, including increased efficiency and competitiveness (Savović, 2020; Umbach & Mathies, 2023). Success factors include effective leadership, cultural integration, and communication (Savović, 2020; Leslie et al., 2018). However, mergers often face challenges such as employee resistance and cultural conservatism (Savović, 2020). While mergers may not always lead to financial or staffing efficiencies, they can have a positive impact on university rankings (Umbach & Mathies, 2023). The outcomes of mergers can be evaluated through various dimensions, including teaching, research, and service (Leslie et al., 2018; Eastman & Lang, 2001). Successful mergers are more likely to occur between institutions of different sizes or those with complementary strengths (Savović, 2020). To avoid pitfalls, institutions should prioritize the proper integration of systems and cultures, ensuring effective leadership throughout the process (Leslie et al., 2018). Overall, merger success depends on careful planning and execution, taking into account both organizational and human factors. Ultimately, mergers are not just administrative or financial decisions; they redefine universities' roles, making it crucial to evaluate their outcomes through the lens of academic and societal contributions.

The core functions of universities, teaching, research, and service, form the foundation of higher education institutions' missions and contribute to their long-term sustainability (Boyer, 1990; Olo, Correia, & Rego, 2021; Slade et al., 2022). These functions are interconnected, although service remains less clearly defined compared to teaching and research, despite its growing importance in universities' strategic plans (Abukari, 2009). Emerging trends, including global education services, international research collaboration, economic activities, regional development, and leadership training, are reshaping the role of universities (Jacob & Meek, 2013; Qian et al., 2016; De Wit & Altbach, 2021). With the rapid introduction of new technologies and evolving employment landscapes, it has been suggested that universities should shift their focus from merely teaching practical skills (savoir-faire) to fostering a way of life (savoir-vivre) that prepares students for changing work patterns while also prompting critical reflection on traditional assumptions about employability and the value of a degree (Moscardini et al., 2022). Since mergers fundamentally reshape universities' structures and operations, their success should ultimately be assessed through their influence on these core academic functions.

Synthesizing prior research, the key benefits of successful mergers include enhanced research productivity, expanded academic offerings, and stronger university-industry partnerships (Harman & Harman, 2003; Leslie et al., 2018). In this study, we operationalize these outcomes through indicators such as publication output, collaboration funding, and graduate employment rates, particularly at the undergraduate level, to examine whether these benefits are materializing post-merger at NKUST.

2.4 Constructs for Merger Evaluation

To evaluate the success and impact of university mergers, this study adopts three fundamental institutional functions, teaching, research, and services, as its core evaluative constructs. These functions reflect the traditional missions of higher education institutions and serve as widely accepted benchmarks for institutional performance and development (Boyer, 1990; Olo et al., 2021). Teaching focuses on student enrollment, retention, and post-graduation employability, capturing how well the university meets the educational needs of its students (Tinto, 1993; Hénard & Roseveare, 2012; Slade et al., 2022). Research performance is assessed through outputs such as publications, citations, and international collaborations, reflecting the institution's capacity to generate knowledge and contribute to academic advancement (Altbach & Salmi, 2011). Service, though often less clearly defined, encompasses industry-academia collaboration and societal engagement, highlighting the university's role in applying knowledge to address real-world challenges (Abukari, 2009; Ankrah & AL-Tabbaa, 2015). By grounding the evaluation of the NKUST merger in these three constructs, the study aligns with established frameworks and provides a holistic understanding of institutional transformation.

3. Methodology

This study adopts a single-case study design, focusing on the NKUST as a representative case of an involuntary university merger in Taiwan. A case study approach is suitable for this research due to the complexity, uniqueness, and early-stage nature of the NKUST merger, which allows for an in-depth examination of institutional change over time (Stake, 1995; Yin, 2017). While mergers often lead to organizational disruptions, such as administrative restructuring and cultural integration issues, they can also yield significant benefits, including the consolidation of academic programs, enhanced research capacities, and improved resource allocation (Harman & Harman, 2003; Harman & Harman, 2008; Pinheiro et al., 2016). This study utilizes data from the institutional research database of the case study university, focusing on trends and changes over six years from 2017 to 2022, encompassing teaching, research, and service activities. By adopting a longitudinal approach, it seeks to uncover patterns of adaptation and growth in the aftermath of a merger, providing insights into how universities can strategically align their missions with evolving societal and academic demands (Tight, 2020).

3.1 Research Design

This study aims to evaluate the core functions of universities, which include teaching, research, and service (Boyer, 1990; Slade et al., 2022). It examines the impact of institutional mergers on these functions, highlighting both the disruptions and the potential positive outcomes, such as the enhancement of academic programs and research capacities (Harman and Harman, 2003, 2008). This study draws on secondary data collected at the undergraduate level from NKUST's Institutional Research Office and relevant administrative units. The data cover the period from 2017 to 2022, except for industry-academia collaboration data, which is available starting from 2018. The university administration granted access to these records. All datasets were verified for consistency and completeness before analysis.

The analysis employed descriptive statistics (e.g., mean comparisons, growth rates) and trend analysis to examine changes in key performance indicators before and after the merger. Data were compiled and visualized using Microsoft Excel and IBM SPSS to detect patterns across the six years. Research output

was evaluated using bibliometric indicators, including publication volume, field-weighted citation impact (FWCI), and international co-authorship rates, as obtained from Scopus.

3.1.1 Teaching Performance

To evaluate the performance of teaching functions, this study collects data on three key metrics: the number of new students, freshman retention rates, and the employment status of graduates. These indicators provide valuable insights into a university's effectiveness in attracting, retaining, and preparing students for successful careers.

Enrollment Rate

The enrollment rate is a critical measure of a university's attractiveness and competitiveness. High enrollment rates indicate the institution's ability to meet the diverse needs and expectations of students, including academic programs, campus facilities, and career prospects. According to the OECD (2020), increased enrollment rates often correlate with enhanced institutional reputation and the perceived ability to prepare students for successful futures. Furthermore, robust enrollment figures provide a sustainable revenue stream through tuition, supporting institutional growth and the development of academic and infrastructural resources.

Freshmen Retention Rate

The retention rate, which measures the percentage of students who continue their studies beyond their first year, serves as a vital indicator of student satisfaction, institutional support, and the overall quality of the educational experience. Tinto (1993) emphasizes that strong retention rates reflect the effectiveness of student engagement strategies, such as academic advising, extracurricular activities, and support services. High retention rates also contribute to improved graduation rates, further boosting the university's reputation and standing in global rankings.

Student Employability

The employment rate of graduates is a pivotal indicator of a university's success in preparing students for the workforce. Institutions with high graduate employment rates are more attractive to prospective students and key stakeholders. According to the QS Graduate Employability Rankings (2022), universities that actively facilitate employment opportunities through internships, industry partnerships, and career counseling demonstrate a strong commitment to long-term student success. Additionally, high employment rates enhance a university's reputation on both national and international stages, reinforcing its appeal to future applicants and collaborators.

3.1.2 Research Performance

The performance of research functions is assessed through indicators that measure academic research capability. The performance of research functions is a vital indicator of a university's academic strength, innovation capacity, and global impact. A strong research capacity significantly enhances a university's academic reputation. As noted by Altbach and Salmi (2011), research output and citations are crucial factors in global university rankings, such as the QS World University Rankings and Times Higher Education (THE) rankings. Universities with robust research programs are better positioned to attract top-tier faculty and high-achieving students, further solidifying their status as academic leaders. Assessing this performance involves several key metrics, each of which provides valuable insights into different aspects of research capability and quality.

Number of Publications

The total number of publications reflects the volume of research activity within an institution. A high publication count indicates active engagement in knowledge creation and dissemination across various academic fields. It serves as a foundational metric for evaluating the university's overall research productivity.

Field-Weighted Citation Impact (FWCI)

The FWCI measures the influence and quality of a university's research by comparing its citation rates to global averages within specific disciplines. A high FWCI indicates that the institution's research is frequently cited and influential in advancing knowledge, often exceeding global standards in terms of quality and relevance.

Proportion of Highly Cited Papers

The percentage of highly cited papers is a critical indicator of research excellence. These papers, which represent the top 1% or 10% of most-cited articles globally, demonstrate the university's ability to produce groundbreaking and impactful research that resonates within the academic community.

Proportion of Articles Published in Top-Tier Journals

Publishing in top-tier journals is a hallmark of research quality and prestige. These journals are often highly selective and peer-reviewed, ensuring that only the most rigorous and innovative studies are accepted for publication. A high proportion of publications in such journals reflects the university’s commitment to excellence in research.

Proportion of Internationally Co-Authored Papers

The percentage of papers co-authored with international collaborators underscores the institution's global reach and its capacity to establish networks across borders. This metric underscores the importance of interdisciplinary and cross-cultural collaboration in addressing complex global challenges, enhancing both the visibility and impact of the university's research.

These metrics provide a comprehensive evaluation of a university's research performance. They not only quantify productivity and quality but also highlight the institution’s global influence, reputation, and capacity to drive innovation. By excelling in these indicators, universities can strengthen their position as leaders in knowledge creation and societal advancement.

3.1.3 Service Performance

The performance of service functions in universities is assessed through the capability of industry-academia collaboration, which is measured by two key indicators: the amount of funding for industry-academic cooperation and the number of industry-academic cooperation projects. These collaborations play a pivotal role in translating cutting-edge academic research into practical innovations and technological advancements within the industry.

Academic Cooperation Funding

The amount of academic cooperation funding is a critical indicator of the financial support and resources dedicated to industry-academia collaborations. This funding enables universities to invest in research

initiatives, infrastructure, and technology transfer processes that directly benefit both academic and industrial sectors. Strong financial backing enhances universities' capacity to conduct high-quality, cutting-edge research and implement innovative projects in collaboration with industry partners. Additionally, it facilitates the commercialization of academic research, enabling universities to translate theoretical knowledge into practical applications that have a tangible impact in the real world. Furthermore, significant funding for cooperation strengthens the university's ability to attract top-tier researchers, foster innovation, and expand its research capabilities.

Number of Industry-Academic Cooperation Projects

The number of industry-academic cooperation projects is another vital indicator of the strength and extent of collaborations between universities and industries. A high number of such projects demonstrates the university's active role in fostering partnerships that bridge the gap between academic knowledge and industrial practice. These projects often involve applied research, internships, co-op programs, and joint ventures that provide students with valuable real-world experience and skills aligned with industry needs. Such collaborations enhance the employability of graduates and improve the university's reputation as a career-oriented institution. Moreover, a high volume of cooperation projects indicates a strong network of industry partners and reflects the university's ability to address global challenges.

University-industry collaborations also enable institutions to address pressing societal issues through applied research. For example, partnerships in fields such as renewable energy, healthcare, and digital transformation contribute to solving global challenges, reinforcing the university's role as a leader in societal progress (Ankrah & AL-Tabbaa, 2015).

4. Results

This study aims to evaluate the fundamental functions of universities—teaching, research, and service (Slade et al., 2022). This section examines how institutional mergers impact these functions, exploring both the challenges they pose and the potential benefits, such as the strengthening of academic programs and the expansion of research capabilities (Harman & Harman, 2003, 2008).

4.1 Teaching Performance

To address research objective 2, which explores how the merger has impacted NKUST's core functions of teaching, we analyzed data to capture shifts in enrollment, retention, and employment outcomes, central to evaluating academic continuity and student success.

4.1.1 Enrollment by Home Location

The analysis of student enrollment by home location at NKUST over the past five years is shown in Figure 1. It reveals distinct geographical patterns, with the majority of students originating from the southern region of Taiwan, particularly Kaohsiung City. This aligns with findings in the literature, which indicate that proximity and regional familiarity significantly influence students' choices of higher education institutions (Chen & Zimitat, 2006). The university's location likely plays a pivotal role in attracting students from nearby areas due to logistical convenience, affordability, and familiarity with the local context.

The steady increase in students from the central region suggests that NKUST is gradually broadening its appeal beyond its immediate geographical area. This trend may be attributed to enhanced marketing strategies, academic reputation, or specific program offerings that resonate with students from central Taiwan. Studies have shown that universities can expand their geographical reach by promoting unique

program features and emphasizing career prospects associated with their academic offerings (Hemsley-Brown & Oplatka, 2015). NKUST's growing appeal to students from the central region could indicate the effectiveness of such strategies.

The decline in enrollment from outlying islands, however, warrants attention. Geographic and socioeconomic challenges, including travel costs and limited access to resources, may contribute to this decline, as highlighted by Deil-Amen & Turley (2007). Addressing these challenges through targeted initiatives, such as transportation subsidies, scholarships, or distance learning opportunities, could help mitigate the barriers faced by students from outlying islands.

Additionally, NKUST's reliance on students from the southern region raises concerns about the diversification of its student body. A more geographically diverse student population can foster cross-regional exchange and enhance the university's academic environment, as suggested by Choudaha (2017). To attract students from northern Taiwan and other regions, NKUST may need to adopt strategic initiatives, such as collaboration with high schools in northern Taiwan, the establishment of satellite campuses, or the offering of programs tailored to the interests of students from those areas.

While NKUST has established a strong regional presence in the southern region, efforts to diversify its student base geographically could enhance its institutional profile and long-term sustainability. Addressing the decline in students from outlying islands and implementing targeted recruitment strategies in northern and central regions could support this goal.

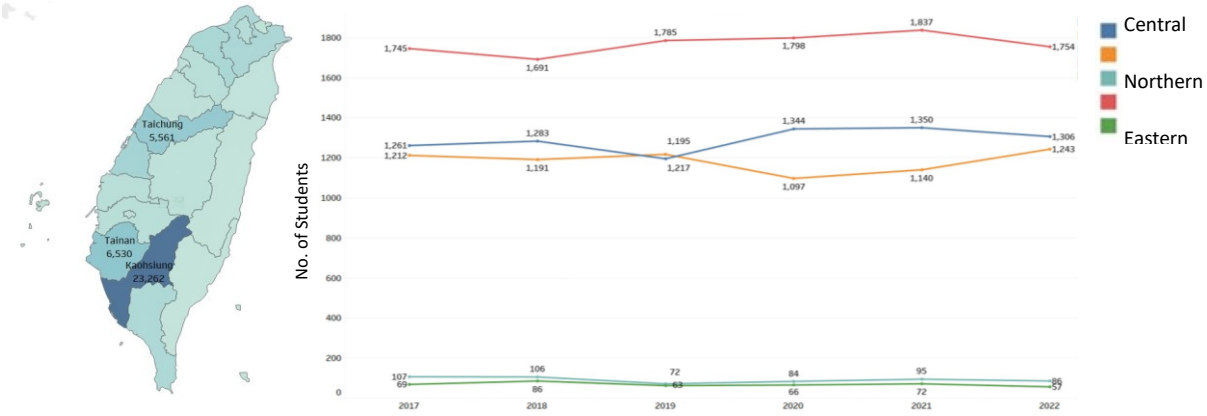

Figure 1. Student Enrollment by Geographical Location in Taiwan

4.1.2 Freshman Retention Rates

The retention rate has become an important indicator for universities over the past five years (Aljahani, 2016; Nieuwoudt & Pedler, 2023). This data not only serves as a key factor in university rankings but also influences high school students' considerations when choosing schools. In the Taiwanese context of higher education, with universities being widely established, almost all high school graduates have access to tertiary education. Consequently, university education has become more accessible to the general population. However, declining birth rates have led many universities to face enrollment challenges.

Table 1. Freshman Retention Rate by Campus

	School Year	2017	2018	2019	2020	2021	2022
Programs	5-Year Junior Colleage	97.06	▲ 99.01	▼ 95.15	▲ 96.72	▼ 96.62	▲ 100.00
	2-Year Technical Program	90.87	▲ 95.48	▼ 91.58	▲ 96.51	▼ 91.67	▼ 80.98
	4-Year Technical Program	96.72	▲ 97.19	▲ 98.47	▼ 97.90	▲ 99.45	▼ 98.56
	Master Program	88.77	▲ 89.89	▲ 90.75	▲ 92.04	▼ 90.00	▼ 84.97
	PhD program	100.00	▼ 93.07	▼ 91.67	▲ 100.00	▼ 94.59	▼ 70.37

Note: Retention rates compared to the previous school year: ▲incline ▬equal to ▼decline

The freshmen retention rates at NKUST, as highlighted in Table 1, demonstrate a strong overall average of 93.54%, suggesting a high level of student satisfaction and institutional effectiveness in meeting students' needs. Retention rates serve as an essential metric for evaluating institutional performance, as they reflect not only the quality of academic offerings but also the adequacy of support services provided to students (Tinto, 2012). The higher retention rates observed in 5-year junior colleges and 4-year technical programs suggest that these programs are particularly well-aligned with student expectations and needs, possibly due to targeted academic support and industry-relevant curricula.

However, the decline in retention rates for the other three programs in 2022 warrants further investigation. Studies have shown that retention rates are influenced by a combination of factors, including student engagement, the availability of academic advising, and campus resources (Reason, 2009). A drop in retention rates may signal challenges in these areas or external factors, such as changes in student demographics or economic conditions, that affect their ability to continue their education. Institutions with high retention rates often excel in providing comprehensive support systems, including mentoring, career counseling, and financial aid, which contribute to students' persistence (Kuh et al., 2005).

Retention is also tied to the balance between academic rigor and support. While academic rigor is necessary to maintain program quality and standards, overly stringent requirements without adequate support can lead to higher dropout rates (Astin, 1999). Suppose the decline in retention rates for specific programs at NKUST is linked to academic challenges. In that case, it may be beneficial to review and potentially enhance academic support measures, such as tutoring services, peer mentorship programs, or study skills workshops, to support students better.

Furthermore, tuition fees and the perceived value of education play a critical role in student retention. As noted by Hossler et al. (2009), students are more likely to remain enrolled if they perceive their educational investment to be worthwhile in terms of academic experience, career readiness, and future opportunities. If retention rates are dropping due to concerns about the return on investment, NKUST could consider implementing strategies to increase transparency regarding career outcomes and the value of its programs.

4.1.3 Student Employability

Student employability data were obtained from the student survey after graduation. Alumni are invited to answer the survey 1 year after they graduate. Respondents were asked to report the length of time it took them to find their first job after graduation. Over the past 5 years, up to 95% of alumni reported finding their first job within six months after graduation.

Table 2. Time of Finding the First Job After Graduation

School Year	2017	2018	2019	2020	2021	2022
Found a job before graduation	30.17%	26.29%	34.49%	34.46%	37.05%	33.27%
within 1 month	26.75%	34.80%	26.14%	28.97%	27.93%	23.85%
1-2 months	16.21%	14.47%	16.27%	15.32%	15.56%	16.27%
2-3 months	9.94%	10.09%	8.47%	7.11%	7.76%	10.80%
3-4 months	5.41%	4.18%	3.43%	3.41%	3.03%	4.48%
4-6 months	4.81%	5.98%	4.50%	7.11%	6.00%	6.87%
6 months above	6.74%	4.20%	6.66%	3.60%	5.96%	4.45%
Survey Return Rate	**75.98%**	**93.46%**	**80.74%**	**80.80%**	**61.70%**	**75.80%**

The findings from the alumni survey are presented in Table 2. Notably, 95% of respondents secured their first job within six months of graduation, which is consistent with broader trends observed in graduate employability research. Various studies have shown that the time it takes graduates to find employment is a crucial indicator of the effectiveness of academic programs and their alignment with labor market needs. According to Harvey (2001), early employment outcomes are often linked to the relevance and quality of the education provided, as well as the employability skills imparted to students.

Additionally, the finding aligns with the concept of 'employability capital' (Yorke, 2006), which emphasizes the importance of personal, academic, and professional development throughout a student's academic journey in securing employment in a timely manner. The high percentage of alumni reporting early job acquisition may be reflective of the institution's effective career services and strong industry connections developed during and after the students' studies. It is also important to consider external factors, such as economic conditions, that may influence employment rates for recent graduates.

Moreover, the data from the 1-year post-graduation survey provides insight into the impact of early career experiences on long-term employability. As noted by Tomlinson (2017), the first job is often critical in shaping career trajectories and earning potential. The quick transition into the workforce observed in this study may be indicative of the strong employability preparation within the university's curricula and support systems, which should be further explored through longitudinal studies to understand long-term career development patterns.

4.2 Research Performance - Academic research capability of NKUST

This section addresses research objective 3 by evaluating NKUST's academic research capability through an analysis of its research publications from 2017 to 2022. In particular, the post-merger trends in publication output, citation impact, and international collaboration offer valuable insights into the institution's research performance and the effects of structural changes following the 2018 merger. The results, as presented in Table 3, highlight an initial decline in research performance indicators following the merger, a phenomenon commonly observed during institutional transitions. This decline can be explained by the "institutional shock" theory, which posits that mergers or reorganizations often lead to temporary disruptions in productivity as institutions adjust to new structures and systems (Bower & Doz, 2018).

Interestingly, while there was a drop in most research metrics in 2018, key indicators such as the Field-Weighted Citation Impact and the proportion of international collaboration papers showed resilience. This suggests that the quality of research, especially in terms of global impact and cross-border cooperation, remained strong even during the transition period. According to Aksnes and Sivertsen (2019), international collaborations are a significant driver of high-impact research, and this trend may have helped NKUST maintain visibility and influence in the global academic community despite the merger-induced setbacks.

Furthermore, the steady growth observed in research performance indicators post-merger, particularly the rebound in publication numbers by 2021, is an encouraging sign of recovery and adaptation. This aligns with research on institutional mergers, which often show a period of adaptation followed by eventual growth in output once faculty and resources are fully integrated (Fang, 2014). The continued increase in publications into 2022, despite the slower pace, indicates that NKUST has regained its research momentum, potentially benefiting from the synergies of the merger, such as pooling resources and expertise.

The slight decline in performance within the Top 10% Journal Percentiles by CiteScore in 2022 could be indicative of a longer-term trend where initial improvements in publication quantity eventually require more focused efforts on quality. This could be attributed to shifts in academic priorities or challenges in sustaining the earlier momentum, as noted in studies on post-merger performance (Mårtensson et al., 2014).

NKUST's ongoing revision of "Teacher Research Publication Incentives" reflects a proactive strategy to address this challenge. As suggested by Morrow et al. (2020), faculty incentives play a critical role in driving the quality of academic output, particularly in high-impact journals. By continuously adapting these incentives, NKUST can better align faculty motivations with institutional research goals, ensuring sustained progress in both the quantity and quality of publications.

Table 3. Academic research capability of NKUST

School Year	2017	2018	2019	2020	2021	2022
Numbers of Papers	872	▼ 725	▲ 799	▲ 847	▲ 977	▲ 1034
Field-Weighted Citation Impact	0.71	▲ 0.73	▲ 0.87	▲ 0.96	▲ 1.09	▲ 1.25
Output in Top 10% Citation Percentiles (%)	7.7	▼ 6.3	▲ 8.3	▲ 11.2	▲ 12.6	▲ 13.2
Publications in Top 10% Journal Percentiles by CiteScore percentile (%)	26.6	▼ 21.3	▲ 23.0	▲ 26.7	▲ 28.7	▼ 28.6
International collaboration (%)	18.9	▲ 23.6	▲ 25.5	▲ 30.7	▲ 31.9	▲ 36.5

4.3 Service Performance - Industry-Academia Collaboration capability of NKUST

This section addresses research objective 4 by assessing NKUST's service performance, specifically its industry-academia collaboration capability, through an analysis of trends in collaborative project numbers and funding levels following the merger. Since the merger, NKUST has established the Industry-Academia Operations Office as the primary unit responsible for promoting sustainable development through university-industry collaboration. This office oversees initiatives such as industry-academia cooperation, intellectual property management, industrial incubation, and other related matters.

Additionally, NKUST has created a platform for industry-academia matching and technical cooperation exchange services, maintaining a comprehensive database of faculty expertise and technical research. This resource allows companies to quickly understand NKUST's capabilities and faculty research fields, facilitating product technology upgrades and development. Consequently, it enhances the university's industry-academia research projects, patent transfers, and overall cooperation capacity. This platform also helps match faculty research achievements with industry needs, facilitating commercialization, fostering startups, and forming strategic, sustainable alliances to establish a seamless service chain from research to industry collaboration.

The data presented in Table 4 on industry-academia collaboration at NKUST from 2018 to 2022 underscores a significant positive trend in both the quantity and funding of collaboration projects. This growth, particularly the 68.5% increase in total collaboration funds from 2018 to 2022, suggests a successful expansion of ties between the university and its industry partners. Several studies on industry-academia collaboration provide context to this trend, highlighting the growing recognition of the mutual benefits such collaborations offer.

According to Perkmann et al. (2013), collaboration between universities and industries has become a critical strategy for fostering innovation and enhancing knowledge transfer. The increase in collaboration cases and funds at NKUST is consistent with the broader global shift toward closer academic-industrial partnerships, which are often seen as a mechanism for translating academic research into real-world applications. The financial growth observed may be reflective of the university's growing reputation and capacity to secure funding for collaborative projects, which aligns with studies showing a positive correlation between university research output and industry partnerships (Crespi et al., 2015).

The increasing number of participating teachers and the higher average collaboration amounts per teacher further reinforce the institutional commitment to fostering research with practical industrial relevance. The growing involvement of faculty members in these collaborations is likely a result of institutional policies and incentives designed to encourage academic-industry engagement. As suggested by Sykes et al. (2015), faculty participation in industry-academia partnerships is crucial to the success of these collaborations, often leading to enhanced academic productivity and innovation outcomes.

The integration of industry-academia resources post-merger also highlights the importance of organizational restructuring in enhancing research partnerships. Mergers in higher education institutions are often associated with the pooling of resources and expertise, which can lead to greater capacity for securing industry funding and expanding the scope of collaborations (Harrison & Wicks, 2019). The significant increase in collaboration funds post-merger at NKUST could, therefore, be seen as an outcome of the strategic advantages gained through the merger, such as increased research visibility and a broader network of industry contacts.

Table 4. Industry-Academia Collaboration Capability of NKUST

Year	2018	2019	2020	2021	2022
Industry-Academia Collaboration Projects	633	623	701	714	672
Industry-Academia Collaboration Amount (NTD)	726,667,430	826,006,282	955,600,559	1,393,928,926	1,185,033,006
Number of Teachers Involved in Industry-Academia Collaboration	266	251	263	252	232
Average Number of Projects per Teacher	2.4	2.5	2.7	2.8	2.9
Average Amount per Teacher (NTD)	2,731,832	3,290,862	3,633,462	5,531,464	5,107,901

5. Discussion

This study evaluated the impact of Taiwan's first involuntary university merger by analyzing primarily undergraduate-level trends in teaching, research, and service at the NKUST. The results reveal that while the merger preserved continuity in student demographics—largely concentrated in southern Taiwan—it also introduced new challenges in enrollment strategies, academic restructuring, and long-term institutional positioning.

Skodvin (1999) emphasizes that geographical proximity is a critical factor in the success of university mergers, as demonstrated by international case studies. Consistent with this observation, NKUST's campuses continue to attract a majority of students from southern Taiwan, maintaining a similar demographic composition. However, this overlap in student sources has created challenges in admissions and recruitment strategies.

In 2018, the first full academic year following the merger, no significant changes were made to the colleges or academic departments, and student demographics remained stable. By 2019, restructuring efforts within colleges and departments led to a noticeable decline in the minimum required entrance exam scores for referral admissions. This trend could potentially impact the university's ranking and reputation, emphasizing the need for strategic planning in academic and enrollment policies.

Institutional mergers often promise long-term benefits, such as increased resources and competitiveness, but they require time for stabilization. Harman, Beswick, and Schofield (1985) found that Australian university mergers typically take between one and five years to integrate fully. Similarly, NKUST's merger is still in its early stages, making it premature to assess its ultimate success. The current study provides only a preliminary comparison of student enrollment data before and shortly after the merger, necessitating further longitudinal analysis to provide a more comprehensive understanding.

In response to Research Objective 5, which explores the implications of the merger for future policy and practice, the findings suggest that while initial disruptions are inevitable, a phased approach to integration supported by stable governance, inclusive faculty engagement, and continuous monitoring is crucial for long-term merger success. The case of NKUST offers insights into both the risks and opportunities that accompany large-scale institutional consolidation in higher education, particularly when such initiatives are driven by government policy rather than voluntary cooperation.

The literature suggests that voluntary mergers tend to yield better outcomes compared to those imposed from above (Skodvin, 1999). While the merger discussions among the three Taiwanese universities involved some level of deliberation, the final decision was imposed top-down by the Ministry of Education (MOE). This marks Taiwan's first involuntary university merger, further complicated by a short preparation period. This unique context presents additional challenges in achieving smooth integration and long-term success.

Internationalization in higher education is inherently complex, shaped by a combination of political, economic, socio-cultural, and academic factors. Although this article does not deeply explore the relationship between university rankings and internationalization, it highlights the critical role of faculty in advancing this agenda. Faculty are particularly important in implementing English-Medium Instruction (EMI) policies, which have a direct impact on educational outcomes (Macaro et al., 2018).

Countries such as Japan and South Korea have expanded EMI offerings and actively attracted international students, shifting from unidirectional student outflows to bidirectional mobility (Csizmazia, 2019; Yonezawa, 2020). In contrast, Taiwan faces challenges including a shortage of EMI-qualified faculty and high turnover rates, which add strain to administrative systems (Galloway et al., 2020). Key issues include insufficient support for faculty teaching EMI courses and instability in faculty composition, leading to limited progress in this area.

5.1 Limitations and recommendations for future research

Several limitations must be acknowledged. First, the study relies primarily on secondary data from internal databases, which may not fully capture qualitative aspects such as staff morale, cultural integration, or inter-campus collaboration. Second, the absence of a control institution limits external comparison. Third, the time frame (2017–2022) provides only short- to medium-term insights, making it premature to conclude long-term outcomes. Furthermore, the study focuses primarily on undergraduate-level data, which may not represent the full spectrum of institutional change affecting graduate education, continuing education, or internationalization efforts.

Given that NKUST is in the early stages of its merger, more comprehensive data collection is essential to evaluate its impact across academic, administrative, and student-related dimensions. A longitudinal study tracking the merger's progress over an extended period would provide valuable insights into the key factors influencing the success or failure of higher education mergers. Such an approach would contribute to a deeper understanding of merger dynamics and offer lessons for similar initiatives in the future.

To build on this preliminary analysis, future studies should incorporate longitudinal data beyond 2022 and include multi-level qualitative assessments involving faculty, staff, and students. Mixed-method approaches would be particularly valuable in capturing the lived experiences and organizational culture shifts post-

merger. Further research should also explore the effects of top-down policy design on institutional autonomy and innovation in merged universities. Lastly, comparative studies across regions or systems with different governance models (e.g., voluntary vs. mandated mergers) would offer broader insights into the conditions for successful integration.

5.2 Conclusion

From a teaching perspective, early indicators show a temporary decline in admissions thresholds and enrollment competitiveness following departmental restructuring in 2019. This highlights the importance of proactive academic planning and quality assurance during transition periods. On the research front, the merger has led to a gradual increase in publication output and international collaboration, indicating a consolidation of research capacity. Following the merger, NKUST established the Industry-Academia Operations Office, laying a structural foundation for strengthening external engagement and sustainability through industry partnerships. This case illustrates that institutional mergers in higher education must strike a balance between structural efficiency, academic integrity, and regional relevance. Strategic communication, faculty development (especially in EMI readiness), and student support are essential components of a successful transition. Additionally, merger outcomes should be evaluated not solely by output metrics, but also by institutional identity, cohesion, and stakeholder alignment.

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Institutional Age, Size, Ownership and Ratings: An Empirical Study of Indian Higher Education Institutions

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ABSTRACT

Multiple factors influence the ratings of educational institutions, yet limited research has examined how structural institutional characteristics relate to these ratings, particularly in emerging economies. This study examines whether institutional ratings differ between government-run and privately managed engineering institutes, and whether campus size and institutional age are significant predictors of these ratings. Understanding these relationships is important for institutions seeking to enhance their perceived quality and for students making informed choices. To ground the inquiry, we conducted a preliminary research audit through interviews with two engineering aspirants and one industry expert, which revealed strong perceptions about the role of ownership, infrastructure, and legacy in shaping ratings. We then analysed secondary data from Career360.com, covering 299 engineering institutes across India. Using one-way ANOVA, we tested whether ownership is associated with significant differences in ratings. Regression analysis was employed to assess the predictive influence of campus size and institutional age. The results indicate that ratings do not significantly differ between government and private institutions, despite prevailing assumptions to the contrary. However, both campus size and institutional age significantly predict institutional ratings. These findings contribute to the literature on higher education rankings in the Indian context and offer actionable insights for academic administrators, policymakers, and prospective students. Future studies can extend this work by incorporating additional institutional and performance-related variables across disciplines and over time.

Keywords: Rankings, Institutional factors, Ownership, Campus size, Institutional age

1. Introduction

"*Education is the best friend. An educated person is respected everywhere. Education beats the beauty and the youth*." - Chanakya.

Education has long been regarded as a fundamental pillar of societal progress. The above quote by Chanakya, an ancient Indian philosopher and strategist, encapsulates the transformative power of education. A strong education system not only fosters intellectual growth but also serves as the foundation for a nation's economic and social development. (Tvaronavičienė et al., 2017). As technology advances at an unprecedented pace, education has undergone remarkable transformations, with new methodologies, disciplines, and evaluation systems shaping how knowledge is imparted. Across the globe, governments and educational institutions are working to make education more accessible, recognizing its critical role in equipping individuals with the skills necessary for personal and professional growth. A well-developed education sector yields both micro-level (individual growth) and macro-level (national development) benefits, reinforcing the idea that education is truly the best friend of humankind. As education systems evolve to meet modern challenges, the ways in which institutions are assessed and compared, particularly through global and national ranking systems, have gained increasing prominence, shaping both perception and policy in higher education.

In recent years, institutional rankings have emerged as a key force shaping the higher education landscape, influencing how universities position themselves, how students and parents make decisions, and how governments and academic bodies allocate resources (S. Arupiciute & Druteikiene, 2019). Rankings are no longer merely performance indicators but strategic tools, with many universities, especially those in the top tiers, integrating them into their planning processes. This is particularly true in the domain of STEM education, where rankings have driven institutions to emphasize interdisciplinary learning, 21st-century skills, and international competitiveness (Hawkins et al., 2018; Rodionov et al., 2014). Despite their growing significance, the underlying institutional factors that shape these rankings remain insufficiently understood, especially in emerging economies.

India, as one of the world's largest producers of STEM graduates and a recognized global hub for technical education, offers a compelling setting to examine these dynamics. Engineering education, in particular, holds a dominant position in the Indian academic landscape, with approximately 1.5 million engineering graduates produced annually (The Times of India, 2020). However, little empirical research has explored how institutional characteristics such as campus size and age influence the rankings of engineering institutions (Fauzi et al., 2020). This lack of clarity may perpetuate assumptions such as the presumed superiority of private institutions or the importance of infrastructure without robust evidence. As rankings continue to shape institutional reputation, student choices, and policy direction, it becomes crucial to understand how these structural factors interact with perceptions and outcomes in the Indian engineering education context. Given the centrality of engineering education, it is essential to understand the factors that shape how these institutions are perceived and evaluated, particularly through institutional rankings, which serve as a key reference point for various stakeholders.

Institutional rankings play a crucial role in shaping student decisions, institutional reputation, and policy interventions in higher education (Soysal et al., 2024). However, the determinants of these rankings remain unclear, particularly in emerging economies like India, where higher education structures differ significantly from Western contexts (Johnes et al., 2022). Existing research primarily focuses on faculty quality, research output, and funding. Still, the impact of institutional characteristics such as ownership (public vs. private), campus size, and institutional age on rankings has not been empirically examined (Buckner & Zapp, 2021; Valmorbida & Ensslin, 2017; Vernon et al., 2018). This lack of clarity leads to misconceptions among students and institutional leaders regarding what truly influences rankings. Understanding these institutional factors is essential for both prospective students making enrolment decisions and administrators striving to enhance institutional reputation. Thus, this study aims to address this gap by empirically analyzing how these three institutional factors impact ratings in Indian engineering education.

The problem is critical because institutional rankings significantly influence student decision-making processes, institutional reputation, and resource allocation (Dowling-Hetherington, 2020; Sułkowski et al., 2020); however, the underlying determinants of these rankings remain unclear. Students and policymakers often assume that private institutions inherently perform better in rankings due to perceived advantages in resources, infrastructure, and marketing (Gupta & Kumar, 2020). This study challenges the assumption and seeks to uncover whether there is a significant difference between the ratings of government-run and private institutes, and whether institutional age and campus size are significant predictors of ratings, thereby providing a clearer picture of how these factors influence perceptions and rankings in India's engineering education sector.

The primary objective of this study is to examine the impact of institutional factors, i.e., campus size and institutional age, on the ratings of engineering institutes in India. Specifically, this study aims to empirically test whether private institutes' rating significantly differs from that of government-run institutes, determine whether campus size contributes to higher institutional ratings as a signal of infrastructure and resource availability, assess whether institutional age affects rankings given its role in reputation-building and legitimacy, and compare student perceptions with empirical findings to uncover possible misconceptions regarding ranking determinants (Fauzi et al., 2020). To achieve these objectives, the study employs a mixed-method approach: a preliminary research problem audit involving interviews with engineering aspirants and an industry expert to capture perception-based insights, followed by a quantitative analysis of secondary data from Career360.com covering 299 engineering institutions, using ANOVA and regression analysis to test the formulated hypotheses.

This study aims to fill three significant gaps in the existing literature: First, the gap in empirical research on institutional factors in India, as while numerous studies focus on faculty quality, research output, and financial resources (Gupta et al., 2025; N.K. et al., 2018; Nassa et al., 2023; Thomas, 2025), however the impact of institutional characteristics such as age and campus size on rankings has not been extensively studied in the context of Indian engineering institutions. Second, the gap in understanding the public versus private debate remains, as there is limited empirical research testing whether public or private institutes in India have different ratings (Jaiswal, 2019; Sharma & Sharma, 2022). Third, the gap in understanding the relative importance of infrastructural factors, such as campus size and institutional age, is often presumed to influence rankings; however, there is limited scholarly work that compares how these factors specifically impact

institutional ratings in India (Kumar et al., 2022). By addressing these gaps, this study contributes to a more nuanced understanding of the structural determinants of institutional rankings in Indian engineering education, offering evidence-based insights for students, policymakers, and institutional leaders.

2. Motivation for the study

Our experience in the education sector has provided us with valuable opportunities to interact with a diverse range of stakeholders, including students, educators, and parents. Through these interactions, we developed a keen interest in understanding how aspirants perceive academic institutions and the factors that shape these perceptions. One of the most striking observations was that, despite the availability of multiple institutional rating agencies, students often rely on personal perceptions and anecdotal information rather than objective comparative ratings when making critical career decisions. This raised a fundamental question: How accurately do these perceptions align with empirical data on institutional ratings?

Higher education rankings play a pivotal role in shaping the reputation of institutions and guiding student choices. In India, where engineering remains one of the most sought-after career paths, the decision-making process for students and parents is often influenced by institutional ratings (Srivastava & Dhamija, 2022). However, the factors contributing to these ratings remain ambiguous. While students and parents tend to associate high rankings with private ownership, modern infrastructure, and perceived reputation, it remains unclear which institutional characteristics actually impact these ratings (Thomas, 2025). This study is motivated by the need to critically examine these perceptions and empirically evaluate the institutional factors that influence the ratings of engineering institutes in India.

To gain deeper insights into this issue, we conducted a preliminary research audit by interviewing two engineering aspirants and one industry expert. Their responses revealed a set of common beliefs regarding how institutional characteristics impact rankings. Notably, students perceived that privately owned institutions generally receive higher ratings than government-run institutions. At the same time, factors such as campus size and institutional age were believed to play a crucial role in determining rankings. Interestingly, the industry expert highlighted that while older institutions tend to have stronger reputations and better industry connections, ownership itself may not be a decisive factor in rating outcomes. These insights further strengthened our motivation to explore whether these widely held perceptions are supported by empirical evidence.

Based on our motivation to bridge this perception-reality gap, we formulated the following research questions to guide our investigation:

> **RQ1:** Are the ratings of government-run and privately owned engineering institutes significantly different?
>
> **RQ2:** What is the impact of institutional factors such as age and campus size on the ratings of engineering institutes in India?

This study aims to address an existing research gap by providing empirical evidence on how institutional characteristics influence rankings in the Indian engineering education sector. By integrating student perceptions with objective data analysis, we seek to contribute to the ongoing

discourse on higher education rankings and their underlying determinants. The findings of this study will provide valuable insights for students, academic institutions, and policymakers, enabling them to make more informed decisions about higher education institutions and their ranking methodologies.

3. Literature Background and Hypotheses Building

This article draws on multiple theoretical perspectives to understand how institutional characteristics influence institutional ratings in higher education, with a particular focus on engineering institutes in India. The primary framework guiding this study is **Institutional Theory**, which explains how organizational structures and practices are shaped by external regulatory environments, cultural norms, and social expectations (Scott, 2001; Meyer & Rowan, 1977; DiMaggio & Powell, 1983). Within this framework, organizations seek legitimacy through three main mechanisms:

1. **Regulative Pressures (Coercive Isomorphism):** Institutions conform to rules, laws, and accreditation requirements to gain legitimacy, especially government-run colleges that must align with state regulations (Scott, 2008).
2. **Normative Pressures (Normative Isomorphism):** Institutions adopt practices aligned with professional norms, such as hiring qualified faculty and focusing on research, to gain credibility in academic circles (DiMaggio & Powell, 1983).
3. **Cultural-Cognitive Pressures (Mimetic Isomorphism):** Institutions imitate more successful peers, such as expanding campuses or emulating ranking-focused strategies to remain competitive in a legitimizing field.

In addition, the study incorporates Signaling Theory**,** which suggests that institutions use observable attributes, such as campus size and age, as cues to signal quality and credibility to external stakeholders (Spence, 1973). For instance, older institutions or those with large campuses may be perceived as more stable, better resourced, or prestigious.

To further enhance the theoretical foundation, the study integrates Path Dependency Theory**,** which posits that early institutional advantages (e.g., funding, historical recognition, policy alignment) create trajectories that reinforce long-term status and outcomes (Pierson, 2000). Older institutions often benefit from accumulated legitimacy, extensive alumni networks, and favourable government relations, making them more likely to be perceived positively in rating systems.

Lastly, drawing from the Resource-Based View (RBV) (Barney, 1991), we treat campus size and institutional age as strategic resources that are valuable, rare, and inimitable. These resources can enhance an institution's ability to achieve competitive advantage through better visibility, reputation, and student perception, all of which influence ratings.

Through this multi-theoretical lens, Institutional Theory, Signalling Theory, Path Dependency Theory, and RBV, this study theorizes and tests the influence of three institutional characteristics: ownership, campus size**,** and institutional age, on institutional ratings.

3.1. STEM Instruction and Institutional Attributes

Growing attention to STEM (Science, Technology, Engineering, and Mathematics) education has led to a significant allocation of financial resources to educational institutions worldwide. STEM is not just about training students in technical areas; it involves developing the ability to solve problems, innovate, and work beyond disciplinary boundaries, shaping people who are qualified for today's workforce (Shaughnessy, 2013; California Department of Education, 2014). In developing countries such as India, STEM education is recognized as crucial for economic growth, technological advancement, and industrial competitiveness (Kennedy & Odell, 2014).

Unfortunately, there is scant research available on how institutional traits impact the rankings of STEM education, specifically in the context of India. Although other studies have focused on faculty quality, facilities, and research productivity, structural factors such as campus size and institutional age have received little attention, and there is a lack of empirical research on the relationship between campus size, in particular, and rankings. Because students and parents often use rankings to make enrollment decisions, it is essential to determine whether apparent ranking criteria align with the actual rating stimuli.

This research gap is what this analysis aims to address by examining the impact of institutional characteristics, including campus size and institutional age, on the ratings of engineering institutes. In doing so, it contributes to the flow of literature addressing education rankings and offers empirically based insights into the choice criteria of engineering applicants.

3.2. Influence of Institutional Aspects in Schools

Instructional factors have been extensively researched in the educational sector; however, there has been very little research on their influence on institutional rankings. Previous studies have been conducted on different institutional factors that influence students' learning outcomes and institutional performance such as: faculty: student ratio: and teaching quality (which have a significant effect on student performance; Bassi,2001; Rivera-Batiz & Marti, 1995;) institutional culture, leadership, and policy (affects faculty motivation and over-all academic performance; Ismail, 2024); infrastructure: library facilities: and tech; no logical resources (enhances student engagement, and academic outcomes; Mishra et al., 2021; Aboobaker& KA, 2021). Although these studies offer valuable insights, they overlook the impact of institutional characteristics, such as campus size and the institution's age, on institutional rankings. In addition, the existing literature is predominantly dominated by Western educational systems, which presents a challenge to generalizing the results to Indian higher education institutions.

The existence of this literature gap provides impetus for our study on the impact of institutional factors on the rankings of engineering institutes in India. Specifically, we examine the impact of campus size and institutional age on the institutional score.

3.3. Institutional Classifications and Determinants

Academic ranking has been widely explored in the Western world, particularly in the United States (e.g., Arzt, 2018; Duggan, 2009; Walker II, 2016). These efforts highlight the fact that institutional

reputation, faculty qualifications, research productivity, and funding sources have a significant influence on rankings (Meredith, 2004). Yet little is known about whether these factors are also important in countries of the global South, such as India. Furthermore, there is often a debate between the public and private. Private ownership in the context of rankings conversations. Chirikov (2023) believes that private institutions have a good faculty enrollment and better resources. Klemenčič and Zgaga (2014) argue that government institutions have regulatory assistance and institutional heritage. These contrasting views highlight the need for empirical validation to determine whether there is a significant difference between the ratings of public and private institutions.

In the same vein, although infrastructure and campus facilities have been considered distinctive factors for institutions (Hajrasouliha, 2017), their specific impact on institutional rankings remains unclear. The relationship between (large) size and prestige is often taken for granted, even though this may not hold for the market for Indian education. Institutional age, third, is associated with strength and repose in academia. Older institutions tend to be well-connected to industry, have qualified faculty, and a strong networking base among their alumni, all of which could lead to higher rankings (Dextre-Chacón et al., 2021). Yet, its association has not been empirically tested in the context of Indian engineering education.

3.4. Implications for (Others)Applying Theory to Institutional Concepts

3.4.1. Institutional Ownership and External Legitimacy

Ownership (governmental vs. private) is an institutional feature that determines the level of public scrutiny, financial support, and operational autonomy afforded to the sponsor. Public institutions are more likely to be affected by a range of official pricing and other policies than private ones, which modify their pricing and trade practices in pursuit of competitive student recruitment and prestige (Andrabi et al., 2017). According to Institutional Theory, public institutions gain legitimacy from state support, whereas private institutions must build their legitimacy through branding, partnerships, and student engagement activities (Klemenčič & Zgaga, 2014).

Both public and private organizations must adhere to accreditation standards and educational goals, from a regulatory and normative standpoint. However, their tactical reactions to these pressures are not identical, which could leave rankings by institutional ownership prone to variation. We examine whether rankings differ based on ownership or if other organizational forces are more operative.

3.4.2 Campus and Institutional Size and Prestige

Institutional Theory places significance on mimetic isomorphism, which refers to the mimicry of strategies by successful peers for legitimization. 23 In the sector of higher education, larger campuses with developed infrastructure and modern facilities are also considered a sign of institutional prestige and quality (Hajrasouliha, 2017). Extensive amounts of campus space, research facilities, and student amenities are often associated with higher institutional rankings, as these facilities attract students, faculty, and funding (Wilkins et al., 2024).

From an institutional legitimacy perspective, as well as with the support of Signaling Theory, the size of the campus is viewed as a measure of stability, resource availability, and institutional assurance of a high-quality education. However, the question of whether the size of the campus has a direct influence on ratings remains empirically open, especially in the context of developing countries such as India, where the allocation of resources and policies for land procurement varies widely among institutions.

3.4.3 **Institutional age and reputation:**

Institutions established relatively longer ago are generally more reputable and credible due to their long-standing histories, established networks, and academic traditions (Dextre-Chacón et al., 2021). Institutional Theory predicts that age confers depth to organizational norms and culture, industry connections, and alumni networks, which, when combined, bolster rankings and sustained visibility (Vernon et al., 2018).

From an institutional legitimacy perspective, as historic entities, old academic institutions enjoy historical prestige, regulatory stability, and intellectual capital. Some of the best universities in the world are also among the oldest, so it's difficult for these elements not to be intertwined; this is a case where an aged institution seems especially scholarly. However, if this is the case in Indian engineering education, it raises a question that remains unaddressed.

3.4.4 **Institutional Theory Lens**

Enriched with Institutional Theory, we offer a theoretical explanation of how institutional features influence the formation of rankings. The theory also contributes to our understanding of why ownership differences may or may not be related to various ranking differences (as a function of external regulatory legitimacy), the extent to which campus size may function as a form of legitimacy sign among members of a highly competitive education market, and the extent to which school age may explain reputational advantages and variations in the relative position of the institutions in rankings. The constructs are also theoretically justified based on signaling theory and RBV, which jointly provide theoretical support for the presumed relationships.

It is this that we wish to empirically examine in the case of India – whether what we can infer about the nature of these organizations from theory, norms and comparative experience, is in fact reflected in the Indian higher education landscape.

4. Hypotheses Development

4.1. Institutional factors of ownership and ratings

Higher education institutions operate in an increasingly competitive environment where rankings influence institutional visibility, student preferences, and policy decisions. In India, the dichotomy between public and private engineering institutions is particularly pronounced, given the significant differences in governance, funding structures, and operational autonomy. Institutional ownership is a foundational attribute that shapes institutional strategy and perception. Public institutions are typically state-funded, follow regulatory oversight, and enjoy historical legitimacy

and policy alignment. In contrast, private institutions are driven by market forces and rely heavily on tuition, partnerships, and branding to maintain competitiveness (Klemenčič & Zgaga, 2014).

Institutional Theory suggests that both public and private institutions seek legitimacy, albeit through different mechanisms. Public institutions align with government mandates and long-term reputational capital, whereas private institutions emphasize innovation, responsiveness, and efficiency to gain stakeholder trust (Scott, 2008; DiMaggio & Powell, 1983). For instance, private institutions may have greater flexibility in recruiting faculty, designing curricula, and developing infrastructure, which can be reflected in their public ratings (Chirikov, 2023). On the other hand, the historic prestige and stable funding of public institutions (Andrabi et al., 2017) may enhance their perceived credibility.

Although previous studies have produced mixed evidence regarding ownership and rankings, these differences in institutional pathways and legitimacy suggest that government-run institutes and private institutes may have significant differences in their ratings. Therefore, this study posits the following hypothesis:

H1*: There is a significant difference in the ratings of government-run and private-run academic engineering institutions.*

4.2. Institutional factor of campus size and rating

Campus size is more than a spatial attribute—it reflects institutional capacity, investment in infrastructure, and the ability to offer a comprehensive academic experience. Larger campuses typically feature advanced laboratories, libraries, sports complexes, and student services, all of which contribute to a holistic learning environment (Hajrasouliha, 2017). Such features are not only valued by students but are also used as tangible indicators of institutional strength in public evaluations and rankings.

Drawing on Institutional Theory, campus expansion can be seen as a visible signal of legitimacy and growth, particularly in contexts where physical infrastructure is closely tied to educational quality. Moreover, the process of mimetic isomorphism suggests that institutions often emulate prestigious universities by investing in large campuses and modern facilities to appear more credible and resourceful (DiMaggio & Powell, 1983). While few studies have directly tested the influence of campus size on institutional ratings, research suggests that infrastructure plays a critical role in shaping perceptions and may serve as a proxy for institutional commitment to quality (Wilkins et al., 2024).

In the context of Indian engineering education, where visible infrastructure heavily influences public opinion and student decision-making, it is plausible that campus size plays a role in shaping institutional ratings. Hence, we hypothesize:

> *H2: The Institutional factor of campus size has a significant impact on the rating of the academic institutions.*

4.3. Institutional factor of age and ratings

Institutional age is a critical determinant of how academic institutions are perceived and evaluated. Older institutions typically possess a deeper academic legacy, long-standing faculty bodies, stronger alumni networks, and sustained industry or policy relationships all of which contribute to their symbolic capital and institutional legitimacy (Dextre-Chacón et al., 2021; Vernon et al., 2018). These characteristics are often perceived by stakeholders as proxies for quality and trustworthiness, resulting in more favorable ratings.

Institutional Legitimacy Theory (Meyer & Rowan, 1977) posits that institutions accumulate legitimacy over time by maintaining continuity, aligning with established norms, and integrating themselves within existing regulatory structures. Path Dependency Theory (Pierson, 2000) further explains how these early-established advantages, such as public trust, policy support, and reputation, tend to reinforce themselves over time, creating a self-sustaining cycle of prestige and recognition. In the context of rankings, older institutions may have already established reputational capital, giving them a structural advantage over newer entrants.

Complementing this, Signaling Theory suggests that institutional age itself can act as a signal of quality and reliability. Stakeholders, including students, parents, and industry experts, may interpret longevity as a sign of stability and consistent academic performance. Although newer institutions may attempt to compensate through modern infrastructure and innovative teaching, these signals may not be as influential as the historical reputation that older institutions carry.

Given these theoretical perspectives and empirical indications, institutional age is expected to have a significant and positive association with how engineering institutes are rated. Therefore, we hypothesize:

> *H3: The Institutional factor of the age of the institute has a significant impact on the rating of the academic institutions.*

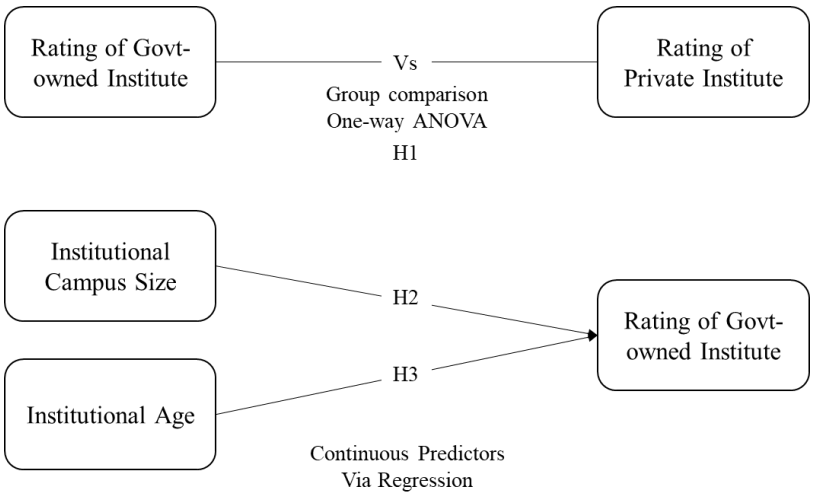

Figure 1: Proposed research model

5. Research Methodology

5.1. Research context

This study aims to examine how institutional characteristics, specifically campus size and institutional age, influence the ratings of engineering institutions in India. Additionally, the study investigates whether there is a significant difference in ratings between government-run and privately managed institutions, reflecting commonly held perceptions about ownership and institutional quality. Given the complexity of these relationships, a quantitative approach was employed to analyse the data and provide systematic empirical clarity.

A secondary dataset was selected to ensure objective, large-scale, and diverse representation across institutions. India offers a particularly relevant context for this inquiry, as it is home to one of the world's largest higher education ecosystems, with over 5,900 engineering institutions offering a broad spectrum of academic programs (Jain, 2022). Unlike Western systems, where rankings are typically influenced by metrics such as research output and faculty credentials, institutional ratings in India are shaped by a combination of factors, including infrastructure, legacy, and public perception. Despite the significance of rankings in guiding student choices and institutional strategy, there has been limited empirical research on how specific institutional attributes shape these outcomes within the Indian context.

To address this gap, the present study focuses on engineering institutions due to their central role in India's STEM education landscape. The research design is guided by three core questions: (1) Do institutional ratings significantly differ between public and private institutions? (2) Does campus size predict higher institutional ratings? and (3) Does institutional age contribute positively to institutional ratings? The methodology is directly aligned with these questions, employing one-way ANOVA to test for group differences in ratings based on ownership, and regression analysis to assess the predictive impact of campus size and institutional age on ratings.

5.2. Sample and procedures

To empirically test the research hypotheses, the study relies on secondary data obtained from Careers360.com, a widely recognized and credible educational platform in India that aggregates institutional data, including rankings, infrastructure details, and ownership classification. The dataset provides a comprehensive representation of engineering institutions across India, ensuring that the findings are generalizable.

The sample consists of 299 engineering institutions, selected from a total population of approximately 1,210 engineering institutes in India. (Careers360.com, 2024). These 299 institutes represent the top engineering colleges for which accurate data were available on all four relevant parameters: institutional age, ownership, campus size, and rating. The selection ensures both data completeness and quality. These institutes span across all major states and regions in India, allowing for geographical and institutional diversity. Furthermore, the majority of these institutions actively participate in and are featured in the National Institutional Ranking Framework (NIRF), reinforcing their national standing and visibility (NIRF, 2024).

The dataset includes variables that enable a comparative analysis across public and private colleges, as well as across institutions of different sizes and ages. Institutional ratings published by Careers360.com are based on a multi-criteria evaluation framework that includes academic excellence, infrastructure and facilities, placement performance, research output, accreditations, student–faculty ratio, alumni feedback, and social responsibility. (Careers360.com, 2024). Each parameter is weighted, and the final rating reflects a comprehensive aggregation of both objective indicators and qualitative inputs.

Operationalization of variables was conducted as follows: Institutional ownership was treated as a binary variable (1 = government, 2 = private). Institutional age was measured as the number of years since the institute's establishment. Campus size was measured as the total area of the institution's campus in acres. The institutional rating was measured using a 5-point Likert scale, where 1 indicated the lowest rating and 5 the highest.

The choice of Careers360.com as the data source is justified based on its credibility, comprehensiveness, and relevance to the study's objectives. The platform aggregates and verifies data from multiple government and private sources, enabling a level of analytical depth and national coverage that would be difficult to achieve through primary data collection.

5.3. Method

To test the hypotheses and determine the influence of institutional factors on rankings, the study employs quantitative statistical techniques using IBM SPSS 26. The selected methods are carefully aligned with the research questions, ensuring rigorous hypothesis testing and robust analytical validity.

For H1, which examines whether ratings differ significantly based on ownership (public vs. private), a one-way ANOVA test is performed. This method is appropriate because it allows for the comparison of mean ratings across two independent groups, i.e., government vs. private institutions; thereby determining whether there is a statistically significant difference in their ratings. Two key considerations inform the decision to analyze ownership separately using ANOVA. First, during the preliminary research audit, engineering aspirants perceived that private institutions generally receive higher ratings, whereas industry experts expressed that ownership and ratings may not be directly related. This highlighted a perception gap that warranted a focused analysis of ownership's role in shaping institutional ratings. Second, the nature of the data necessitated a separate analytical approach - ownership is a categorical (binary) variable, whereas the other predictors (campus size and institutional age) are continuous. ANOVA is thus the most appropriate statistical technique for testing mean differences across categorical groups with a continuous outcome.

For H2 and H3, which investigate the impact of campus size and institutional age on ratings, linear regression analysis is conducted. This method enables a quantitative assessment of the strength and direction of relationships between the continuous independent variables and the dependent variable (institutional rating). Before conducting the regression, the data is tested for normality, linearity, multicollinearity, and homoscedasticity to ensure that the results are statistically valid and reliable.

The choice of ANOVA and regression analysis aligns with the study's objective of providing empirical evidence on how institutional factors influence rankings. By using statistical methods that assess both group differences (ownership) and continuous relationships (campus size and institutional age), the study offers a comprehensive and nuanced understanding of the determinants of engineering institute rankings in India. This methodological approach ensures that the research questions are answered using appropriate and rigorous statistical techniques, reinforcing the study's contribution to the literature on higher education rankings and institutional legitimacy.

5.4. Data Analysis

Tables 1 and 2 present the descriptive statistics for campus size (in acres), age of the institution (in years), and rating of the institution (out of 5.0). As shown in the table, the minimum, maximum, mean, and standard deviation of these variables have been presented. Table I presents interesting descriptive statistics that warrant highlighting. The range for campus size is shown to be from 2 acres to 2000 acres, suggesting the inclusion of the smallest to the largest campuses of engineering institutes in India. Our data also includes engineering institutes that are as old as 164 years (established during the British era), as well as those established in 2011, i.e., merely a decade ago. The lowest rating given to any institute is 2.01, and the highest rating given to any institute is 3.77, as shown in the table. Table II shows the breakup of the ownership of these institutes. Such a vast range is an indication of the richness of the data to be used in the analysis.

Table 1: Descriptive statistics for campus size, age and rating of the institutes

	N	Minimum	Maximum	Mean	Std. Deviation
Campus_Size	299	2	2000	165.38	259.862
Age	299	10	164	31.32	22.205
Rating	299	2.01	3.77	3.0681	.29525
Valid N (listwise)	299				

Table 2: Frequency distribution of government-run coded as "1" and privately run coded as "2" engineering institutes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	89	29.8	29.8	29.8
	2	210	70.2	70.2	100.0
	Total	299	100.0	100.0	

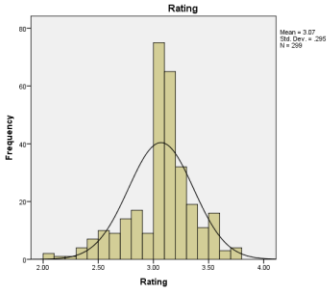

Figure 2: Normality test for the rating variable

Figure 2 illustrates the test of the assumption of normality for the rating variable, which is the dependent variable of our study. As can be seen from the figure, the data appear to be normally distributed, with the mean values for the ratings. We have also checked the skewness and kurtosis values for the dependent variable. The results are presented in Table III, which is given below. As can be seen from the table, the values for skewness and kurtosis seem to be well within the acceptable range.

Table 3: Skewness and Kurtosis for rating

N	Valid	299
	Missing	0
Mean		3.0681
Std. Deviation		.29525
Skewness		-.664
Std. Error of Skewness		.141
Kurtosis		1.138
Std. Error of Kurtosis		.281

To test H1, we conducted a one-way ANOVA to examine whether the mean institutional ratings differ significantly between government-run and privately run engineering institutes. In this analysis, institutional ownership was treated as an independent factor, and institutional rating (measured on a 5-point Likert scale) was the dependent variable.

Prior to the ANOVA, we performed Levene's test for homogeneity of variances, which yielded a significance value of 0.642, exceeding the 0.05 threshold, indicating that the assumption of homogeneity of variance was met. The results of the one-way ANOVA are presented in Table V. The p-value of 0.214 suggests that there is no statistically significant difference in the mean ratings between government and private institutions. Therefore, H1 is not supported by the statistical evidence.

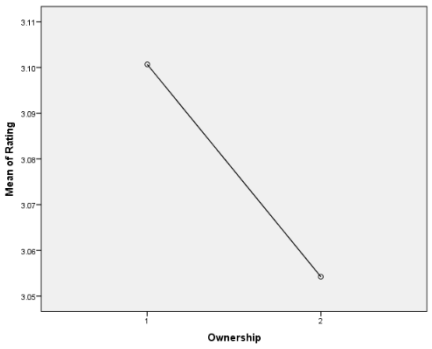

Figure 3: Mean plot for the rating of government-run colleges coded as "1" and privately run colleges coded as "2"

It is important to note that one-way ANOVA tests for mean differences between groups and do not imply causal impact or predictive influence of ownership on ratings. While the analysis reveals no significant difference, the mean rating for government institutions was numerically higher than that of private institutions (as shown in Figure 3), which contrasts with commonly held perceptions among students and parents in India. These results underscore the importance of evaluating institutional quality through evidence-based approaches rather than relying on assumptions tied to ownership type.

To further investigate the combined influence of multiple institutional characteristics (ownership, campus size, and age) on ratings, a multiple regression analysis may offer more comprehensive insights and is recommended as a possible extension of the present analysis.

Table 4: Levene's test for homogeneity

Levene Statistic	df1	df2	Sig.
.216	1	297	.642

Table 5: Result of one-way ANOVA test for H1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.135	1	.135	1.549	.214
Within Groups	25.842	297	.087		
Total	25.977	298			

To test H2 and H3, we performed a linear regression analysis with the institute's rating as the dependent variable and age and campus size as the independent variables. We also tested the data to check whether we fulfilled the assumptions of linear regression. As evident from Fig. 2 and Table III, the data for the dependent variable are checked for the assumption of normality. We have also conducted tests for multicollinearity and homoskedasticity to verify the assumptions of the regression model. The results for these tests are reported in Table 6 and Figure 4. As evident from Table VI, the VIF values for both independent variables, i.e., the rating, which is the dependent variable, come to 1.170, which is well within the acceptable range. Hence, we can conclude that multicollinearity is not present in the data analyzed. As can be seen in Figure 3, the scatter plot of the rating suggests that our data is homoscedastic. By testing these assumptions, we ensure that the data used in linear regression meets all the necessary checks, allowing for the most accurate analysis and the presentation of reliable findings. The result of all the tests for assumptions suggests that our data is robust.

Table 6. Test for collinearity assumption & VIF values

Model		Collinearity Statistics	
		Tolerance	VIF
1	Campus_Size	.855	1.170
	Age	.855	1.170

Dependent Variable: Rating

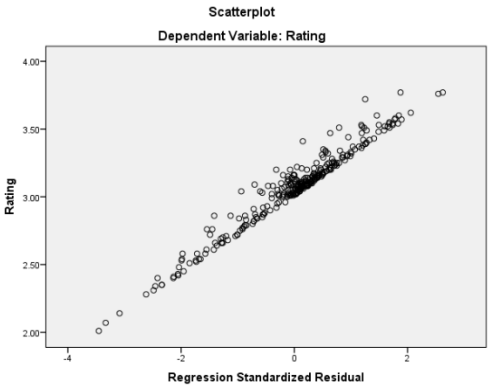

Figure 4: Scattered plot for rating to test for homoscedasticity

Finally, we performed the linear regression to test H2 and H3. The results of the linear regression from SPSS are shown below.

Table 7: Model summary for linear regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.221[a]	.049	.042	.28893	2.156

Table 8: ANOVA table for linear regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.266	2	.633	7.580	.001[b]
	Residual	24.711	296	.083		
	Total	25.977	298			

a. Dependent Variable: Rating
b. Predictors: (Constant), Age, Campus Size

Table 9: Coefficient for independent variables for the rating & significant value for each independent variable

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.986	.029		103.037	.000	2.929	3.043		
	Campus_Size	.000	.000	.125	2.043	.042	.000	.000	.855	1.170
	Age	.002	.001	.140	2.287	.023	.000	.003	.855	1.170

Tables 7, 8, and 9 present the results of linear regression from SPSS. From Table VII, we can see the value of the Durbin-Watson test for autocorrelation, which is 2.156. This value is well within the ideal range (1.5 to 2.5), which suggests that there are no traces of autocorrelation in our data. As shown in Table VIII, the p-value for the overall model is 0.001, which is less than 0.05. Hence, we can conclude that there is a significant overall effect of independent variables on the dependent variable. Table IX presents the coefficient values and significance levels for each independent variable. Significant values for both variables, as indicated by p-values less than 0.05, provide support for H2 and H3, suggesting that campus size and the age of the institution have a significant impact on the rating of engineering institutes in India.

6. Results

The results of our analysis provide empirical evidence in favor of all three hypotheses proposed by us. The one-way ANOVA test comparing the means of ratings of institutes run by government and private bodies provides empirical support for the hypothesis that ratings of colleges with different ownership have no significant difference. The significant value for this test is reported to be 0.214 (>0.05). This p-value indicates that the two groups, i.e., government-run and privately run institutes, do not differ significantly in terms of their ratings. The linear regression analysis suggests that institutional factors, i.e., campus size and age of the institute, both have a significant impact on the ratings of the institutes. The tests conducted to verify the assumptions of linear

regressions suggest that our data fulfills all the assumptions required for accurate regression analysis. The significant value for campus size is observed to be 0.042 (<0.05). This value suggests that campus size has a positive impact on the rating of engineering institutes. The larger the campus size is, the higher the rating of the institute can be predicted. The significant value for institutional age is observed to be 0.023 (<0.05). This value suggests that institutional age has a positive impact on the rating of engineering institutes. The older the institute is, the higher its rating can be predicted. The results of our study are presented in the table below.

Table 10: Final results

Sr No	Hypothesis	Result
H1	*There is a notable difference in the ratings of government-run and privately run academic engineering institutions.*	Rejected
H2	*The institutional factor of campus size has a significant impact on the rating of the academic institutions.*	Supported
H3	*The institutional factor of the institute's age has a significant impact on its academic rating.*	Supported

7. Discussion and conclusion

This study aimed to investigate how institutional factors, specifically campus size and institutional age, impact the ratings of engineering institutes in India. Moreover, the study examined whether ratings of government-run and private institutes are significantly different. Institutional rankings play a crucial role in shaping the perceptions of students, parents, and policymakers, yet the factors contributing to these rankings remain underexplored in emerging economies. Using Institutional Theory as the analytical lens, this study empirically tested whether infrastructure (measured by campus size) and institutional heritage (measured by age) significantly impact institutional ratings. The findings offer valuable theoretical and practical insights into how institutional legitimacy, stakeholder perceptions, and infrastructural investments interact to influence rankings.

The study's first hypothesis (H1) proposed that there is a significant difference in the institutional ratings of public and private engineering colleges. However, the results from the one-way ANOVA analysis did not support this hypothesis, as there was no statistically significant difference in ratings between government-run and privately owned engineering institutions. This finding challenges the widely held perception that private institutions inherently receive higher ratings due to their financial independence, infrastructure investments, and aggressive marketing strategies. While private institutions often emphasize modern facilities, branding, and faculty recruitment, government-run institutions derive legitimacy from state recognition, historical credibility, and regulatory backing. Institutional Theory helps explain why both public and private institutions maintain comparable ratings: public institutions adhere to strict regulatory standards, ensuring consistent quality assurance, while private institutions compete for market legitimacy, leading to similar performance outcomes.

This result aligns with previous research suggesting that ownership type alone does not determine educational quality (Klemenčič & Zgaga, 2014; Andrabi et al., 2017). The absence of a significant difference in ratings suggests that other institutional characteristics, such as reputation, faculty strength, and research output, may have a more pronounced impact on rankings than ownership status. This insight is particularly relevant for students and policymakers, who often assume that

private institutions provide superior education solely because of their ownership. Future research could explore whether specific internal factors within public and private institutions, such as governance models, faculty qualifications, and industry partnerships, play a more decisive role in rankings.

The second hypothesis (H2) tested whether campus size has a significant impact on institutional ratings, and regression analysis confirmed that campus size is a statistically significant predictor of ratings. Institutions with larger campuses were found to have higher mean ratings (M = 3.10) compared to institutions with smaller campuses (M = 2.76), suggesting that physical infrastructure is positively associated with perceived institutional quality. This finding provides empirical support for the idea that campus size may serve as a proxy for institutional resources, academic environment, and student support systems—all of which contribute to an enhanced reputation. This result is also consistent with Mimetic Isomorphism, as explained within Institutional Theory (DiMaggio & Powell, 1983), where institutions adopt visible and symbolic features, such as expansive physical space, to signal legitimacy, prestige, and competitiveness in the higher education landscape. Prior research corroborates this interpretation, indicating that better infrastructure and larger campuses enhance student satisfaction and shape public perceptions of institutional quality (Hajrasouliha, 2017; Wilkins et al., 2024). Thus, campus size not only reflects physical capacity but also influences how institutions are evaluated and ranked.

However, while the results confirm that larger campuses tend to receive higher ratings, it is important to consider potential underlying mechanisms. One possibility is that larger campuses attract higher enrolments, leading to greater funding and better faculty recruitment, which in turn enhances institutional quality. Another interpretation is that ranking agencies and students use campus size as a heuristic for institutional excellence, even if it does not directly correlate with educational quality. This finding has important managerial implications for academic administrators. Institutions aiming to improve their rankings should consider strategic infrastructure expansion as a means of signaling prestige. However, policymakers should ensure that rankings reflect actual educational quality rather than physical expansion alone, to prevent institutions from prioritizing infrastructure investments at the expense of academic development.

The third hypothesis (H3) proposed that institutional age has a significant impact on ratings, and the regression results confirmed a positive relationship between institutional age and rankings. Older institutions tend to receive higher ratings, reinforcing the idea that historical reputation and long-standing credibility contribute to institutional rankings. This finding aligns with institutional legitimacy theory (Meyer & Rowan, 1977), which suggests that older institutions benefit from cumulative legitimacy, established industry connections, and alumni networks. Path dependency theory (Pierson, 2000) further explains why older institutions maintain higher rankings—their established reputation attracts better faculty, research funding, and student enrolments, creating a self-reinforcing cycle of prestige. This result also aligns with findings from global university rankings, where older institutions often occupy top-tier positions (Dextre-Chacón et al., 2021; Vernon et al., 2018). However, the relationship between age and rankings may not be entirely deterministic, while older institutions tend to score higher, newer institutions can offset their age disadvantage by investing in innovation, modern pedagogy, and strategic industry collaborations. For institutional leaders, these findings suggest that establishing a strong, long-term reputation is crucial for achieving a high ranking. While newer institutions may struggle to compete solely

based on age, they can adopt alternative strategies, such as developing specialized programs, forging strong industry partnerships, and leveraging technology-enhanced learning, to compensate for their lack of historical credibility.

The study makes several theoretical contributions by extending Institutional Theory to the context of higher education rankings in an emerging economy. It provides empirical support for the idea that institutional legitimacy is shaped by multiple external and internal factors, rather than ownership alone. The findings reinforce the relevance of Mimetic Isomorphism, Legitimacy Theory, and Path-Dependency Theory, demonstrating how institutions gain and sustain credibility over time. From a practical perspective, these insights offer valuable guidance for students, academic institutions, and policymakers. Students and parents should consider factors beyond ownership when selecting institutions, as rankings do not significantly differ between public and private institutions. Institutional administrators should recognize that campus size contributes to rankings, but strategic investments in teaching quality, faculty development, and student engagement remain critical. Newer institutions must adopt alternative credibility-building strategies, while older institutions should leverage their historical reputation to maintain a competitive advantage.

This study contributes to the literature on higher education rankings by empirically testing the influence of campus size and institutional age on institutional ratings in the Indian engineering education sector. Using Institutional Theory, it demonstrates that institutional legitimacy is constructed through both structural characteristics (such as campus size and age) and external perceptions (including ownership legitimacy). The results indicate that ratings of government-owned and private institutions are not significantly different, challenging conventional perceptions about the differences between public and private institutions. However, campus size and institutional age significantly impact ratings, suggesting that infrastructure and historical reputation serve as key indicators of legitimacy in the higher education sector. These findings have significant implications for institutional decision-makers, ranking agencies, and students making decisions about higher education. Future research can expand this work by exploring additional factors, such as faculty qualifications, research output, student satisfaction, and employment outcomes, to develop a more comprehensive understanding of institutional rankings in emerging economies. By highlighting the structural and perceptual drivers of institutional legitimacy, this study underscores the need for a balanced approach to rankings that considers both quantitative indicators and qualitative educational outcomes.

8. Academic and managerial implications

This study offers significant academic contributions by extending Institutional Theory to the context of higher education rankings in an emerging economy. The findings demonstrate that institutional legitimacy is not solely determined by ownership structure but is also influenced by factors such as campus size and institutional age. This challenges the prevailing assumption that private institutions inherently perform better in rankings, highlighting the importance of structural attributes in shaping institutional credibility. Scholars studying higher education systems, institutional legitimacy, and rankings can build upon these findings by investigating how additional factors, such as faculty qualifications, student satisfaction, industry collaborations, and research output, interact with institutional characteristics to influence rankings. Furthermore, longitudinal

studies can explore how institutional rankings evolve, particularly as newer institutions attempt to establish legitimacy through innovative pedagogies and global partnerships. Future research should also consider cross-country comparisons to determine whether the observed patterns hold across different regulatory environments and cultural contexts.

From a managerial perspective, this study provides actionable insights for institutional leaders, policymakers, and ranking agencies. First, administrators of newer institutions should recognize that while age plays a role in rankings, it can be counterbalanced through strategic investments in academic reputation, research initiatives, and faculty development. Second, institutions seeking to improve their rankings should not focus solely on branding or marketing, but also enhance their physical infrastructure, as larger campuses signal legitimacy and prestige to students and evaluators. Third, government agencies and accreditation bodies should ensure that ranking methodologies account for both qualitative and quantitative measures, preventing institutions from gaining an undue advantage through superficial expansions. Finally, students and parents must be educated about the factors influencing rankings, encouraging data-driven decision-making rather than relying on outdated perceptions of public and private institutions. By aligning strategic institutional investments with the evolving landscape of higher education rankings, institutional leaders can foster a more transparent, credible, and competitive academic environment.

9. Limitations and future research directions

Our study is accompanied by a few limitations that could be addressed in future research. We have relied on secondary data for a particular year (2022–23). Future studies may gather panel data spanning a longer period (e.g., five to ten years) to analyze how changes in institutional factors impact institutional ratings over time. Additionally, we have focused on only one source of ratings Careers360. Future research may consider collecting ratings from multiple sources (such as NIRF or private education platforms) and conducting a comparative analysis to understand how different institutional factors influence different rating systems and with what intensity. The study examined only three institutional characteristics: ownership, institutional age, and campus size. Future studies should consider incorporating other influential variables such as faculty–student ratio, academic leadership, research productivity, funding sources, and geographic accessibility to provide a more comprehensive view of what shapes institutional ratings. Furthermore, the adjusted R^2 value for the regression model was relatively low (0.042), indicating that the included variables explain only 4.2% of the variance in institutional ratings. This suggests that a significant portion of the variance remains unexplained, possibly due to other qualitative or performance-based factors not included in this model. Future studies may build on this by integrating broader sets of predictors and applying multivariate models to improve explanatory power and offer deeper insights into what drives institutional ratings.

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Internationalization Policies in South Korean Higher Education: Attracting and Managing International Students

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ABSTRACT

Recently, the decline in the school-age population in South Korea has led to several international policies aimed at attracting international students. This study aims to provide key information on the current situation of international students in South Korea and analyze and discuss the issues related to international student attraction policies in South Korea from 2003 to 2023. To fulfill the research purpose, we combined qualitative analysis and quantitative analysis to analyze government policy documents and real-time statistical data. The findings were: (1) The development of internationalization policies in South Korean higher education can be divided into three stages: the quantitative expansion period (2001-2007), the quality management period (2008-2013), and the integration management period (2014-2024); (2) The total number of international students in South Korea has grown steadily and reached 181,842 in 2023, whereas problems such as failing to meet expected growth and insufficient quality management exist; (3) Uneven distribution of international students' countries of origin, majors, and institutional locations of higher education institutions has improved to a certain extent compared with the past but is still severe. Based on the results, we provided implications for focusing on improving the quality of international students, providing policy support for Asian students, increasing the attractiveness of universities in non-capital regions, as well as science and technology majors, and promoting the system for attracting international students. We hope to present a case study from South Korea and discuss some implications for the internationalization of higher education in other Asian countries.

Keywords: Higher Education, Internationalization Policy, International Student, International Student Management, International Student Attraction

1. Introduction

Over the past two decades, the internationalization of higher education has become a central strategic priority for governments and institutions worldwide. The number of students studying abroad has more than tripled from approximately 2 million in 2000 to 6.8 million in 2020, reflecting the rapid globalization of tertiary education. This growth has been driven by both academic and economic imperatives: host countries seek to enhance their global competitiveness and cultural influence. At the same time, students pursue improved educational and career opportunities abroad. In particular, many Western countries (e.g., the United States, the United Kingdom, Australia, and Canada) have implemented comprehensive national policies, such as scholarships, streamlined visas, and international marketing, to attract international students. These efforts have yielded substantial benefits (Department of Education, 2019). International students not only diversify campuses academically and culturally, but also make significant economic contributions. For example, in 2019, international students contributed over $44 billion to the U.S. economy and £25.9 billion to the UK through tuition and living expenses. Such trends underscore the importance of internationalization as a policy investment in both educational quality and economic development (Altbach & Knight, 2007; Knight, 2015). At the same time, global competition for talent has intensified: institutions and nations now vie for prestige and high-quality students in an increasingly competitive global higher education arena (Marginson, 2016; de Wit & Altbach, 2021).

South Korea has emerged as a key player in this shifting landscape of international higher education. Internally, South Korea faces a demographic imperative to internationalize: the domestic college-aged population is shrinking due to ultralow birth rates, which fell to a record low fertility of 0.98 in 2018 (the lowest globally) and continue to decline. This has led to fewer university entrants and concerns about under-utilized educational capacity. Externally, South Korea aspires to enhance the global standing of its universities and to position itself as an educational hub in Asia. Beginning in the early 2000s, the government implemented proactive policies to attract foreign students, aiming to fill enrollment gaps, foster international partnerships, and enhance the country's soft power. A landmark initiative was the Study Korea Project (2004), which set an initial goal of 100,000 international students by 2012 – a target surpassed ahead of schedule. Building on this momentum, the government introduced the more ambitious Study in Korea 300K Project, aiming to enroll 300,000 international students by 2027 (Ministry of Education [MOE], 2023b). These policies have been accompanied by scholarship programs (e.g., the Global Korea Scholarship), enhanced marketing efforts (tapping into the South Korean Wave of pop culture), and improved student services, all designed to make South Korea an attractive destination for global talent. As a result, the number of international students in South Korean higher education has grown exponentially, from roughly 16,000 in 2004 to over 180,000 by 2023, accounting for about 4% of total tertiary enrollments as of 2021. This influx has helped mitigate the impact of a declining domestic student population and generated significant economic gains: for instance, international students spent over 2.7 trillion KRW (approximately $2.3 billion) in South Korea in 2020 through tuition and local living expenses. Additionally, the presence of international students has promoted cultural exchange and global awareness on campuses, thereby bolstering South Korea's soft power and academic reputation (MOE, 2021). These achievements underscore the crucial role of internationalization policies in supporting South Korea's higher education sector amid demographic challenges.

However, despite considerable successes, significant challenges and imbalances have emerged in the implementation of South Korea's internationalization policies. One major concern is the uneven distribution of international students. A large majority of foreign students are concentrated in Seoul and a few metropolitan areas, while many regional universities struggle with low international enrollment (Green, 2015). This urban concentration exacerbates the gap between capital-area institutions and those in other provinces, undermining the goal of equitable development across the higher education system. There is also an imbalance in the academic fields pursued by international students: a disproportionate number enroll in

humanities and social sciences programs, whereas STEM fields (science, technology, engineering, and math) remain underrepresented. This disciplinary skew limits the academic diversification benefits of internationalization and may reflect underlying issues such as language barriers in technical courses or labor market perceptions (Lee & Rhee, 2019). Furthermore, the academic and social integration of international students into South Korean campus life and society has proven challenging. Many students face difficulties adapting to the local academic culture and language; for example, Korean-taught programs can pose language hurdles, and teaching styles may differ from those in students' home countries. Beyond graduation, international alumni often struggle to find employment in South Korea due to factors like limited Korean language proficiency, restrictive work visa policies, and employer biases. As a result, retaining foreign talent post-graduation remains problematic (Ishikura & Tak, 2024). These challenges suggest that simply increasing numbers is insufficient; attention must also be given to the quality of the experience, support systems, and policy adjustments to ensure sustainable success. Indeed, observers have noted the need for more robust academic support, career counseling, and integration initiatives so that South Korea "not only attracts but also effectively retains" international talent in the long run (Jon & Yoo, 2021).

The above issues point to a clear knowledge and policy gap. While the growth in international student numbers and short-term economic benefits in South Korea is well documented, there is a limited understanding of how the qualitative outcomes of internationalization are unfolding. Existing studies and reports have largely focused on quantitative expansion e.g., tracking enrollment targets and financial impacts but have paid less attention to questions of academic integration, student experiences, and educational quality outcomes (Lee & Kim, 2021; Park, 2022). Moreover, the structural reasons behind uneven student distribution (by region and field) have not been comprehensively analyzed, nor have the long-term implications of South Korea's heavy reliance on certain countries (such as China) as source markets been considered. There is also a paucity of research on the effectiveness of recent policy measures intended to improve quality and support (for instance, do new scholarship programs or support centers measurably enhance international student success and satisfaction?). In short, evaluative research on South Korea's internationalization policies, particularly with regard to outcomes such as distribution equity, academic integration, and quality assurance, remains limited. This study aims to fill these gaps by systematically examining South Korea's higher education internationalization policies over the past two decades and assessing their outcomes in the aforementioned key dimensions. By doing so, the research provides insights into the sustainability and effectiveness of these policies, offering evidence-based implications for future policy directions.

The significance of this research is multi-fold. Practically, it delivers an evidence-based evaluation of South Korea's internationalization efforts, informing national policymakers and university leaders about what has worked and what challenges persist. The findings can guide adjustments to current policies (for example, strategies to better support regional universities or STEM programs, or initiatives to improve post-graduation retention of foreign talent). More broadly, South Korea's experience offers a valuable case study for other countries in Asia and beyond that are pursuing internationalization in higher education. Many Asian nations face similar pressures of shifting demographics or aspire to increase their global academic profile (Organization for Economic Co-operation and Development [OECD], 2023). Understanding South Korea's policy trajectory – its achievements and pitfalls – can provide lessons and transferable insights for other regions in policy evaluation and institutional development. At the theoretical level, this study contributes to the literature on international higher education by linking policy measures to outcome variables (student distribution, integration, and quality) in a single-country context, thus enriching comparative perspectives on how national strategies translate into institutional realities. Accordingly, this paper is guided by the following research questions:

(1) **Policy Trajectory**: What has been the development trajectory of internationalization policies in South Korean higher education from the early 2000s to the present? In particular, what are the

major phases of policy effort and their characteristics?

(2) **Current Outcomes and Issues**: What are the current patterns and issues in South Korea's higher education internationalization, specifically regarding the number of international students and their distribution by country of origin, field of study, and institutional location? What challenges emerge in terms of academic integration and quality management?

(3) **Future Implications**: What are the implications of these findings for future policymaking in South Korea and for broader research on higher education internationalization in similar contexts?

2. Literature Review

Conceptualizing Internationalization

Internationalization in higher education has been widely defined as "the process of integrating an international, intercultural, or global dimension into the purpose, functions, and delivery of post-secondary education" (Knight, 2004). This definition, adopted at the institutional, sector, and national levels, highlights that internationalization is a multi-dimensional process affecting curriculum, research, student mobility, and organizational policies. Scholars have identified various rationales driving this process. Knight (2015) noted that key motivations include economic imperatives (e.g., revenue generation and workforce development), cultural and social enrichment, and the strategic goal of enhancing global competitiveness. Altbach and Knight (2007) similarly argued that universities internationalize to gain commercial benefits, knowledge exchange, and prestige, as well as to better prepare students for a globalized world. The presence of international students on campus is seen as enriching the academic environment by fostering cross-cultural perspectives and a global exchange of ideas. At the national policy level, attracting international students can help offset demographic declines and generate economic benefits for the education sector and local economies (Knight, 2015; OECD, 2023). Indeed, the fees and living expenses of international students often substantially exceed those of domestic students, providing a crucial source of income for institutions, especially where public funding is constrained. As a result of these factors, many countries have mainstreamed internationalization into their higher education policies. However, the literature also cautions that internationalization is not without challenges. Altbach (2012) and Knight (2015) note that rapid internationalization can introduce risk factors, such as dilution of academic quality, cultural tensions, and inequities, which may potentially undermine the educational experience if not properly managed. This has led to an increasing emphasis on quality assurance and strategic oversight as integral components of internationalization efforts (Brandenburg et al., 2019). Furthermore, from a global perspective, internationalization is occurring in a competitive context: institutions compete for globally mobile students and high rankings, while nations compete for talent and influence. Marginson (2016) describes this as a dual competition among universities (for status and resources) and among states (for human capital and soft power) in the global field of higher education. These theoretical and contextual insights underscore that effective internationalization policy must balance growth with quality, and expansion with considerations of equity and sustainability. Building on this foundation, the following review examines three core outcome dimensions highlighted in the literature – international student distribution, academic integration, and quality assurance – which will inform the conceptual framework of this study as it analyzes South Korea's case.

International Student Distribution

One important outcome of internationalization policies is the distribution of international students, both in terms of their origin and the dispersion across various destinations and programs. Globally, the flow of international students has expanded dramatically, but it is unevenly distributed across regions. A majority of internationally mobile students originate from Asia, and they tend to concentrate in a relatively small number of host countries. According to UNESCO data, students from Asia and Oceania comprise about

half of the world's international student population, with China, India, and other large Asian countries being major senders of students abroad (Jung-Mee, 2024). On the destination side, the United States, United Kingdom, Australia, and Canada have traditionally dominated as hosts, together attracting a large proportion of all foreign students (often due to English-language advantages and established reputations). However, in recent years, there has been a notable shift as East Asian nations have become increasingly significant players in the global higher education landscape (de Wit & Altbach, 2021). China and Japan, for instance, have rapidly expanded their international student enrollments, and South Korea has joined the top tier of host countries. By the early 2020s, South Korea ranked among the top 10 OECD countries for international student enrollment growth, reflecting its active recruitment efforts (OECD, 2023).

In the South Korean context, the distribution of international students has shown both achievements and persistent imbalances. On the one hand, South Korea has successfully grown its international student body from a very small base into one of the largest in Asia over the past two decades. This growth initially relied heavily on a few source countries: China has long been the dominant country of origin for international students in South Korea, at times accounting for more than half of all foreign students in the country (Chang, 2019). Such heavy reliance on a single country poses a risk; for example, geopolitical or economic changes in China could directly impact South Korea's international enrollments. Recognizing this, South Korean policies in the 2010s aimed to diversify source countries, with some success. The proportion of students from other countries such as Vietnam, Nepal, Uzbekistan, and Mongolia has increased in recent years, gradually reducing (though not eliminating) the over-concentration of Chinese students. South Korea's Global Korea Scholarship and bilateral partnership programs have targeted a broader range of countries in Asia and beyond, contributing to this diversification (Song & Kim, 2022).

Another aspect of distribution is the institutional and geographical spread of international students within South Korea. Here, a significant imbalance remains: a large majority of international students are enrolled in universities located in Seoul and the surrounding capital region, whereas universities in smaller cities and rural areas attract relatively few international students. Recent data indicate that over 70% of all international students in South Korea study in the Seoul metropolitan area. This centralization reflects the overall domestic prestige hierarchy of South Korean higher education – Seoul's universities, especially top-tier institutions, are more internationally recognized and have more resources for recruitment. The government has introduced incentives and regional university development programs to encourage better distribution (for example, special funding for campuses in provincial areas to build international dormitories and marketing consortia). Yet, policy effectiveness has been limited so far. Studies report that many regional universities continue to struggle to attract foreign students, in part due to perceptions of lower institutional rankings and fewer urban amenities (Kim, 2024; Istad et al., 2021). This uneven distribution is a policy concern because it can exacerbate inequalities between institutions and does not fully utilize the capacity of non-capital-region universities. In summary, the literature on student distribution suggests that while South Korea has achieved notable growth in international enrollments, ensuring a more balanced distribution across countries of origin, fields of study, and campus locations remains an ongoing challenge. These distributional outcomes are a crucial metric for evaluating the impact of internationalization policies, as they relate to the goals of diversification and equitable development in the higher education system.

Academic Integration of International Students

Another core theme in the literature is the academic and social integration of international students, essentially, how well international students adapt and succeed in their host academic environment. Successful integration is considered both an outcome and a facilitator of internationalization: when international students are effectively integrated, they are more likely to have positive academic experiences, complete their studies, and contribute to the host institution's intellectual community (Tinto, 1998; Glass et al., 2014). Conversely, poor integration can lead to student dissatisfaction, high dropout rates, or

underutilization of the skills that international students bring to the institution. Research consistently highlights several integration challenges that international students face across different countries. These include language barriers, differences in academic culture and teaching styles, limited interaction with domestic peers, and inadequate support services (Smith & Khawaja, 2011; Andrade, 2006). For non-English-speaking host nations like South Korea, language is often the primary barrier: although many universities offer courses in English, a significant portion of instruction and campus life operates in Korean, which can impede international students' classroom participation and socialization unless they attain a high level of Korean proficiency.

Studies focusing on South Korea confirm that language and cultural adjustment issues are prevalent. Many international students, especially those enrolled in Korean-medium programs, report difficulties in understanding lectures or expressing themselves academically in Korean (Lee, 2017). In addition, pedagogical differences, such as more hierarchical student-teacher relationships or a heavy emphasis on exams in Korea, may contrast with international students' prior educational experiences, requiring adjustment. Social integration on campus is another concern, as Jon et al. (2014) found that international students in Korea often form separate social groups, interacting more with fellow internationals or co-nationals than with Korean students, partly due to communication barriers and mutual unfamiliarity. This can limit the extent of intercultural exchange that internationalization is supposed to foster. Moreover, support services (like academic advising, counseling, language support, and career services) play a critical role in integration. South Korean universities have expanded such services (for example, setting up international student offices and Korean language centers). Still, the quality and staffing of these services vary, and not all students are aware of or utilize them effectively (Park & Bae, 2019).

A particularly salient issue in South Korea is the post-graduation integration of international students, which extends the academic experience into the labor market. Many international graduates express a desire to work in South Korea or otherwise leverage their Korean education; however, they often encounter difficulties transitioning to employment. Factors include stringent immigration regulations (e.g., work visa quotas and conditions), employers' preferences for local graduates or those with Korean language fluency, and limited professional networks available to foreigners (Ishikura & Tak, 2024). Consequently, a significant number of international alumni either return to their home country or move to a third country for work, representing a loss of talent that South Korea had trained. This outcome raises concerns about the long-term effectiveness of internationalization: attracting international students is less beneficial if they do not integrate into the society or economy after graduation. Recent policy discussions in Korea have therefore started to emphasize not just attraction but also retention, suggesting that integration support needs to extend into career development and alumni engagement (MOE, 2023c).

Overall, the literature suggests that while South Korea's internationalization policies have increased enrollment, ensuring the academic success and integration of these students remains a work in progress. There is evidence that insufficient integration can undermine the educational outcomes of internationalization. For instance, if international students struggle academically or feel socially isolated, this can lead to lower satisfaction and higher attrition rates (Kim & Shin, 2022). On the other hand, success stories are also noted, such as international students who do achieve high levels of Korean proficiency and act as cultural bridges on campus, or programs that effectively facilitate cross-cultural teamwork and mentorship. These highlight the potential when integration is supported. Importantly, Jon and Yoo (2021) argue that strong integration and support systems are crucial for converting initial recruitment into long-term talent retention. They stress that host countries must invest in "not only attracting but also retaining" international students by addressing their academic and personal development needs. In evaluating policy outcomes, this study will therefore pay special attention to integration-related aspects (e.g., student support services, language training programs, and employment pathways) as indicators of the quality and inclusiveness of South Korea's internationalization process.

Quality Assurance in Internationalization

The expansion of internationalization in higher education invariably raises the question of quality assurance. As institutions increase international enrollment and cross-border activities, maintaining academic standards and providing a high-quality educational experience become paramount concerns. The literature emphasizes that quality assurance is both a driver and a necessary complement to internationalization. On one hand, being able to demonstrate high quality (through international accreditation, rankings, etc.) is crucial for universities to attract international students. On the other hand, the rapid influx of international students can strain resources and, if unmanaged, potentially compromise quality in areas such as admissions standards, instructional quality, or student services (Altbach, 2012; Knight, 2015). Quality assurance in the context of internationalization thus involves implementing policies and mechanisms to monitor and enhance the educational conditions under which internationalization occurs, ensuring that growth does not come at the expense of academic rigor or student support.

Globally, various approaches have been adopted to safeguard quality amid internationalization. For example, many countries have established guidelines or accreditation standards for programs that cater to international students, and some have specific quality audit schemes that focus on international education. The OECD and UNESCO have also promoted frameworks to support quality in cross-border higher education, emphasizing the importance of transparency, recognition of qualifications, and student protection (OECD, 2005; UNESCO, 2019). A notable initiative was the International Education Quality Assurance System (IEQAS) developed in South Korea in 2011. In response to early signs of quality problems (such as reports of some institutions admitting inadequately prepared foreign students or providing insufficient support), the South Korean government introduced IEQAS to evaluate and certify universities on their capacity to manage international students. Under this system, institutions are assessed on criteria including academic support, language assistance, student services, and regulatory compliance. Universities that fail to meet the basic quality standards can face penalties such as restrictions on recruiting international students or loss of eligibility for certain government programs. The implementation of IEQAS had a noticeable impact: in the immediate years following its introduction, the total number of international students in South Korea actually declined slightly (2011–2014), as some lower-tier institutions reduced intakes or lost their international student visa sponsorship due to not meeting standards. This period is interpreted as a transitional phase from a quantity-driven expansion to a quality-controlled growth model. By tightening oversight, the policy aimed to eliminate diploma mills and improve the overall educational environment for international students. Subsequent data suggest that after this adjustment period, growth resumed on a more sustainable footing, accompanied by improvements such as higher average language proficiency of incoming students and better student satisfaction scores (KEDI, 2020).

Ensuring quality also involves providing ongoing support and conducting regular evaluations. Knight (2015) emphasizes that internationalization should be seen as “an ongoing process of integrating” global dimensions, which inherently requires continuous quality review and enhancement. This means institutions must regularly assess outcomes (academic performance of international students, graduation rates, feedback on services) and use those assessments to inform policy updates. In South Korea, beyond IEQAS, other quality-related measures have included raising admissions criteria for international applicants, expanding Korean language training (through pre-college language institutes), and increasing funding for improving dormitories and advising services for international students (MOE, 2018). The South Korean Ministry of Education also publishes annual monitoring reports on international student enrollment and institutional compliance, adding a layer of public accountability. From a research perspective, quality assurance is considered a critical factor in the long-term success of internationalization strategies: it helps maintain the reputation of the host country’s education system and ensures that the benefits of internationalization (academic, cultural, and economic) are realized without degrading educational standards (European Association for Quality Assurance in Higher Education [ENQA], 2015). Studies in Europe and Asia have

found that students are more likely to choose and remain in destinations that are perceived to have robust educational quality and support (Chen & Zimitat, 2006). Therefore, a key indicator of effective policy is how well quality is upheld and improved as internationalization scales up.

In summary, the previous studies suggested that deliberate quality assurance mechanisms must accompany internationalization policies. South Korea's case exemplifies this principle: after an initial phase of rapid expansion, policy focus shifted toward consolidation and quality improvement, recognizing that uncontrolled growth could be counterproductive. The integration of a quality assurance regime (like IEQAS) into the national internationalization strategy reflects an effort to institutionalize high standards and build trust in South Korean higher education globally. This literature review has highlighted three outcome dimensions – distribution, integration, and quality – that are central to understanding the impact of internationalization policies. These dimensions are interrelated: for instance, uneven student distribution can affect integration (e.g., if most international students cluster at a few universities, those institutions face greater pressure on support services), and quality assurance efforts can influence distribution (e.g., enforcement of standards might temporarily reduce quantity, as seen in 2011–2014). Figure 1 shows the conceptual framework for evaluating internationalization policies in South Korean higher education.

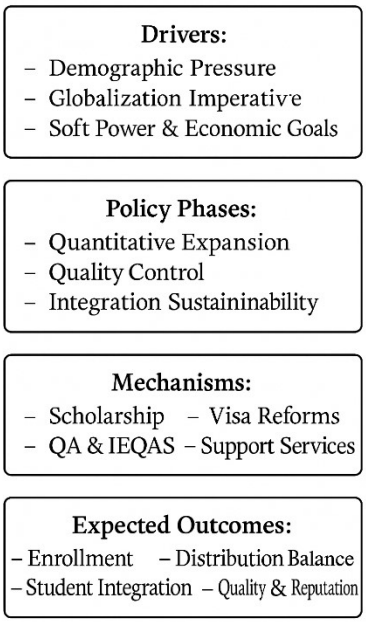

Figure 1. Conceptual Framework of the Study

3. Methodology

We adopted a mixed-methods approach that integrates qualitative policy analysis and quantitative data analysis to examine the strategic intentions behind South Korea's international student recruitment policies and to evaluate their outcomes and trends over the past two decades. The analytical framework combines qualitative interpretation of policy developments with empirical assessments of structural changes in the international student population. Figure 2 provides an overview of the research process, outlining the sequential stages of analysis.

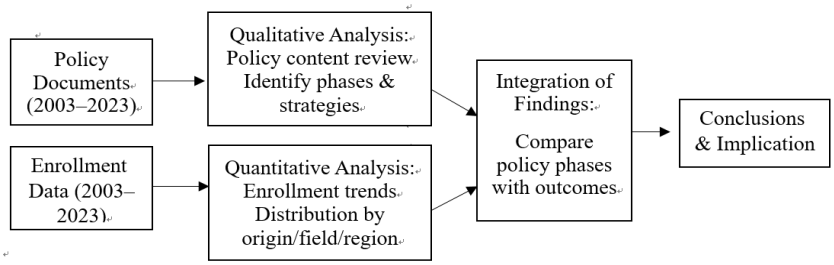

Figure 2: Research Procedure

First, major policy documents and national strategic plans (2003–2023) were collected and subjected to qualitative content analysis in order to identify the evolution of government strategies and objectives for internationalization. For the qualitative analysis, we systematically reviewed major policy documents issued by the Ministry of Education (MOE) and related government agencies between 2003 and 2023. Based on the classification proposed by KEDI (2020), the evolution of international student policy in South Korea was divided into three major phases: the Expansion Period (2003–2007), the Quality Management Period (2008–2013), and the Integration Management Period (2014–2023). Representative policies within each phase were analyzed to trace shifts in policy goals, measures, and governance logic.

For the quantitative analysis, both linear trend analysis and chi-square tests were employed to assess changes in the composition of international students by nationality, major, and institutional location. Due to differences in data coverage across variables, the units of analysis were adjusted accordingly. Specifically, data on student majors were only available from 2013 to 2023, and were therefore analyzed on an annual basis to capture year-on-year trends. In contrast, data on student nationality and institutional location covered the full 2003–2023 period, making them suitable for aggregated analysis by policy phase. To ensure consistency, policy phase boundaries were marked in all relevant figures, and the results were interpreted in reference to the corresponding policy contexts. This approach ensured that variation in analytical units did not compromise the study's overall alignment with its core objective, which was to evaluate the policy-driven transformation of South Korea's international student landscape.

Finally, we collected all the statistical data from authoritative sources, primarily the MOE and the KEDI website. Policy information was retrieved from the official MOE website and the KEDI website. At the same time, statistical data related to international students were obtained from multiple official statistical documents publicly available on the MOE's website. Although these documents were published by the MOE, the underlying data were originally compiled and provided by the KEDI. Specifically, statistical data for the period from 2003 to 2014 were obtained from a comprehensive dataset, while data for 2015 and subsequent years were sourced from annually published datasets. Therefore, we extracted and integrated the official data from each year into a unified dataset for descriptive and inferential analysis.

However, several limitations of the dataset should be noted. First, data on students' majors were not available prior to 2013. Second, the dataset focused on macro-level demographic indicators and did not include qualitative dimensions such as student satisfaction or career trajectories. Third, the absence of institution-level data limited the ability to assess differential policy effects in finer detail. Despite these limitations, the integrated use of document analysis and statistical modeling provides a systematic and policy-sensitive understanding of the evolution of South Korea's higher education internationalization strategy, offering a valuable reference for future policy design and comparative research.

4. Findings

The Development of International Student Policies in South Korea

In the early 21st century, the South Korean government began to make significant efforts to enhance the appeal of universities to international students. From 2003 through 2023, the policies formulated by the South Korean government to attract and manage international students can be roughly divided into three different stages: the expansion period (2003-2007), the quality management period (2008-2013), and the integration management period (2014-2023) (KEDI, 2020). Distinct policy priorities and instruments characterized each stage.

During the expansion period, the Ministry of Education and Human Resources Development (MOEHRD) officially launched the *Study Korea Project* in 2004 with the goal of attracting 50,000 international students by 2010. It was built upon the earlier comprehensive plan introduced in 2000 to expand the recruitment of international students and was adjusted in 2005. In addition to increasing the number of international students, *the Study Korea Project also aimed to establish South Korea as a higher education hub in Northeast Asia, expand overseas internship opportunities, and enhance the country's* international influence. To achieve this vision, South Korean government dedicated to strategic tasks including the expansion and reform of international student invitation programs, the establishment and activation of overseas networks, promotion of studying in Korea, improvements to academic and living conditions, dissemination of Korean language and culture, and the construction of an efficient administrative support system (MOEHRD, 2004). In parallel, the Ministry of Justice unveiled complementary institutional measures. To manage international students more efficiently, the language training visa was unveiled in 2004. In 2005, the *Immigration Act* was implemented, clarifying the obligation of managing international students in higher education institutions (Ministry of Justice, 2014).

In the quality management period, the policy priority shifted from merely expanding the number of international students to enhancing the quality of education and strengthening institutional management capacity. In 2008, the Ministry of Education, Science and Technology announced the *Study Korea Project Development Plan*, revising the original *Study Korea Project* target upward to 100,000 international students by 2012 (Ministry of Education, Science and Technology [MEST], 2008a). It emphasized quantitative growth and identified strategic goals such as diversifying countries of origin, improving educational and support services, expanding academic programs, and strengthening post-graduation career pathways. A comprehensive set of policy instruments, ranging from financial subsidies and regulatory reforms to university-industry cooperation, was deployed to lay the foundation for establishing South Korea as a regional hub for international education. This period marked a critical shift in South Korea's governance logic, from enrollment-centered expansionism toward quality-oriented and performance-driven coordination. The role of the state in international student policy has become more prominent, shifting beyond institutional autonomy to a model characterized by centralized oversight, multi-stakeholder engagement, and outcome-based management. It is notable that international education policies during this period were increasingly integrated with national demographic and economic strategies, reflecting the institutionalization of internationalization as a long-term national agenda. To strengthen the institutional foundations for this transition, the government introduced policy measures in 2009 to reinforce universities' accountability in managing international students and enhance student support services.

In 2010, the Global Korea Scholarship (GKS) was formally integrated into the national strategic framework (MEST, 2008b). As a flagship initiative for promoting South Korea's national brand, the GKS program operates on a dual-track model: providing targeted support for academically outstanding students and emerging global leaders. The program serves as both a mechanism for talent attraction and a vehicle for expanding public diplomacy and soft power. The GKS system offers support for both degree-seeking

students and short-term exchange participants including overseas Koreans and is structured as a comprehensive 'selection–support–return' cycle. It includes pre-arrival orientation, in-country services (language training, counseling, and community engagement), and post-graduation alumni networking, illustrating South Korea's transition from a provider of international education to a global talent governance hub. To build upon and expand these efforts, the MEST launched the Study Korea 2020 Project in 2012(MEST, 2012). The initiative set an ambitious goal of attracting 200,000 international students by 2020, formally embedding international student policy into South Korea's national strategic planning. The project promoted a shift from passive recruitment to full-cycle management, outlining key reforms that included expanding the GKS budget, enhancing housing and employment support, and strengthening South Korea's global education promotion platforms. By foregrounding "talent-centered" and "network-oriented" goals, the Study Korea 2020 Project signaled a new stage in South Korea's international education policy, which focused on structural optimization and national branding. Accordingly, the expansion of the GKS system and the launch of the Study Korea 2020 Project marked a transition from structural adjustment to systemic governance. It also reflected the deepening of South Korea's governance logic centered on state-led coordination, multi-level performance monitoring, and the institutionalization of global talent networks.

During the integration management period (2014–2023), South Korea's international student policy underwent a comprehensive shift toward quality-centered governance and institutional system building. In response to the evolving global education landscape, the government launched new initiatives in 2014–2015 to enhance the country's attractiveness to international students. However, the overemphasis on quantitative expansion led to lower admission requirements for universities. As a result, an increasing number of international students faced academic difficulties, leading to higher dropout rates and instances of illegal employment. These challenges highlighted the limitations of expansion-driven governance logic and prompted the state to reorient its international education policy framework. To address these concerns, the Ministry of Education introduced the International Education Quality Assurance System (IEQAS) in 2011, formally institutionalizing quality monitoring within the international education sector. IEQAS evaluates universities' capacity to manage international students and imposes restrictions on institutions that fail to meet basic standards (KEDI, 2020). Following the implementation of this system, the number of international students declined between 2011 and 2014, indicating a transitional phase from quantity-driven to quality-controlled governance.

Considering these developments, the government extended the original Study Korea 2020 Project to 2023 and subsequently proposed a more ambitious national strategy under the Study Korea 300K Project. This new initiative aims to attract 300,000 international students by 2027, positioning South Korea as a global hub for higher education. The policy framework emphasizes a shift from "input-focused" to "outcome-oriented" governance, outlining several core strategies, including enhancing the integration of higher education and industry, strengthening international partnerships, improving the competitiveness of regional universities, and nurturing global talent in high-tech and emerging fields (MOE, 2023b). Additionally, the project promotes an inter-ministerial governance model to enhance institutional access to visa, employment, and residency services for international students. Overall, from 2003 to 2023, the number of international students in South Korea has steadily increased, signaling a transition from experimental initiatives to a comprehensive, state-led governance system. This trajectory reflects South Korea's sustained commitment to higher education internationalization and its strategic intention to expand global influence through international talent attraction.

Table 1: The Development of International Student Policies in South Korea (2003-2023)

Era	Year	Development of International Student Policies
Expansion Period (2003~2007)	2004	· Implementation of 'Study Korea' Project, aiming at attracting 50,000 foreign students by 2010 · Enactment of the language training visa
	2005	· Implementation of the Immigration Act
Quality Management Period (2008-2013)	2008	· Implementation of the 'Study Korea Project Development Plan', aiming at attracting 100,000 foreign students by 2012 · Establishment of Guidelines for Standard Business Processing for International Students and Language Students
	2009	· Release of Measures to Reinforce the University's Responsibility for the Management of International Students · Release of Improvement Measures for Managing Support for International Students
	2010	· Implementation of Global Korea Scholarship
	2012	· Launch of 'Study Korea 2020' Project, aiming at attracting 200,000 foreign students by 2020
Integration Management Period (2014-2023)	2014	· Release of Strategy for International Student Attraction and Retention
	2015	· Release of Strategy for Expanding the Attraction of International Students · Extending the goal of the 'Study Korea 2020' Project to 2023
	2023	· Implementation of 'Study Korea 300K' Project, aiming at attracting 300,000 foreign students by 2027

Source: Korea Educational Development Institute (2020). *A study on the analysis of universities' recruitment and management practices for international students.*

Current Situation and Issues of International Students in South Korea (2003-2023)

a. Current Situation of International Students in South Korea

Over the past two decades, the number of international students enrolled in South Korean higher education institutions has steadily increased. The number of international students in South Korea increased from 12,314 in 2003 to 181,842 in 2023, reflecting significant growth and highlighting South Korea's growing appeal in the global education market.

Between 2003 and 2011, the number of international students in South Korea increased substantially. This period coincided with South Korea's active efforts to expand its global influence and promote the internationalization of its education system. In 2004, the number of international students increased from 12,314 in 2003 to 16,832. Although this growth trend declined slightly in 2012, it still demonstrated a continuous upward trend, indicating that the attractiveness of South Korean universities remains high. In 2014, the South Korean government's strategy for attracting and retaining international students led to a rapid increase in the number of international students in South Korea, which exceeded 100,000 by 2016. Although the number of international students decreased from 2020 to 2021 due to the impact of COVID-19, it rebounded immediately after the pandemic and reached 181,842 in 2023.

Overall, the number of international students in South Korea has grown steadily from 2003 to 2023. This trend also reflects South Korea's efforts to expand its global influence and promote the internationalization of universities.

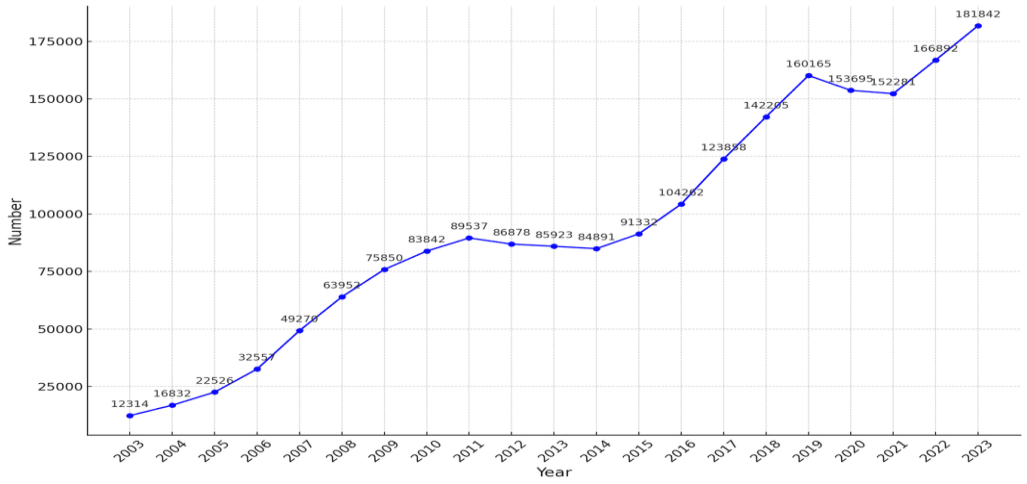

Figure 3: Number of International Students in HEIs in South Korea (2003-2023)
Source: Korea Educational Development Institute. (2023).

b. International Students in South Korea by Country of Origin

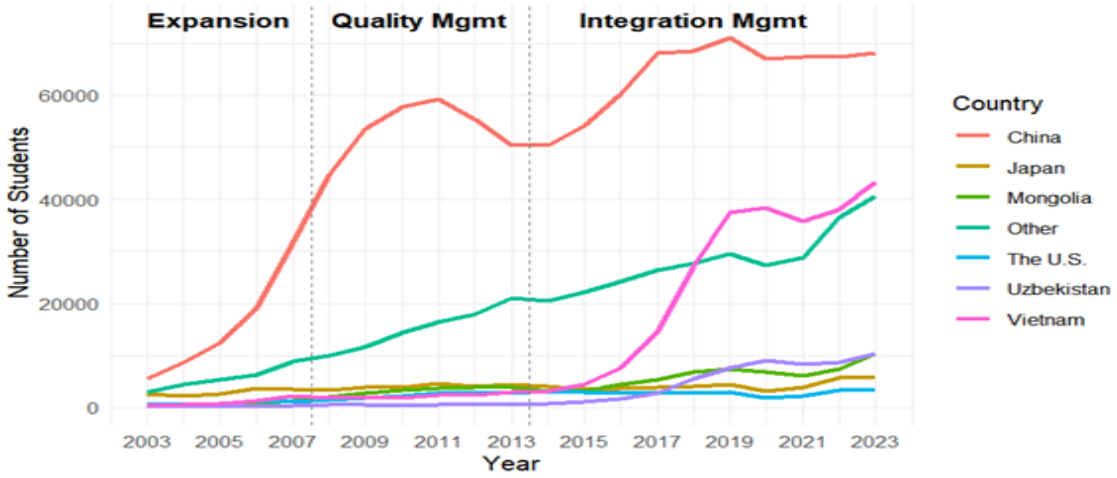

Figure 4: Trend of International Students by Country of Origin
Source: Author's compilation based on data from the Ministry of Education (2003–2023)

Figure 4 illustrates the trends in international student numbers from six major countries between 2003 and 2023. During the expansion period (2003–2007), China showed a sharp increase and became the dominant source of international students. Following the launch of the 'Study Korea' project in 2004, policies such as large-scale admissions expansion, visa reforms, and overseas promotion networks contributed to a rapid rise in Chinese student enrollment.

During the quality management period (2008–2013), China maintained its leading position, but its growth rate began to slow. In the meantime, Asian countries such as Vietnam and Uzbekistan started to show noticeable increases. It reflects the South Korean government's efforts to diversify the origins of students, particularly through the 2008 'Study Korea Development Plan' and the expansion of the Global Korea Scholarship (GKS). These measures enhanced the inflow of students from emerging countries.

During the integration management period (2014–2023), Vietnam's student numbers rose significantly, narrowing the gap with China. Steady increases were also observed for Uzbekistan and Mongolia. These

changes align with policies such as the 'Study Korea 2020', 'Study Korea300K' Project and the implementation of IEQAS, which emphasized structural reform, institutional accountability, and enhanced student services. Collectively, these initiatives marked a transition from a quantity-driven approach to one focused on quality and diversity.

To further assess the statistical significance of these trends, we conducted linear regression analyses for each of the six major countries. In this analysis, the independent variable was the year, and the dependent variable was the annual number of international students from each country. Table 2 showed that China had the highest annual increase (slope = 3,031, $p < .001$), followed by Vietnam (slope = 2,232, $p < .001$), establishing both countries as the leading contributors to South Korea's international student population. In addition, Uzbekistan (slope = 502, $p < .001$), Mongolia (slope = 420, $p < .001$), Japan (slope = 100, $p < .001$), and the United States (slope = 117, $p < .001$) also exhibited statistically significant growth.

In terms of structural proportion (Figure 5), China accounted for nearly 70% of international students in 2008, but this share declined to approximately 45% by 2023. In contrast, Vietnam's proportion increased from less than 3% in 2003 to 29% in 2023, while Uzbekistan's share grew from under 1% to over 7%. Additionally, Japan, the U.S., and Mongolia have remained relatively stable, while other countries have continued to account for a considerable proportion. These shifts clearly indicate a transition from a China-dominated structure to a more balanced and diversified composition, reflecting the South Korean government's effective governance in realigning the international student landscape over successive policy phases.

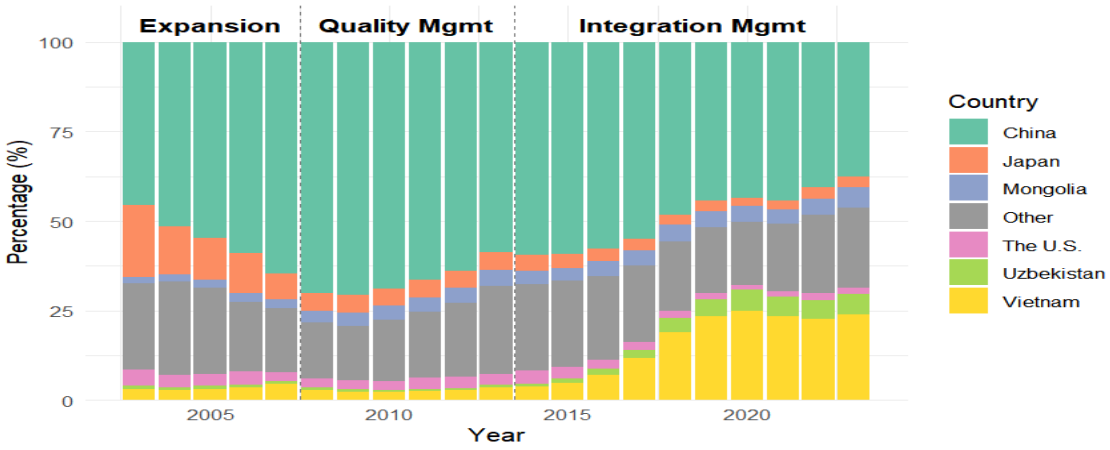

Figure 5: Proportion of International Students by Country (2003–2023)
Source: Author's compilation based on data from the Ministry of Education (2003–2023)

c. International Students in South Korea by Major

Figure 6 illustrates changes in the distribution of international students across majors from 2013 to 2023. Due to data limitations, this section covers only the integration management period. Humanities and social sciences remained the most popular fields throughout this period. However, the number of students in STEM and the arts grew significantly. In particular, enrollment in engineering increased from fewer than 10,000 in 2013 to over 18,000 in 2023.

To further verify the statistical significance of the observed trends, we conducted annual linear regression analyses for six major academic fields. The year served as the independent variable, and the annual number of international students in each field was used as the dependent variable. The results show that the humanities and social Sciences exhibited the highest annual growth rate (slope = 5,888, $p < .001$), followed

by arts and physical Education (slope = 1,599, $p < .001$) and engineering (slope = 965, $p < .001$). These findings suggested that while student preferences continue to favor the humanities, technology and creativity-oriented fields have shown steady expansion during the integration management period. While natural sciences demonstrated significant growth (slope = 380, $p < .001$), language courses did not reach statistical significance (slope = 1,459, $R^2 = 0.271$), which may be partially attributed to entry restrictions during the COVID-19 pandemic. Additionally, medicine showed no statistically significant trend ($p > .05$), with unclear growth and a low degree of model fit.

This trend corresponds to policy developments during the integration period. The South Korean government promoted links between higher education and high-tech industries, expanded GKS coverage, and encouraged international enrollment in emerging fields of study. These efforts aimed to move beyond numerical expansion and strengthen post-graduation outcomes. The rising popularity of applied fields reflects both employment considerations and the influence of policies supporting career-relevant programs.

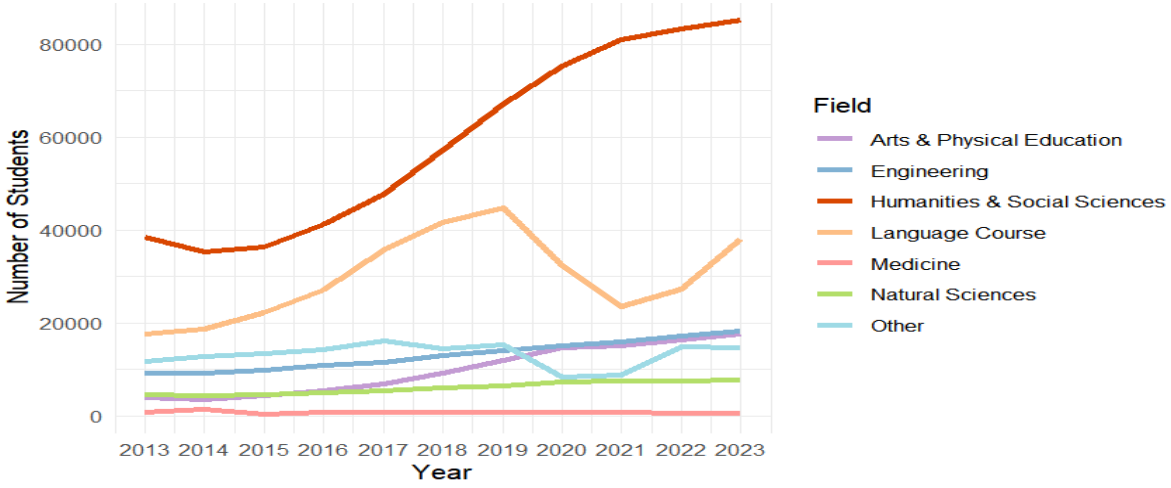

Figure 6: Trend of International Students by Major
Source: Author's compilation based on data from the Ministry of Education (2013–2023)

In addition to overall growth trends, the proportional structure of international students by major has also undergone notable changes. Figure 7 illustrates the relative proportion of each major between 2013 and 2023. While the humanities & social sciences consistently maintained the largest proportion throughout the period, their dominance has gradually declined over time. In contrast, language courses experienced an increase in share before 2018, followed by a sharp decline during the COVID-19 pandemic. Although there has been some recovery in recent years, the proportion has yet to return to pre-pandemic levels. Technology-oriented fields, such as engineering and the natural sciences, have demonstrated a steady upward trend. At the same time, arts and physical education have shown a slight increase since 2018, contributing to a more diversified structure.

Moreover, the proportion of other majors has steadily decreased since 2013, suggesting a structural shift away from ancillary domains toward core academic areas. Overall, the trend indicates that South Korea's international student composition has evolved from a humanities-centered structure toward a more functionally differentiated and application-oriented disciplinary landscape.

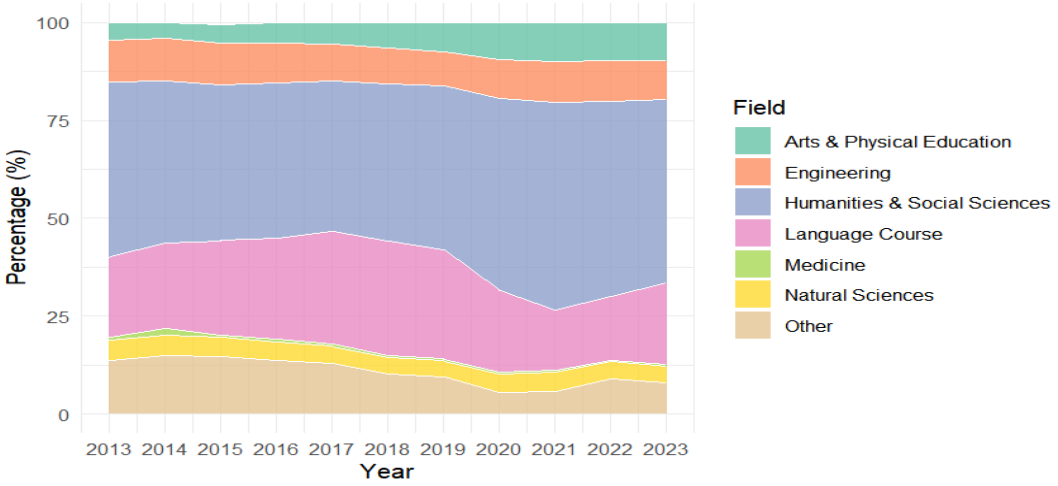

Figure 7: Proportion of International Students by Major (2013–2023)
Source: Author's compilation based on data from the Ministry of Education (2013–2023)

d. International Students in South Korea by Locations of Higher Education Institutions

Figures 8 and 9 show the trends in the number and the proportional distribution of international students between capital and non-capital regions in South Korea from 2003 to 2023. The findings revealed a clear pattern of spatial concentration, closely aligned with the evolution of national policy phases.

During the expansion period (2003–2007), non-capital regional institutions enrolled a slightly higher number, with their proportion exceeding 55%. It reflected the early objectives of the 'Study Korea' project, which emphasized quantitative expansion and encouraged regional participation in international student recruitment.

During the Quality Management Period (2008–2013), capital regional institutions experienced a notable increase in international student enrollment, eventually surpassing their non-capital counterparts around 2011. Advantages in infrastructure, resource concentration, and employment support systems drove this shift. Government initiatives, such as the GKS and national branding strategies, have increasingly targeted high-ranking universities, most of which are located in the capital area, thereby reinforcing their competitive edge.

The trend intensified during the integration management period (2014–2023). As shown in Figure 8, the proportion of international students in capital regional universities rose to 58% by 2023, with total enrollment exceeding 100,000 students. The chi-square test ($\chi^2 = 1227.5$, $p < .001$) in Table 4 confirmed a statistically significant association between policy phase and spatial distribution. Particularly, the implementation of the IEQAS limited the enrollment capacity of non-capital regional institutions that failed to meet certification standards, accelerating the shift of international student flows toward universities in the capital region.

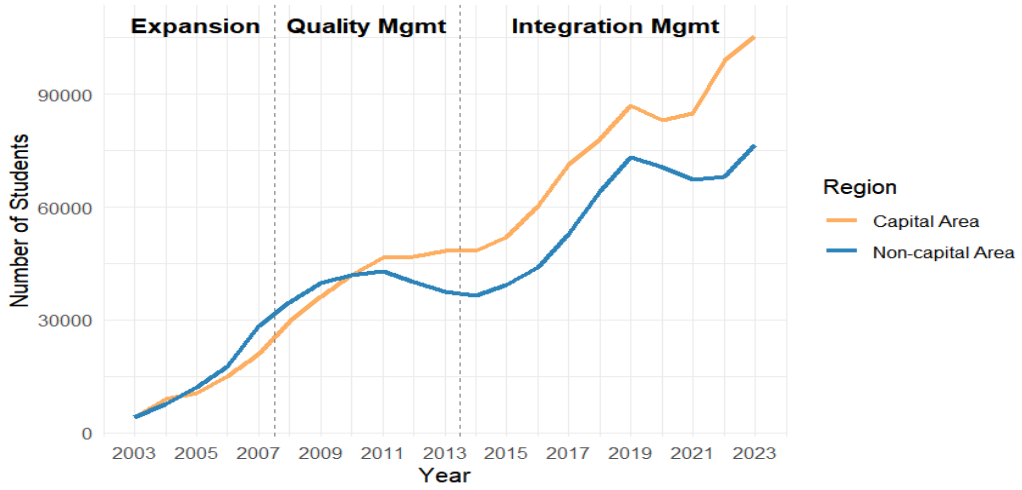

Figure 8: Trend of International Students by Institutional Location
Source: Author's compilation based on data from the Ministry of Education (2003–2023)

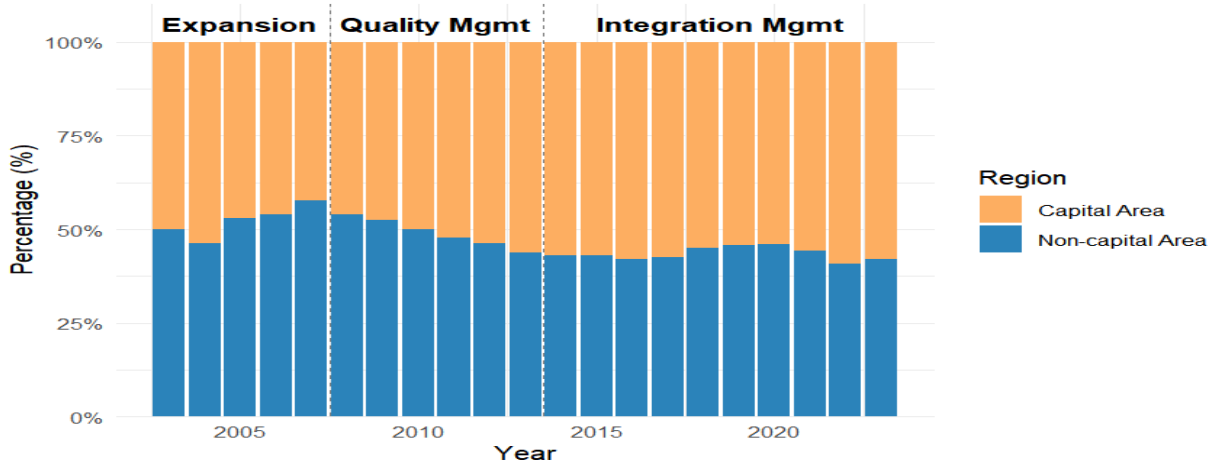

Figure 9: Proportion of International Students by Institutional Location (2003–2023)
Source: Author's compilation based on data from the Ministry of Education (2003–2023)

In sum, South Korea's international student spatial distribution has transitioned from an initially balanced regional model to a highly centralized structure. It is evident in both the proportional differences and growth patterns, reflecting a broader transformation in governance logic from quantity-driven expansion to quality-focused consolidation. As policy mechanisms continue to evolve, spatial concentration has emerged as a key factor influencing the institutional choices of international students.

5. Conclusions and Implications

Over the past two decades, South Korea has made significant efforts to attract international students, resulting in a steady increase in the number of international students. Additionally, the international student management system has evolved gradually from a policy experiment stage in the early 2000s to a relatively structured institutional governance system by 2023. The government's international education policy evolved through three distinct stages: the expansion period (2003-2007), the quality management period (2008-2013), and the integration management period (2014-2023). Each period was marked by a shift in

focus from increasing student numbers to strengthening institutional accountability, enhancing educational quality, and aligning with national development strategies.

We analyzed statistical data on international students in South Korea from 2003 to 2023, categorizing them by country of origin, major, and institutional location. The results demonstrated that while Chinese students have remained the dominant group, the increasing presence of students from Vietnam, Uzbekistan, and other Asian countries reflects a growing diversification in international student demographics. The distribution of majors has also shifted from a humanities-centered structure to a more balanced one that includes engineering and the natural sciences. Spatially, international students are increasingly concentrated in the capital region, indicating a growing preference for metropolitan institutions.

However, while the policy of attracting international students has achieved notable successes, several issues have also been exposed. First, the government's ambitious "Study Korea 2020" initiative fell short of its target due to quality control issues, with only 181,842 international students in 2023. Second, while there has been some improvement in the distribution of students by country of origin, major, and institutional location, the concentration of Chinese students and humanities majors remains high. Third, non-capital regional universities continue to struggle to compete with capital regional institutions, suggesting structural disparities in higher education capacity and attractiveness.

Based on the above research results, the following implications are suggested. First, to ensure the quality of international students, universities should formulate more rigorous admission standards to ensure that international students possess a high level of academic background, language proficiency, and comprehensive ability. Additionally, it is recommended that the language proficiency requirements for international students be strengthened and that interviews be conducted for majors with higher academic standards.

Second, the government should provide exceptional policy support for Asian international students to further enhance the international appeal of South Korean higher education institutions. According to the current situation, Asian students account for the highest proportion. It is necessary for the South Korean government to expand this advantage to achieve the expected goal of attracting more than 300,000 international students by 2027. With the increase in international students from Vietnam and Uzbekistan, the South Korean government can establish scholarship programs and provide living subsidies for international students from Central and Southeast Asia to alleviate their financial burden.

Lastly, the government should actively enhance the international appeal of non-capital regional universities and attract students from engineering and natural sciences. To enhance the academic and employment competitiveness of non-capital regional universities, the government should encourage local universities to collaborate with enterprises and local communities. Additionally, the government could encourage international students to pursue engineering or natural science majors by introducing foreign professors, increasing the number of English-taught courses, enhancing scientific research facilities, and establishing scholarships.

In conclusion, the internationalization of South Korean higher education has entered a critical stage. While numerical expansion has largely succeeded, the next decade must focus on improving quality, fostering diversity, and reducing structural imbalances to solidify South Korea's position as a global education hub.

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Bridging the Gap: Integrating Employability Skills - From Course Syllabi to Classroom Instruction

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ABSTRACT

This study investigates the integration of employability skills into course instruction at a medium-sized university in Vietnam, addressing a critical gap between learning and career preparedness. Using a convergent mixed-methods design, the research analyzes 30 course syllabi through qualitative content analysis and surveys 470 students for quantitative insights. Content analysis showed that objectives and learning outcomes more often signal these skills than do teaching activities or assessments. Personal qualities and problem-solving appear frequently in objectives (43% and 47%, respectively), but rarely in assessments (4% and 20%, respectively). Critical thinking is more often tested than taught, while communication and teamwork are primarily featured in activities (43% and 34%), rather than in stated goals. Time management is almost absent. ANOVA results indicate significant differences in syllabus engagement ($F = 4.394$, $p = .013$), with year 4 students engaging more than year 2 students (Mean Difference = -0.215, $p = .023$). Correlation analysis ($r = .503$, $p < .01$) confirms a link between skill integration and perceived career relevance. No year-level differences emerged in perceived skill integration or teaching effectiveness. Findings highlight misalignments between intended and enacted skill development, underscoring the need for clearer, practice-based syllabus design.

Keywords: course syllabus, skills development, mixed-methods, higher education.

1. Introduction

In today's dynamic and competitive labor market, higher education plays a pivotal role in equipping graduates with the employability skills that organizations increasingly demand. Academic credentials alone are no longer sufficient in complex professional environments that require a broad range of interpersonal and cognitive abilities (Smith et al., 2016; Suleman, 2018). A 2023 PwC Asia-Pacific survey reports that 69 percent of employers prioritize adaptability and flexibility, followed closely by collaboration (67 percent) and critical thinking (66 percent). These findings reaffirm the ongoing global trend of embedding employability skills into university curricula a movement that has been well established over the past few decades (Yorke, 2006; Tomlinson, 2017; PwC, 2023). As universities continue this evolution, they are rethinking course design and delivery to ensure that students develop employability skills, such as communication, teamwork, and problem-solving, through purposeful teaching strategies and assessment practices. Moreover, numerous studies have documented efforts to enhance graduate employability by embedding essential skills into curriculum design and teaching practices (Huq & Gilbert, 2013). While these initiatives highlight the crucial role of educators in aligning learning outcomes with industry needs, implementing them at the course level can be challenging. For example, syllabi often list broad, competency-based outcomes but fail to show how specific class activities or assessments develop those skills (Jackson, 2016). At the same time, instructors report struggling to integrate employability skill development without compromising the depth of their subject matter content (Anthony, 2014).

In the specific context of Vietnam, although many higher education programs now aim to integrate employability skills into their curricula, these competencies often remain unarticulated or underdeveloped in course materials, especially within the rapidly changing landscape of Vietnamese higher education. Course syllabi often fail to emphasize these essential skills. As the foundational document guiding both instruction and assessment, the syllabus plays a critical role in shaping how students engage with employability competencies. When learning objectives, in-class activities, and evaluation tasks are intentionally aligned with clearly defined, transferable outcomes, students are more likely to receive consistent and meaningful support in developing those skills. Although aligning these elements at the course level can be challenging, it remains vital for fostering skill development in a structured and intentional manner (Rana et al., 2023). Thoughtfully designed syllabi, therefore, can serve as a bridge between academic instruction and workplace readiness by explicitly connecting course content with real-world skill requirements.

While studies on the integration of employability skills exist, little research has systematically analyzed course syllabi to assess the development of these skills. To address this gap, our convergent mixed-methods study examines the competencies specified in faculty-designed syllabi. How they're enacted through teaching and learning activities, as well as students' own reflections on their skill growth, at a medium-sized university in the South-Central U.S. We map key employability competencies onto syllabus components, objectives, learning outcomes, classroom activities, and assessment, and then compare this curricular blueprint with students' perceptions of how those activities fostered their skill development. Ultimately, our findings provide Vietnamese educators with an evidence-based guide to designing course syllabi that intentionally cultivate the transferable skills graduates need to succeed in the modern workplac

2. Literature Review

Employability Skills

As global labor markets evolve, and the importance of employability skills becomes more widely recognized, universities face increasing pressure to prepare students with more than just subject-specific knowledge. The ability to adapt, collaborate, and think critically has long been valued by employers, and in recent years, these competencies have received growing attention in educational planning and curriculum design (Smith et al., 2016; Dolce et al., 2020). Institutions are therefore under rising pressure to embed what are often referred to as employability skills or soft or transferable skills into their curricula. These competencies are emphasized as essential not only for immediate career readiness but also for students' long-term professional adaptability and lifelong learning (Ting et al., 2017).

Employability skills are commonly described as broad competencies that cut across disciplines and work environments. Research has consistently identified key attributes such as communication, critical thinking, collaboration, problem-solving, adaptability, and time management as essential for workforce success (Fahimirad et al., 2019; Mainga et al., 2022; Rana et al., 2023). In a LinkedIn-based survey of professionals, Barker (2014) reported that communication was rated as the most critical workplace competency, followed by critical thinking and logical analysis. This sustained emphasis on employability skills is echoed in recent employer surveys across Asia, including PwC's regional findings, which continue to highlight the value of human-centered competencies in today's labor market (PwC, 2023).

Note. Adapted from *Employability Skills Framework*, by U.S. Department of Education, n.d. (https://cte.ed.gov/initiatives/employability-skills-framework). Copyright by the U.S. Department of Education.

Figure 1: Common Framework for Employability Skills

To help institutions and organizations structure the development of these competencies, several established frameworks have emerged. The 21st Century Skills Framework (Binkley et al., 2010) and the U.S. Department of Education's Employability Skills Framework, for example, categorize these skills into interconnected domains such as applied knowledge (e.g., creativity, critical thinking), workplace skills (e.g., communication, collaboration), and personal effectiveness (e.g., accountability, time management). These models offer practical guidance for integrating employability competencies into course design and instructional practices. Building on these conceptual foundations, the present study adopts a framework-based approach to examine how

employability constructs are represented in course syllabi and how students perceive their own development of these skills.

Graduate Employability Skills in the Context of Vietnam

Graduate employability has become a national priority in Vietnam, influencing higher education reforms and institutional strategies (Bui et al., 2019; Tran, 2020; Vu et al., 2022). While universities have taken steps to align academic programs with labor market needs, a noticeable disconnect persists between curricular intentions and employer expectations, particularly in areas such as communication, critical thinking, and teamwork (Tran, 2018a, 2018b).

Truong's (2016) survey of 577 business educators identified communication and accountability as top-priority skills, with teamwork, time management, and presentation skills also ranking highly, while customer service and leadership received less emphasis. These findings also suggest variation in how employability skills are prioritized, which may influence the integration of such competencies into course design, instructional practices, and student learning outcomes.

From the employer perspective, Pham et al. (2018) reported dissatisfaction with graduates' communication, teamwork, and planning abilities, suggesting that traditional, content-heavy curricula may fall short in preparing students for workplace demands. Students have echoed similar concerns: Doan and Le (2017) found that 36.8% of students desired more opportunities to develop skills such as communication and planning, while Tran (2020) documented low confidence in critical thinking and self-management among final-year students. Together, these perspectives underscore the need for more intentional, syllabus-level interventions aimed at developing core employability competencies.

Employability Skills and Course Syllabi

Course syllabi are foundational documents that communicate a course's instructional approach, learning outcomes, and expectations and thus serve as strategic vehicles for embedding employability skills (Slattery & Carlson, 2005; O'Brien et al., 2009). Ludy et al. (2016) emphasize the value of learner-centered syllabi, which shift from listing content to guiding students through meaningful engagement and reflective practice. Such syllabi promote clarity in objectives, task sequencing, and assessment rubrics—elements closely tied to employability development, such as time management and decision-making.

In Vietnam, although most universities require syllabi, they are often underutilized for skill development. As Tran (2018a, 2018b) notes, Vietnamese syllabi often omit these scaffolding details, leaving students uncertain about the skills they are expected to develop.
While international efforts to embed employability into syllabi have gained momentum, empirical research in Vietnam remains limited. To address this gap, the present study examines through both syllabus analysis and student perception surveys how employability constructs are explicitly integrated and experienced in Vietnamese higher-education courses.

Global frameworks, employer surveys, and local studies converge on a core set of competencies, yet the syllabus itself often remains the "missing link" for operationalizing these skills in daily teaching. Drawing on models 21st Century Skills Framework (Binkley et al.,2010) and the U.S.

Department of Education's Employability Skills Framework, and empirical work by Barker (2014), Fahimirad et al. (2019), and Rana et al. (2023), we focus on six key constructs:

- **Communication**: Conveying and receiving information effectively.
- **Teamwork**: Collaborating with peers.
- **Critical thinking**: Evaluating and reasoning through complex problems, manifest in problem-based tasks and higher-order cognitive outcomes.
- **Problem-solving**: Applying knowledge to real-world challenges.
- **Time management**: Planning and meeting deadlines.
- **Personal qualities** (e.g., Accountability and independent learning): Demonstrating responsibility for one's own work and learning process.

By mapping these constructs to syllabus components (objectives, outcomes, teaching methods, assessments) and triangulating with student perceptions, this study builds a conceptual bridge between instructional design and employability outcomes, making integration of career-relevant skills more visible, structured, and actionable in the Vietnamese context.

3. Research Framework

To guide our study, we developed an Employability Integration Framework (Figure 2), which is grounded in both international employability models and empirical research in higher education contexts. The framework comprises three interrelated domains, each connected by bidirectional arrows to illustrate their dynamic interplay:

- **Syllabus Content & Core Employability Skills**
  This domain encompasses formal syllabus components, Course Objectives, Learning Outcomes, and Assessment, that explicitly signal the employability skills targeted by faculty.
- **Teaching–Learning Activities**
  These in-class and out-of-class activities operationalize syllabus content and shape student engagement. Examples include group projects, case studies, simulations, presentations, and reflective journals. Although embedded within syllabi, we treat these activities as a distinct variable: syllabi are coded for planned activities, and students report whether they perceived skill development through them.

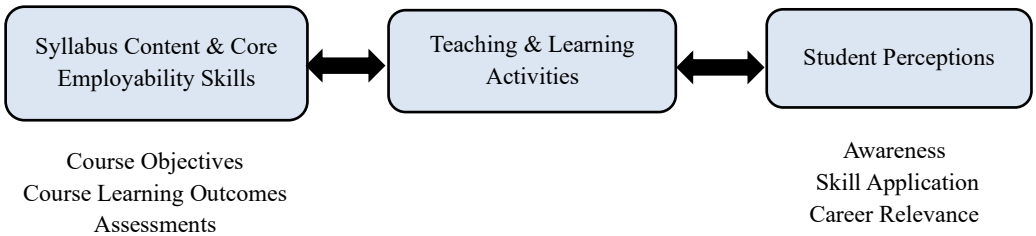

Figure 2: Employability Integration Framework

- **Student Perception**
  This domain captures how students interpret and respond to the employability skills embedded in their coursework. We assess three dimensions:

- **Awareness**: Recognition of skill emphasis in the syllabus.
- **Skill application**: Whether students feel they gained the skill through course activities.
- **Career relevance**: Perceived usefulness of the skill for future employment.

Grounded in the Employability Integration Framework, this study addresses the following research questions:

1. Which employability skills (e.g., communication, teamwork, critical thinking, problem-solving, time management) are explicitly embedded in the course syllabi?
2. How do students from different academic years (2nd, 3rd, and 4th) perceive the integration of those employability skills in their syllabi?
3. How does the clarity of employability skill integration in the syllabus influence students' perceptions of their skill development in the classroom?

4. Methodology

Research Design

This study employs a **co**nvergent mixed-methods design**,** in which qualitative and quantitative data are collected concurrently and analyzed separately before integration (Creswell, 2014; Dawadi et al., 2021). Qualitative content analysis of course syllabi uncovers how faculty embed employability skills; a student survey then captures how those same skills are perceived "on paper" and in practice.

By comparing statistical results with qualitative findings, we triangulate insights to enhance validity and deepen our understanding of alignment (Bowen, 2009; Morgan, 2022). Although direct educator input is not collected, their influence is inferred through the syllabus content.

Instrument Development

We created a ***Perceptions of Employability Skills Questionnaire*** in Vietnamese to capture three dimensions—awareness, skill acquisition, and career relevance—across six target employability skills (communication, teamwork, critical thinking, problem-solving, time management, and personal qualities). The instrument comprises 20 closed-ended items plus demographic questions and three open-ended prompts.

- **Item generation:** Drafted from definitions and examples in the 21st Century Skills Framework (Binkley et al., 2010), the U.S. Department of Education's Employability Skills Framework, and empirical studies (Fahimirad et al., 2019; Mainga et.al., 2022; Rana et al., 2023; Truong, 2016). Each item was worded to reflect how that skill appears in course syllabi.
- **Scale structure:** We used a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) to provide respondents with a balanced range of options, allowing for nuanced expression of agreement without overwhelming complexity.
- **Content validity:** The draft of the questionnaire was reviewed by three higher-education quality assurance specialists and two instructional designers for clarity, relevance, and cultural appropriateness. Their feedback led to minor wording refinements to ensure that Vietnamese undergraduates could easily understand the items.

- **Pilot testing:** The pilot test was administered to 25 undergraduates to assess comprehension and timing. No item exceeded an average 10-second read time, and at least 95% of pilot participants rated all items unambiguous.

Data Collection and Analysis

Qualitative Data: Data for this study were collected through syllabus content analysis, following the approach outlined by Bowen (2009), who emphasizes the value of documents in providing contextual information, supplementing data, and verifying findings. This method was selected to examine how employability skills were embedded in course syllabi. A total of 30 syllabi were purposively selected based on Flick's (2018) inclusion criteria: authenticity, representativeness, and meaning. Only syllabi officially approved by department chairs were included. The sample covered general education (8 syllabi, e.g., Philosophy, Mathematics), foundational (8 syllabi, e.g., Microeconomics, Theory of Translation), and specialized courses (14 syllabi, e.g., Strategic Management, Raw Aquatic Materials) to ensure comprehensive representation. The sample size was determined based on the principle of data saturation in qualitative content analysis (Merriam & Tisdell, 2016) to ensure both depth and breadth in analyzing instructional priorities and the integration of employability skills.

Guided by Bowen's (2009) framework, content analysis was employed to identify text elements related to employability skills systematically. This involved examining specific words, phrases, and sentences within key syllabus components, such as course descriptions, objectives, learning outcomes, teaching methods, assessments, assignments, and schedules.

Once the syllabi were collected and initially coded, the data were organized into classifications based on syllabus components and employability skills, allowing for a deeper analysis. Two researchers independently coded all 30 syllabi using *Taguette*, an open-source qualitative analysis tool. A consensus coding process followed, incorporating trustworthiness strategies recommended by Creswell and Poth (2018) and Nowell et al. (2017), including independent coding, reflexive discussion, and audit documentation to ensure analytic rigor and transparency.

Quantitative Data: A quota sampling approach ensured adequate representation from students in years 2, 3, and 4 (120+ participants per year) to capture perspectives from various academic stages. This method, commonly used in educational research (Battaglia, 2011), allows for flexibility while ensuring key subgroups are represented. Participants were selected from diverse disciplines to enhance insight variety, balancing feasibility with meaningful representation for a thorough exploration of students' perceptions on the integration of employability skills.
T
he survey was distributed through course instructors and Student Associations, ensuring broad accessibility. Students were encouraged to participate by completing the questionnaire within the designated timeframe. Conducted between October 25 and November 2024, the study successfully collected 470 valid responses, all of which were included in the analysis. Since the survey was designed with a sequential response format, requiring students to answer each question before proceeding, there were no incomplete or invalid responses.

Statistical Considerations: Given the research questions, ANOVA and correlation analyses were used to compare perceptions across academic years and identify key relationships between syllabus engagement and skill perception.

5. Findings and Discussion

Qualitative Findings: Integration of Employability Skills in Course Syllabi.

Our analysis of 30 undergraduate course syllabi (Table 1) reveals that all six target employability skills personal qualities, problem-solving, critical thinking, communication, teamwork, and time management are represented to varying degrees across four key syllabus components: objectives, learning outcomes, teaching and learning activities, and assessments. Personal qualities appear most frequently in course objectives (43 percent). Still, they are sparsely reflected elsewhere, appearing in only 10 percent of learning outcomes and a mere 4 percent of both teaching activities and assessments. For example, the Political Economics syllabus includes an objective to "foster professional working attitudes," encouraging confidence, discipline, and responsibility; yet it offers little in the way of structured tasks or evaluations to develop these attributes further.

Table 1: Skill–Component Matrix

Skill	Course Objectives (n/30, %)	Learning Outcomes (n/30, %)	Teaching & Learning Activities (n/30, %)	Assessment (n/30, %)
Personal Qualities (Accountability, Independent learning)	(13) 43%	(3) 10%	(1) 4%	(1) 4%
Problem - Solving	(14) 47%	(15) 50%	(10) 34%	(6) 20%
Critical Thinking	(10) 34%	(17) 57%	(9) 30%	(11) 37%
Teamwork	(3) 10%	(2) 7%	(10) 34%	(9) 30%
Communication	(4) 14%	(13) 43%	(13) 43%	(14) 47%
Time Management	(2) 7%	(2) 7%	(2) 7%	0%

Problem-solving is signaled in nearly half of the course objectives (47 percent) and learning outcomes (50 percent), demonstrating instructors' intent to cultivate analytical skills. However, fewer than one-third of syllabi translate this intent into practice: only 34 percent outline specific activities, and just 20 percent incorporate problem-solving into assessments. The Microeconomics syllabus, for instance, emphasizes "equipping learners with the skills to analyze and evaluate management decision-making processes," but provides limited guidance on how students are to practice and be evaluated on that skill.

Critical thinking emerges most consistently in course objectives (34%), learning outcomes (57%), teaching and learning activities (34%), and assessments (37%), suggesting that many instructors both aim for and test analytical reasoning. The Tourism Management syllabus, for example, tasks students with "analyzing and evaluating marketing strategies for restaurant and food-service businesses," yet offers few hands-on activities to build such evaluative skills prior to assessment. Communication skills are emphasized in nearly half of teaching activities (43 percent) and assessments (47 percent), primarily through presentations, written reports, and oral exams, but

are rarely mentioned in course objectives (14 percent). Teamwork follows a similar pattern: present in just 10 percent of objectives and 7 percent of learning outcomes but integrated into 34 percent of activities and 30 percent of assessments, often via collaborative projects and group work activities.

Time management, despite its importance in organizing tasks and meeting deadlines, is virtually absent, being mentioned in only 7 percent of objectives and entirely omitted from assessments. Only two syllabi briefly note the need to plan deadlines, and none provide explicit assignment schedules or grading timelines. This lack of formal structure obscures how students might develop.

Overall, our findings suggest that syllabus objectives and learning outcomes are more reliable indicators of employability skills than are teaching and learning activities or assessments. The almost total neglect of time management in formal evaluation highlights a significant misalignment between intended skill integration and actual practice. By contrast, U.S. syllabi often include detailed assignment schedules and grading criteria, which foster transparency and nurture time-management development. The sparse treatment of time management in our Vietnamese sample echoes prior reports of graduate skills gaps (Tran, 2018a; Pham et al., 2018) and diverges from international employability frameworks (e.g., Binkley et al., 2010; U.S. Department of Education's Employability Skills Framework). These patterns set the stage for our next inquiry: exploring how students themselves perceive their development of these competencies in the classroom.

Quantitative Findings

A total of 470 student responses were analyzed, comprising 196 year 2 students (41.7%), 143 year 3 students (30.4%), and 131 year 4 students (27.9%) across various disciplines at the research site. The ANOVA results (Table 2) reveal differences in students' perceptions and behaviors across different academic years (Year 2, Year 3, and Year 4) regarding syllabus engagement, employability skills, and teaching methods. The Tamhane post-hoc test was conducted to explore further the significant differences identified in the ANOVA results, particularly for the variables "Often read the syllabus before starting a course" and "Gained skills are helpful for future work." The results (Table 3) reveal specific pairwise differences between academic years (Year 2, Year 3, and Year 4), providing deeper insights into the nature of these differences.

Engagement with Course Syllabi: For the item *"Often read the syllabus before starting a course",* the ANOVA result (Table 2) indicates a statistically significant difference ($F = 4.394$, $p = .013$) in how often students read the syllabus before starting a course. This suggests that students in different academic years vary in their engagement with course syllabi. The Post-Hoc Tamhane test was conducted and confirmed the significant difference. The results (Table 3) show that significant differences were found between Year 4 and both Year 2 (Mean Difference = -0.215, $p = 0.023$) and Year 3 (Mean Difference = -0.229, $p = 0.026$). This indicates that Year 4 students are significantly more likely to read the syllabus before starting a course compared to students in Years 2 and 3. The findings suggest that as students progress through their academic journey, they become more proactive in engaging with course materials, possibly due to increased awareness of the importance of aligning their learning with career goals (Kuh et al., 2008). The significant result highlights the importance of encouraging early engagement with syllabi to foster a deeper

understanding of course objectives and expectations. Research by Slattery and Carlson (2005) supports this, noting that students who engage with syllabi early are better equipped to manage their learning and achieve academic success.

Table 2: One-Way ANOVA of Student Perceptions of Employability Skills by Year Level

Items	Between Group Sum of Squares	Within Group Sum of Squares	Total Sum of Squares	Degrees of Freedom (B/W)	Mean Square (Between)	F-value	Significance (p-value)
Often read the syllabus.	4.613	245.142	249.755	2, 467	2.307	4.394	.013*
Employability skills clearly presented in the syllabus	0.644	227.996	228.640	2, 467	0.322	0.660	.517
Teaching activities help understand skill development	0.503	157.644	158.147	2, 467	0.251	0.744	.476
Teaching activities connect to job-required skills	0.052	212.791	212.843	2, 467	0.026	0.057	.945
Skills are clearly integrated into courses	1.214	273.341	274.555	2, 467	0.607	1.037	.355
Teaching methods help develop skills	0.136	37.287	37.423	2, 467	0.068	0.852	.427
Learning activities help apply skills	0.088	291.878	291.966	2, 467	0.044	0.070	.932
Gained skills helpful for future work	29.248	1831.239	1860.487	2, 467	14.624	3.729	.025*

Perceptions of the Gained Skills Helpfulness for Future Work: A significant difference, however, emerged regarding the perception of how helpful the skills gained through courses would be for future work. The ANOVA results showed a statistically significant difference ($p = .025$) in how students from different year levels viewed the usefulness of the skills they acquired. Year 2 students rated the helpfulness of the skills they gained more positively (mean = 3.98) compared to Year 3 students (mean = 3.86) (Table 3), with the difference between Year 2 and Year 3 students being statistically significant (mean difference = -0.541, $p = .045$) (Table 3). However, no significant differences were found between Year 2 and Year 4 students, nor between Year 3 and Year 4 students. This suggests that while Year 2 students perceive the skills they gain as more helpful for future employment, this perception diminishes slightly by Year 3, with Year 4 students' perceptions remaining somewhat neutral.

The variation between Year 2 and Year 3 students may reflect the changing nature of students' academic and professional expectations as they move through their university education. As students progress, they may begin to feel more skeptical or uncertain about the direct applicability of the skills they learn in the classroom to real-world employment situations.

Table 3: **Student Perceptions by Year Level with Post Hoc Comparisons**

Variable	Cohort Comparison	Mean (I)	Mean (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval
Often read syllabus	Year 2 (n=196)	3.68 ± 0.73	—	—	—	—	—
	Year 3 (n=143)	3.66 ± 0.74	—	—	—	—	—
	Year 4 (n=131)	3.89 ± 0.69	—	—	—	—	—
	Year 2 vs. Year 4	3.68	3.89	-0.215*	0.080	0.023	[-0.41, -0.02]
	Year 3 vs. Year 4	3.66	3.89	-0.229*	0.087	0.026	[-0.44, -0.02]
Gained skills helpful for future work	Year 2 (n=196)	3.98 ± 0.85	—	—	—	—	—
	Year 3 (n=143)	3.86 ± 0.75	—	—	—	—	—
	Year 4 (n=131)	3.76 ± 0.82	—	—	—	—	—
	Year 2 vs. Year 3	3.98	3.86	0.541*	0		

Notes:

1. **Means (Mean ± SD)** reflect responses on a **5-point Likert scale** (1 = Strongly Disagree, 5 = Strongly Agree).
2. *$p < .05$. Significant differences are marked with an asterisk (**).
3. **Post hoc comparisons** use the Tamhane T2 test.

Perceptions of Employability Skills Integration and Teaching Methods: The ANOVA results (Table 2) reveal a consistent pattern across academic years regarding students' perceptions of employability skills integration and the effectiveness of teaching methods. No significant differences were found in students' perceptions regarding whether employability skills are clearly mentioned in syllabi ($p = .517$), whether teaching and learning activities help in understanding skill development ($p = .476$), or whether skills are integrated into courses ($p = .355$). Similarly, students across all years perceived a disconnect between classroom activities and job-required skills ($p = .945$). They shared similar views on the effectiveness of teaching methods in fostering skill development ($p = .427$). These findings suggest that students generally feel employability skills are not explicitly communicated or effectively integrated into their courses, which aligns with research by Tomlinson (2017) and Bridgstock (2009), who argue that employability skills are often implicit in curricula, making it difficult for students to recognize their relevance to future careers.

The lack of significant differences also highlights a broader issue with the perceived gap between academic activities and the application of real-world skills. Students across all years struggle to see the relevance of classroom activities to their future careers, as noted by Jackson and Wilton (2017). This underscores the need for more experiential learning opportunities, such as internships, simulations, and project-based learning, to bridge this gap. Knight and Yorke (2004) emphasize that employability is not just about possessing skills but also about understanding how to apply them in real-world contexts, which traditional teaching methods often fail to address.

Furthermore, the shared perception of teaching methods' inadequacy in developing skills suggests a need for innovative pedagogical approaches. Bridgstock (2009) and Biggs and Tang (2011) advocate for collaborative learning, technology-enhanced methods, and constructive alignment between learning outcomes, teaching activities, and assessments. These approaches are crucial for fostering skill development and may not be fully realized in current research site practices.

To explore the relationships between variables, particularly for questions that showed no significant differences in the ANOVA, Spearman's correlation analysis was performed (Table 4). The results highlight several significant relationships that complement the ANOVA findings, offering a deeper understanding of how students perceive employability skills, teaching methods, and their connection to future work.

Teaching Methods and Skill Development (Table 4): Perceptions of teaching methods helping develop skills (*Variable 7*) showed weak but significant negative correlations with almost all other variables, including employability skills mentioned in syllabi (*Variable 3*, $r = -.188$, $p < .01$), teaching and learning activities helping understand skill development (*Variable 4*, $r = -.224$, $p < .01$), and skills being integrated into courses (*Variable 6*, $r = -.280$, $p < .01$). This indicates that students who perceive teaching methods as less effective in developing skills are also less likely to recognize the integration of employability skills in their courses. This finding supports the ANOVA result, which showed no significant differences in perceptions of teaching methods across academic years, suggesting a widespread dissatisfaction with traditional teaching approaches. Bridgstock (2009) emphasizes the need for innovative pedagogical methods to address this gap.

Connection between Learning Activities and Employability Skills: The perceived connection between teaching and learning activities and job-required skills (*Variable 5*) showed strong positive correlations with employability skills mentioned in syllabi (*Variable 3*, $r = .503$, $p < .01$), teaching and learning activities helping understand skill development (*Variable 4*, $r = .544$, $p < .01$), and skills being integrated into courses (*Variable 6*, $r = .517$, $p < .01$). This suggests that students who perceive a strong alignment between classroom activities and job-required skills are also more likely to recognize the integration of employability skills in their coursework and how these skills contribute to their professional preparation. This finding aligns with the ANOVA result, which showed no significant differences in perceptions of this connection across academic years, highlighting a consistent need for better alignment between academic activities and workplace requirements (Jackson & Wilton, 2017).

Helpfulness of Gained Skills for Future Work: The perceived most useful skill for future work (*Variable 9*) showed weak but significant negative correlations with several variables, including skills being integrated into courses (*Variable 6*, $r = -.181$, $p < .01$) and classroom activities helping apply skills (*Variable 8*, $r = -.154$, $p < .01$). This suggests that students who prioritize certain skills for future work are less likely to perceive those skills as being effectively integrated or applied in their courses. This could reflect a broader appreciation of multiple skills rather than a singular focus. This finding complements the ANOVA result, which showed significant differences in perceptions of the most useful skill across academic years, indicating evolving skill priorities as students' progress through their studies (Hinchliffe & Jolly, 2011).

Table 4. Spearman's Correlation Matrix: Relationships Between Student Perceptions of Employability Skills and Teaching Methods

#	Variable	1	2	3	4	5	6	7	8	9
1	Year of Study	1								
2	Often read the syllabus	.102*	1							
3	Skills clearly presented in the syllabus	–.012	.288**	1						
4	Activities help understand skill development	–.037	.257**	.495**	1					
5	Activities connect to job-required skills	–.005	.285**	.503**	.544**	1				
6	Skills clearly integrated into courses	.048	.354**	.482**	.467**	.517**	1			
7	Teaching methods help develop skills	–.051	–.137**	–.188**	–.224**	–.214**	–.280**	1		
8	Activities help apply skills	.008	.301**	.349**	.404**	.440**	.461**	–.221**	1	
9	Gained skills helpful for future work	.036	–.119**	–.072	–.073	–.093*	–.181**	.094*	–.154**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation results offer a nuanced understanding of the relationships between the variables examined in the ANOVA. While the ANOVA identified significant differences in syllabus engagement and perceptions of the most useful skill across academic years, the correlation analysis reveals the interconnectedness of these variables. For example, the strong positive correlation between syllabus engagement and perceptions of employability skills integration (*Variables 2 and 3*) supports the ANOVA finding that Year 4 students, who are more likely to read syllabi, also perceive a stronger emphasis on employability skills. Similarly, the weak negative correlations involving teaching methods (*Variable 7*) align with the ANOVA result, which shows no significant differences in perceptions of teaching methods across academic years, suggesting a consistent dissatisfaction with traditional approaches. These findings underscore the need for tailored interventions to address the unique needs of students at different stages of their academic journey and better prepare students for the demands of the modern workforce, as emphasized by Tomlinson (2017) and Bridgstock (2009).

Comparison of Employability Skills Across Courses: The analysis of students' perceptions of employability skills development across course groups (Figure 3), alongside the opportunities for practicing these skills (Figure 4), reveals a cohesive narrative about the strengths and gaps in course instruction. These findings highlight the critical role of intentional course design, practical learning opportunities, and alignment between course objectives and employability outcomes.

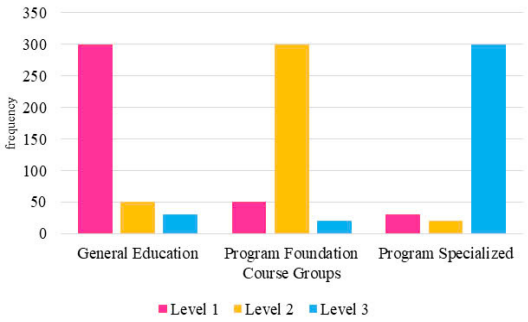

Figure 3: Employability Skills Development Across Course Groups

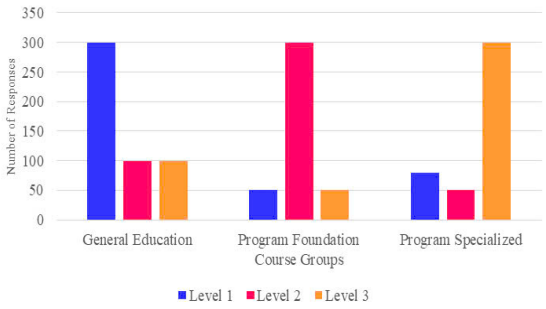

Figure 4: Opportunities for Practicing Employability Skills Across Course Groups

General education courses, designed to provide students with a broad foundational knowledge, were ranked the lowest (Level 1) by students in terms of both employability skill development and opportunities for practice. These courses were perceived as offering limited exposure to career-specific skills due to their theoretical and generalized nature.

Foundation courses, which provide more discipline-specific knowledge than general education courses, received moderate rankings (Level 2) for both skill development and opportunities for practice. Students' perceptions indicate that foundation courses incorporate some hands-on methods, such as problem-solving exercises and analytical tasks. However, these methods are not applied consistently across all courses, which could undermine their effectiveness in fostering employability (Tymon, 2013). Specialized courses, which focus on advanced, discipline-specific competencies, were ranked the highest (Level 3) for both employability skill development and opportunities for practice. Students identified these courses as offering the most targeted and practical learning experiences, often through assignments such as capstone projects, practicums, and research activities. These experiences enable students to engage in authentic tasks that mirror workplace challenges, thereby fostering essential skills such as critical thinking, teamwork, leadership, and adaptability (Jackson, 2016).

Triangulation of Quantitative and Qualitative Insights: Bridging Syllabi, Student Perceptions, and Institutional Practice

In our study of undergraduates' engagement with employability skills, three interwoven patterns emerge when we bring together survey data and syllabus analyses. First, although every syllabus nominally enumerates learning outcomes, often citing teamwork and critical thinking, the document itself seldom captures the full range of classroom activities that bring those skills to life. In practice, instructors deploy peer-review activities, client simulations, and in-class debates that remain "invisible" within the syllabus. Over time, students learn this hidden curriculum: fourth-year students, who read their syllabi significantly more often than their second- and third-year counterparts ($F(2,467)=4.39$, $p=.013$; Year 4 > Year 2,3; $|MD| \approx 0.22$, $p<.05$), have internalized the need to hunt for subtle cues deadlines, weightings, project descriptions that point to unannounced requirements. In contrast, early-year students take the syllabus at face value and engage less eagerly, trusting the document to outline what truly matters.

Second, optimism about the career relevance of course-acquired skills peaks in the second year and softens thereafter. Year 2 students rated the helpfulness of learned skills most highly ($M=3.98 \pm 0.85$),

significantly above Year 3 (adjusted MD=-0.541, p=.045), before settling into a more neutral stance in Year 4. This trajectory aligns with our syllabus review: foundational courses for second-year cohorts offer clearly scaffolded assignments such as case studies, structured reports, and guided problem-solving exercises that make the connection between classroom tasks and professional competencies unmistakable. In upper-level courses, however, many rich learning experiences continue to occur but are often omitted from the formal syllabus. Without explicit rubrics or documented practice opportunities, advanced students may underappreciate the very exercises that, in reality, hone their employability.

Third, students across all years rate the clarity of skill integration and the alignment of teaching activities with workplace requirements as only moderate and crucially, these ratings do not differ by cohort (all $p > .35$). Our document analysis sheds light on this uniformity: although time management, adaptability, and digital literacy surface as critical for today's graduates, they are either omitted or mentioned only in passing within syllabi - an issue also identified in previous studies (Tran, 2018a, 2018b; Pham et al., 2018). For example, only 47 percent of syllabi use group presentations or oral reports to evaluate communication, 30 percent incorporate team-based projects to assess collaboration, and 37 percent include case analyses or problem-solving assignments to gauge critical thinking, while time management is never mentioned. This helps explain why students, regardless of year, perceive a disconnect between what they believe they should practice and what the syllabus makes visible. Without clear outlines of classroom activities, submission deadlines, and grading criteria, students struggle to see how their coursework builds real-world skills.

To bridge this divide, we recommend updating course documents to include succinct overviews of all major teaching-and learning activities, whether foundational case studies or advanced simulations—and explicitly map each to the targeted skills. By making the hidden curriculum visible, we can nurture proactive engagement from the outset, sustain students' confidence in the relevance of skills throughout their program, and ensure that every learner recognizes how classroom experiences build the competencies they will need in their careers.

6. Conclusion and Implications

This study highlights the importance of aligning syllabus design with students' evolving needs and expectations across academic years. While employability skills such as teamwork, communication, and problem-solving are frequently listed as intended learning outcomes, their successful development depends not only on classroom practice but also on how clearly these activities and expectations are communicated to students through course documents. Our findings suggest that students, particularly in their early years, benefit from greater transparency and scaffolding in how syllabi present learning activities and their relevance to professional competencies.

The patterns revealed across survey and syllabus data point to several implications for improving instructional design and student engagement:

1. **Clarify skill development pathways in syllabi.** Beyond stating intended learning outcomes and assignment weights, instructors should provide concise descriptions of how specific assignments (e.g., oral presentations, peer review sessions, simulations) contribute to targeted employability skills. This transparency helps students, especially in earlier years, recognize the purpose behind tasks and connect coursework with career readiness goals.

2. **Encourage early engagement with syllabi.** Since more senior students are better equipped to interpret syllabi, institutions should introduce strategies such as syllabus orientations, brief quizzes, or annotated syllabi to guide students in understanding expectations and skill-building opportunities from the outset of their academic journey.
3. **Diversify teaching methods to reinforce the relevance of skills.** Integrating active learning strategies, such as industry-linked projects, collaborative case studies, and reflective writing, can strengthen students' perception that classroom experiences mirror real-world demands. This approach is especially important given that similar instructional methods are being applied across disciplines, as indicated by the ANOVA results.
4. **Promote discipline-specific clarity.** Despite variations in content, syllabi across fields tend to use a similar format that may downplay field-specific skill sets. Tailoring language and examples to specific disciplines could enhance relevance and engagement for students.

By treating syllabi not just as administrative documents but as tools for signaling learning priorities, instructors and institutions can enhance students' awareness of how course activities contribute to their development of employability skills. Greater intentionality in syllabus design, especially when paired with active teaching practices, can empower students to take ownership of their learning and prepare more confidently for the workplace.

7. Limitations

This study has several limitations. First, since quota sampling is a non-probability method, findings cannot be generalized to all students beyond the study sample with high confidence. Although students from different academic years and disciplines were included, the sample may not fully represent diverse perspectives on the integration of employability skills.
Second, course syllabi were the primary data source for assessing skill integration. While syllabi outline objectives, activities, and assessments, they may not fully capture how these skills are taught in practice. Some instructors may emphasize skill development in ways not explicitly documented in the syllabus.

Finally, the study focused on syllabi from a specific institutional context, limiting comparisons with international practices. While references were made to syllabus structures in American universities, a broader cross-institutional analysis could provide deeper insights into best practices.

8. Recommendations for Future Research

1. **Instructor perspectives**: Examining faculty views on the integration of employability skills can reveal challenges and best practices in embedding these skills.
2. **Teaching strategies**: Investigating the impact of experiential learning, internships, and industry collaborations can offer practical recommendations.
3. **Employer insights**: Assessing employer perspectives on graduate preparedness can inform curriculum improvements and strengthen university-industry collaborations.

Future research in these areas can enhance employability skill development, ensuring graduates are well-prepared for the job market.

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The Impact of Business Coaching on the Entrepreneurial Competencies of Vocational Students in Higher Education

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ABSTRACT

This study examines the factors influencing entrepreneurial competency (EC) among students in vocational higher education, with a focus on entrepreneurial mindset (EM), entrepreneurial experience (EE), and business coaching (BC). It also explores the moderating role of BC in these relationships. Using a quantitative explanatory approach, data were collected from 312 students enrolled in vocational programs at the university level. The findings indicate that EE has the strongest influence on EC, followed by EM and BC. While BC contributes directly to EC development, its moderating effect varies. It strengthens the relationship between EE and EC but shows limited impact when paired with EM alone, especially in learning environments with reduced direct interaction. These results underscore the importance of combining experience-based learning with structured coaching that is responsive to students' backgrounds. The study contributes to the theoretical discourse on competency development by integrating perspectives from Student Involvement Theory and Connectionism. Practically, it recommends integrating adaptive coaching into experiential learning modules in entrepreneurship curricula. Future research should investigate additional moderating factors, such as digital learning engagement and industry exposure, to further enhance the effectiveness of coaching in entrepreneurship education.

Keywords: Coaching strategy, competency development, entrepreneurial mindset, startup experience, vocational education

1. Introduction

The growth of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia is heavily influenced by entrepreneurship, accounting for over 62% of the country's Gross Domestic Product (GDP) in 2021. However, despite its significant economic impact, entrepreneurship continues to face challenges in adapting to rapid technological advancements and disruptive changes in the business environment, particularly in the digitalization of business processes, shifting consumer behavior, and increasing global competition. One of the key strategies to address these challenges is the development of entrepreneurial competencies (EC), particularly in vocational education, where students are expected to gain practical skills and knowledge to prepare them for entrepreneurial careers.

Several studies have emphasized the importance of entrepreneurial competencies (EC) in fostering economic resilience and innovation (Pulka et al., 2021). However, most prior research has focused on cognitive skill-building and entrepreneurial intentions, with limited attention to behavioral and contextual factors that shape EC among vocational students. (Iwu et al., 2021). The current approach to entrepreneurial education in vocational programs often prioritizes curricular content over experiential learning, thereby limiting students' opportunities to engage in real-world entrepreneurial experiences. (Asikainen & Tapani, 2021).

A preliminary exploration was carried out at two Indonesian state universities in East Java, where vocational and diploma-level programs are offered through various faculties, including vocational and engineering faculties. Observations suggest that both institutions have moved beyond traditional teacher education by integrating more multidisciplinary and practice-based learning approaches into their vocational curricula. This evolving educational context provides a relevant setting to examine how entrepreneurial competencies are developed among vocational students within higher education institutions. Given the increasing demand for entrepreneurial skills in the Fourth Industrial Revolution, there is a pressing need to rethink how vocational students, particularly those in diploma-level applied education tracks, are prepared to develop entrepreneurial readiness and competencies. (Triyono et al., 2023).

Prior research has shown that an entrepreneurial mindset significantly predicts students' entrepreneurial intention and career adaptability. (Anjum et al., 2020). Similarly, students with hands-on entrepreneurial experience are more likely to develop strategic thinking and resilience in entrepreneurial ventures. (Fiandra et al., 2023). While these studies emphasize the individual contributions of EM and EE to entrepreneurial development, few have examined how these factors interact within vocational education settings. Moreover, the role of structured interventions such as business coaching remains underexplored in this context.

Despite extensive research on EC, there remains a significant gap in understanding how entrepreneurial mindset (EM), entrepreneurial experience (EE), and business coaching (BC) collectively contribute to EC development. While previous studies have explored these variables independently, their combined effects and potential moderating relationships, particularly in the context of disruptive education, remain underexplored. (Qureshi et al., 2023; Rae, 2005). Given the evolving demands of entrepreneurship education, particularly in vocational settings, it is essential to understand how these factors interact to shape students' entrepreneurial competencies (Lv et al., 2021; Vivekananth et al., 2023). Moreover, while business coaching (BC) has been widely recognized as an

effective strategy for developing entrepreneurial skills, its role in moderating the relationship between EM, EE, and EC in vocational education remains unclear.

Social Perception Theory explains how individuals interpret and respond to social cues, which influences entrepreneurial behavior and learning in coaching settings. Student Involvement Theory emphasizes that students learn more effectively when they are actively and purposefully engaged in structured learning environments. Meanwhile, Connectionism Theory suggests that learning is reinforced through repeated exposure and hands-on experience, aligning with the experiential nature of entrepreneurship education. This study seeks to clarify this relationship by integrating theoretical perspectives from Social Perception Theory, Student Involvement Theory, and Connectionism Theory to build a more comprehensive understanding of competency development in entrepreneurial education. This study aims to empirically examine these relationships using a structured explanatory approach, ensuring methodological alignment with its objectives and contributing to the broader discourse on the effectiveness of entrepreneurship education.

By addressing this research gap, this study makes a significant contribution to both theoretical and practical discussions in entrepreneurship education. The findings are expected to provide valuable insights for educators, policymakers, and vocational institutions in designing more effective entrepreneurship education models that align with the evolving business landscape.

2. Literature Review and Hypotheses

Entrepreneurial Competencies (EC) in Vocational Education

Entrepreneurial competencies (EC) are a combination of skills, knowledge, and attitudes that enable individuals to recognize, develop, and exploit business opportunities (Bauman & Lucy, 2021; Pulka et al., 2021) . EC plays a critical role in preparing students for entrepreneurial careers, particularly in vocational education, where practical and hands-on learning is emphasized. According to a study by (Fagadar et al., 2021) EC is a strong predictor of entrepreneurial success and can be cultivated through structured educational interventions. However, traditional pedagogical approaches in vocational education often lack the experiential learning components necessary to enhance these competencies. (Muhammad et al., 2023).

Recent studies have highlighted the need for competency-based entrepreneurial education, emphasizing skills such as opportunity recognition, risk management, and resilience. (Kanaan-Jebna et al., 2022; Pennetta et al., 2024). Despite these findings, research suggests that a gap remains in understanding how contextual and behavioral factors, such as entrepreneurial mindset, family entrepreneurial background, and business coaching, influence EC development among vocational students. (Pulka et al., 2021).

This study is grounded in three theoretical perspectives to explain the development of entrepreneurial competencies in vocational education: Social Perception Theory, Connectionism Theory, and Student Involvement Theory. These theories offer a multidimensional lens for understanding how students acquire, internalize, and refine entrepreneurial competencies through mindset formation, experiential learning, and structured coaching interventions. By integrating these theories, the study positions EC not merely as a product of instruction but as an outcome of students' perceptions, active involvement, and iterative entrepreneurial experiences in a disruptive educational environment.

Entrepreneurial Mindset (EM) and Its Impact on Entrepreneurial Competency (EC)

Entrepreneurial mindset (EM) refers to a cognitive framework that enables individuals to identify and act upon entrepreneurial opportunities. (Cui & Bell, 2022). It includes traits such as proactiveness, risk-taking, and innovativeness, which are essential for developing EC. (Nurliawati et al., 2023). Studies have shown that individuals with a strong EM are more likely to develop higher levels of EC, as they actively engage in entrepreneurial activities and learning experiences. (Namwat et al., 2024).

The Social Perception Theory has further supported the relationship between EM and EC. (Bandura & Hall, 2018), which explains how students' perceptions of entrepreneurial role models, peers, and educators influence their cognitive orientation toward entrepreneurship. When vocational students perceive entrepreneurial success as socially validated, they are more likely to internalize entrepreneurial traits and behaviors, thus enhancing their competencies. While an entrepreneurial mindset has a direct influence on entrepreneurial competency, recent studies suggest that this relationship may also be shaped by external support systems such as business coaching. In line with this perspective, the following hypotheses are proposed:

H1: EM has a significant effect on the EC of vocational students.

H3: Business coaching moderates the relationship between entrepreneurial mindset and entrepreneurial competency.

Entrepreneurial Experience (EE) and Its Impact on EC

Entrepreneurial experience (EE) refers to students' prior exposure to entrepreneurship-related activities, including participation in business planning, startup simulation, or real-world ventures. EE provides contextual learning that enables students to develop practical skills, including opportunity recognition, risk assessment, and decision-making. (Fiandra et al., 2023; Lyons et al., 2020). Research consistently shows that EE significantly contributes to the development of entrepreneurial competency (EC), especially when students engage directly in entrepreneurial projects during their studies. (Pennetta et al., 2024b).

This connection is also supported by Connectionism Theory, which posits that learning and behavior are shaped through repeated experiences and associations. (Brock, 2020). In entrepreneurship education, repeated engagement in entrepreneurial tasks reinforces students' cognitive and behavioral responses to business challenges, thereby enhancing their ability to effectively address these challenges. Coaching and mentorship can enhance this experience further by providing structured feedback and promoting reflective practice. (Jones & Smith, 2022). Accordingly, the second hypothesis is proposed:

H2: EE significantly affects the EC of vocational students

Business Coaching (BC) and Its Influence on Entrepreneurial Competency (EC)

Business coaching (BC) is a structured developmental process in which experienced mentors guide aspiring entrepreneurs. (Games, 2021; Reid et al., 2020). It has been demonstrated to enhance entrepreneurial competency (EC) by improving self-efficacy, problem-solving skills, and strategic decision-making. Jones & Smith (2022) Found that students who receive coaching report greater confidence in entrepreneurial ventures and are better equipped to face market challenges. Despite these

benefits, there is ongoing debate about the role of BC as a moderating factor. While some studies suggest that BC amplifies the effects of entrepreneurial mindset (EM) and contextual factors on EC, others caution that overdependence on coaching may hinder independent decision-making. (Kuratko et al., 2021; Nurliawati et al., 2023). Further research is needed to determine the optimal application of BC within entrepreneurship education, particularly in vocational contexts. (Istiyono et al., 2024).

The pedagogical relevance of BC is supported by Student Involvement Theory, which asserts that learning outcomes improve when students are actively engaged in structured educational experiences. (Astin, 1999). Business coaching provides such structure by promoting goal setting, reflective learning, and iterative practice, key components of experiential learning. Within vocational education, coaching interventions not only reinforce entrepreneurial content but also facilitate personalized development of competencies. This theoretical lens justifies the inclusion of BC as both an independent and moderating variable in this study.

Taken together, the literature indicates that while entrepreneurial mindset, experience, and coaching each contribute to competency development, their interrelationships, particularly in the context of vocational education, have not been fully explored. The integration of these variables, supported by established theoretical frameworks, provides a strong foundation for the empirical model proposed in this study. In addition to its direct influence on EC, BC is hypothesized to moderate the effects of both EM and EE. Therefore, the following hypotheses are proposed:

H4: Business coaching moderates the relationship between entrepreneurial experience and entrepreneurial competency.

H5: Business coaching has a direct significant effect on entrepreneurial competency.

H6: Business coaching moderates the relationship between entrepreneurial mindset, entrepreneurial experience, and entrepreneurial competency simultaneously.

Research Gap and Conceptual Framework

Although prior studies have examined entrepreneurial competencies (EC), entrepreneurial mindset (EM), entrepreneurial experience (EE), and business coaching (BC) as individual predictors of entrepreneurial outcomes, there is limited empirical evidence on how these factors interact, particularly within the context of vocational education. Most existing research has focused on traditional university students, neglecting the unique experiential and practical orientation of vocational learners who are expected to transition directly into entrepreneurial careers. Moreover, the impact of business coaching as a moderating variable remains underexplored in this setting, especially in relation to mindset-driven and experience-driven pathways to competency development.

This study addresses this gap by proposing a model that integrates EM and EE as predictors of EC, with BC serving both as an independent predictor and a moderating variable. Additionally, the study investigates whether BC enhances the impact of EM and EE on EC, either independently or in combination. The conceptual framework (Figure 1) illustrates the direct and moderating relationships hypothesized in this study, guiding the empirical validation through quantitative methods.

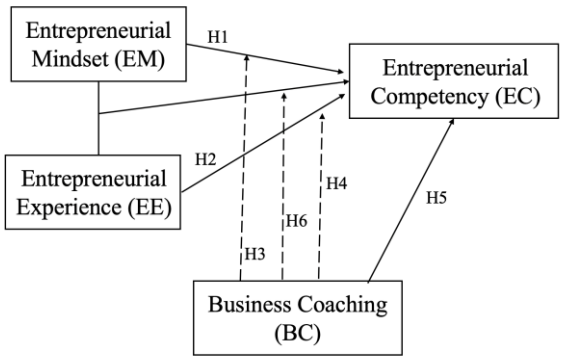

Figure 1. Conceptual Framework of This Study

As illustrated in Figure 1, the conceptual framework presents six hypothesized relationships: three direct effects, namely from EM to EC, EE to EC, and BC to EC. Three moderating effects in which BC moderates the relationships between (1) EM and EC, (2) EE and EC, and (3) the simultaneous influence of EM and EE on EC. This framework serves as the basis for formulating the research hypotheses.

3. Methods

Research Design

This study employed a quantitative, causal-explanatory research design, which is widely used to examine causal relationships between variables and assess the strength and direction of such effects. (Hair et al., 2014). A survey-based method was chosen for its effectiveness in collecting standardized data from a large sample, thereby enabling robust statistical testing of hypotheses. The research model (Figure 1) was developed through a synthesis of relevant literature to ensure that the constructs and hypothesized relationships were theoretically grounded and aligned with the study's objectives.

The research instrument consisted of a structured questionnaire divided into three sections: (A) demographic information, (B) measurements of the independent variables: entrepreneurial mindset (EM) and entrepreneurial experience (EE), and (C) measurements of the dependent variable, entrepreneurial competency (EC), as well as the moderating variable, business coaching (BC). All items were adapted from previously validated instruments and were assessed for content validity and internal consistency. Responses were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Davis et al., 2016; Iwu et al., 2021; Nofrida et al., 2022).

Population and Sample Size

The target population of this study consisted of vocational students enrolled in public universities in East Java, specifically at Universitas Negeri Malang and Universitas Surabaya. These two institutions were selected due to their active entrepreneurship programs and established track records in vocational and applied science education. Participants were eligible if they had completed at least the fifth semester, had taken entrepreneurship-related courses, and had participated in formal entrepreneurial activities such as business competitions or startup incubation programs.

From a total population of 632 students, a sample of 312 students was drawn using proportionate stratified random sampling. This technique was employed to ensure that different departments and academic programs were proportionally represented, allowing for broader generalization across vocational specializations. The minimum sample size was determined using Slovin's formula, applying a 95% confidence level and a 5% margin of error, ensuring statistical validity.

Research Instrument and Data Collection

The instrument for this study was a structured questionnaire adapted from previously validated scales in entrepreneurial education research. (Davis et al., 2016; Iwu et al., 2021; Nofrida et al., 2022). The items were translated into Bahasa Indonesia and refined through a back-translation process to ensure conceptual and linguistic equivalence. A pilot test involving 30 vocational students was conducted to assess clarity, language consistency, and face validity. Feedback from this stage informed minor revisions before full implementation.

The final survey was administered over four weeks in October 2024, using a mixed-mode strategy that included digital distribution through institutional platforms and printed forms in classrooms. This approach ensured broad and inclusive participation.

After data collection, Exploratory Factor Analysis (EFA) was performed using SPSS to examine construct validity. Internal consistency was assessed with Cronbach's Alpha, with all constructs showing values above 0.90, indicating excellent reliability. Operational definitions and indicator items are summarized in Table 1.

Table 1. Operationalization of Variables

Variable	Code	Question
EM	EM_1	I'll start a business if I have the chance and the resources.
	EM_2	Of the choices available, I favour being an entrepreneur.
	EM_3	I'm interested in a job as an entrepreneur.
	EM_4	I stand to gain more benefits from being an entrepreneur.
	EM_5	I would get enormous joy from starting my own business.
EE	EE_1	I'm excited to participate in this institution's entrepreneurship education programs.
	EE_2	One of the better courses in the area is this one.
	EE_3	This course on entrepreneurship development has taught me a lot.
	EE_4	My life will never be the same again because of this course.
	EE_5	The instructors make every effort to ensure that students are properly informed.
	EE_6	Thanks to this course, I now have the knowledge and abilities to launch my own business.
	EE_7	It is quite great that this university has started offering courses on entrepreneurship development.
	EE_8	I'm happy with this university's entrepreneurship development courses overall.
BC	BC_1	I'll do whatever I want to succeed as an entrepreneur.
	BC_2	I'm determined to open a business someday.
	BC_3	My professional ambition is to launch my own business.
	BC_4	I've seriously considered starting my own business.
	BC_5	I'll try my hardest to launch and manage my own business.
	BC_6	In the future, I'm committed to starting a business.
EC	EC_1	Calculated effects of macro-environmental variations. Calculate the project's risks.
	EC_2	· Calculate the project's budgetary demands.
	EC_3	· Develop a marketing and advertising plan.
	EC_4	· Identify pertinent competitor data.
	EC_5	· Getting external funding.
	EC_6	· Establish an operating strategy.

Data Analysis Techniques

The data collected from 312 valid responses were analyzed using SPSS version 26. The analysis began with descriptive statistics to summarize the demographic characteristics and response distributions for each variable, including measures such as mean, standard deviation, frequency, and percentage. Following this, a series of preliminary diagnostic tests were conducted to assess classical statistical assumptions. These included tests for normality, heteroscedasticity, and multicollinearity, ensuring the suitability of the data for regression analysis.

To evaluate the proposed hypotheses, Multiple Regression Analysis (MRA) was performed to examine the direct effects of entrepreneurial mindset (EM) and entrepreneurial experience (EE) on entrepreneurial competency (EC). In addition, Moderated Regression Analysis was applied to assess the moderating role of business coaching (BC) in the relationships between EM, EE, and EC. These analyses were supplemented with the PROCESS Macro, developed by Hayes (2022), which enabled the testing of interaction effects and the generation of bootstrapped confidence intervals for more robust inference. The significance of moderation effects was determined based on t-values exceeding 1.96 and p-values below 0.05, in accordance with standards suggested by Preacher & Hayes (2004) and Zhao et al. (2010). Model fit and explanatory power were assessed using the coefficient of determination (R^2), while the Variance Inflation Factor (VIF) was used to evaluate multicollinearity among predictor variables.

4. Result

Respondent Profile

The demographic characteristics of the sample are summarized in Table 2, which covers variables such as gender, age group, and prior entrepreneurial experience.

Table 2. Students Profile

Measurement	Rate
Gender	
Male	128
Female	184
Age	
19-20	91
21-22	149
23-24	72
Background	
Mechanical	72
Electrical	89
Civil	65
Technology Information	86
Has Entrepreneurship Experience?	
Yes	240
No	72
Has he created a business?	
Yes	163
No	149
Approximately how long have you had a business?	
Fewer than a year	215
Approximately one to three years	66
Above years	31

Table 2 shows that the sample consisted of 312 vocational students with diverse demographic profiles. The majority were female (58.4%), and the largest age group was 21–22 years (47.3%). Most students came from backgrounds in electrical and information technology. A high proportion (76.2%) reported prior entrepreneurial experience, and more than half (51.7%) had already started a business. These characteristics indicate that the respondents were highly relevant for investigating entrepreneurial competencies in vocational education.

Descriptive Statistics and Reliability

In addition to demographic information, the study also examined the statistical properties of the four main constructs, as presented in Table 3.

Table 3. Descriptive Statistics for Variables

Variable	Cronbach's Alpha	Mean	Interpretation
EM	0,577083333	04.33	High
EE	0,629861111	04.44	High
BC	0,681944444	04.03	High
EC	0,632638889	03.52	Medium

Table 3 summarizes the descriptive statistics and reliability scores of the four constructs. Entrepreneurial Mindset (EM), Entrepreneurial Experience (EE), and Business Coaching (BC) demonstrated high mean scores ($M > 4.00$), indicating strong agreement among respondents. Entrepreneurial Competency (EC) had a moderate mean score ($M = 3.52$). All constructs showed excellent internal consistency, with Cronbach's Alpha values exceeding 0.90.

Coefficient of Determination (R^2)

Table 4 presents the coefficient of determination (R^2), which explains the variance in Entrepreneurial Competency (EC) contributed by the independent variables EM, EE, and BC.

Table 4. Coefficient of Determination (R^2) and Percentage Contribution of Predictors to Entrepreneurial Competency

Variable	(R^2),	Percentage Effect (%)
EM	0.2027	20.27
EE	0.3251	32.51
BC	0.2816	28.16
Total		80.94

Table 4 presents the coefficient of determination (R^2), which indicates the proportion of variance in Entrepreneurial Competency (EC) explained by the independent variables: Entrepreneurial Mindset (EM), Entrepreneurial Experience (EE), and Business Coaching (BC). Collectively, these three predictors account for 80.94% of the variance in EC. Based on established thresholds in social science research, an R^2 value above 0.26 is considered substantial (Hair et al., 2010), suggesting that the proposed model demonstrates strong explanatory power.

Among the predictors, Entrepreneurial Experience (EE) contributed the most, explaining 32.51% of the variance. This finding highlights the crucial role of experiential learning in developing students' entrepreneurial competencies. Business Coaching (BC) accounted for 28.16%, indicating the value of

structured guidance in reinforcing entrepreneurial skill development. The Entrepreneurial Mindset (EM) contributed 20.27%, indicating that while psychological disposition is important, it is comparatively less influential than practical experience and coaching within vocational education contexts.

Hypothesis Testing and Moderation Analysis

Table 5 presents the hypothesis testing results using multiple regression analysis and moderation analysis, showing standardized coefficients (β), t-values, and p-values (significance levels) for each hypothesis.

Table 5. Hypothesis Analysis Results

Hypotheses	EM		EE		BC		Simultan	
	t	Sig.	t	Sig.	t	Sig.	F	Sig.
H1	5.908	0.000						
H2			8.156	0.000				
H3	-0.131	0.896			-0.203	0.840		
H4			-2.839	0.005	-2.903	0.004		
H5					7.336	0.000		
H6	5.543	0.000	7.005	0.000	0.680	0.497	48.061	0.000

Table 5 presents the results of hypothesis testing using multiple regression and moderation analysis. The findings indicate that Entrepreneurial Mindset (EM) has a significant positive effect on Entrepreneurial Competency (EC), as reflected in the support for H1 ($t = 5.908$, $p < 0.001$). Similarly, H2 is accepted, indicating that Entrepreneurial Experience (EE) has a significant influence on EC ($t = 8.156$, $p < 0.001$). This result reinforces the importance of experiential learning in enhancing students' entrepreneurial abilities.

In addition to these direct effects, H5 is also confirmed, indicating that Business Coaching (BC) exerts a direct and statistically significant influence on EC ($t = 7.336$, $p < 0.001$). This highlights the role of structured coaching interventions in fostering entrepreneurial skills, particularly in vocational education contexts.

Conversely, H3 is not supported. The interaction effect of BC on the relationship between EM and EC is not significant ($t = -0.131$, $p = 0.896$), suggesting that coaching does not enhance or alter the influence of entrepreneurial mindset on competency outcomes. In contrast, H4 is supported, showing that BC significantly moderates the relationship between EE and EC ($t = -2.839$, $p = 0.005$). This implies that coaching is particularly effective when students already possess hands-on entrepreneurial experience.

Finally, H6, which tests the simultaneous interaction of EM, EE, and BC on EC, receives partial support. While both EM and EE remain significant in the combined model ($t = 5.543$ and 7.005, $p < 0.001$, respectively), the interaction term for BC does not reach statistical significance ($t = 0.680$, $p = 0.497$). Nevertheless, the overall model remains significant ($F = 48.061$, $p < 0.001$), indicating that the structural framework retains explanatory value, even though the moderating effect of BC is not consistently strong across all paths.

5. Discussion

H1 – The Effect of Entrepreneurial Mindset on Entrepreneurial Competency

The results of this study provide empirical support for H1, indicating that entrepreneurial mindset (EM) has a significant positive effect on entrepreneurial competency (EC) ($t = 5.908$, $p < 0.001$). This finding aligns with prior research that highlights mindset as a fundamental driver of entrepreneurial behavior, particularly in how individuals recognize opportunities, navigate uncertainty, and persist in the face of challenges. (Cui & Bell, 2022; Nurliawati et al., 2023). Students with a strong EM are more likely to exhibit proactive attitudes, strategic thinking, and a willingness to innovate, traits essential to competency development. (Daspit et al., 2023).

This result also supports Social Perception Theory. (Zebrowitz, 1990), which suggests that individuals form behavioral patterns through exposure to role models and environmental cues. In vocational education, students often develop perceptions of successful entrepreneurs through family, media, or institutional programs. These perceptions can shape their motivation and behavioral engagement. However, the impact of EM is not uniform. Factors such as self-efficacy, access to entrepreneurial networks, and availability of structured learning opportunities may moderate the relationship between mindset and competency. (Anjum et al., 2020; Pulka et al., 2021).

While mindset provides a psychological foundation for entrepreneurial growth, Cui & Bell (2022) caution that it is often insufficient in isolation. Without a supporting environment that offers coaching, practice-based projects, and feedback mechanisms, students may struggle to convert their mindset into measurable skills. This is particularly relevant for vocational higher education in developing contexts, such as Indonesia, where entrepreneurship education often emphasizes cognitive dimensions but lacks practical reinforcement. These findings confirm that mindset development should be integrated within a broader learning ecosystem that encompasses experiential learning and adaptive coaching.

H2 – The Effect of Entrepreneurial Experience on Entrepreneurial Competency

The findings provide strong empirical support for H2, indicating that entrepreneurial experience (EE) has a significant influence on entrepreneurial competency (EC) ($t = 8.156$, $p < 0.001$). This result aligns with prior research emphasizing the value of experiential learning in enhancing entrepreneurial skills (Fiandra et al., 2023; Pennetta et al., 2024). This finding suggests that students who have previously participated in entrepreneurship competitions or campus-based startup programs report stronger confidence and strategic capabilities, supporting the role of experience in developing problem-solving and adaptability skills.
This outcome also confirms the core principle of Connectionism Theory. (Brock, 2020), which states that learning is reinforced through repeated exposure and application. In vocational education settings, where hands-on skills are prioritized, this pattern was evident among students who had participated in structured entrepreneurship training or incubation projects, reinforcing competencies more effectively than those limited to classroom instruction.

Furthermore, the analysis suggests that entrepreneurial resilience may act as a mediating factor. Seibert et al. (2016) noted that hands-on experience builds emotional and cognitive strength, a finding echoed in our pilot testing phase, where students reported increased self-efficacy and confidence after real-world exposure. The effectiveness of EE, however, is not merely a function of experience alone.

Games (2021) emphasizes that mentorship enhances the learning process, especially when coaching is embedded into experience-based programs. Our findings support this, as the moderated regression analysis demonstrated that coaching amplifies the effect of EE on EC. These insights suggest that vocational education must not only provide experience but also pair it with structured entrepreneurial guidance to optimize the development of competencies.

H3 – The Moderating Effect of Business Coaching on the Relationship Between EM and EC

The results of this study indicate that H3 is not supported. Business coaching (BC) does not significantly moderate the relationship between entrepreneurial mindset (EM) and entrepreneurial competency (EC) ($t = -0.131$, $p = 0.896$). This finding contrasts with initial expectations that structured coaching would enhance the impact of mindset on competency outcomes. It also differs from studies suggesting that coaching universally strengthens entrepreneurial development. (Iwu et al., 2021). The findings indicate that its role may be limited when learners already exhibit strong internal drive and autonomy.

One plausible explanation is that students with high EM are often intrinsically motivated and capable of directing their learning. In such cases, coaching may offer little added value, particularly if it fails to align with students' developmental readiness. This interpretation aligns with Cognitive Load Theory, which posits that additional external input may be unnecessary or even counterproductive for autonomous learners. (Plass et al., 2010). For these students, alternative approaches such as peer-based learning or reflective practice may offer greater cognitive engagement.

These findings highlight the need for greater flexibility in implementing coaching within vocational education. Rather than applying uniform coaching models, programs may benefit from tailoring support mechanisms to students' learning profiles. For learners with high levels of entrepreneurial mindset, lighter-touch interventions such as mentoring or peer collaboration could provide a more meaningful developmental pathway.

H4 – The Moderating Effect of Business Coaching on the Relationship Between EE and EC

The results support H4, indicating that business coaching (BC) significantly moderates the relationship between entrepreneurial experience (EE) and entrepreneurial competency (EC) ($t = -2.839$, $p = 0.005$). This finding highlights that students with practical entrepreneurial exposure demonstrate higher levels of competency when supported by structured coaching interventions. Such outcomes align with previous studies emphasize the importance of guided reflection and mentorship in converting experience into applicable entrepreneurial skills. (Bouhalleb, 2020; Fiandra et al., 2023).

This result also aligns with the principles of Student Involvement Theory. (Astin, 1999), which asserts that learning outcomes are enhanced when students are purposefully engaged in structured environments. Coaching offers this structure through regular feedback, reflective learning, and strategic planning. In vocational contexts, particularly in systems where experiential learning is present but inconsistently supported, such as in many Indonesian institutions, coaching may provide the continuity needed to translate experience into sustained competency.

Empirical literature further supports this mechanism. Studies have shown that coaching following experiential learning leads to improved outcomes in planning, problem-solving, and business execution. (Fagadar et al., 2021; Hua et al., 2022). These patterns indicate that coaching contributes not only to knowledge retention but also to the refinement of entrepreneurial behaviors. The interaction effect observed in this study reinforces the view that experience alone is insufficient without structured reinforcement mechanisms.

Based on these findings, it becomes evident that coaching should be positioned not as a supplementary tool but as a pedagogical core in vocational entrepreneurship programs. Integrating coaching into project-based modules, startup incubators, and internships can bridge the gap between exposure and mastery, enhancing the practical relevance of entrepreneurship education in higher education institutions.

H5 – The Direct Effect of Business Coaching on Entrepreneurial Competency

The findings confirm H5, indicating that business coaching (BC) has a significant direct effect on entrepreneurial competency (EC) ($t = 7.336$, $p < 0.001$). This outcome aligns with existing literature emphasizing the role of coaching in enhancing students' decision-making, self-efficacy, and strategic behavior in entrepreneurial settings. (Games, 2021; Reid et al., 2020). Student Involvement Theory (Astin, 1999) Offers a relevant lens through which this result can be interpreted. The theory posits that structured engagement contributes positively to learning outcomes, and coaching provides such structure through individualized guidance, reflective learning, and targeted feedback. Unlike informal mentoring, coaching operates with deliberate goals, facilitating the development of practical skills beyond theoretical instruction.

In vocational education, this direct effect is particularly valuable. Students often enter programs with varied levels of prior exposure to entrepreneurship. Coaching helps bridge the gap between formal instruction and workplace realities by enabling students to personalize learning goals, correct errors, and strengthen decision-making processes. Research (Istiyono et al., 2024) Supports this view, showing that students who participate in coaching demonstrate higher entrepreneurial confidence and readiness compared to those who do not receive coaching support. These findings reinforce the argument that business coaching should be embedded intentionally within vocational entrepreneurship programs. When integrated into capstone projects, internships, or startup-based coursework, coaching can play a formative role in ensuring that students develop not only theoretical understanding but also practical entrepreneurial competencies.

H6 – Business Coaching Moderates the Relationship Between Entrepreneurial Mindset, Entrepreneurial Experience, and Entrepreneurial Competency Simultaneously

The findings offer partial support for H6. While entrepreneurial mindset (EM) and entrepreneurial experience (EE) remained significant predictors of entrepreneurial competency (EC) in the joint model ($t = 5.543$ and 7.005, respectively), the moderating effect of business coaching (BC) was not statistically significant ($t = 0.680$, $p = 0.497$). This result indicates that although coaching plays a valuable independent role, it may not amplify the combined influence of mindset and experience when considered simultaneously. This diverges from previous research expectations, suggesting a synergistic interaction among EM, EE, and structured coaching interventions. (Ly et al., 2019).

A plausible explanation relates to the functional overlap between EM and EE. Students who exhibit both high psychological readiness and substantial entrepreneurial experience may already operate with a degree of autonomy that minimizes the added value of coaching. In such cases, generic coaching may yield limited gains unless it is adapted to the profiles of advanced learners. Prior studies have shown that peer-based support, mentorship-driven coaching, and startup-oriented environments often produce stronger outcomes for students with established entrepreneurial foundations. (Games, 2021; Jones & Smith, 2022).

These findings imply that a one-size-fits-all approach to coaching may not be effective across all student profiles. In vocational education, where learner readiness varies widely, coaching frameworks must be differentiated based on students' developmental positions along the mindset–experience spectrum. Rather than assuming universal effectiveness, coaching should be designed as a responsive mechanism that supports learners based on their unique capacity for entrepreneurial engagement.

Synthesis and Implications

The results of this study provide a comprehensive understanding of how entrepreneurial mindset, entrepreneurial experience, and business coaching interact to shape entrepreneurial competency among students in vocational higher education. Entrepreneurial mindset and experience both showed strong direct effects on competency, reaffirming prior literature that emphasizes the psychological and experiential foundations of entrepreneurship. However, the role of business coaching was found to be more nuanced. While coaching significantly moderated the effect of entrepreneurial experience on competency, it did not moderate the effect of entrepreneurial mindset, nor did it significantly influence the combined relationship between mindset and experience.

These findings suggest that business coaching is not universally effective across all student profiles or learning conditions. Its greatest impact appears when it is used to strengthen practical experience, rather than as a blanket intervention. This has important implications for entrepreneurship education in vocational settings within higher education, where students come with diverse academic backgrounds, motivations, and readiness levels. From a theoretical perspective, the study extends the application of Student Involvement Theory by demonstrating that structured support mechanisms, such as coaching, enhance learning only when they align with students' prior experiences. It also reinforces Social Perception Theory and Connectionism by showing how exposure and repetition interact with guidance to foster deeper competency development.

Practically, the results suggest the need for differentiated coaching models in higher vocational education. Educators and curriculum designers should consider tailoring coaching programs based on students' entrepreneurial maturity. This may involve embedding flexible mentoring structures into experiential learning modules, such as startup incubators, internships, or capstone projects, rather than applying coaching as a uniform requirement across all programs. A more intentional integration of coaching, mindset training, and experience-based learning will better prepare students to develop resilient, applicable entrepreneurial competencies that are aligned with the demands of tertiary-level vocational education.

6. Conclusion and Recommendations

This study examined the relationships among entrepreneurial mindset (EM), entrepreneurial experience (EE), business coaching (BC), and entrepreneurial competency (EC) in the context of vocational higher education. Using multiple regression and moderation analysis, the study confirmed that both EM and EE have a significant influence on EC. While BC demonstrated a significant direct effect on EC and moderated the relationship between EE and EC, it did not moderate the relationship between EM and EC, nor did it moderate the combined influence of EM and EE on EC. These findings highlight the complex and context-dependent role of coaching in entrepreneurship education.

Theoretically, the study contributes to the broader discourse on entrepreneurial competency development by integrating Student Involvement Theory, Social Perception Theory, and Connectionism. It demonstrates that structured support, such as coaching, must align with students' experiential backgrounds to be effective. Coaching is most impactful when it complements experience-based learning, reinforcing the idea that one-size-fits-all approaches may limit learning outcomes, particularly in vocational higher education.

Practically, the study underscores the importance of differentiated instructional strategies in entrepreneurship curricula. Vocational institutions should consider integrating flexible, student-centered coaching models that adapt to varying levels of entrepreneurial maturity. Rather than mandating uniform coaching structures, programs should embed coaching into experiential components such as capstone projects, startup incubators, and internships to ensure that students not only gain exposure but also develop applicable entrepreneurial competencies.

7. Limitations and Future Research

While the study offers valuable insights, its scope and sampling limitations are notable. The participants were drawn from two universities in East Java, Indonesia, which may limit the generalizability of the findings. Future research could expand the geographic and institutional coverage to validate the model across different vocational contexts. Moreover, incorporating longitudinal designs and qualitative approaches may uncover deeper insights into how coaching dynamics evolve and how students perceive the integration of coaching with mindset and experience.

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Exploring the Relationship of Students' Perceptions of Teacher Immediacy and Self-Motivation on Communicative Willingness among Vietnamese English Majors

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ABSTRACT

Although teacher immediacy and the Ideal L2 Self have been the subjects of many past works, no article has reported the synchronous influence of students' perceptions of teacher immediacy and Ideal L2 Self on willingness to communicate (WTC) and the predictive role of the former for the latter. To explore this influence through the relationship between the three mentioned constructs, this research analyzed data collected from 80 Vietnamese students majoring in English, using a self-report questionnaire. The results revealed that the students' perceived teacher immediacy directly influenced WTC and indirectly through the Ideal L2 Self mediator. As predictors, students' perceived teacher immediacy and Ideal L2 Self concurrently predicted WTC, accounting for 51.7% of the variance. The findings suggested that high WTC students would likely feel more motivated to learn English due to high levels of teacher immediacy than those with low WTC. Thus, teachers may need to implement parallel WTC-fostering strategies to make immediacy behaviours more effective. Practically, for teachers who want to perform only the most effective teacher immediacy items, an item-reduced scale, easily obtained through a principal component analysis, might be helpful.

Keywords: Motivation, mediating role, teacher immediacy, communicative readiness, English majors

1. Introduction

Effective communication in the target language is one of the primary goals in English teaching and learning as a foreign language (EFL). Obtaining this goal requires the joint effort of both the teacher and the learner. The student should cooperate with the teacher to determine which teaching-learning process best suits both parties and capitalize on every opportunity to communicate in English. The teacher should implement effective teaching strategies to motivate the students and enhance their willingness to communicate (WTC). Many past studies have shown a positive correlation between teacher-related factors and the EFL students' WTC construct (e.g., Alrabai, 2022; Dewaele & Dewaele, 2018; Hsu et al., 2007).

WTC is a learning construct which reflects the readiness of an L2 student "to enter into discourse at a particular time with a specific person or persons, using a L2" (MacIntyre et al., 1998, p. 547). The EFL students in a class vary in WTC level. Some students' levels are so low that they cause students to feel reluctant to take part in classroom activities. Meanwhile, students with high levels of WTC are eager to participate in most communicative events both inside and outside the classroom. The high WTC students have a higher frequency of using the target language and correcting errors. Thus, they gradually obtain better communication skills (MacIntyre et al., 1998).

EFL students carry out their learning activities according to the teacher's teaching strategies. Teaching strategies encompass teacher-related factors that either motivate or demotivate students to study English, depending on their appropriateness. Previous research has highlighted that certain teaching constructs may demotivate students in English learning, including teacher behavior and teaching methods (Kikuchi, 2009), teacher immediacy (Falout et al., 2009), and teacher instructional styles and personality (Quadir, 2021). Meanwhile, a student can also be self-motivated to learn a second or foreign language (L2) by, for example, possessing the Ideal L2 Self – one component of the L2 Motivational Self System (Dörnyei, 2005; Wei & Xu, 2021). Thus, L2 students can gain motivation to learn the target language through their perception of teacher immediacy and their future image as L2 users, namely the Ideal L2 Self. The motivation, in turn, enhances various learning constructs (Christophel, 1990), particularly the WTC in L2 (Alrabai, 2022; Fallah, 2014; Peng, 2007; Yashima, 2020). However, previous research findings were not always consistent. For example, while Fallah (2014) claimed the existence of an indirect effect of teacher immediacy on WTC through learning motivation, Alrabai (2022) asserted no. The latter researcher explained that this inconsistency might be due to the difference in sample size between the two works, but he admitted that "it merits further investigation" (Alrabai, 2022, p.56).

To date, researchers have investigated the relationship between teacher immediacy and the Ideal L2 Self, specifically examining the connections between teacher immediacy and WTC, as well as between the Ideal L2 Self and WTC. No article examined the relationship between teacher immediacy and Ideal L2 Self. Furthermore, there is an unexplored shortage of available reports examining the indirect effect of teacher immediacy on WTC through the mediation of learning motivation, and no work has dealt with the Ideal L2 Self as a mediator. To fill this gap, this study examined the relationship between the students' perceptions of teacher immediacy, the ideal L2 self, and the WTC among Vietnamese undergraduates majoring in English.

2. Literature Review

Willingness to Communicate

Communicative ability is one of the primary goals of any foreign language teaching process, although the required degree of proficiency varies among different educational institutions. Gaining a high level of communicative ability requires students to possess a high degree of linguistic competence and engage in frequent communication (MacIntyre et al., 1998).

Many teachers encounter cases where some students are not very eager to communicate in the target language, despite being proficient in listening, speaking, vocabulary, and grammar. In contrast, some individuals are not enthusiastic about joining a conversation (MacIntyre et al., 1998). The concept of willingness to communicate with students learning a second or foreign language may help to perceive this issue and improve the teaching-learning process. In this regard,

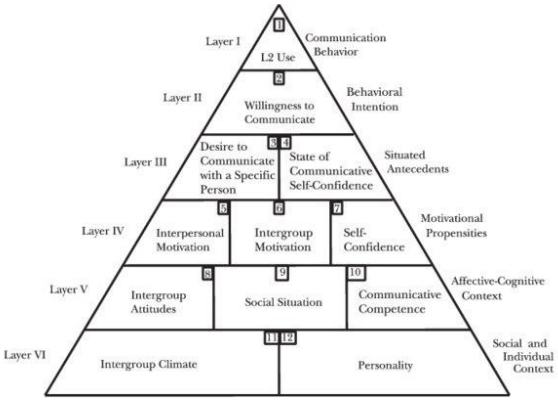

Figure 1: Heuristic Model of Variables Influencing WTC (MacIntyre et al., 1998)

MacIntyre et al. (1998) proposed a layered pyramid (Figure 1) that describes variables affecting WTC. In their proposal, behavioural intention, specifically WTC, is situated in layer II, directly below the L2 learner's communication behaviour, namely L2 use. Meanwhile, WTC is situated above antecedents, motivational propensities, affective-cognitive context, and social and individual context. The stability and enduringness of the affective variables increase from the top to the bottom of the pyramid.

In short, WTC refers to a student's intention to learn a foreign language in order to engage in a communicative exchange in the target language. The WTC level determines whether a student decides to initiate and maintain communication in the learning language when an opportunity arises, assuming the student is free to make this choice (MacIntyre et al., 1998). Each learner possesses a level of WTC, which depends on psychological, social, and linguistic factors. Although many researchers have attempted to understand the factors that affected WTC, their findings have been inconsistent at times. For instance, while Ghonsooly (2012) found self-confidence to be a better predictor of WTC, Aliakbari et al. (2016) emphasized the importance of communicative competence. Past works have shown that high WTC students participate more frequently in L2 communication and make substantial progress in language competence (e.g., Kang, 2005). Social factors encompass not only a crucial classroom atmosphere but also broader environmental influences. Many researchers believe that this learning

construct is crucial for learners to use the target language effectively in communicative exchanges (e.g., Kang, 2005).

Teacher Immediacy and Its Relation to Willingness to Communicate

Based on Mehrabian's (1971) definition of immediacy behaviors as those that result in better psychological and physical closeness with others, Christophel and Gorham (1995) defined teacher immediacy as "nonverbal and verbal behaviors, which reduce psychological and/or physical distance between teachers and students" (p. 292). Verbal immediacy behaviors include, for example, using effective humour, encouraging students to participate in discussions, and praising students' actions or comments. Meanwhile, actions such as smiling, relaxed body gestures, and moving around the classroom are examples of nonverbal immediacy behaviors.

Previous research has shown that teacher immediacy correlates with students' WTC. Gol et al. (2014), for instance, established a positive link between teacher immediacy and students' WTC among Iranian EFL undergraduates, while Hsu et al. (2007) concluded a similar finding in Taiwanese students. Cai (2021) reported the same relationship in his study on Chinese EFL students. Recently, Alrabai (2022) reached a similar conclusion based on research on Saudi EFL learners. Despite this general consistency, the details of past findings lead to confusion. For example, while Hsu (2007) reported a positive relationship between teacher nonverbal immediacy and student WTC, Carrell and Menzel (1999) concluded that the two factors had no significant link. Nevertheless, many authors have shown a positive correlation between teacher immediacy and WTC when employing verbal and nonverbal immediacy as a unique variable (Gol et al., 2014; Sheybani, 2019; Cai, 2021; Alrabai, 2022; Hu & Wang, 2023).

Table 1 presents a summary of the above review.

Table 1: Results of Past Investigations on Teacher Immediacy-WTC Relationship

Source	Teacher immediacy-WTC correlation		Note
	Yes	No	
Hsu et al. (2007)	x		Only nonverbal immediacy. Predictive role of teacher immediacy reported.
Gol et al. (2014)	x		
Sheybani (2019)	x		Predictive role of teacher immediacy reported
Cai (2021)	x		Predictive role of teacher immediacy reported
Alrabai (2022)	x		Indirect predictive role of teacher immediacy through the meditation of communication confidence reported
Hu and Wang (2023)	x		Predictive role of teacher immediacy reported

Ideal L2 Self and Its Relation to Willingness to Communicate

The Ideal L2 Self is a component of the L2 Motivational Self System (L2MSS), introduced by Dörnyei (2005), consisting of this component and two others the Ought-to L2 Self and the L2 Learning Experience to explain individual differences in the motivation of learning a second or foreign language (L2). The Ideal L2 Self relates to the image of an L2 proficient user that an L2 student aspires to become. The Ought-to L2 Self component concerns learning L2 as an obligation to meet the expectations of those around us. The L2 Learning Experience deals with "situation-specific motives related to the immediate learning environment and experience" (Dörnyei, 2005, p. 106).

Among the three L2MSS components, the Ought-to L2 Self possesses a preventive function (Dörnyei, 2005). The student is motivated to learn L2 by external pressure, such as avoiding exam failure or negative evaluation by relatives or friends. Although many studies have shown this component to be linked to students' intended effort to study English, they reported that this correlation was weak (e.g., Taguchi et al., 2009). Meanwhile, the L2 Learning Experience component relates to an L2 learner's feelings about the learning environment, especially the social connection with the teachers and classmates. This student-teacher link seems to be influenced by the verbal and nonverbal teacher immediacy, one of the three factors in the present research. Thus, the current work employed only the Ideal L2 Self as a self-motivated agent.

As the Ideal L2 Self involves the image of an L2 competent person the student aspires to be, this component reflects the student's goals in L2 learning and thus creates an impetus to bridge the gap between the present and desired linguistic proficiency. Together, these generate L2 learning motivation (Dörnyei, 2005). Attracted by this type of motivation, many researchers have investigated the relationship between the Ideal L2 Self and WTC among EFL students in several contexts. Teimouri (2017) employed factor analysis, partial correlational analysis, and multiple regression analysis to investigate the relationship between L2MSS, classroom enjoyment, classroom anxiety, shyness, and WTC among 524 Iranian EFL learners. The result showed that the ideal L2 self was a predictor of WTC, and the Ought-to L2 Self did not play a similar predictive role. While both components predicted classroom enjoyment, only the Ought-to L2 Self predicted anxiety and shyness. Teimouri reasoned that students with high Ideal L2 Self could recognize and avoid possible negative impacts. The relationship between the Ideal L2 Self and WTC was the primary focus of a study conducted by Bursalı and Öz (2017) on 56 Turkish undergraduates majoring in English Language. The two authors used MacIntyre et al. (2001)'s Willingness to Communicate in the Classroom Scale, which consists of four subscales: reading, writing, speaking, and comprehension. Their finding showed positive correlations between the Ideal L2 Self and all four WTC subscales with moderate strength. A positive correlation between the Ideal L2 Self and the speaking WTC was also reported among EFL students in Japan (Munezane, 2013), Iran (Ghanizadeh et al., 2016), Turkey (Sak, 2020), China (Wei & Xu, 2021; Farahan et al., 2023), and Ethiopia (Welesilassie & Nikolov, 2024).

Table 2 summarizes the results of cited studies on the Ideal L2 Self-WTC relationship.

Table 2: Results of Past Investigations on Ideal L2 Self-WTC Relationship

Source	Ideal L2 Self-WTC correlation		Note
	Yes	No	
Munezane (2013)	x		Predictive role of Ideal L2 Self reported
Ghanizadeh et al. (2016)	x		
Teimouri (2017)	x		Predictive role of Ideal L2 Self reported
Bursalı and Öz (2017)	x		
Sak (2020)	x		Predictive role of Ideal L2 Self reported
Wei and Xu (2021)	x		
Farahan et al. (2023)	x		Predictive role of Ideal L2 Self reported
Welesilassie and Nikolov (2024)	x		Predictive role of Ideal L2 Self only for WTC inside the classroom

The Indirect Effect of Teacher Immediacy on Willingness to Communicate through Motivation

This study identified only two available articles that investigate the mediating role of learning motivation in the influence of teacher immediacy on WTC. One of them concluded that the existence of this indirect path was possible, whereas the other did not. The two papers differed in several factors, particularly in the scale measures of teacher immediacy, learning motivation, and WTC. Table 3 shows more details on this issue.

Table 3: The Indirect Effect of Teacher Immediacy on WTC via Motivation

Source	Conclusion		Learning context	Sample size	Scale Measures		
	Yes	No			Teacher immediacy	Motivation	WTC
Fallah (2014)	x		Iranian	252	Gorham (1988) for verbal, Richmond et el. (1987) for nonverbal	Gardner (1985)	McCroskey (1992)
Alrabai (2022)		x	Saudi	412	Gorham (1988) for verbal, McCroskey et al. (1996) for nonverbal	Christophel's (1990) State Motivation *plus* Yashima's (2002) Motivational Intensity	Khajavy et al. (2016)

Research Questions

As mentioned above, there is a contradiction in the conclusions of Alrabai (2022) and Fallah (2014) regarding the presence or absence of an indirect effect of teacher immediacy on WTC through motivation. Although Alrabai (2022) attributed the differences to the varying sample sizes, Table 3 reveals that the two works had numerous differences, including learning contexts, participant populations, and instruments. Thus, this study revisited the indirect path but employed a different learning context, sample size, and scale measures compared to the two aforementioned investigations. Namely, the present work explored the mediating role of the Ideal L2 Self in the influence of teacher immediacy on WTC.

Although the predictor-response relationships of teacher immediacy on the WTC (Table 1) and the Ideal L2 Self on WTC (Table 2) have been well-established in many published articles, there is no available report dealing with the direct impact of teacher immediacy on Ideal L2 Self. Assuming such a link exists, a mediating role of the Ideal L2 Self is possible. Namely, aside from a direct influence, teacher immediacy has the potential to indirectly influence WTC via Ideal L2, as hypothesised in Figure 2.

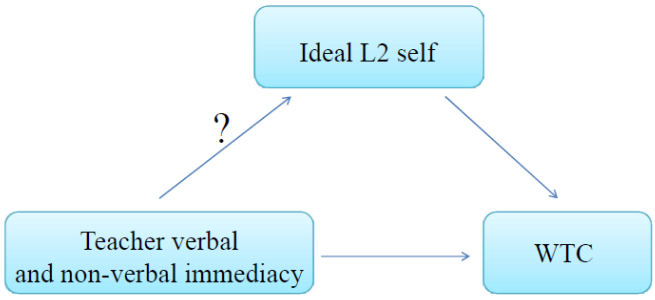

Figure 2. Conceptual framework

As the purposes of this study are to investigate the relationship between Vietnamese English majors' perceptions of teacher immediacy, Ideal L2 Self, and WTC, it addresses the following research questions:

1. What are Vietnamese English majors' perceptions of teacher immediacy, Ideal L2 Self, and WTC?
2. Do teacher immediacy, Ideal L2 Self, and WTC correlate in pairs?
3. Do teacher immediacy and Ideal L2 Self predict WTC? Does teacher immediacy predict the Ideal L2 Self?
4. Does teacher immediacy indirectly influence WTC through the meditation of the Ideal L2 Self, besides a direct effect?

3. Methodology

Research Design

The present study employed a descriptive and inferential quantitative research design, using an adapted questionnaire to collect data on students' perceived teacher immediacy, ideal L2 self, and willingness to communicate among Vietnamese English majors. These data were necessary to investigate the relationship between these three factors. The study then discusses its findings, referencing previous works.

Participants

The participants voluntarily joined the present study through a non-probabilistic convenience sampling method. They were students majoring in English Language at a university in Central Vietnam. To obtain an acceptable sample size of participants with relatively similar WTC levels among the entire population of English majors at the Faculty of Foreign Languages and Oriental Studies of the university, the researchers selected second- and third-year students as potential participants for this research. Regarding experience in teacher immediacy, these students had already gained experience working with many English language teachers and could clearly perceive what teacher immediacy behaviors motivated them to learn English. Moreover, the teachers in charge of many of their courses, such as English Grammar, English Pronunciation Practice, Linguistics, Listening, Speaking, Reading, and Writing, were the same. Upon invitation, 80 of the 98 students, including 41 second-year students (51.2%) and 39 third-year students (48.8%), agreed to participate in this study. Among these students, 20 were males (25%) and 60 were females (75%).

Instruments

The present work utilized a self-report questionnaire comprising the following three scales. Teacher reflections were another source of information on the students' use of English inside the classroom. For each statement in the self-report questionnaire, participants chose one of five options, ranging from 5 (strongly agree) to 1 (strongly disagree). Analysis using Cronbach's alpha revealed that the entire questionnaire achieved an acceptable scale reliability of $\alpha = 0.926$.

Teacher Immediacy Scale: The present work used a teacher immediacy scale adopted from the Verbal and Nonverbal Immediacy Questionnaire developed by Gorham (1988). Gorham's validated scale, which is based on Western culture, has already been used by many researchers with some adaptations depending on the target learning contexts, including most of those mentioned in the Literature Review section above (e.g., Alrabai, 2022; Cai, 2021). As some original items are ambiguous and unreliable, such as "touches students in class" (Titsworth & Smith, 2005), this study did not employ such items. As a result, the employed questionnaire consisted of eleven items measuring verbal immediacy and six items measuring nonverbal immediacy (Appendix A). In this research, Cronbach's alpha performance yielded a value of $\alpha = 0.843$, indicating satisfactory scale reliability for the used scale.

Ideal L2 Self scale: This research used a scale of eight statements (Appendix B). These statements were from the work of Taguchi et al. (2009), which is an authentic scale for investigating the Ideal L2 Self. Taguchi et al. (2009) have effectively utilized their scale in various contexts, including those in Asia, such as Japan and China. In this study, an α-value *of* 0.904 indicated that the adapted scale achieved acceptable reliability.

Willingness to Communicate Scale: The current study employed an adapted version of the WTC in a Foreign Language Scale (WTC-FLS), developed and validated by Baghaei (2011) and further adapted by Ha et al. (2023) (Appendix C). To our knowledge, there have been very few published articles investigating the WTC among Vietnamese EFL students. Under such circumstances, the authors of this research chose the mentioned scale since it fits the Vietnamese context. The authors also received positive feedback beforehand from six selected students who were asked to provide their opinions on the length of the scale and their understanding of the statements. In this research, the adapted scale, consisting of thirteen items measuring willingness to communicate, demonstrated good reliability, with an α of 0.891.

Data Collection and Analysis

The participants gathered in a classroom, and the authors of this study briefly informed the students about the research and answered their related questions. The authors also assured them that their responses were used only for research purposes. After reconfirming the participants' voluntariness, the researchers delivered the questionnaire sheet. The students then answered the research questionnaire in a classroom with no time limitations.

This work conducted the necessary analyses, including descriptive statistics, Cronbach's alpha scale reliability, Pearson's correlation, simple and multiple regressions, the Sobel test, the PROCESS Procedure for mediation, one-way ANOVA for significant differences, and principal component analysis (PCA) for dimension reduction.

4. Results

Perceived Teacher Immediacy, Ideal L2 Self, and Willingness to Communicate

The present study first calculated the participants' responses using descriptive statistics to obtain the answer to RQ-1 and the input data for further analysis. Table 4 shows the result of this calculation.

Table 4: Questionnaire Responses of the Three Scales Involved[a]

	Minimum	Maximum	M[a]	SD	Agree and Strongly agree responses (%)
Teacher immediacy	3.24	5.00	4.26	.39	78.7
Ideal L2 Self	1.00	5.00	3.75	.76	43.7
WTC	2.15	5.00	3.88	.55	47.5

[a]N=80; 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree.

As seen in Table 4, the mean values of the responses to the teacher immediacy, the Ideal L2 Self, and WTC were almost in a range considered a positive response on a five-point Likert scale. Teacher immediacy received the highest mean and percentage of Agree and Strongly Agree responses, 4.26 and 78.7%, respectively.

Relationship between Teacher Immediacy, Ideal L2 Self, and Willingness to Communicate

For the answer to RQ-2, the study then conducted a Pearson correlation test. Table 5 lists the correlations found in this work.

As shown in Table 5, correlations existed between the students' perceptions of each pair of teacher immediacy, Ideal L2 Self, and WTC, with a coefficient of 0.313, 0.596, and 0.583, respectively. The strength of these correlations was almost moderate, and all these relationships were positive. Therefore, increases in one factor will likely cause an increase in its counterpart.

Table 5: Results of Pearson's Analysis[a]

	Teacher Immediacy [a]	Ideal L2 Self [a]	WTC
Teacher Immediacy	1		
Ideal L2 Self	.313 (.005) [b]	1	
WTC	.583 (.000) [b]	.596 (.000) [b]	1

[a]. Coefficient (*p*-value)
[b]. Correlation is significant at the 0.01 level (2-tailed)

Table 6: Results of Linear Regression Analysis[a]

Entry	Dependent variable		B	Std. Error	Adjusted R Square	*p*-Value	VIF
1	WTC	Constant	0.401				
		Teacher immediacy[b]	0.817	0.583	0.331	0.000	1.000
2	Ideal L2 Self	Constant	1.189				
		Teacher immediacy[b]	0.601	0.313	0.087	0.005	1.000
3	WTC	Constant	2.249				
		Ideal L2 Self[b]	0.436	0.596	0.347	0.000	1.109
4	WTC	Constant	0.401				
		Teacher immediacy[b]	0.616	0.115	0.517	0.000	1.109
		Ideal L2 Self[b]	0.335	0.060			

[a] Enter method
[b] Predictor

In search of the answer to RQ-3 and the necessary input data for the Sobel test (Sobel, 1982), the present investigation performed a linear regression using the enter method. The results showed that teacher immediacy and Ideal L2 Self predicted WTC (Entries 1 and 3, Table 6). In particular, teacher immediacy was found to predict the Ideal L2 Self (Entry 2, Table 6). Teacher immediacy and Ideal L2

Self also concurrently predicted WTC, accounting for a variance of 51.7% (Entry 4, Table 6). The regression analysis was valid, as all p-values were well below 0.05, and the VIF values were significantly less than five, indicating no multicollinearity among the variables.

The Mediating Role of the Ideal L2 Self

Loading the input data, specifically the B-value and its standard error for each path, from Table 6 in the conceptual framework (Figure 2), resulted in the outline shown in Figure 3. The Sobel test was then calculated using a web-based calculator (for example, Preacher & Leonardelli, n.d.).

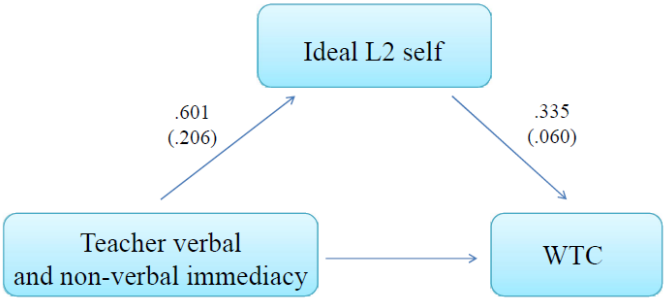

Figure 3. Model for the Sobel test

The PROCESS Procedure, developed by Preacher and Hayes (2004), is a powerful tool for mediation tests in the natural and social sciences, as it can be applied to a variety of sample sizes (e.g., Lijuan & Hallinger, 2016; Abu-Bader & Jones, 2021). This work conducted the PROCESS Procedure analysis on PROCESS v4.2 by Andrew F. Hayes, employing Model 4 of the version for standardized effects. The results of the Sobel test and PROCESS performance are shown in Table 7.

Table 7: Results of the Analysis of the Mediating Role of Ideal L2 Self

Tool	Total effect of X[a] on Y[a]	Direct effect of X on Y	Indirect effect of X on Y *via* M[a]
PROCESS Procedure	0.8170	0.6159	0.2012
Sobel test[b]			0.201335

[a]X: Teacher immediacy, Y: WTC, M: Ideal L2 Self
[b]*p*-Value = 0.00971681, test statistic 2.58574746, and standard error 0.07786337

As presented in Table 7, both measurements showed almost the same point effect for the Ideal L2 Self as a mediator, 0.2012. Since the Sobel test does not account for the total and direct effects, a similar comparison of these values was not possible.

The ANOVA Analysis for Year, Order, and Gender

Since the participants of this study included second and third-year students, the relative similarity of their levels towards teacher immediacy, Ideal L2 Self, and WTC might be questionable. To look for a clear answer, the authors conducted an ANOVA test. As a result, the one-way ANOVA analysis revealed no significant difference between second- and third-year students, or between males and females, in their perceptions of teacher immediacy, Ideal L2 Self, and WTC, with all p-values greater than 0.05 (Table 8).

Table 8: One-way ANOVA Test Results

Dependent variable	Factor	Sum of Squares	df	Mean Square	F	*p*-value
Year order	Teacher immediacy	.244	1	.244	1.578	.213
Year order	Ideal L2 Self	.005	1	.005	.008	.927
Year order	WTC	.004	1	.004	.012	.914

[a] Between Groups

Factor Reduction for Teacher Immediacy Scale

As principal component analysis (PCA) reduces the number of scale items while maintaining the scale's function, the present work employed this technique for the Teacher Immediacy Scale. The performance was to make the scale more practicable by gathering information for concerned teachers to focus on the most effective items. The PCA analysis result (Table 9) showed that the remaining four principal items, which accounted for 69.077% of the variance, were distributed across two components. The item reduction was valid, with a p-value of Bartlett's Test = 0.000 < 0.05 and a factor loading > 0.5. A variance threshold for PCA analysis is typically 70 to 90%, but depending on the dataset's context, this limit can be lower or higher (Hartmann et al., 2023). In social science research, the extracted factors usually explain only 50% to 60% (OARC Stats, n.d.). Thus, the explained variance in this study is acceptable.

Pearson's correlation and stepwise regression (Appendix D) revealed that the PCA-teacher immediacy could play a similar role to the adapted scale in relation to the Ideal L2 Self and WTC. Sobel test and PROCESS Procedure also confirmed that the PCA-teacher immediacy directly influenced the WTC and indirectly through the Ideal L2 Self (Appendix E).

Table 9. Results of Item Reduction for the Used Teacher Immediacy Scale

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy.		.594
Bartlett's Test of Sphericity	Approx. Chi-Square	26.397
	df	6
	p-Value	.000

Items	Statement: I am motivated to learn English when my English teacher…	Factor loading	
		Component 1	Component 2
Verbal-7	refers to "our" class or what "we" are doing.	.848	
Verbal-2	gets into discussions based on something a student brings up, even when this doesn't seem to be part of his/her lecture plan.	.824	
Verbal-8	asks how students feel about an assignment, its due date, or a discussion topic.		.835
Nonverbal-5	has a very relaxed body position while talking to the class.		.802

Note: Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Cumulative variance explained: 69.077%

5. Discussion

Vietnamese English Majors' Perceptions of Teacher Immediacy, Ideal L2 Self, and WTC

In response to RQ-1, the mean of students' perceptions of teacher immediacy and the percentage of 'Agree' and 'Strongly Agree' answers were high compared to those of the ideal L2 self and WTC inside the classroom. These values might imply that most participants believed they would be motivated to some extent by teacher immediacy regardless of their Ideal L2 Self and WTC. This result partly supports the finding of Frymier (1993), who examined the influence of teacher immediacy on students' self-report motivation and noted that the students responded differently to teacher immediacy. According to Frymier (1993), exposure to a highly immediate teacher caused low- or moderately motivated students to increase their motivation. Meanwhile, students with high motivation would keep it unchanged regardless of the level of teacher immediacy exposed.

Teacher Immediacy-WTC, Ideal L2 Self-WTC, and Teacher Immediacy-Ideal L2 Self Correlation

Regarding RQ-2, the positive correlations between teacher immediacy and WTC, as well as between Ideal L2 Self and WTC, found in the present study, affirm the findings of many previous works, as presented in Table 1. It is worth noting that the current work asked the students to rate their learning motivation created by teacher immediacy behaviours. Therefore, the positive correlation between teacher immediacy and the WTC suggests that students with higher WTC scores will likely feel more motivated to learn English from a highly immediate teacher. That means high levels of teacher immediacy might function as a means of enhancing student motivation to study English to varying extents depending on the level of WTC. Thus, parallel WTC-fostering classroom activities seem indispensable for a better effect of practicing teacher immediacy behaviours, which partly contributes to effective teaching. Previous findings support the current discovery. Min and Chon (2020) found that students' perceptions of the teacher's motivational strategies depend on their language proficiency, and those with low proficiency did not value their teacher's efforts.

The present positive correlation between students' perceptions of teacher immediacy and the Ideal L2 Self is the first reported case. Many previous studies have also reported similar positive correlations between teacher motivation and student outcomes. However, they used different motivation measures, not Ideal L2 Self (Liu, 2021). Nevertheless, although the types of motivation measurement are different, the positive correlation between teacher immediacy and learning motivation leads to similar implications. For example, Christophel (1990) employed a state motivation scale and claimed that teacher immediacy might modify motivation, leading to increased learning.

The Predictive Role of Teacher Immediacy and Ideal L2 Self for WTC

In response to RQ-3, the predictive role of teacher immediacy and the Ideal L2 Self for WTC is not a discovery. Several previous studies have reported similar findings (see Table 1). The predictor–response relationship between Ideal L2 Self and WTC appears to be "natural" since both factors are intrapersonal, and students with high Ideal L2 Self are inclined to enter communicative opportunities enthusiastically. The motivation of the Ideal L2 Self, employed in this study, is the image of a fluent L2 user that the student wants to be in the future. Therefore, gaining more motivation would likely enhance WTC. A similar relationship between teacher immediacy and WTC may exist because highly immediate teachers help increase students' WTC by, for instance, delivering enjoyable courses

(Dewaele & Dewaele, 2018) and creating positive teacher-student rapport (Cai, 2021; Song et al., 2022).

This study uncovered that teacher immediacy was a predictor of Ideal L2 Self, and these two factors also synchronously predicted WTC. These findings have not been reported in other works. It helped strengthen the conceptual hypothesis featured in Figure 1. This finding is consistent with past studies concluding that the teacher can help increase students' WTC by, for instance, enjoyable course delivering (Dewaele & Dewaele, 2018), creating positive teacher-student rapport (Cai, 2021; Song et al., 2022), and teachers' verbal and nonverbal behaviours (Sheybani, 2019).

The Mediation of Ideal L2 Self

Concerning RQ-4, as a new finding, the current study found that students' perceptions of teacher immediacy, besides directly affecting WTC, also indirectly affected it via the mediation of the Ideal L2 Self. This finding is consistent with Fallah's (2014) result but inconsistent with Alrabai's (2022) findings. The reason for that remains unknown. Since this study and the two others by Fallah (2014) and Alrabai (2022) differed in learning context, sample size, and scale measures of teacher immediacy, learning motivation, and WTC, we cannot attribute the differences to these factors. Perhaps more investigations on this issue are necessary.

The Pedagogical Implication of the PCA-Teacher Immediacy Scale

The findings of this study showed that teacher immediacy practice helped motivate students to learn English and might enhance their self-motivation and communicative willingness. Moreover, the last but not least valuable point deserving a discussion is the possibility of reducing the items on the teacher immediacy scale by a principal component analysis (PCA). The PCA results of this work may indicate that the teacher can still foster students' motivation and WTC by practicing only a few behaviours most desired by their students. In this study, the students felt they were motivated to learn English when the teacher "refers to "our" class or what "we" are doing", "gets into discussions based on something a student brings up even when this doesn't seem to be part of his/her lecture plan", "asks how students feel about an assignment, due date or discussion topic", and "has a very relaxed body position while talking to the class." The present findings support the claim of previous studies that teacher immediacy is a component of effective teaching (e.g., Sheybani, 2019). That means effective teacher immediacy behaviours appear to be indispensable for the benefit of their students. It is worth noting that enhancing motivation leads to improvements not only in WTC but also in other learning constructs, as motivation encourages L2 students to exert and sustain effort in learning (Dörnyei, 2005).

The findings of the present investigation suggest that teachers can enhance students' WTC by effectively performing immediacy behaviors alone or in combination with strategies that foster learning motivation, such as those reported by Gudu and Jesse (2023), Kouraichi and Lesznyák (2022), and Radil et al. (2023). This suggestion may be worthy of consideration, especially for teachers working with Vietnamese students and possibly others from a Confucian heritage culture, in which students may unintentionally inherit, to some extent, a learning mode characterized by passivity, uncritical thinking, and reproduction (Biggs, 1998; Thompson, 2009). In the Vietnamese teaching-learning context, teachers still play a 'centered role' to some extent (Ha, 2020). Practicing teacher immediacy behaviors, even on the PCA scale, allows the teacher to create an enjoyable learning atmosphere by enhancing the teacher-student relationship and reducing the psychological distance

between the teacher and students. An enjoyable classroom, in turn, helps the teacher succeed in implementing other effective teaching strategies.

6. Limitations

This study has some limitations. The self-report questionnaire might result in possible response bias. Meanwhile, convenience sampling within a university might have its inevitable weak point of being unable to represent a broader Vietnamese learning context. The relatively small sample size is also a concern. However, the participants of this work were university students majoring in the English language. As not many English majors enter the faculty each year, addressing this issue proved challenging. Finally, the non-equivalent numbers of males and females might lead to a less valuable result of a significant difference test between the two groups. Future research in this direction is worthwhile, for example, by using other variables instead of WTC and a questionnaire that encompasses classroom observation or a longitudinal design to gain a more comprehensive picture.

7. Recommendations

Students of the same language course possess individual differences. They have diverse views on the target language, motivation, and personality. To select an appropriate teaching method, foreign language teachers should investigate many variables that might influence the learning-teaching process. The findings of this study suggest that self-report measures of students' perceptions of teacher immediacy, Ideal L2 Self, and communicative readiness may be helpful for teachers to obtain students' responses towards these factors. These values, together with the association among the three variables, may help the teacher identify, for example, some crucial verbal and nonverbal immediacy behaviors that are necessary for effective teaching as a motivational strategy. Min and Chon (2020) asserted that teachers' implementation of motivational strategies will support students to achieve their language professional goals. Pogue and Ahyun (2006) pointed out that the good practice of teacher immediacy created a better teacher-student relationship, resulting in more effective interpersonal interaction and affecting students' eagerness to learn. As shown in the Results section of this study, a simple PCA analysis allowed the teacher to identify which items of teacher immediacy are most effective in enhancing the student's self-motivation and WTC. Thus, the PCA teacher immediacy scale is helpful for teachers who are short of time or want to concentrate only on the main items. In this study, the PCA item-reduced teacher immediacy scale had three verbal and one non-verbal item. However, it is worth noting that other cases may yield different results from those of this study, except in cases of coincidence. Then, there are two points worth noting. Firstly, in social science research, the extracted factors usually explain only 50% to 60% (OARC Stats, n.d.). Therefore, if the PCA-teacher immediacy scale explains 50% or more of the variance, it may be effective. Secondly, teachers may need to implement parallel strategies that foster students' WTC and learning motivation, such as those suggested in Radil et al. (2023), to make immediacy behaviors more effective. For its simplicity and helpfulness, the authors of this study recommend this procedure to teachers interested in employing teacher immediacy to enhance their students' motivation and communicative willingness to learn L2.

8. Conclusion

The present research examined students' perceptions of teacher immediacy, the Ideal L2 Self component of the L2 Motivational Self System, and communicative willingness among Vietnamese students majoring in English. It showed the relatively high means of the three involved factors and the

positive correlation of each pair among the three factors. The research then reported the predictive role of students' perceptions of teacher immediacy and the Ideal L2 Self in relation to the WTC construct. It also concluded that the Ideal L2 Self was a mediator in the influence of students' perceptions of teacher immediacy on WTC.

The findings of the present work indicated some pedagogical implications. Teachers can perform appropriate verbal and nonverbal immediacy behaviours to enhance their students' motivation and WTC. As high WTC students will probably feel more motivated to learn English by high levels of teacher immediacy than low WTC ones, teachers may need to implement parallel WTC-fostering strategies to make immediacy behaviours more effective. Although this study had several limitations, such as those related to its sample size and sampling, it provides a means for obtaining information on teacher immediacy to inform effective teaching practices. Future research in this direction may need to consider a broader subject, such as EFL students majoring in different disciplines from English Language and other factors, rather than focusing solely on the Ideal L2 Self and WTC.

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Appendices

Appendix A: Students' Perceptions of Teacher Immediacy

Statement[a] : I am motivated to learn English when my English teacher…	M[b]	S.D.
Verbal		
(1) uses personal examples or talks about experiences she/he has had outside of class.	4.50	.636
(3) asks questions or encourages students to talk.	4.10	.773
(2) gets into discussions based on something a student brings up, even when this doesn't seem to be part of his/her lecture plan.	4.18	.759
(4) uses humor in class.	4.73	.477
(5) addresses students respectively.	4.06	.946
(6) gets into conversations with individual students before or after class.	3.90	.894
(7) refers to "our" class or what "we" are doing.	3.96	.892
(8) asks how students feel about an assignment, its due date, or a discussion topic.	4.44	.653
(9) asks questions that solicit viewpoints or opinions.	4.18	.671
(10) Praise students' work, actions, or comments.	4.60	.518
(11) will have discussions about things unrelated to class with individual students or with the class as a whole.	4.35	.638
Nonverbal		
(1) gestures while talking to the class.	4.33	.776
(2) looks at the class while talking.	4.21	.741
(3) smiles at the class as a whole, not just individual students.	4.44	.653
(4) moves around the classroom while teaching.	3.90	.922
(5) has a very relaxed body position while talking to the class.	4.39	.755
(6) uses a variety of vocal expressions while talking to the class.	4.20	.683

Adapted statements developed by Gorham (1998).
[b] Sample size N = 80; 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree.

Appendix B: Students' Responses to Ideal L2 Self

Statement [a]	M[b]	S.D.
(1) I can imagine myself living abroad and having a discussion in English.	3.73	.968
(2) I can imagine myself living abroad and using English effectively for communicating with locals.	3.71	1.034
(3) I can imagine a situation where I am speaking English with foreigners.	3.75	.987
(4) I can imagine myself speaking English with international friends or colleagues.	3.74	.938
(5) I can imagine myself speaking English as if I were a native English speaker.	3.58	1.065
(6) Whenever I think of my future career, I imagine myself using English.	3.94	.862
(7) The things I want to do in the future require me to use the English language.	4.15	.915
(8) I can imagine myself writing an English email fluently.	3.40	1.038

[a] Extracted from Taguchi et al. (2009).
[b] Sample size N = 80; 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5= trongly agree.

Appendix C: Students' Willingness to Communicate

Statement[a]	M[b]	S.D.
(1) In group work activities in the class, I am willing to speak in English.	3.74	.882
(2) I am willing to give a presentation in English to my classmates.	3.74	.725
(3) I am willing to participate in pair and group activities in class so I can practice speaking English with my classmates.	3.79	.951
(4) I am willing to talk and express my opinions in English in the classroom when all my classmates are present.	3.96	.754
(5) I am willing to ask questions in English during the university classes.	3.85	.781
(6) If someone introduced me to a foreigner, I would like to try my abilities in communicating with him/her in English.	4.21	.688
(7) In order to practice my English, I am willing to talk in English with my classmates outside the class.	3.79	.924
(8) I am willing to talk with foreigners.	4.21	.758
(9) I am willing to accompany some foreigners and serve as their tour guide for a day, free of charge.	3.75	1.013
(10) If I encountered some foreigners who are facing problems in my country because of not knowing our language, I would take advantage of this opportunity and talk to them.	4.18	.708
(11) In order to practice my English, I am willing to talk in English with my professors outside the class.	3.65	.982
(12) If I encountered some foreigners, I would find an excuse and would talk to them.	3.59	.867
(13) If I encountered some foreigners, I hope an opportunity would arise and they would talk to me.	4.03	.811

[a] Statements developed by Baghaei (2011) and adapted by Ha et al. (2023).
[b] N = 80; 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree.

Appendix D: Correlation and regression using PCA 5Ts framework

Pearson's correlation

		Ideal L2 self	WTC
PCA-Teacher immediacy	Coefficient (*p*-value)	.231* (.039)	.506** (.000)
Ideal L2 self	Coefficient (*p*-value)		.596** (.000)

* Significant at the 0.05 level (2-tailed),** Significant at the 0.01 level (2-tailed).

Regression using PCA-scale of the teacher immediacy

Model [a]		B	□	Adjusted R-squared	*p*-value	Tolerance
1	Constant	2.249				
	Ideal L2 self [b]	0.436	0.596	0.347	0.000	1.000
2	Constant	0.590				
	Ideal L2 self [b]	0.370	0.506	0.486	0.000	0.947
	PCA-Teacher immediacy[b]	0.451	0.389		0.000	0.947

[a] Dependent variable: WTC, [b] Predictor

Appendix E: The Mediating Role of Ideal L2 Self

Tool	Total effect of X[a] on Y[a]	Direct effect of X on Y	Indirect effect of X on Y *via* M[a]
Sobel test			0.13542[b]
PROCESS Procedure	0.5869	0.4514	0.1354

[a]X: PCA Teacher immediacy, Y: WTC, M: Ideal L2 Self

[b]*p*-Value = 0.04801959, test statistic 1.97719499, and standard error 0.06849097

Self-control and grit: How do they affect Academic Procrastination among Malaysian Undergraduates?

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ABSTRACT

Research has shown that both self-control and grit are negatively associated with procrastination. However, the mechanisms linking these three variables remain insufficiently understood. Drawing on the hierarchical model of goals as a theoretical framework, this study proposed an indirect-only model, hypothesizing that self-control influences procrastination solely through its effect on grit. To test this hypothesis, a sample of 160 undergraduate students from a Malaysian university participated in an online survey, recruited through purposive and snowball sampling techniques. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate both the measurement and structural models. The results supported the proposed predictions, confirming the indirect effect of self-control on procrastination via grit. These findings suggest that, despite their conceptual overlap, self-control and grit perform distinct roles in the pursuit of goals. Specifically, self-control alone appears insufficient for attaining long-term objectives; achieving overarching goals amidst setbacks and disappointments necessitates the sustained effort embodied by grit. This study enhances the understanding of the intricate interplay among self-control, grit, and academic procrastination among undergraduate students. Furthermore, it highlights the potential of self-control training to enhance grit, thereby indirectly promoting academic success.

Keywords: self-control; grit; hierarchical goal framework; procrastination; undergraduate students; Malaysia

1. Introduction

Procrastination, a ubiquitous behavioral pattern, afflicts numerous individuals daily. This behavior is characterized by the intentional postponement of intended actions, even when individuals fully recognize the potential negative consequences of their procrastinatory tendencies. (Klingsieck, 2013). Typically, procrastination involves deferring essential tasks and responsibilities in favor of more immediate or less demanding activities. In essence, procrastination entails a voluntary, irrational, and sometimes gratuitous delay in executing actions, disregarding the subjective discomfort and detrimental consequences that such delays can have. (Steel, 2007)

In the academic realm, procrastination manifests in a unique and specialized form, commonly referred to as academic procrastination. Ajayi (2020) defines academic procrastination as the deliberate postponement of tasks and activities that are fundamental to an individual's educational journey and the development of their cognitive abilities. Such tasks encompass a range of academic undertakings, including exam preparation, completing assignments, conducting research, and participating in coursework. Individuals struggling with academic procrastination frequently defer these scholastic obligations until the last minute or sometimes fail to meet crucial deadlines (Novitasari & Prihantoro, 2023).

Numerous studies have investigated the prevalence of procrastination, yielding compelling evidence of its widespread nature across diverse populations and academic settings. Uzun Ozer et al. (2014) conducted an empirical investigation that unequivocally demonstrated the ubiquity of procrastination within contemporary society. Further corroborating this notion is a study conducted by Ferrari et al. (2005) in the United States. Their research estimated that procrastination is a common practice among approximately 20% of men and women, deeply ingrained in their daily routines.

Academic procrastination, a specific manifestation of this pervasive behavior, has also been extensively studied across various countries. Steel (2007) comprehensively reviewed academic procrastination among college students. His findings revealed a staggering statistic: over 75% of college students habitually engage in academic procrastination. This widespread pattern of deferring crucial tasks, such as assignment completion, paper writing, or exam preparation until imminent deadlines, highlights the deep-seated nature of procrastination within the academic realm.

He (2017) further explored the prevalence of academic procrastination across different academic levels within a United Kingdom-based university. His study unveiled that academic procrastination affected a substantial proportion of students at all levels – 34% of undergraduates, 43% of master's students, and 44% of doctoral students. These findings underscore the pervasiveness of procrastination across the academic spectrum, suggesting that it is not a phenomenon limited to any stage of education.

Bakar and Khan (2016) conducted a study at a university in Johor, Malaysia, revealing an even higher prevalence of procrastination among undergraduates. Their findings indicated that an astonishing 79% of the undergraduates could be classified as either procrastinators or, in more severe cases, as severe procrastinators.

Saplavska and Jerkunkova (2018) conducted research involving undergraduate students at a university in Latvia. Their research outcomes revealed that a significant proportion, specifically 48%, of these

undergraduates consistently engaged in the practice of completing their academic tasks at the eleventh hour, indicating a prevalent tendency toward academic procrastination.

The pervasive nature of academic procrastination has drawn attention to its detrimental impacts on students' academic performance and overall well-being. Numerous studies have shed light on the multifaceted repercussions of procrastination, encompassing physical, mental, and social dimensions.

Procrastination can have a significant impact on physical health. For example, Sirois et al. (2015) have highlighted that individuals struggling with procrastination frequently experience sleep deprivation, characterized by disrupted sleep patterns and difficulty falling asleep. As a result, they often awaken feeling unrested, contributing to a cascade of adverse health consequences.

Procrastination also exerts a profound influence on mental health. Beutel et al. (2016) have demonstrated an inverse relationship between procrastination and psychological well-being, with procrastination escalating stress and anxiety levels. The act of postponing tasks engenders discomfort and unease, fostering persistent anxiety, stress, and fatigue among procrastinators. Duru and Balkis (2017) have extended these findings to reveal that procrastination is correlated with diminished self-esteem, academic achievement, and overall personal well-being. Westgate et al. (2017) demonstrated a significant link between academic procrastination and heightened alcohol craving and consumption among American undergraduates. Melaku et al. (2015) further emphasized this association, revealing that Ethiopian medical undergraduates grappling with academic stress due to procrastination exhibited a higher propensity for substance abuse, including alcohol consumption.

Furthermore, social ramifications also come to the fore. Andangsari et al. (2018) conducted a study involving Indonesian undergraduate students, illuminating a positive correlation between academic procrastination and emotional and social loneliness. These findings underscore the deleterious effects of procrastination on social connections and emotional well-being.

Self-control plays a significant role in procrastination. Duckworth and Steinberg (2015) defined self-control as the voluntary act of restraining immediate urges and placing more excellent value on long-term goals. It involves overriding one's inner responses, including impulses, emotions, thoughts, and behaviors. Individuals with higher self-control capacity often demonstrate better abilities to restrain impulsive actions, manage their emotional expressions, avoid distractions, and focus on essential tasks.

Gottfredson and Hirschi (1990) proposed the theory of crime. They identified characteristics associated with low self-control, including impulsivity, a tendency towards risk-seeking behavior, a short temper, a preference for simple tasks, a tendency to engage in risky activities, and being self-centered. Individuals who lack self-control may struggle to prioritize long-term benefits. Low self-control may impact various aspects of one's life, including the quality of marriage, career choices, and relationships with peers and family. Individuals with low self-control are more likely to experience unstable relationships, friendships, or jobs, often due to their inability to maintain long-term commitments or a lack of interest in them. Studies have supported the associations between low self-control with crime, drug use, school underachievement, and failure at task performances (Baumeister et al., 2007; Li et al., 2022; Ramadhan, 2022).

Family plays a crucial role in developing self-control (Holmes et al., 2019). Self-control development unfolds through the interactions between individuals and their families. Changes in the family environment can impact self-control development, and changes in adolescents' self-control can also influence the dynamics of their family environment (Kim et al., 2022). Parental behavior plays a significant role in fostering self-control. Various parenting behaviors, including inadequate parental supervision, insufficient discipline, and insufficient affection, can adversely affect self-control.

Conversely, effective parenting behavior can instill self-control. Beyond family and parenting behaviors, other factors are associated with self-control, such as peer influence (Meldrum et al., 2012). Research has demonstrated that peer factors exert a powerful influence on self-control. Peer influence can impact self-control through social learning, emphasizing that peers act as socializing agents and influence individuals' attitudes and behaviors.

A compelling body of research has established a significant association between self-control and academic procrastination (Dewany et al., 2023; Widya Nadya Rostania et al., 2023; Wijaya & Tori, 2018). Individuals with higher levels of self-control consistently demonstrate lower tendencies for academic procrastination, while those with lower self-control are more likely to engage in procrastination (Marliyah et al., 2020).

Empirical studies further support this inverse relationship between self-control and academic procrastination. Haekal et al. (2022) examined the self-control levels of 125 Psychology students at the University of Muhammadiyah Bandung, Indonesia, and found a significant correlation between self-control and academic procrastination. Students with higher self-control tended to procrastinate less, while those with lower self-control were more likely to procrastinate. Similarly, Zheng and Xu (2022) conducted a study involving 157 college students in China and found a significant negative correlation between self-control and academic procrastination.

Moreover, Wijaya and Tori (2018) revealed that self-control significantly predicted both general and academic procrastination, with a more significant impact on general procrastination than academic procrastination. Widya Nadya Rostania et al.'s (2023) study involving 105 students from vocational high schools in Jakarta found that self-control significantly predicts academic procrastination. Students with high self-control can prioritize important tasks over those they may find more enjoyable. In contrast, those lacking self-control are more likely to engage in activities that are not in their best interests. Additionally, Zhao et al.'s (2021) survey of 503 Chinese college students uncovered a significant correlation between self-control and its impact on academic procrastination. Self-control influences academic procrastination through its effect on time management disposition. Students with a lower level of time management often require assistance in managing their time effectively, which can lead to procrastination.

Besides self-control, grit has also been found to be associated with procrastination. Grit, a concept introduced by psychologists Angela Duckworth and James Gross (2014), is a distinctive personality trait characterized by an individual's unwavering passion and perseverance in pursuing long-term goals. It encompasses the ability to sustain unwavering determination and effort in the face of adversities and setbacks, a quality that plays a pivotal role in achieving enduring success. Individuals endowed with grit are less likely to give up when confronted with challenges, demonstrating remarkable resilience and capacity for sustained effort. Duckworth et al. (2007) emphasize that gritty

individuals are not necessarily more talented or intelligent than their peers; instead, they possess the unwavering determination to persevere through challenges and setbacks, ultimately achieving their goals. Vallerand (2012) highlights that gritty individuals are not content with sporadic bursts of effort; they are committed to the long-term journey, even when faced with setbacks and plateaus.
Empirical research suggests that the influence of nature surpasses that of nurture in shaping one's grit. Twin studies have revealed moderate heritability estimates of 37% for grit perseverance and 20% for grit consistency of interest (Rimfeld et al., 2016). These findings imply that grit exhibits a certain degree of resistance to change. Nevertheless, grit tends to burgeon over time, particularly as individuals attain clarity regarding their aspirations and passions (Duckworth & Eskreis-Winkler, 2013).

A substantial body of research has investigated the relationship between grit, a personality trait characterized by perseverance and passion, and academic procrastination. These studies have consistently shown a negative association between grit and procrastination, suggesting that individuals with higher levels of grit are less likely to procrastinate.

In a study conducted in China, Jin et al. (2019) found a significant negative correlation between grit and academic procrastination among 1,098 university students. Similarly, Attia and Abdelwahid (2020) reported a similar inverse relationship between grit and procrastination in a study involving 324 nursing students in Egypt. These findings were further corroborated by Rouhi et al. (2021), who observed that grit negatively predicted academic procrastination among 500 Iranian high school students. Additionally, Siah et al.'s (2019) study involving 430 Malaysian undergraduates provided further evidence of this inverse relationship.

Recent research has delved into the relationship between grit and self-control. While these constructs share similarities, they also exhibit distinct roles in shaping an individual's success.

Several studies have demonstrated a substantial correlation between grit and self-control. Vazsonyi et al. (2019) The study, involving 1907 participants, found a significant overlap between the two constructs. Similarly, Muenks et al. (2017) observed a noteworthy convergence between grit and self-control in their research involving U.S. high school students and undergraduates. These findings were further corroborated by Gonzalez et al. (2020) in their study involving two distinct participant samples.

Despite this evidence of overlap, Duckworth and Gross (2014) posit that grit and self-control exhibit distinct qualities. According to their perspective, grit is more closely aligned with long-term goals that span an individual's entire life, while self-control is primarily linked to achieving day-to-day successes. This distinction is supported by empirical evidence from Boerma (2020), who found that grit significantly predicted grade point averages, while self-control demonstrated less predictive power.

Further research has examined the relationship between grit, self-control, and academic outcomes. Oriol et al. (2017) discovered that grit is positively associated with academic self-efficacy rather than self-control within primary and secondary student samples. Similarly, Suzuki et al. (2015) concluded that grit significantly predicted work engagement even after controlling for other personality traits, including self-control and the Big Five personality factors.

Werner et al. (2019) employed commonality analysis to scrutinize the unique and combined influences of grit, self-control, and conscientiousness in predicting motivation for academic goals. Their findings indicated that the collective effects of grit, self-control, and conscientiousness accounted for the greatest variance in motivation for academic goals, followed by the combined effects of grit and conscientiousness. In contrast, the unique contribution of self-control to motivation for academic goals was minimal.

In conclusion, although grit and self-control exhibit conceptual overlap and a strong correlation (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019), their predictive validity differs across contexts (Boerma, 2020; Duckworth & Gross, 2014; Oriol et al., 2017; Suzuki et al., 2015). Grit appears to be more strongly associated with long-term academic and motivational outcomes, while self-control plays a more limited role in these domains. These findings highlight the nuanced interplay between these constructs and their distinct contributions to individual success.

Despite thoroughly examining the available scholarly literature, we have yet to uncover any studies that specifically investigate the interplay among self-control, grit, and academic procrastination. However, relevant research explores the association between self-control, grit, and other significant outcomes. These findings provide valuable insights into the potential relationships between these constructs and academic procrastination.

Hwang et al. (2018) conducted a study involving 509 female undergraduates in South Korea. Their findings revealed that grit mediates the relationship between self-control and academic performance, as measured by grade point averages. These findings suggest that grit is crucial in translating self-control into concrete academic achievements.

Similarly, Ramos Salazar and Meador (2023) conducted an online survey involving 511 undergraduate students. Their results indicated that self-control serves as a mediating construct in the relationship between grit and autonomous behaviors, as well as well-being. These results imply that self-control may facilitate the positive effects of grit on individual outcomes.

1.1. Aims of Study

Previous research on self-control and grit has yielded mixed findings, with some studies suggesting a high correlation between the two constructs (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019) and others indicating distinct predictive validities (Boerma, 2020; Oriol et al., 2017; Suzuki et al., 2015). These results suggest that, despite some overlapping, self-control and grit possess unique characteristics that warrant further exploration. This study aims to reconcile these perspectives by employing the hierarchical model of goals (Duckworth & Gross, 2014) as a theoretical framework, specifically, it hypothesizes that self-control and grit serve distinct functions in reducing academic procrastination.

Based on Duckworth and Gross's (2014) A hierarchical model of goals allows for an understanding of the similarities and differences between self-control and grit within a framework of hierarchical goals. According to this model, goals are organized hierarchically, with lower-order goals (e.g., completing daily tasks) serving as prerequisites for higher-order goals (e.g., achieving long-term success). Self-control is more closely associated with everyday success, such as meeting deadlines or resisting

immediate distractions. At the same time, grit is linked to exceptional, long-term achievements that may take years or even a lifetime to accomplish.

Building on this framework, we propose that reducing academic procrastination can be conceptualized as a higher-order goal, requiring individuals to sustain self-control across multiple trimesters of undergraduate study consistently. We hypothesize that self-control influences procrastination indirectly through the concept of grit. This is because self-control alone may not be sufficient to manage procrastination in the long term, and sustaining self-control throughout an entire academic program requires the grit for perseverance and long-term focus. In other words, while self-control enables students to resist immediate distractions and complete tasks within a given trimester, grit provides the sustained motivation and resilience needed to maintain this self-discipline across all trimesters of their undergraduate studies.

Accordingly, an indirect-only model (Zhao et al., 2010) proposed to examine the psychological mechanism that associates the relationships among self-control, grit and academic procrastination. The conceptual framework (Fig. 1) and hypotheses are shown as follows:

H1: Self-control is not associated with procrastination.
H2: Grit is associated with procrastination.
H3: Self-control is associated with grit.
H4: Grit mediates the relationship between self-control and procrastination.

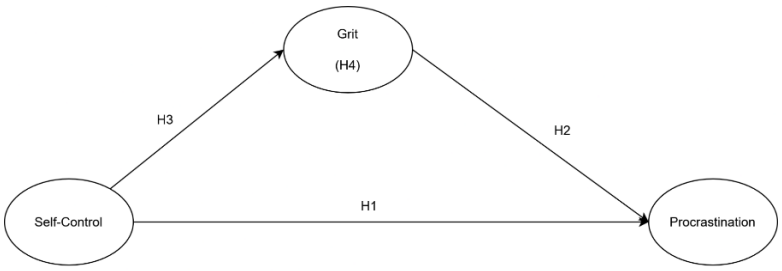

Fig 1. The conceptual framework

2. Method

2.1 Sample

The sample size for this study was determined using an online structural equation model calculator (Daniel, 2023). The criteria used for the sample size calculation were an effect size of 0.3, a statistical power of 0.8, three latent variables, 26 observed variables, and a significance level of 0.05. The minimum sample size calculated using these criteria was 119. One hundred sixty respondents from a university participated in the study (M = 21.74, SD = 0.973). Of the respondents, 99 (60.7%) were female, and 61 (37.4%) were male.

2.2 Procedure

Following approval from the University's Scientific and Ethical Committee (U/SERC/02/2023), an online questionnaire was developed using Qualtrics to facilitate data collection. Participant recruitment was conducted through purposive and snowball sampling techniques. Purposive sampling, a non-probability method, involves selecting participants based on their suitability for the study's objectives, guided by specific inclusion and exclusion criteria (Daniel, 2011). For this study, the inclusion criteria required participants to be undergraduate students enrolled at a Malaysian university and aged between 18 and 25 years. Exclusion criteria eliminated individuals who were not undergraduate students in Malaysia, those studying at overseas universities, or those younger than 18 or older than 25 years of age. Complementing this approach, snowball sampling, also known as chain or sequential sampling, was utilized, whereby initial respondents recruited additional participants from their personal networks, such as friends, relatives, or acquaintances (Makwana et al., 2023). The questionnaire link was disseminated through the researchers' personal contacts, including their own social media networks (e.g., WhatsApp, Facebook, and Instagram), as well as through participants' contacts. Additionally, participants were encouraged to share the survey link with their own social media connections. Prior to completing the questionnaire, participants were presented with an informed consent form on the first page of the survey. This form outlined the study's objectives, potential benefits and risks of participation, and data management protocols, emphasizing that only the research team would have access to the data and that all data would be destroyed following publication. Participants were required to indicate their consent by selecting a checkbox to either agree or disagree before proceeding with the survey. The questionnaire was structured into three distinct sections. Section A contained the informed consent form, Section B collected demographic information from participants, and Section C included validated measurement tools: The Academic Procrastination Scale, the Brief Self-Control Scale, and the Short Grit Scale. Data collection was successfully completed over one month.

2.3 Measurements

2.3.1 Demographic Information: In this section, participants were asked to provide their age, gender, and whether they were undergraduate students at a Malaysian university.

2.3.2 Academic Procrastination Scale: The Academic Procrastination Scale-Short Form is a 5-item scale designed by Yockey (2016) to measure academic procrastination. Participants were asked to rate their level of agreement with each item on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A sample item is "I put off projects until the last minute." Higher mean scores indicate a greater frequency of academic procrastination. The Cronbach's alpha coefficient for the scale was reported as 0.87. Its applicability has been evidenced across diverse contexts, as it has been utilized in studies conducted in Spain, Indonesia, and Malaysia(Martín-Puga et al., 2022; Rasyid et al., 2023; Siah et al., 2019).

2.3.3 Brief Self-Control Scale: The Brief Self-Control Scale is a 13-item scale developed by Tangney et al. (2004) to measure self-control. Participants were asked to rate the extent to which each item described them on a 5-point Likert scale (1 = Not at all like me to 5 = Very much like me). A sample item is "I am good at resisting temptation." Four reversed items were recoded. Higher mean scores indicate higher levels of self-control. The Cronbach's alpha for the scale was reported as 0.89. Its utility

has been demonstrated in research across various countries, including Indonesia, China, and Malaysia (Kadri et al., 2019; Wijaya & Tori, 2018; Zhao et al., 2021).

2.3.4 Short Grit Scale: The Short Grit Scale is an 8-item scale developed by Duckworth and Quinn (2009) to measure grit. Participants were asked to rate their agreement with each item on a 5-point Likert scale (1 = Not at all like me to 5 = Very much like me). A sample item is "Setbacks don't discourage me." Four reversed items were recoded. A higher mean score indicates a higher level of grit. Cronbach's alpha coefficient for the scale was reported as 0.81. Its applicability has been established in research across diverse countries, including the United Kingdom, China, and Malaysia (Jin et al., 2019; Rimfeld et al., 2016; Siah et al., 2019). For this study, only the total mean score of the Grit-S was utilized, rather than the separate perseverance and interest subscales. This decision aligns with empirical evidence indicating that the Grit-S is essentially unidimensional, with a single factor accounting for the majority of the scale's variance. Moreover, the subscales offer limited incremental predictive power beyond the total score, supporting the use of a composite grit measure in analyses (Gonzalez et al., 2020).

2.4 Data Analyses and Data Cleaning

The descriptive results were analyzed using the SPSS program, while the Partial Least Squares Structural Equation Modeling (PLS-SEM) was analyzed using the SmartPLS program. According to Hair et al. (2016)PLS-SEM is particularly suitable when the primary objective of applying structural modeling is to predict and explain target constructs. PLS-SEM is primarily employed in exploratory research to develop and refine theories, as it emphasizes explaining the variance in dependent variables within the model. Unlike covariance-based SEM, which is better suited for confirmatory analysis and theory testing, PLS-SEM excels in situations where the research aims to identify relationships and patterns in complex models, especially when the focus is on prediction rather than strict model fit.

The SPSS program with Mardia's macro was employed to assess the normality of the data by examining multivariate skewness and kurtosis (Cain et al., 2017). The findings revealed that the data were not multivariate normal, as evidenced by Mardia's multivariate skewness ($\beta = 9.23$, $p < 0.001$) and Mardia's multivariate kurtosis ($\beta = 59.16$, $p < 0.001$). Following recommendations from Hair et al. (2019) and Ramayah et al. (2017), the SmartPLS program, a non-parametric analysis software capable of fulfilling the objective of testing a theoretical framework from a predictive perspective (Willaby et al., 2015), was utilized to evaluate the measurement model, followed by a structural model to investigate the relationships among the variables (Wong, 2013). Additionally, the bootstrapping method with 5000 resamples was utilized to assess the significance of the path coefficients. No data was missing since the survey was conducted online and designed to elicit responses to all questions.

3. Results

3.1 Measurement Model

3.1.1 Construct Reliability and Discriminant Validity: Composite reliability was employed to assess the internal consistency of the scales, as it is better suited for the Partial Least Squares-Structural Equation Model (PLS-SEM) due to its consideration of varying outer loadings on the construct (Hair et al., 2016). As presented in Table 1, all scales exhibited composite reliability values ranging from 0.74 to 0.90, exceeding the recommended threshold of 0.7. These results suggest that the latent constructs of all scales possess acceptable internal consistency. Furthermore, all measurements demonstrate heterotrait-monotrait ratios below the critical value of 0.90, indicating that the discriminant validity of all measurements is satisfactory (Table 1).

Table 1. Composite Reliability and Discriminant Validity of Measurements

	Total items	Mean	SD	Composite reliability	Heterotrait-monotrait Ratio	
					1	2
1. Grit	8	3.16	0.67	0.83		
2. Procrastination	5	2.81	1.06	0.90	0.69	
3. Self-control	13	3.39	0.75	0.74	0.81	0.53

3.1.2 Coefficient of Determination, Effect Size, and Collinearity Statistics of Measurements: Table 2 shows that large effect sizes were found for grit and procrastination, with r^2 values of 0.53 and 0.35, respectively. Besides, a large effect size was found between self-control and grit, $f^2 = 1.11$. A medium to large effect size was found between grit and procrastination, $f^2 = 0.14$, and a small effect size was found between Self-control and Procrastination, $f^2 = 0.02$. There was no collinearity issue as the variance inflation factor of all predictors was also below 5 (Hadi et al., 2016).

Table 2. Coefficient of Determination (r^2), Effect Size (f^2), and Collinearity Statistics (VIF) of Measurements

Exogenous	Endogenous	r^2	f^2	VIF
Grit		0.53		
	Self-control		1.11	1.00
Procrastination		0.35		
	Grit		0.14	2.22
	Self-control		0.02	2.12

3.2 Structural Model

After controlling for the gender and age variables, the one-tailed test, along with bootstrapping results using 5000 samples, revealed that Self-control was positively associated with grit ($p < 0.001$), but not with procrastination ($p = 0.059$). Besides, grit is also associated with procrastination, $p < 0.001$ (Table 3).

Table 3. Results of Structural Model Analyses

	Hypothesis	Beta	Std. Beta	T-Values	*p*-Values	95% Percentile Confidence Interval
Self-control → Procrastination	H1	-0.17	0.11	1.51	0.066	[-0.37, -0.01]
Grit → Procrastination	H2	-0.44	0.10	4.25	< 0.001	[-0.59, -0.27]
Self-control → Grit	H3	0.73	0.04	19.56	< 0.001	[0.67, 0.79]
Self-control → Grit → Procrastination	H4	-0.32	0.08	3.93	< 0.001	[-0.45, -0.19]
Control Variables						
Age → Procrastination		0.01	0.06	0.01	0.498	[-0.09, 0.09]
Gender → Procrastination		-0.31	0.14	2.27	0.012	[-0.54, -0.09]

3.3 Mediating and Moderating Effects

The decision tree proposed by Zhao et al. (2010) was used to examine the mediating effects of grit. As shown in Table 3, the findings revealed that grit significantly indirectly affects the relationship between Self-control and Procrastination ($p < 0.001$). These findings indicate that grit mediates the relationship between Self-control and Procrastination. Additionally, the direct effect of Self-control on Procrastination was insignificant ($p = 0.059$), further supporting the indirect-only mediating effect of grit. Moreover, the moderating effect of Grit and Self-control on Procrastination was not found to be significant ($p = 0.231$).

4. Discussion

Academic procrastination, delaying or postponing tasks until the last minute, is prevalent among students worldwide. Identifying the factors contributing to procrastination is crucial for developing effective interventions to promote academic success. This study investigates the complex relationships among self-control, grit, and academic procrastination, employing Duckworth and Gross's (2014) hierarchical model of goals as a theoretical framework.

Extensive research has established a negative association between self-control and grit, on the one hand, and academic procrastination, on the other. However, the precise nature of the relationship between self-control and grit remains a subject of debate. Some scholars argue that self-control and grit are distinct constructs, each contributing uniquely to an individual's success (Boerma, 2020). In contrast, others argue that grit constitutes a subcomponent of self-control, positing self-control as a broader construct encompassing grit (Werner et al., 2019). To address these perspectives, this study adopts Duckworth and Gross's (2014) hierarchical model of goals, which provides a lens to examine how self-control and grit interact to influence procrastination. Given that sustaining self-control throughout an academic program demands perseverance and long-term focus qualities encapsulated by grit, this study proposes an indirect-only model, wherein self-control affects procrastination solely through grit.

The results of this study revealed no significant direct effect of self-control on procrastination, suggesting that self-control alone is insufficient to mitigate procrastinatory behavior. This finding diverges from prior research that identified a significant association between self-control and academic procrastination (Widya Nadya Rostania et al., 2023; Wijaya & Tori, 2018). One plausible explanation for this discrepancy is that earlier studies may not have adequately differentiated between self-control and grit. The significant association previously attributed to self-control might, in fact, stem from grit rather than self-control in isolation.

Conversely, a significant positive association with a large effect size was observed between self-control and grit, indicating shared underlying mechanisms. This aligns with prior research documenting substantial overlap between the two constructs (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019).

Furthermore, grit exhibited a significant negative association with procrastination, underscoring its more direct role in reducing such behavior. This finding supports Duckworth and Gross's (2014)

assertion that grit is particularly adept at addressing long-term, goal-related challenges, such as procrastination.

The study also identified a significant indirect mediating effect of grit in the relationship between self-control and procrastination. While self-control contributes to the development of grit, it is grit that directly influences procrastination behavior. These findings corroborate Duckworth and Gross's (2014) hierarchical model, which positions self-control and grit within a framework of goal pursuit. Self-control enables individuals to navigate conflicting immediate, lower-level goals, but it is insufficient for achieving long-term, overarching objectives in the face of setbacks, where grit becomes essential. Thus, although self-control and grit share conceptual similarities, they serve distinct functions in goal attainment.

5. Conclusion

This study advances the understanding of the intricate interplay among self-control, grit, and academic procrastination among undergraduate students. The findings suggest that self-control and grit are interconnected, with self-control potentially enhancing the effectiveness of grit in reducing procrastination. These insights carry both theoretical and practical implications, emphasizing the value of enhancing self-control to bolster grit and, consequently, indirectly reduce procrastination.

6. Implication

From a theoretical standpoint, this study provides empirical support for Duckworth and Gross's (2014) hierarchical model of goals, suggesting that self-control underpins grit and may be foundational to its development. This contribution enriches our comprehension of the psychological mechanisms linking self-control and grit to academic procrastination.

Practically, the findings highlight the potential of self-control training as an intervention to indirectly enhance grit and reduce procrastination among undergraduates. Existing programs demonstrate that self-control can be cultivated through various means, such as parental and peer relationships (Holmes et al., 2019; Kim et al., 2022; Meldrum et al., 2012), mindfulness training (Suárez-García et al., 2020), goal-setting exercises (Duckworth et al., 2018), and cognitive reappraisal strategies (Stiller et al., 2019). By fostering self-control, educators and counsellors can empower students to develop the grit necessary for achieving academic goals. Additionally, targeted interventions to enhance grit directly have also been proposed (Hwang & Nam, 2021), offering further avenues for practical application. However, the efficacy of such programs within the Malaysian context remains underexplored and warrants further empirical investigation.

7. Limitations

Despite its contributions, this study has limitations that warrant consideration. The use of purposive and snowball sampling methods may limit the generalizability of the findings to the broader undergraduate population. Moreover, the correlational design precludes definitive conclusions about causality among the variables (Shaughnessy et al., 2015). Future research should employ more diverse sampling techniques to examine the robustness of the findings and consider longitudinal designs to explore the causal dynamics among self-control, grit, and procrastination over time. In addition, Future

research should explore alternative theoretical frameworks to investigate further the relationship between self-control, grit, and academic procrastination. Additionally, qualitative approaches could provide deeper insights into students' perceptions of their procrastination behaviors and the roles of grit and self-control in these patterns. Such studies could also examine potential contextual differences, including whether the current model demonstrates greater applicability for specific subgroups of undergraduate students based on demographic or academic backgrounds.

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Emerging Research Fronts in the Digital Educational Ecosystem: A Systematic Qualitative and Quantitative Analysis

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ABSTRACT

The digital educational ecosystem has undergone rapid evolution through the integration of modern digital technologies, transforming teaching, learning, and research practices within higher education. This study conducts a systematic qualitative and quantitative analysis of emerging research fronts in this dynamic field, utilizing bibliometric data from Scopus spanning the years 2019-2023. Key research fronts identified include Digital Assessment, Blockchain, Artificial Intelligence, Lifelong Learning, and Online Learning, each demonstrating significant growth and influence on educational practices. The study introduces innovative metrics, including Growth Rate (R), the gap between the publication years of published and citing papers (ΔT), and the Emerging Factor (EF), to assess the prominence and immediacy of these research areas. Findings reveal that Digital Assessment and Blockchain are the most rapidly emerging topics, driven by their increasing growth rates (R) and the proximity of average publication years (T) between published and citing papers. The geographical analysis highlights substantial contributions from leading institutions in the United States, China, and Europe, underscoring the global nature of research in the digital educational ecosystem. This study provides critical insights for educators, policymakers, and researchers, offering a comprehensive overview of the current landscape and future directions in digital education research.

Keywords: Digital Educational Ecosystem, Emerging Research Fronts, Bibliometric Analysis, Digital Assessment, Blockchain in Education, Growth Rate, Emerging Factor Growth

1. Introduction

In recent years, the higher education sector has undergone a profound transformation driven by the integration of digital technologies across teaching, learning, research, and administration. This transformation has given rise to what is now known as the digital educational ecosystem, where tools such as artificial intelligence, blockchain, virtual reality, and online platforms converge to reshape pedagogical practices and institutional strategies (Nguyen & Tuamsuk, 2022; Chinchua et al., 2022). As universities adapt to this shift, it becomes increasingly important to identify which digital technologies and scholarly domains are emerging most rapidly, drawing academic attention and influencing future educational paradigms.

Research fronts, defined as clusters of thematically linked scholarly activities, serve as vital indicators of these dynamic developments. Initially conceptualized by Garfield (1955) and further refined by Price (1965), research fronts illustrate how new ideas disseminate and gain momentum across academic communities. Their application in science and technology foresight is well established, particularly through Clarivate Analytics' use of bibliometric indicators to identify "hot" and "emerging" fronts (Research Fronts, 2024). For higher education institutions, such knowledge can inform strategic planning, policy formulation, and investment in innovation.

Despite the growing relevance of the digital educational ecosystem, most existing studies address individual technologies in isolation - such as artificial intelligence (Kaur et al., 2020; Hashim et al., 2022; Guo et al., 2024), virtual reality (Rojas-Sánchez et al., 2023), online teaching (Bao et al., 2020), educational technology (Bedenlier et al., 2020), gamification (Kummanee et al., 2020; Chinchua et al., 2022), and digital literacy (Wang & Jing, 2021; Yong, 2024). However, few have attempted to holistically map how these areas converge into broader research fronts that shape the digital transformation of higher education. This creates a significant gap in understanding the structure and trajectory of emerging knowledge in this domain. In particular, limited attention has been given to identifying and evaluating emerging research fronts those that may become the next major drivers of academic and institutional innovation.

To address this gap, the present study conducts a systematic bibliometric analysis using Scopus data from 2019 to 2023 to identify key emerging research fronts in digital education. By understanding how these research fronts evolve, universities and higher education institutions can better align their research strategies, curricular design, and digital transformation efforts. In particular, this study emphasizes scientific and geographical mapping at both institutional and national levels**,** identifying which universities and countries are leading contributors to these emergent domains. While the final discussion elaborates on these institutional implications, this paper also integrates this perspective throughout the analysis. Specifically, the study aims to answer the following questions: (i) How can quantitative metrics be formulated to determine emerging research fronts? (ii) What are the most prominent emerging research areas within the digital educational ecosystem? (iii) Which countries and institutions are the leading contributors to scholarly output in this field?

2. Literature Review

Concept of Research Front

The notion of research fronts emerged from Garfield's (1955) pioneering work on citation indexing. These fronts are structured around two key elements: core papers that are frequently cited, forming the foundational knowledge base, and citing papers that further develop and expand these ideas (Small & Griffith, 1974). This framework enables the tracking of established knowledge, as well as the dynamic progression of research innovations. Zheng et al. (2016) demonstrated the application of keyword co-occurrence analysis in identifying research fronts, emphasizing the effectiveness of bibliometric approaches in monitoring their development. Advanced techniques such as co-citation analysis and co-word analysis play a vital role in exploring these domains (Li & Chu, 2016). Mazov et al. (2020) offered a modern interpretation, describing research fronts as clusters of recently published works with shared topical interests, distinguished by dense internal citation links and relatively sparse external connections.

Existing Frameworks and Limitations

Research fronts are typically grouped into three primary categories: Emerging research fronts, which signal novel areas of investigation driven by innovative methodologies or unresolved issues; Hot research fronts, characterized by heightened academic engagement and rapidly increasing citations and outputs; and Impactful research fronts, which have a lasting impact on scholarly discourse, policy decisions, and industry practices. To classify and analyze the most influential research fronts, indicators and formulas, integrating key bibliometric parameters is commonly introduced.

Traditionally, hot research fronts have been identified primarily using Clarivate's CPT indicator, which is based on metrics such as the number of core papers and the volume of citing articles (e.g., Research Fronts, 2024; Chung & Cam, 2024). In such a study, the CPT indicator, which is defined as the ratio of the average citation impact of a research front to the age/occurrence of its citing papers and is calculated as follows:

$$CPT = \left(\frac{P_{citing}}{P_{core}}\right)/T_{citing} = \frac{P_{citing}}{(P_{core} \times T_{citing})} \quad (1)$$

where:

- P_{core} is the number of foundational core papers, i.e., the highly cited papers that are explicitly defined as papers that rank in the top one percent in terms of citations within the same Essential Science Indicator field and publication year. In studies analyzing research fronts within a specific field (e.g., digital education) (Chung & Cam, 2024), P_{core} has also been determined using the Hirsch index (H-index) (Hirsch, 2005).

- P_{citing} represents the number of citing articles, i.e., the total of articles citing the core papers;

- T_{citing} indicates the age of citing articles, which is the number of citing years, from the earliest year of a citing paper to the latest one.

In this case, the higher the CPT number, the hotter or more impactful the topic.

CPT is the ratio of the average citation (P_{citing}/P_{core}) of a research front to the age/occurrence of its citing papers (T_{citing}), meaning the higher the average citation, the hotter or more impactful the topic. It measures the extent and immediacy of a research front and can be used to explore the developing aspects of research fronts and to forecast future possibilities. The degree of citation impact can also be

seen from CPT, which considers the average publication years of citing papers and demonstrates the trend and extent of attention on specific research fronts over time.

This CPT approach emphasizes the core number of published articles (P_{core}) and their citations (P_{citing}). It does not account for the growth rate (R) and the interaction between published (or core) and citing publications. Notably, the growth rate (R) of both published and citing articles is absent, which is crucial for understanding extensive and immediate trends. To identify impactful research trends, it is essential also to consider publication productivity (S). Specifically, examining the gap between the average publication years of published and citing papers, T_{pub} and T_{citing}, respectively, can offer valuable insights. A narrower gap ($\Delta T = T_{citing} - T_{pub}$) indicates emerging trends and suggests stronger alignment with global research directions.

Toward a New Analytical Framework for Digital Education

To address the gaps mentioned above, recent work by Chung & Cam (2025) proposed an Impact Factor (IF) for evaluating research fronts in the digital educational ecosystem by incorporating the total productivity (S_{pub}) and growth rate (R_{pub}) of published publications. Building on this, the present study introduces an Emerging Factor (EF) that incorporates three key bibliometric components: the growth rate of published papers, the growth rate of citing papers, and the time gap between the average publication years of the published and citing papers. This framework is specifically designed to capture emerging relevance—how quickly and extensively new research areas gain scholarly traction. The current study applies this enhanced framework to higher education-focused literature within the digital educational ecosystem.

Research fronts, when applied to digital education, do more than trace scholarly attention. They help identify the institutions and nations at the forefront of educational innovation. By mapping bibliometric indicators to affiliated universities and countries, one can assess not only the thematic evolution of digital education but also the geographic diffusion and institutional leadership driving that change. Despite the increasing volume of research on emerging technologies in education, prior bibliometric studies have rarely linked these trends back to organizational-level insights, such as which universities produce the most influential core papers or which national systems demonstrate leadership across research fronts. This study addresses that gap by integrating a geospatial lens into the analysis, enabling insights into both scientific concentration (research productivity and citation growth) and institutional strategy alignment within higher education ecosystems.

3. Methodology

Data Source and Keyword Selection

To address the research questions, bibliometric data were collected from the Scopus database, covering all publication types (journal articles and conference papers) from 2019 to 2023. The selection of high-frequency keywords was informed by a triangulated approach comprising: (i) a review of previous systematic reviews and bibliometric studies in the field of digital education; (ii) expert consultation with scholars and practitioners specializing in educational technology, instructional design, and digital pedagogy; and (iii) a pilot keyword frequency analysis using preliminary Scopus data from 2019–2023 to identify terms with consistently high relevance and citation linkage. This multifaceted process ensured that the selected keywords reflect both influential and emerging themes within the digital

educational ecosystem, aligning with historical research trends and forward-looking innovations. Ultimately, 17 keywords were selected for analysis based on the criterion that each exhibited either a total number of published or citing papers exceeding 1,000, or a publication/citation growth rate greater than 1.25. These keywords reflect key themes and technological trends shaping modern education, including Artificial Intelligence, Blockchain, Cloud Computing, Collaborative Learning, Digital Assessment, Digital Literacy, Educational Technology, Gamification, Hybrid Learning, Learning Analytics, Learning Management Systems, Lifelong Learning, Massive Open Online Courses (MOOCs), Mobile Learning, Online Learning, Personalized Learning, and Virtual Reality (see table 1). Each keyword represents a distinct domain within the digital education landscape, contributing to the formation of research fronts by addressing critical challenges and advancements.

The search syntax was formulated as follows: TITLE-ABS-KEY [("synonyms keyword terms") AND ("higher education" OR "university*" OR "college*")] (see also Table 1). This approach was carefully designed to ensure both the validity and reliability of the data collection process. After a thorough manual review, the results, along with all available bibliometric information, were exported in CSV format for further analysis.

Table 1: Research fronts and keywords using synonyms in the search string. The total number of published (P_{pub}) and citing (P_{citing}) papers from the period of 2019-2023 is included.

No	Research front	Keywords and Synonyms terms	P_{pub}	P_{citing}
1.	Artificial Intelligence	"Artificial Intelligence" OR "Machine Learning"	11572	15848
2.	Blockchain	"Blockchain"	737	1883
3.	Cloud Computing	"Cloud Computing" OR "Internet-based computing"	1020	1880
4.	Collaborative Learning	"Collaborative Learning" OR "Cooperative Learning"	1933	3571
5.	Digital Assessment	"Digital Assessment" OR "Online Assessment"	557	2192
6.	Digital Literacy	"Digital Literacy" OR "Digital Competence" OR "Digital Skill"	1447	2356
7.	Educational technology	"Learning technology" OR "Educational technology"	2135	4541
8.	Gamification	"Gamification"	1347	2105
9.	Hybrid Learning	"Hybrid Learning" OR "Blended Learning" OR "Hyflex Learning"	2499	3816
10.	Learning Analytics	"Learning Analytics" OR "Academic Analytics" OR "Learning Data Analysis"	1094	3045
11.	Learning Management Systems	"Learning Management Systems" OR "LMS"	1372	2604
12.	Lifelong Learning	"Lifelong Learning" OR "Lifelong Education"	555	1420
13.	Massive Open Online Courses	"Massive Open Online Courses" OR "MOOC"	1109	1907
14.	Mobile Learning	"Mobile Learning" OR "M-learning"	1081	3117
15.	Online Learning	"Online Learning" OR "E-learning" OR "Distance Education"	17675	17350
16.	Personalised Learning	"Personalised Learning" OR "Individualised Learning"	310	945
17.	Virtual Reality	"Virtual Reality"	3221	4752

Instrumentation and Analytical Tools

To extract publication and citation statistics, this study primarily utilized Scopus's built-in analytics features, including the Document Search, Analyze Search Results, and Citation Overview tools. These were used to determine the total and annual number of publications (P_{pub}) and citations (P_{citing}) for each research front, as well as to calculate the average publication year (T_{pub}) and average citation year (T_{citing}) across the period from 2019 to 2023. Subsequent metrics, such as growth rates (R_{pub}, R_{citing}), the time gap (ΔT), and finally, the Emerging Factor (EF), were computed in Microsoft Excel using

standardized formulas. The combination of Scopus's validated citation data and transparent Excel-based computation ensured both accuracy and replicability in the analysis.

Scopus's built-in Citation Overview and Analyze Search Results tools were utilized to extract institutional affiliation data and country-level contributions, enabling scientific and geographical mapping at two levels.

- Institution-level: Identifying top universities contributing to core publications in each emerging research front (e.g., the University of Illinois Urbana-Champaign in Digital Assessment; Universitas Raharja in Blockchain).
- Nation-level: Mapping national scientific output (e.g., U.S., China, South Africa) in terms of publication volume and core contribution to emerging areas.

In total, 122,899 papers, including 49,664 published (P_{pub}) and 73,335 citing (P_{citing}) papers, were retrieved from Scopus between 2019 and 2023 across the 17 identified research fronts. The total number of published and citing papers for each research front is included in Table 1.

Metric Formulation

Figure 1 illustrates the search string and analysis process, outlining the various steps involved in the process. The source data consists of Scopus's annual number of published papers at year y ($S_{pub}(y)$). At the first output level (Output 1), the growth rate (R_{pub}) is calculated according to the following equation:

$$R_{pub} = \frac{S_{pub}(y=2023)}{S_{pub}(y=2019)} \quad (2)$$

Additionally, the average published year (T_{pub}) is calculated based on the annual published papers in year y ($S_{pub}(y)$):

$$T_{pub} = \frac{\sum_{y=2019}^{2023} y \times S(y)}{\sum_{y=2019}^{2013} S(y)} \quad (3)$$

At the second output level (Output 2), the step involves determining the annual number of citing articles at year y ($S_{citing}(y)$), i.e., the number of articles citing the published papers, and determining the growth rate (R_{citing}) and the average citation year (T_{citing}) using similar formulas to eq. (1) and (2), respectively:

$$R_{citing} = \frac{S_{citing}(y=2023)}{S_{citing}(y=2019)} \quad (4)$$

$$T_{citing} = \frac{\sum_{y=2019}^{2023} y \times S_{citing}(y)}{\sum_{y=2019}^{2013} S_{citing}(y)} \quad (5)$$

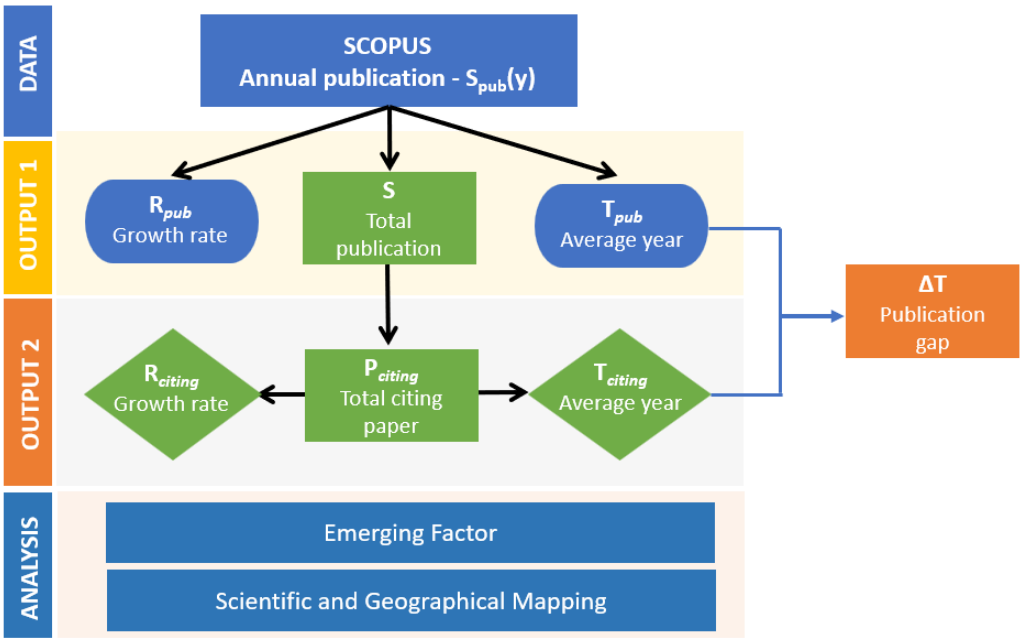

Figure 1. The search string and analysis process

Regarding emerging aspects, the immediacy of the published papers is a priority, which is why they are characterized as "emerging." To identify emerging specialties, the growth rates of R_{pub} and R_{citing} are key indicators. Additionally, the average year of publication of the papers (Tpub) and those cited (T_{citing}) offer valuable insights. The closer T is to the present, the more it reflects emerging trends. In particular, the narrower gap between the publication years of published and citing papers (ΔT) suggests a stronger resonance with global research trends.

ΔT is evaluated as a consequence of the first and second output levels (Fig. 1):

$$\Delta T = T_{citing} - T_{pub} \quad (6)$$

The analysis process also includes the calculation of the Emerging Factor (EF) along with Scientific and Geographical Mapping. The EF is determined using the following formula:

$$EF = \frac{R_{pub} \times R_{citing}}{\Delta Y} \quad (7)$$

4. Results and Discussion

Emerging Research Fronts

Table 2 presents the number of annual published $S_{pub}(y)$ and citing papers $S_{citing}(y)$ for various research fronts within the digital educational ecosystem, collected from the Scopus database from 2019 to 2023. Artificial Intelligence has the highest number of both published and citing papers, indicating its leading position in terms of research impact and academic activity. Online Learning ranks second in both published and citing papers, reflecting the significant attention it received, particularly during the pandemic years. Virtual Reality shows consistent growth, indicating its increasing relevance in digital

education. Educational Technology and Hybrid Learning also have substantial numbers of citing papers, suggesting they are prominent areas of ongoing research.

Table 2: The number of annual published papers – $S_{pub}(y)$ and citing papers – $S_{citing}(y)$ collected from Scopus database from 2019 to 2023

No	Topic keyword	Published papers - $S_{pub}(y)$					Citing Papers – $S_{citing}(y)$				
		2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
1	Artificial Intelligence	1256	1740	2435	2731	3410	744	4021	10573	19053	29261
2	Blockchain	70	109	145	181	232	27	234	508	1054	1516
3	Cloud Computing	187	188	254	235	156	102	364	873	1360	1664
4	Collaborative Learning	357	449	376	375	376	125	814	1866	3061	3987
5	Digital Assessment	37	73	143	156	148	16	160	665	1232	1399
6	Digital Literacy	158	244	301	360	384	62	459	1105	1880	2729
7	Educational technology	492	457	382	400	404	234	987	2221	3297	4404
8	Gamification	196	215	272	311	353	89	471	974	1405	2070
9	Hybrid Learning	375	437	562	589	536	112	706	1933	3385	4414
10	Learning Analytics	187	232	210	217	248	117	586	1146	1879	2544
11	Learning Management Systems	249	272	303	269	279	89	511	1285	2043	2796
12	Lifelong Learning	88	93	110	117	147	16	175	486	841	1160
13	Massive Open Online Courses	219	246	254	214	176	73	366	927	1501	1782
14	Mobile Learning	224	203	232	215	207	97	567	1199	1928	2676
15	Online Learning	2003	2812	4501	4455	3904	616	3411	10439	18285	23770
16	Personalized Learning	52	48	68	66	76	16	128	266	489	711
17	Virtual Reality	481	477	703	706	854	184	1138	2546	4442	6167

Regarding the emerging research fronts, key metrics such as the growth rates (Rpub and Rciting), the average publication year of published papers (Tpub) and citing papers (Tciting), the gap between the publication years of published and citing papers (ΔT) and Emerging Factor (EF), as defined in equations (2-7), are determined and listed in Table 3. The results indicate that the most emerging topics, as determined by the formula (6), are as follows: Digital Assessment (with EF = 627.0), Blockchain (EF = 310.1), Artificial Intelligence (RF = 158.4), Lifelong Learning (EF = 154.8), Online Learning (EF = 142.9), Digital Literacy (EF = 97.1), Virtual Reality (EF = 79.1), Personalized Learning (EF = 74.3), Hybrid Learning (EF = 64.0), and Gamification (EF = 62.2). Among these, Digital Assessment and Blockchain rank first and second, respectively, due to the convergence of the five key indicators (Rpub, Rciting, Tpub, Tciting, and ΔT), all of which are within the top five. Although Artificial Intelligence is ranked as the top impactful hot research topic (Tran Ai & Chung, 2025), it places third in emerging topics because its Rciting does not fall within the top five.

For better visualization of the variation in these key metric values across research fronts, the normalized data on R_{pub}, R_{citing}, ΔT and EF are presented in Figure 2. It also includes trendlines illustrating the relative influence and growth of these metrics across the topics.

The growth rate of citing papers (R_{citing}), shown by the orange bars, is consistently higher than that of core published papers (R_{pub}), indicated by the blue bars, across all topics. This imbalance highlights the significant impact and influence of these core published papers in driving new research. Topics such as Digital Assessment, Blockchain, and Artificial Intelligence have notably high Rciting values, further confirming their strong influence within the academic community.

Table 3: The values of the growth rates R_{pub} and R_{citing}, the average year of the published papers T_{pub} and citing papers T_{citing}, the gap between the publication years of published and citing papers ΔT and the Emerging Factor (EF) for the investigated research fronts

No	Topic keyword	Published papers		Citing papers		ΔT	EF
		R_{pub}	T_{pub}	R_{Citing}	T_{citing}		
1	Digital Assessment	4.000	2.548	87.438	3.105	0.558	627.0
2	Blockchain	3.314	2.537	56.148	3.137	0.600	310.1
3	Artificial Intelligence	2.715	2.458	39.329	3.132	0.674	158.4
4	Digital Literacy	2.430	2.393	44.016	3.083	0.691	154.8
5	Lifelong Learning	1.670	2.256	72.500	3.103	0.847	142.9
6	Online Learning	1.949	2.308	38.588	3.082	0.774	97.1
7	Virtual Reality	1.775	2.303	33.516	3.055	0.752	79.1
8	Personalized Learning	1.462	2.213	44.438	3.088	0.875	74.3
9	Hybrid Learning	1.429	2.190	39.411	3.069	0.880	64.0
10	Gamification	1.801	2.304	23.258	2.977	0.673	62.2
11	Learning Management Systems	1.120	2.042	31.416	3.033	0.991	35.5
12	Learning Analytics	1.326	2.098	21.744	2.980	0.882	32.7
13	Collaborative Learning	1.053	1.981	31.896	3.012	1.031	32.6
14	Mobile Learning	0.924	1.980	27.588	3.008	1.028	24.8
15	Massive Open Online Courses	0.804	1.894	24.411	2.979	1.086	18.1
16	Educational technology	0.821	1.891	18.821	2.956	1.065	14.5
17	Cloud Computing	0.834	1.985	16.314	2.944	0.959	14.2

The publication gap (ΔT), depicted by green bars, shows the average time difference between the publication of core papers and their subsequent citations. Topics such as Cloud Computing, Educational Technology, and Massive Open Online Courses display the largest ΔT values, indicating that these core publications took longer to be recognized and cited. In contrast, Digital Assessment, Blockchain, and Artificial Intelligence have shorter time gaps, suggesting quicker integration into ongoing research. Indeed, during the investigated period (2019-2023), the average year of publication of the papers ranged from 2020 to 2021, making them approximately more than one and a half years old. In contrast, the average year of the citing papers was slightly more recent, ranging from 2021,94 to 2022,14, indicating that the citing papers are relatively young, being less than a year old. Despite their youth, the growth rate of the citing papers is significantly higher, approximately 20 times greater, compared to that of the published papers. It reflects the high impact of the published papers in each research front on the global research community.

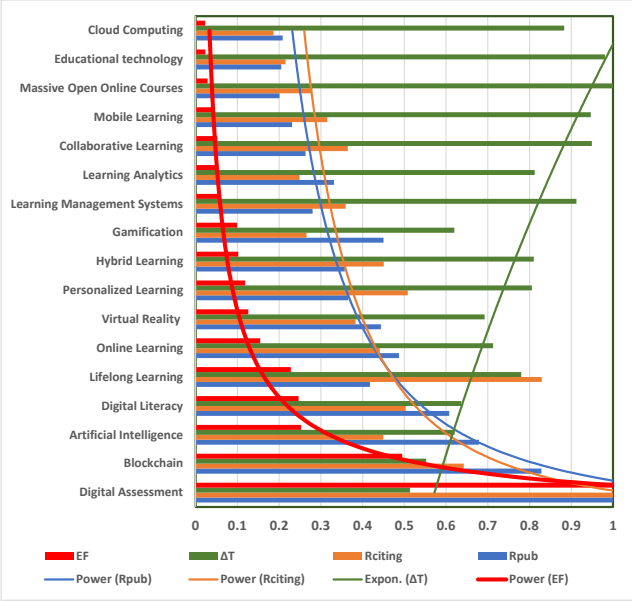

Figure 2. The normalized data on R_{pub}, R_{citing}, ΔT and EF across 17 research fronts in the digital educational ecosystem

For the first two emerging topics, Digital Assessment and Blockchain, the detailed data can be listed as follows. Digital Assessment: R_{pub} = 4.0, T_{pub} = 2021.55; R_{citing} = 87.438, Y_{citing} = 2022.11; ΔT = 0.56. Blockchain: R_{pub} = 3.314, T_{pub} = 2021.54; R_{citing} = 56.148, T_{citing} = 2022.14; ΔT = 0.600. The publication trends for Digital Assessment and Blockchain in higher education have shown remarkable growth from 2019 to 2023, reflecting increasing research interest and citation impact in these areas. Indeed, for the Digital Assessment, in 2019, there were only 37 published papers. This number increased significantly to 148 papers in 2023. Among 558 total published papers, the number of most highly cited core papers, which the H-index determines, is 32 (Hirsch, 2005; Tran Ai & Chung, 2025). The number of citing papers exhibited massive growth from 16 papers (in 2019) to 1339 papers (in 2023). Similarly, for the Blockchain, in 2019, initially, there were 70 published papers. This grew to 232 papers in 2023. The number of core papers is 40. The citing papers experienced substantial growth, increasing from 27 in 2019 to 1,516 in 2023. These trends underscore the growing importance of both Digital assessment and Blockchain technology in educational research, with a significant rise in both the volume of publications and the academic impact as measured by citations. The increase in citing papers for both digital assessment and Blockchain technology highlights their growing significance in academic discourse, positioning them as key emerging research fronts within the digital educational ecosystem. This trend suggests that these topics are not only gaining attention but are also likely influencing new studies and applications in higher education. As these fields continue to evolve, they are expected to play a crucial role in shaping the future of digital education, making them critical areas for ongoing and future research.

The Emerging Factor (EF), represented by the red bars. It shows that Digital Assessment has the highest EF at 627, followed by Blockchain and Artificial Intelligence, indicating that these topics have significantly driven follow-up research. The power curve for EF shows a decreasing trend, with only a few topics exhibiting extremely high EF values, while the majority show lower values. The trendlines illustrate the relative growth and impact of these metrics. The power trendline for R_{pub} shows a gradual increase in core publications, while the power trendline for R_{citing} reflects a steeper growth in citing papers. The exponential curve for ΔT, however, shows a decreasing time gap for more recent topics, indicating that newer research fronts are being adopted more rapidly by the research community. As a result, and consistent with the EF equation formulated in Eq. (6), these opposite trends between Rpub, Rciting, and ΔT strongly enhanced the emerging levels of Digital Assessment, Blockchain, and Artificial Intelligence, among others.

Overall, the figure highlights that recent topics, such as Digital Assessment, Blockchain, and Artificial Intelligence, have had a faster and more significant impact on ongoing research compared to older topics, like Cloud Computing and Educational Technology. The Emerging Factor metric highlights the disproportionate growth of citations for specific key research areas, reflecting their global influence and importance in the academic landscape. This ranking is highlighted below in connection with the obtained values of the key metrics.

Scientific and Geographical Mapping

Digital Assessment

Digital and online assessments utilize technology and internet platforms to evaluate student learning, replacing traditional paper-based methods (Heil & Ifenthaler, 2023; Redecker & Johannessen, 2019; Nicol, 2021). These assessments include various formats such as quizzes, essays, and interactive tasks,

typically administered through Learning Management Systems (LMS) like Moodle or Canvas (Gikandi et al., 2021).

Key components of this approach involve technology integration, with LMSs playing a central role in assessment delivery and grading. The assessment types employed include formative assessments, which provide ongoing feedback; summative assessments, used for final evaluations; adaptive assessments, which tailor difficulty to individual students (Bennett, 2019); and peer assessments, where students evaluate each other's work (Yousef & Sumner, 2021). Design considerations are crucial, focusing on ensuring validity, reliability, security, and accessibility in the creation and execution of these assessments.

Table 4: Top 5 countries and institutions producing core published papers in the research front on Digital and Online Assessment

Top-Contributing Institutions				Leading Countries		
Rank	**Affiliated institution**	**Country**	**Paper**	**Rank**	**Country**	**Paper**
1	University of Illinois Urbana-Champaign	USA	7	1	USA	60
2	University of South Africa	South Africa	7	2	Australia	47
3	University of Alberta	Canada	6	3	UK	41
4	University of Johannesburg	South Africa	6	4	South Africa	33
5	King Abdulaziz University	Saudi Arabia	6	5	Spain	31

The benefits of digital and online assessments include efficiency, as automated grading and quicker feedback streamline the evaluation process (Baird et al., 2017). These assessments also offer flexibility, as they can be accessed from any location, making them particularly useful in remote learning environments. Additionally, they provide valuable data analytics, offering insights into student performance and helping to identify areas where students may need additional support. However, challenges exist, such as technical issues related to connectivity and software reliability (Khan & Khan, 2019), inequities in access to technology (the digital divide), and concerns about academic integrity, which necessitate robust anti-cheating measures (Lancaster & Cotarlan, 2021).

Ultimately, the studies underscored the increasing importance of blockchain across various sectors. They emphasized the need for continued research, particularly in areas where blockchain intersects with emerging technologies like AI and big data. It is recommended that future research should focus on addressing existing challenges, such as scalability and regulatory issues, to fully leverage the potential of blockchain technology (Kuzior & Sira, 2022).

The geographical mapping data presented in Table 3 clearly shows that the University of Illinois Urbana-Champaign in the USA stands out as the leading institution in the research front of Digital and Online Assessment, contributing 7 papers. This highlights the university's significant role and leadership in advancing research within this field. Similarly, the University of South Africa and the University of Alberta have each produced 7 papers, highlighting their active roles in this area of research. The University of Johannesburg follows closely with 6 papers, further solidifying South Africa's growing presence and influence in digital assessment research.

From a country perspective, the United States is the most prolific contributor, with 60 papers, far surpassing other nations. This dominance indicates the substantial investment and prioritization of digital and online assessment research in the US, reflecting the country's leadership in educational innovation. Australia, with 47 papers, and the UK, with 41, also demonstrate significant engagement, highlighting their academic and research priorities in this evolving field. The core papers from Australia (6) and the UAE (5) are particularly notable, as they suggest these countries are not only contributing to the volume of research but also influencing foundational aspects of digital assessment practices.

South Africa's contribution of 33 papers is particularly noteworthy, given the presence of two universities, the University of South Africa and the University of Johannesburg, among the top five institutions in the country. This highlights South Africa's emerging role as a significant player in digital assessment research, particularly within the African context. Spain, with 31 papers, remains a key player in the global research landscape, demonstrating its significant strides in this field.

These results demonstrate a diverse geographical distribution in the research on Digital and Online Assessment, with significant contributions from institutions across multiple continents. The prominence of both established and emerging research institutions highlights the global significance of this field, indicating that digital and online assessments are being increasingly prioritized in various educational and technological contexts. The core papers from countries like Australia and the UAE emphasize the impact of their research on shaping foundational theories and practices in digital assessment, which may guide future developments and standardization efforts in this increasingly critical area of education.

Blockchain

Recent research on blockchain in the digital educational ecosystem underscores the growing interest in utilizing blockchain technology to enhance educational processes, particularly in areas such as credentialing, record-keeping, and data security (Raimundo & Rosário, 2021). These studies highlight blockchain's potential to create decentralized and tamper-proof systems for storing educational credentials, which facilitates easier verification by employers and institutions (Bhaskar et al., 2021). Furthermore, research has explored the ability of blockchain to support more transparent and efficient management of student data, thereby enhancing privacy and giving individuals greater control over their personal information (Juricic et al., 2019).

There is also significant attention to blockchain's role in fostering lifelong learning through the accumulation of verifiable micro-credentials across various educational platforms (Alsobhi et al., 2023). Scholars argue that blockchain could revolutionize traditional learning models by providing a framework for recognizing and validating informal and non-traditional learning experiences (Verma, 2022). Despite these promising applications, challenges such as scalability, regulatory concerns, and the necessity for widespread adoption are frequently noted (Loukil et al., 2021). The importance of overcoming these obstacles to fully realize blockchain's potential in education is emphasized by current research (El Koshiry, 2023).

Table 5: Top 5 countries and institutions producing published and core papers in the research front on Blockchain

Top-Contributing Institutions				Leading Countries		
Rank	**Affiliated institution**	**Country**	**Paper**	**Rank**	**Country**	**Paper**
1	Universitas Raharja	Indonesia	16	1	China	191
2	Bina Nusantara University	Indonesia	12	2	India	155
3	Bucharest University of Economic Studies	Romania	9	3	US	63
4	Kraków University of Economics	Poland	8	4	Indonesia	42
5	University Politehnica of Bucharest	Romania	6	5	UK	33

China leads the field in terms of overall publication productivity, with 191 papers, reflecting its strong focus on and investment in blockchain technology. China's dominance in this research area is further emphasized by its core contributions, positioning it as a global leader in advancing blockchain research. India and the United States also play significant roles, with 155 and 63 papers, respectively, showcasing their substantial involvement in the development and exploration of blockchain applications.

European institutions, such as the Bucharest University of Economic Studies in Romania and the Kraków University of Economics in Poland, also feature prominently, with 9 and 8 papers, respectively. This highlights Europe's growing interest in blockchain research, particularly in countries like Romania and Poland. The presence of institutions like the Politehnica University of Bucharest, which contributed 6 papers, further underscores Romania's active participation in this field.

These results suggest a diverse and widespread interest in blockchain research, with significant contributions coming from both established and emerging economies. The leadership of countries like China and the United States, along with the active participation of Indonesia and various European nations, points to a dynamic and rapidly evolving research landscape. The prominence of core papers from the United States and the United Kingdom suggests that these countries are not only producing a large volume of research but also significantly influencing the foundational theories and practices within the blockchain domain.

5. Conclusion

This study offers a comprehensive examination of emerging research trends within the digital educational ecosystem, utilizing both qualitative and quantitative methodologies. Through the analysis of bibliometric data from 2019 to 2023, key research fronts, including Digital Assessment, Blockchain, Artificial Intelligence, Lifelong Learning, and Online Learning, were identified as pivotal areas driving innovation in higher education. The introduction of metrics such as Growth Rate (R), the gap between the publication years of published and citing papers (ΔT), and the Emerging Factor (EF) enabled a nuanced assessment of the prominence and immediacy of these topics.

Digital Assessment and Blockchain emerged as the most rapidly evolving areas, underscoring their growing significance in educational practices. The geographical analysis revealed substantial contributions from institutions in the United States, China, and Europe, reflecting the global nature of research in this field. These findings underscore the pivotal role that emerging technologies and

practices play in shaping the future of education, offering valuable insights for educators, policymakers, and researchers.

As the digital educational ecosystem continues to evolve, ongoing research is essential to address existing challenges and to explore the potential intersections with other emerging technologies, such as Artificial Intelligence and Big Data. This study not only maps the current landscape but also sets the stage for future research that can further enhance the integration of digital technologies in education, ultimately improving educational outcomes and fostering innovation worldwide.
Finally, the findings of this study offer actionable insights for researchers, institutions, and policymakers. Identifying fast-growing research fronts, such as Digital Assessment, Blockchain, and artificial intelligence, not only reflects current academic attention but also highlights areas of innovation that are likely to shape the future of digital education. These results can inform strategic decisions related to funding allocation, research agenda development, and the integration of educational technology. Additionally, the geographical and institutional mapping sheds light on global research dynamics. Countries such as the USA, China, South Africa, and Romania, and institutions like the University of Illinois and Universitas Raharja, are emerging as key contributors. Understanding these patterns supports global benchmarking, capacity-building initiatives, and the formation of transnational research partnerships in digital education.

Conflict of Interest

The author declares that there is no conflict of interest.

Ethics approval and consent to participate

The author has reviewed the manuscript and has provided his consent for its publication.

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Assessing Digital Technology Adoption in Mathematics Teaching: Attitudes, Beliefs and Usage among Training Teachers

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ABSTRACT

The integration of digital technology in mathematics education presents both opportunities and challenges. One major challenge is that training teachers often struggle to keep pace with technological advancements and effectively apply digital tools in the classroom. This study examines the impact of digital technology adoption. It investigates the relationships between attitudes, beliefs, and the frequency of usage among mathematics training teachers at the Institute of Teacher Education (IPG) in Malaysia. A quantitative research methodology was employed, involving 200 mathematics trainee teachers selected through simple random sampling. Data were analysed using descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (one-way ANOVA and post-hoc Tukey HSD tests). Findings indicate that training teachers exhibit positive attitudes, strong beliefs, and a high frequency of digital technology usage in mathematics instruction. ANOVA results revealed significant differences between attitudes, beliefs, and frequency of usage. Post-hoc analysis further showed that while training teachers recognize the benefits of digitalization, their actual usage varies due to external barriers such as accessibility and training limitations. These findings suggest that enhancing access to digital technology, fostering positive attitudes, and providing targeted professional development programs can significantly improve digital integration in mathematics education. Future research should investigate additional factors, such as institutional support and policy interventions, to further facilitate the adoption of technology among training teachers.

Keywords: Digital technology, accessibility, attitude, frequency of usage, training teachers.

1. Introduction

Digital technology has experienced rapid growth in recent years (Yeo, 2020). Tools such as mobile phones, computers, tablets, artificial intelligence, websites, social media, and multimedia are commonplace and widely used across the globe. Concepts such as open online courses and touch technology have become integral to the daily lives of individuals with Internet access (Borba et al., 2017). The pervasive use of digital technology has profoundly influenced our everyday lives.

However, researchers are finding it challenging to keep up with the swift advancements in digital technology (Borba et al., 2017). The swift evolution in the educational landscape has made it challenging for studies to remain current with the latest issues. The extensive adoption of digital tools has transformed traditional classrooms into online learning environments, eliminating the need for physical attendance (Fransson et al., 2018). As many countries accelerate efforts to digitalize their education systems, concerns regarding the effectiveness of digital tools in education have become increasingly critical.

The rapid expansion of digital technology has reshaped education, driving a shift from traditional, face-to-face classrooms to online and blended learning environments. This transformation highlights the increasing reliance on digital tools for educational delivery. However, the rapid pace of technological advancements poses challenges for educators and researchers, who struggle to keep pace with emerging trends and innovations. As countries continue to push for greater digitalization in education, the need to assess the true impact of digital tools on instructional quality and learning outcomes has become increasingly urgent.

As the world advances towards the Fourth Industrial Revolution (IR4.0), Malaysia is actively striving to stay competitive by embracing digitalization in all sectors, including education. According to Rashvinjee (2021), the Prime Minister's Department has emphasized the importance of embracing IR4.0 to keep the country competitive and prepared for future changes. In response, the education sector has introduced Education 4.0, a paradigm shift driven by digitalization (Priya, 2019).

Mathematics classrooms have not been left behind in this digital transformation. Digital technology is transforming the landscape of mathematics education by offering interactive tools that enhance learning experiences. The integration of digital tools and resources has significantly impacted both teachers and students. According to Dunwill (2016), technological advancements are reshaping teaching methods and learning environments. Web-based learning platforms and interactive mathematics applications, often referred to as game-based learning, offer students engaging and immersive experiences. Popular examples include Minecraft, Roblox, and Prodigy, which utilize virtual reality (VR) to make mathematics learning more enjoyable. Additionally, digital tools like GeoGebra and Tinkercad enable students to explore 3D shapes online, fostering deeper engagement and understanding. Several studies have highlighted the positive impact of digitalization on student motivation in mathematics (Yong et al., 2016; Jannah, 2020; Marpa, 2021). By providing interactive and engaging learning experiences, digital tools can increase students' interest and enthusiasm for the subject. As a result, digitalizing mathematics education is an essential part of Malaysia's efforts to equip students for the challenges and opportunities of the 21st century. Despite its potential, many training teachers struggle with technology integration, often due to a lack of confidence, limited resources, or inadequate training. The rapid evolution of digital tools presents challenges for educators in adopting and effectively utilizing these technologies. Understanding teachers' attitudes, beliefs, and

usage levels of digital technology is crucial for identifying barriers and facilitating effective integration strategies. This research, therefore, aligns with national goals under Malaysia's Education Blueprint and IR4.0 to equip educators with digital competencies.

4 Problem Statement

Recent reviews have highlighted the potential, challenges, and obstacles to integrating digital technology in mathematics education (Yerushalmy & Botzer, 2011). According to Doe (2023), one significant obstacle is the difficulty teachers face in keeping pace with the rapid advancements in digital technology and effectively incorporating it into their teaching practices. Studies have identified several challenges in this regard, including the need for teachers to transition from traditional instructor roles to more facilitative ones and the importance of adopting a structured, research-based approach to technology integration (Bray & Tangney, 2017).

In Malaysia, the readiness of educators to integrate technology into teaching and learning remains a significant challenge, despite the Ministry of Education's initiatives outlined in the Malaysia Education Blueprint (MEB) 2013-2025. Although the integration of technology in classrooms remains limited, the outlines a roadmap for leveraging ICT in education through three waves. Many teachers, however, continue to rely on traditional teaching methods without integrating technology. Research supports studies by Umar and Hassan (2015), which report low levels of technology integration among Malaysian teachers, and Cheok et al. (2020), who highlight the limited use of digital tools in some schools. Additionally, research conducted by Nikian et al. (2013) found that Malaysian teachers face challenges in integrating technology into their classroom practices, contributing to the low usage. While some institutions have organized workshops to train teachers in using technology, teachers still struggle with readiness due to factors such as insufficient training, inadequate resources, and low marks from mentor teachers during their practicum for using technology effectively. Despite the extensive research on the impact of technology in education, studies on teachers' perceptions, particularly those related to teacher training, are limited (Tiba & Condy, 2021). Although digital technology is increasingly emphasized in education policies, its integration into mathematics teaching remains inconsistent. Research has shown that training teachers' attitudes and beliefs significantly impacts their willingness to adopt technology. However, a knowledge gap persists regarding the relationship between attitudes, beliefs, and frequency of usage in the Malaysian context. Moreover, limited studies provide a systematic analysis linking constructs to research design and instrumentation, especially in Malaysian teacher training institutions.

This study aims to 1. Assess the attitudes, beliefs, and frequency of use of digital technology among training teachers in mathematics teaching. 2. Examine the relationship between training teachers' attitudes, beliefs, and frequency of digital technology usage. and 3. Determine the key factors affecting the integration of digital tools in mathematics instruction among training teachers regarding the digitalization of Mathematics learning in Malaysian primary schools.

The rapid advancement of technology has presented challenges for teachers in effectively integrating digital tools into mathematics instruction. Many educators may be unfamiliar with the potential benefits of digital technology in teaching mathematics, which can lead to a reluctance to adopt new tools and strategies. However, research suggests that effective and appropriate use of technology can increase student learning in mathematics (Perienen, 2020). Despite the potential benefits of digital

technology, comprehensive research on its use in mathematics education remains limited (Mulenga & Marbán, 2020).

3. Literature Review & Research Model

The rapid evolution of digital technology continues to reshape mathematics education, creating both opportunities and challenges. Numerous studies have emphasized the positive impact of digital tools on student engagement, mathematical understanding, and interactive learning environments (Borba et al., 2017; Yong et al., 2016; Djidu & Retnawati, 2022). However, a recurring theme across the literature is that successful integration depends not solely on access to technology, but significantly on teachers' internal factors, particularly their attitudes, beliefs, and frequency of usage (Ertmer et al., 2012; Admiraal et al., 2017).

To build a robust research framework and instrument, this study adopted a construct-driven approach, guided by a focused review of empirical and theoretical literature. The search strategy involved selecting peer-reviewed sources published between 2011 and 2023, using keywords such as *"technology acceptance in education"*, *"beliefs and ICT use"*, *"teacher digital attitudes"*, and *"technology integration in mathematics education"*. Studies were selected based on their relevance to training teacher contexts, alignment with quantitative design, and operational clarity of the constructs.

The study is grounded in the Technology Acceptance Model (TAM), which postulates that perceived usefulness and ease of use influence technology adoption. Prestridge (2012) emphasizes how beliefs about ICT shape instructional practice, while qualitative studies by Tiba and Condy (2021) and O'Neal et al. (2017) reveal how environmental, psychological, and pedagogical beliefs frame digital integration in teacher training. All these factors contribute to the development of a conceptual research model that illustrates the interplay between attitudes, beliefs, and the frequency of digital technology usage adopted and operationalized by this study.

The proposed research model is based on the TAM, emphasizing three key constructs influencing digital technology adoption among training teachers: Attitudes towards Digital Technology, Beliefs about Digital Technology, and Frequency of Digital Technology Usage. These constructs interact to determine how effectively training teachers integrate digital tools into their mathematics teaching.

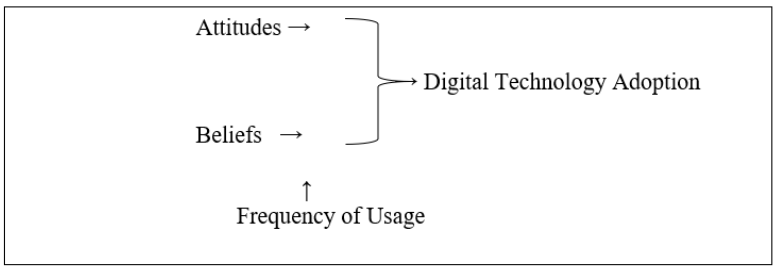

Figure 1: Conceptual framework

TAM posits that attitude, defined as individuals' favourable or unfavourable evaluations of using technology, significantly influences intention and behaviour (Venkatesh & Davis, 2000). In this research, *attitude* refers to how teachers perceive the utility and desirability of using digital tools in the mathematics classroom.

Beliefs**,** while related, refer to deeper cognitive and pedagogical assumptions that influence how teachers interpret the role of digital technology in learning. Prestridge (2012) argues that teachers' underlying beliefs shape whether they use ICT in a merely supportive or truly transformative way. Accordingly, belief constructs in this study were adapted from Prestridge's validated items, with modifications to fit the Malaysian IPG context.

The frequency of usage refers to how often teachers employ digital tools during lesson planning, instruction, and assessment. Previous research (Hsu, 2011; Ghavifekr et al., 2016; Shah & Empungan, 2015) has operationalized this construct using Likert-scaled survey items that focus on the types and regularity of use. This study synthesizes those approaches to develop a localized usage scale.

To ensure theoretical coherence and empirical relevance, each construct is mapped to specific sources, definitions, and adapted instruments (see Table 1). This construct-oriented synthesis directly informed the development of the research model and survey instrumentation. In contrast to descriptive literature summaries, this method ensures a systematic link between theoretical underpinnings and empirical application.

Table 1: Construct Synthesis and Instrument Mapping

Construct	Definition	Source(s)	Instrument Basis	Example Item
Attitude	Teachers' evaluative stance toward technology use in math teaching	Venkatesh & Davis (2000)	TAM-based scale	"I enjoy using digital tools in my teaching."
Beliefs	Teachers' perceptions of how digital tools affect learning and teaching	Prestridge (2012)	Adapted belief items	"I believe ICT improves student mathematical understanding."
Usage Frequency	Frequency of digital tool usage in lesson planning or teaching	Hsu (2011); Ghavifekr et al. (2016)	Modified frequency scale	"I use digital tools in most of my mathematics lessons."

Digital Technology Adoption (Outcome Variable): The dependent variable represents the extent to which training teachers integrate digital technology into mathematics education. The design of the instrument is intended to achieve the objectives of this study.

4. Methodology

This study adopts a quantitative survey design to investigate the attitudes, beliefs, and frequency of digital technology usage among mathematics training teachers in Malaysia. The research design aligns with the study's objectives, which aim to quantify and compare perceptions and usage patterns using validated constructs grounded in the TAM and supporting literature. The research framework is informed by three key constructs: attitudes, beliefs, and usage frequency, all of which are operationalized through a structured questionnaire. These constructs were developed and validated through a literature synthesis (see Table 1 in the Literature Review) and subsequently used to design an instrument that captures the digital technology adoption behaviours of training teachers. Descriptive analysis has been used to analyze the collected data, which includes percentages, frequencies, means, and standard deviations, in order to achieve the first objective. Inferential analysis, specifically one-way ANOVA and Post-Hoc Tests, has been used to investigate the relationship between the aspects and answer the second and third objectives.

Sampling is the process of selecting a subset of the population for research purposes (Turner, 2020). The target population consists of approximately 334 mathematics trainee teachers from various Institutes of Teacher Education (IPG) in Malaysia who have undergone teaching practice. To ensure representative sampling across institutions, disciplines (including Mathematics majors/minors), and training levels, the study employed simple

random sampling using a complete list of eligible trainees from IPG registries. According to Krejcie and Morgan's (1970) table for determining sample size, a minimum of 190 responses is sufficient for a population of this size. This study achieved a sample of 200 respondents, exceeding the recommended threshold to ensure statistical power and generalizability.

In this research, the questionnaire items were adapted from several studies to align with the research objectives. The instrument is divided into four sections, starting with the demographic information of the respondents, followed by attitude items (adapted from the Technology Acceptance Model, or TAM), belief items (from Prestridge, 2012), and usage frequency items (from Hsu, 2011; Shah & Empungan, 2015; and Ghavifekr et al., 2016). All items were rated on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). The instrument comprises a total of 55 items and was reviewed by three experts in mathematics education and educational technology to establish content validity. Validity refers to the accuracy with which a concept is measured in quantitative research (Heale & Twycross, 2015).

A pilot study was conducted with 30 respondents. The results indicated excellent internal consistency, with Cronbach's alpha = 0.942 overall and subscale values above the 0.80 threshold, confirming the instrument's reliability. (Table 2)

Table 2: Cronbach's Alpha Result Value

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of items
.942	.976	55

The attitude aspect assesses respondents' perceptions regarding the utilization of digital technology in classroom instruction. For the belief aspect, the instrument assesses training teachers' beliefs regarding the use of digital technologies. The usage aspect focuses on the respondents' level of engagement with various digital technologies, whether during lesson preparation or in the actual teaching process. Additionally, the instrument also gauges the training teachers' confidence in using these technologies.

Data was collected through a web-based survey using Google Forms, which allowed for broad, asynchronous participation across different IPG campuses. Participation was voluntary, and informed consent was obtained from all respondents. The collected data were analyzed using both descriptive and inferential statistics via SPSS version 27. Descriptive statistics (mean, standard deviation, frequency) were used to summarize training teachers' attitudes, beliefs, and usage.

To test for significant differences across the three constructs, a one-way Analysis of Variance (ANOVA) was employed. ANOVA is appropriate when comparing the means of three or more independent groups, as was the case for this study's constructs. Prior to analysis, key assumptions were tested for normality, which was assessed using the Shapiro-Wilk test. Homogeneity of variance was checked using Levene's test.

Both assumptions were met, confirming the suitability of ANOVA. A Tukey's post-hoc test was also performed to identify specific group differences. This rigorous statistical process ensures the findings are scientifically valid, grounded in accepted quantitative research methodology, and suitable for drawing evidence-based conclusions that support the study's aims and research questions.

5. Findings and Discussions

This study aimed to examine the attitudes, beliefs, and frequency of usage of mathematics trainee teachers regarding digital technology adoption, and to explore the relationships between these constructs. The results are now discussed in relation to the research questions and the underlying theoretical framework (TAM).

5.1 Research Question 1: What are the attitudes, beliefs, and usage levels of digital technology in mathematics teaching among training teachers?

A total of 200 respondents answered the questionnaire. The exploratory data analysis showed that the data collected is normally distributed. For descriptive analysis, the overall mean for attitude, beliefs and level of usage of digital technology in teaching Mathematics among training teachers is at a high level. Inferential analysis revealed a significant difference in attitudes, beliefs, and usage levels. Post-hoc Tukey HSD tests identified specific group differences.

Table 2: Digital Technology in Teaching Mathematics based on Attitudes, Beliefs and Level of Usage

	N	Mean	Std. Deviation
Attitudes	200	3.2970	.3960
Beliefs	200	3.2200	.3530
Level of Usage	200	3.3570	.3700
Influence		3.2904	.3770

Descriptive analysis (Table 2) revealed high mean scores across all three constructs: attitudes (M = 3.297), beliefs (M = 3.220), and usage (M = 3.357), indicating overall positive perceptions of digital technology adoption. These findings align with previous research (Singh & Chan, 2014; Subramanian et al., 2018), suggesting that training teachers are generally open to digital transformation, especially when they perceive the technology as beneficial to student learning shows the positive attitudes observed among the training teachers in this study are supported by Singh and Chan (2014), who found that most respondents believe digital tools enhance teaching effectiveness and facilitate students' understanding of concepts. Training teachers recognize the numerous benefits of digitalization in education and demonstrate favourable attitudes toward its implementation. A significant number of them expressed that lacking digital tools would hinder teaching and learning, while some argued they could still meet learning objectives without them. These findings align with Umar and Hassan's study (2015), which revealed that teachers generally hold positive perceptions of technology use despite facing challenges. Additionally, Shtepura's research (2018) indicates that digital resources enhance the learning experiences of today's students (often referred to as digital natives), who typically have a favourable view of technology in the classroom (Balkan, 2018). These results (M = 3.2970) showed that digital technology promotes interaction between teachers and pupils in mathematics teaching and learning activities more effectively. There is also research that shows that the quality of the learning process and learning outcomes will improve by using mathematical software (Djidu & Retnawati, 2022). These results affirm TAM's core proposition that positive attitudes influence intention and usage. When they are able to learn Mathematics more easily, their confidence and attitude towards using digital technology will improve too. Therefore, training teachers are encouraged to integrate these tools in line with 21st-century learning frameworks such as PAK-21 and Transformation School 2025 (TS25).

In terms of beliefs, as shown in Table 2, the majority of training teachers assert that digital technologies motivate students, enhance their learning, and transform their approach to learning Mathematics (M = 3.2200). This is supported by O'Neal et al. (2017), who found that digital educational tools boost student engagement and interest. The training teachers in this study believe that digitalization has a positive impact on student learning. However, some also expressed concerns that digitalization can be mentally taxing and frustrating. Singh and Chan (2014) noted that many teachers experience stress related to ICT, likely due to technology constraints that lead to technostress. This is corroborated by Ly and Ly's study (2022) in Cambodia, which identified technological challenges and time constraints as common contributors to teacher technostress. There are also

training teachers who find digital technology very confusing, and they face challenges when trying to incorporate it into their mathematics teaching. The reason could be that they lack the skills and knowledge to use digital technology effectively. This statement can be supported by the research of Subramanian et al. (2018), which indicates that students face problems such as a lack of time, inadequate technical support, and a lack of knowledge in integrating digital technology into their study courses. Therefore, it is crucial to plan the implementation of digital tools effectively to mitigate these challenges. Further investigation by educational planners is needed to address these issues, making digitalization a key component of training programs for all teachers.

The high level of digital tool usage (M = 3.3570) among training teachers contrasts with findings from local studies by Ahmad (2014), Umar and Hassan (2015), and Cheok et al. (2020), which suggest a lower level of digital integration among in-service teachers. This suggests that teachers who have received training may have a higher usage rate due to their training and greater familiarity with digital technologies. Siaw (2018) found that training teachers perceive the Digital Innovation course at the Institute of Teacher Education Campus (IPG) as more beneficial than detrimental. This suggests that training teachers acquire significant expertise in digitalization during their training, leading to a high level of application throughout their practicum. In the study, some training teachers are reluctant to explore new software that can help them teach mathematics more effectively. A similar research result suggests that this could be due to a lack of knowledge in using digital technology (Subramanian, 2018). Furthermore, another reason could be due to a lack of access to digital technology. However, this problem can be addressed through the training program at IPG. The theory of Blended Learning can support it as it concentrates on incorporating digital technology into teaching and learning activities.

The study revealed that teachers hold positive attitudes toward digital technology, strong beliefs in its effectiveness, and frequently use digital tools in the digitalization of Mathematics teaching and learning. The overall mean for the three aspects of training teachers' perceptions is 3.2904, indicating a strong positive perception towards the digitalization of Mathematics education in primary schools. This aligns with findings from a study in Indonesia by Djidu and Retnawati (2022), which reported that while most teachers held positive perceptions of digitalization, they faced challenges and barriers that prevented them from fully implementing technology.

5.2 Research Question 2: Are there significant differences between attitudes, beliefs, and frequency of usage?

The one-way ANOVA results showed statistically significant differences among these three aspects [$F(2, 597) = 0.940$, $p = 0.001$ (< 0.05), $\eta^2 = 0.02$]. Notably, beliefs scored slightly lower than usage, suggesting that even when usage is frequent, underlying pedagogical beliefs may not always be deeply formed. This finding aligns with the results of Ertmer et al. (2012), who discovered that frequent tool use does not always lead to transformative integration, often due to incomplete shifts in beliefs.

Table 3: Results of One-Way ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.881	2	.940	6.737	.001
Within Groups	83.332	597	.140		
Total	85.212	599			

Table 3 displays the sum of squares and degrees of freedom for both between-group and within-group variations. Although the actual differences in mean scores among the groups were small (Cohen, 1988), the significance level of less than 0.05 indicates notable differences across the three aspects. Consequently, the null hypothesis is rejected. This suggests that there are significant differences in attitudes, beliefs, and levels of usage concerning the digitalization of Mathematics education among training teachers in Malaysia.

5.3 Research Question 3: What are the key factors affecting the integration of digital tools in mathematics instruction among training teachers regarding the digitalization of Mathematics learning in Malaysian primary schools?

Table 4: Results of Multiple Comparison (Post-hoc Tests)

(I) Aspects	(J) Aspects	Mean Differences (I-J)	Std. Error	Sig.
Attitude	Beliefs	.072	.037	.132
	Level of Usage	-.065	.037	.190
Beliefs	Attitude	-.072	.037	.132
	Level of Usage	-.137*	.037	.001
Level of Usage	Attitude	.065	.037	.190
	Beliefs	.137*	.037	.001

Post-hoc Tukey HSD tests revealed significant differences in the mean scores for beliefs and level of usage regarding digitalizing mathematics teaching and learning among training teachers. Specifically, beliefs were found to be significantly lower than the level of usage ($\eta^2 = 0.02$), indicating a small but statistically significant difference, as per Cohen's (1988) benchmark for interpreting variance; the lack of skills explained. This suggests that while training teachers recognize the benefits of technology, external barriers may limit their application. These findings align with existing research (Ertmer et al., 2012; Badia et al., 2013; Kubiatko, 2013; Admiraal et al., 2017), which emphasizes the interconnectedness of teachers' beliefs, attitudes, and technology usage. This implies a potential surface-level adoption, which requires deeper engagement through reflection, mentoring, and exposure to pedagogical models of technology integration.

6. Conclusion

This study contributes to the understanding of training teachers' readiness for digital integration in mathematics education. The findings confirm that while attitudes and usage are high, beliefs about the value of digital technology in pedagogy are still evolving. This calls for holistic training that nurtures both the technical skills and belief systems necessary for meaningful and sustained digital integration. By aligning the discussion with the research questions and grounding the implications in both the data and theory, this study provides a robust foundation for advancing teacher education practices in a digital age.

This study highlights the importance of attitudes, beliefs, and frequency of digital technology usage among training teachers. Findings suggest that while teachers are inclined to adopt digital tools during training, structural barriers, such as limited training resources and accessibility issues, impact their overall integration. Addressing these issues through curriculum enhancement, institutional support, and policy initiatives will be key to fostering effective digital technology adoption in mathematics education.

The findings indicate that the integration of digital technologies during the training of teachers at the Institute of Teacher Education has successfully shaped their beliefs, attitudes, and readiness for teaching in schools following the completion of the training. To further promote digitalization in education, the Ministry of Education (MOE) could implement offline programs that allow rural schools to access digital learning without requiring a Wi-Fi connection. Additionally, the MOE could organize initiatives focused on teaching students the ethical use of technology to prevent misuse. The Institute of Teacher Education (IPG) should expand digital literacy courses to improve teachers' confidence in using technology. Motivational talks are also vital for boosting the confidence of training teachers and fostering a positive mindset. Policymakers should implement targeted initiatives to address infrastructure gaps, especially in rural schools. Therefore, several implications are as follows:

6.1 Practical Implications

Teacher Training Programs should embed structured reflection activities to strengthen beliefs about the pedagogical value of technology, beyond technical skills. Professional development should go beyond tool use and focus on pedagogical reasoning, emphasizing how digital tools can meaningfully enhance mathematical understanding. Findings suggest that beliefs lag behind usage, indicating a need for mentorship programs during the practicum to help bridge this gap through real classroom experience.

6.2 Policy Implications

The Ministry of Education (MOE) should consider institutionalizing digital competency assessments as part of teacher exit requirements. Training programs must ensure equitable access to digital infrastructure, especially for rural IPG campuses, to sustain high-frequency usage habits into professional teaching life.

6.3 Theoretical Implications

The findings provide empirical support for the Technology Acceptance Model in a teacher education context, particularly affirming the link between attitudes and usage. The observed gap between beliefs and usage highlights the need to expand TAM with belief-specific sub-constructs in future educational technology studies.

7. Recommendations

Acknowledging the study's limitations, future research should explore the long-term effects of digital training programs on technology adoption among in-service teachers. This research aims to compare the attitudes, beliefs, and frequency of digital technology usage in this study. Investigating both urban and rural schools could also reveal contrasting views on technology integration. Future studies might also explore additional dimensions of teachers' perceptions, such as their Technological Pedagogical and Content Knowledge (TPACK). Employing qualitative methods, such as case studies or experimental designs, would enable researchers to delve deeper into real-world scenarios for more nuanced insights.

The study can further include reflective practice modules in digital education courses to strengthen pedagogical beliefs. Introduce simulation tools that enable trainees to observe the impact of technology on real-world learning scenarios. Encourage cross-campus digital tool showcases where IPG students share experiences and build confidence in new tech platforms. And future studies could explore longitudinal changes in beliefs and attitudes from practicum to full-time teaching to track sustained integration.

8. Acknowledgement

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Investigating the Triggers and Outcomes of Academic Procrastination in an Online Learning Environment amid the COVID-19 Pandemic

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ABSTRACT

This study focuses on investigating the causes and consequences of academic procrastination during the current educational disruption, which has led to the remote learning environment. The online survey was completed by 145 respondents, all of whom were students at a Philippine state university. The survey tool was adapted from Busko's Procrastination Scale. Additionally, 16 participants participated in an online focus group discussion. To analyze the data, triangulation was employed, utilizing both quantitative data from the survey and qualitative data from a focus group discussion. Results reveal several factors that contribute to procrastination, including emotional distress and a sense of comfort in procrastination. Particularly, the study revealed a higher level of procrastination during the distance learning brought about by the COVID-19 Pandemic.

Keywords: Academic Procrastination, Perfectionism, Distance Education, Triangulation

1. Introduction

As the pandemic hit the Philippines in the mid of March 2020, a state university in the Philippines issued a memorandum to adapt to the new normal, starting with the implementation of flexible education modalities such as online synchronous and asynchronous, and modular approaches to accommodate the flexible learning environment suitable for the student's needs through a clear guideline by the Academic Affairs. Both faculty members and students would need to adapt to this new learning environment to ensure a continuous education amid the pandemic. This introduced them to new habits and practices that enabled them to adapt to the needs of the academic continuum.

The sudden shift to online learning during the COVID-19 pandemic brought significant challenges to students, particularly in adapting to new modes of instruction, managing academic workloads, and maintaining motivation. One recurring issue that emerged prominently during this period is academic procrastination, the intentional delay of academic tasks despite expecting negative consequences. This behavior has been linked to psychological factors, such as low self-efficacy and perfectionism, as well as environmental influences, including parental support and home learning conditions. Given the educational disruption caused by the pandemic, it is crucial to examine how these factors interact in a remote learning context. This study aims to investigate the triggers and outcomes of academic procrastination among college students during online learning, utilizing both quantitative and qualitative methods to provide a comprehensive understanding of their experiences and behaviors.

Academic procrastination, particularly in online learning environments, presents substantial barriers to student achievement. The shift to remote education during the COVID-19 pandemic intensified these challenges, highlighting the need to understand their psychological and contextual triggers. This study draws upon established theories and empirical evidence to explore how constructs like self-efficacy, perfectionism, and parental authority influence academic procrastination and how these may be exacerbated in an online learning context.

Steel's (2007) Temporal Motivation Theory identifies task aversiveness, impulsiveness, and self-efficacy as primary predictors of procrastination. These constructs are essential to our research framework, which seeks to examine the degree to which students' belief in their ability to complete tasks (self-efficacy) predicts procrastination behaviors. Steel's meta-analysis also identified self-control and achievement motivation as strong correlates, further justifying the inclusion of self-efficacy as a central variable in this study. Research by Pintrich (2003) and Klassen et al. (2010) indicates that students with low self-efficacy are more likely to delay initiating academic tasks, particularly when confronted with challenging or unfamiliar content. Steel's (2007) Temporal Motivation Theory also posits that self-efficacy is a core determinant of procrastination, suggesting that students who doubt their ability to succeed often resort to task avoidance. In online learning environments, where instructor feedback and peer support may be limited, students' self-efficacy becomes even more critical. This study addresses a gap in the literature by examining how self-efficacy specifically affects procrastination in a remote educational context, where independent learning is a primary emphasis.

The work of Solomon and Rothblum (1984) introduced academic procrastination as a multidimensional construct, influenced by emotional and cognitive processes, such as the fear of failure, which aligns with self-oriented perfectionism. Our study builds on this by examining three

forms of perfectionism self-oriented, socially prescribed, and other-oriented—as potential antecedents of procrastination in the unique context of distance learning. Perfectionism has been consistently linked to procrastination, particularly when perfectionist standards are internalized (self-oriented) or perceived as externally imposed (socially prescribed) (Hewitt et al., 2003; Stoeber, 2014). Students who strive for flawless performance often delay task initiation due to fear of failure or dissatisfaction with their initial output. This is especially true in unstructured online settings where assignments are open-ended and feedback may be delayed. Prior research (e.g., Serdar et al., 2021) suggests that while perfectionists aim for excellence, their need for control and fear of imperfection can paradoxically lead to procrastination. The study builds on this by not only assessing self-oriented perfectionism but also integrating socially prescribed and other-oriented perfectionism to examine whether expectations from others, or imposed on others, influence academic delay during remote learning. This nuanced exploration addresses a gap in pandemic-era literature that has often generalized perfectionism without examining its subtypes in context.

Koo (2022) and Pychyl et al. (2000) distinguish between active and passive procrastinators, noting that passive procrastination is often linked to low motivation, poor planning, or emotional distress—factors exacerbated in isolated learning environments. This supports our research aim to identify procrastination patterns based not only on time management but also emotional regulation and internal standards, especially under pandemic-related stressors.
Perfectionism, as examined by Stoeber (2014), offers nuanced insight into how perfectionistic tendencies may paradoxically lead to task avoidance due to fear of imperfection. This connects to our hypothesis that students with higher levels of self-oriented or socially prescribed perfectionism may exhibit more pronounced academic procrastination.

The present study is grounded in a comprehensive theoretical framework that integrates motivational, personality, and social-contextual constructs to explain academic procrastination in an online learning environment, particularly during the COVID-19 pandemic. Central to this framework is Steel's (2007) Temporal Motivation Theory (TMT), which identifies procrastination as a function of task aversiveness, impulsivity, expectancy (i.e., self-efficacy), and value. According to TMT, individuals with low expectancy regarding task success, often due to self-doubt, are more likely to delay task initiation. In an online learning context, where autonomy and self-regulation are crucial, students with lower self-efficacy may be particularly vulnerable to procrastination. This aligns with prior research showing that students with diminished belief in their academic capabilities tend to postpone tasks, especially when feedback is delayed and structure is lacking (Pintrich, 2003; Klassen et al., 2010).

Another integral component of the framework is perfectionism, which has been linked to procrastination through cognitive and emotional pathways. Building on the multidimensional model of perfectionism by Hewitt and Flett (2003), this study examines self-oriented, socially prescribed, and other-oriented perfectionism. Self-oriented perfectionism, characterized by internalized high standards and self-criticism, may lead students to delay work due to fear of not meeting their own expectations. Similarly, socially prescribed perfectionism, which involves the perception that others expect perfection, can lead to avoidance behaviors due to fear of external judgment. These tendencies are exacerbated in remote learning environments, where ambiguity and isolation may heighten anxiety and self-doubt, thus fostering procrastination (Stoeber, 2014; Serdar et al., 2021).

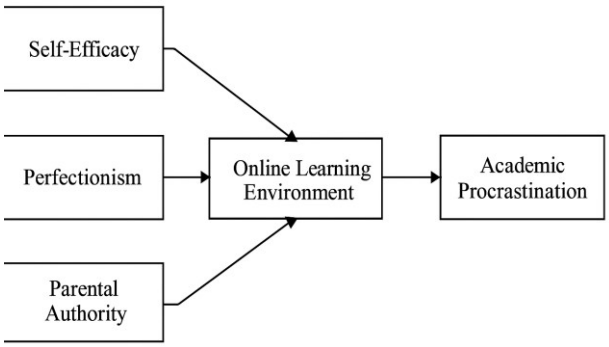
In addition, parental authority is included as a social-contextual variable, drawing on the parenting style model of Darling and Steinberg (1993). Research has shown that authoritative parenting, characterized by both high responsiveness and high control, is negatively associated with academic procrastination (Zakeri et al., 2013). During home-based online learning, the level of parental support, supervision, and provision of resources (e.g., study space, internet access) becomes a critical environmental factor that can either mitigate or exacerbate procrastination behaviors.

To measure these constructs, the study employs Busko's (1998) Student Procrastination Scale, which includes dimensions related to general and academic procrastination, various types of perfectionism, self-efficacy, and parental authority. This scale was selected for its alignment with the theoretical underpinnings of the study and its previous validation in educational research. The scale's multidimensional nature allows for a nuanced analysis of procrastination behaviors and their psychological and contextual antecedents. In adapting the scale for this study, the items were reviewed for cultural relevance and appropriateness. They underwent pilot testing to ensure reliability and appropriateness in the Philippine online learning context, thereby maintaining the validity of the current research setting. Busko's (1998) Student Procrastination Scale, used in this study, is based on constructs of perfectionism, procrastination tendencies, and self-efficacy. Its prior validation in similar educational settings makes it an appropriate tool for measuring the same constructs in our context.

Moreover, the role of parental authority, as outlined in Darling & Steinberg's (1993) model of parenting styles, is integrated as a social-contextual variable. Zakeri et al. (2013) found that students with authoritative parents who show high involvement and high control tend to procrastinate less, suggesting that supportive family environments can buffer procrastination behavior, particularly when students are learning from home. Lastly, Gurumoorthy & Kumar (2020) and Day et al. (2000) provide empirical support for the link between lack of interest or emotional distress and procrastination. These findings directly inform our qualitative component, which explores students' subjective experiences during remote learning.

Hence, this study aimed to determine the causes and effects of student academic procrastination in a remote learning environment, also known as distance education. Specifically, this research intended to:

1. Assess the student's level of agreement regarding the following factors:
    a. Academic Procrastination
    b. General Procrastination
    c. Self-Oriented Perfectionism
    d. Socially Prescribed Perfectionism
    e. Other-oriented Perfectionism
    f. Self-Efficacy
2. Determine the causes and effects of student academic procrastination through an online focus group discussion.
3. Analyze the quantitative and qualitative data to develop a comprehensive understanding of the experiences.



The framework consists of three primary independent variables: Self-Efficacy, Perfectionism, and Parental Authority, which are hypothesized to influence students' tendency to procrastinate academically. The online learning environment serves as a contextual medium through which these variables exert their effects. The outcome variable, Academic Procrastination, is understood as the tendency to delay academic tasks despite expecting negative consequences.

"Self-efficacy, as defined by Bandura (1997), refers to individuals' belief in their capabilities to execute actions required to manage prospective situations. Pintrich (2003) linked academic self-efficacy to student motivation and academic success, particularly in the context of challenging tasks. Perfectionism, a multidimensional trait outlined by Hewitt and Flett (2003), includes self-oriented, socially prescribed, and other-oriented dimensions, each of which has distinct implications for procrastination (Stoeber, 2014). The typology is informed by the parenting styles introduced by Darling and Steinberg (1993), which emphasize the influence of parental control and responsiveness on academic behaviors (Zakeri et al., 2013). These constructs have all been empirically associated with academic procrastination, providing the theoretical basis for their inclusion in this study."

2. Methodology

Study Design

The researcher employed a descriptive research design, utilizing both quantitative and qualitative methods. An online survey was conducted to gather quantitative data, and a focus group discussion was conducted to gain an in-depth understanding of the issue. Data analysis was conducted through triangulation, combining quantitative data from the survey with qualitative data from a focus group discussion to enhance the credibility of the research (Denzin, 2012).

Data collection

For the survey tool, the questionnaire consists of 102 items; items 1-14 focus on the respondent's demographic profile, as well as their student work and study habits, and can be answered in 30 minutes. The rest of the items were adapted from Busko's Student Procrastination Scale, which covers General Procrastination, Academic Procrastination, Self-Oriented Perfectionism, Socially Prescribed Perfectionism, Other-Oriented Perfectionism, Parental Authority, and Self-Efficacy (Busko, 1998), which was also used as a theme for the qualitative approach. The questionnaire employs a Likert Scale of likelihood, ranging from "Almost Always True" to "Almost Never True," with the following

options: "Usually True," "Often True," "Occasionally True," "Sometimes But Infrequently True," and "Usually Not True." The scale scores range from 1 to 7.

The survey questionnaire underwent various stages of review to ensure its consistency and reliability, particularly regarding the structure and content of the questions. First, the questions were adapted from various survey tools and drafted in accordance with the research objectives and relevance. Second, the research team was composed of a Development Communication specialist and an e-learning specialist, who conducted the substantiation of the items in the questionnaires, reviewed the appropriateness of the questions since most items were adapted from foreign scenarios, and consulted a Psychology instructor. Third, a sample survey was conducted with thirty 4th-year students outside of the sample of the study to assess the answerability and time constraints. Finally, the researchers incorporated all the suggestions, feedback, and comments of concerned reviewers and the final survey questionnaire. After validating the survey tool, questionnaires were distributed through an online survey using Google Forms and shared on Facebook Messenger, incorporating the orientation and purpose of the survey.

For the focus group discussion (FGD), the researchers appointed a moderator to conduct an Online FGD through Google Meet. The moderator was chosen based on the previous performance as a research student. This method is used to allow participants to freely express their arguments, as the researchers are Instructors, which might produce prejudice and discrepancies in the interview process and output. The moderator was oriented and mentored on how to conduct an online in-depth interview. The researcher provided a list of 10 open-ended guide questions, including transition questions, to facilitate the discussion. Several students were invited to attend a virtual conference using Google Meet on June 16, 2021, drawn from the pool of respondents from the survey. However, only 16 students were able to attend and participate in the event. A semi-structured interview, lasting 45 minutes, was recorded and transcribed by the researchers. Based on the results of the online FGD, the moderator posed 16 open-ended questions. This activity would help researchers align the survey output from an in-depth perspective, which leads to a more comprehensive understanding of procrastination in an online learning environment.

Settings and Participants

One campus of a Philippine state university served as the study's locale, with a total student population of over 10,000 and nine departments. The study was conducted during the second semester of the 2020-2021 academic year. Data was collected from February 2021 to July 2021.

The online survey was distributed in all departments having 6 colleges that actively responded, such as the College of Computer Studies (CCS), College of Industrial Technology (CIT), College of Business Management and Accountancy (CBMA), College of Industrial Technology (CIT), College of Teacher Education (CTE) and College of Arts and Sciences (CAS) wherein 145 students responded after 2 months of data collection. As a result, the demographic profile was identified as 49% female and 51% male, with 92% in the 18-24 age group and 8% in the 25-34 age group. All respondents are single, and most of them have younger siblings. Their mothers are housekeepers, and the fathers' occupations are mostly from the craft and related trades.

The FGD participants range from 2nd to 4th Year level, all from the College of Computer Studies. The moderator is a 4th-year student at the same college.

Research Instrument

To ensure the credibility and accuracy of the adapted questionnaire, the researchers assessed both its reliability and validity. The questionnaire was based on Busko's (1998) Student Procrastination Scale and included additional subscales on perfectionism, self-efficacy, and parental authority. Reliability was tested through a pilot study involving 30 fourth-year students who were not part of the main sample. Using Cronbach's alpha to measure internal consistency, the following results were obtained: Academic Procrastination ($\alpha = 0.89$), General Procrastination ($\alpha = 0.85$), Self-Oriented Perfectionism ($\alpha = 0.83$), Socially Prescribed Perfectionism ($\alpha = 0.81$), Other-Oriented Perfectionism ($\alpha = 0.78$), Self-Efficacy ($\alpha = 0.86$), and Parental Authority ($\alpha = 0.80$). All values exceeded the acceptable threshold of 0.70, indicating good to excellent internal consistency of the instrument.

In terms of validity, content validity was ensured through expert review. Three professionals—a development communication specialist, an e-learning expert, and a psychology instructor—evaluated the clarity, cultural relevance, and alignment of the items with the research objectives. Revisions were made based on their feedback to ensure appropriateness for the Philippine academic setting. Construct validity was also addressed by anchoring each subscale to established theoretical models: self-efficacy was grounded in Bandura's theory of self-belief, perfectionism in Hewitt and Flett's multidimensional model, procrastination in Steel's Temporal Motivation Theory, and parental authority in Darling and Steinberg's parenting style framework. Furthermore, findings from the qualitative focus group discussion reflected and supported the same theoretical constructs, thereby strengthening construct validity through triangulation. Overall, the instrument demonstrated strong reliability and theoretical alignment, justifying its use in this study.

Data Analysis

Table 1. Seven-Point Likert Scaling

Likert Scale	Interval	Description
1	1.00-1.85	Almost Never True
2	1.86-2.71	Usually Not True
3	2.72-3.57	Sometimes, But Infrequently True
4	3.58-4.43	Occasionally True
5	4.44-5.29	Often True
6	5.30-6.15	Usually, True
7	6.16-7.00	Almost Always True

The quantitative data collected from Google Forms was downloaded, and the researchers used MS Excel for data analysis. The method of converting raw data into meaningful statements involves data processing, analysis, interpretation, and presentation. Data reduction and data processing were performed to ensure that the data was clean, including creating unique IDs, removing duplicates, cleaning the tables, creating separate sheets, categorizing, and balancing using filter functions. For data analysis, MS Excel formulae such as Mean, Standard Deviation, and Count-If Analysis were used. MS Excel charts were used for data presentation. For the interpretation of quantitative data, refer to Table 1 (Pimentel, 2019), which will be used to interpret the weighted mean per item.

The qualitative data gathered was analyzed, and a deductive approach to content analysis was used (Elo and Kyngäs, 2008) to test a previous theory in a different situation. Data were analyzed via the following steps: (1) transcribing the interview verbatim from the virtual meeting (2) choosing the unit of analysis (3) attaining the sense of whole via reading the unit of analysis based on the quantitative data (3) taking codes out through open coding (4) collecting similar codes in subthemes by comparing the codes and labeling them (5) gathering similar subthemes together in one group and labeling theme (main themes). Busko's Student Procrastination Scale and its criteria were used to analyze the themes in the qualitative data.

It should be noted that during the data analysis, the trustworthiness or credibility of the data was recognized and taken into full consideration throughout the entire process. Ethical issues in this study included ensuring the confidentiality and autonomy of the participants.

3. Results and Discussion

Procrastination is the behavior of deferring fewer essential chores in favor of more urgent ones or doing more pleasurable things in place of less pleasurable ones, and therefore deferring important tasks until later. To be classified as procrastination, the conduct must be counterproductive, unnecessary, and delaying. Similarly, it is to willingly postpone a planned course of action, even though you expect to be worse off as a result of the postponement. Procrastination is defined by is a prevalent and destructive form of self-regulatory failure that is not entirely understood. It is defined as the unnecessary postponing or avoidance of tasks that must be completed (Schraw, Wadkins, and Olafson, 2007).

Table 2. Result Summary of the Online Survey

Criteria	Mean	Verbal Interpretation
Procrastination	3.82	Occasionally True
Academic Procrastination	4.48	Often True
Self-Oriented Perfectionism	4.17	Occasionally True
Socially Prescribed Perfectionism	4.10	Occasionally True
Other-Oriented Perfectionism	4.09	Occasionally True
Parental Authority	4.09	Occasionally True
Self-Efficacy	4.32	Occasionally True

General and Academic Procrastination

Quantitative results indicated that general procrastination had an overall mean of 3.82, interpreted as "Occasionally True", while academic procrastination scored slightly higher at 4.48 or "Often True". This suggests that although students generally acknowledge procrastinate behavior, they are more likely to delay specifically academic-related tasks. These findings were supported by FGD responses, where students cited reasons such as laziness, distractions at home, and perceived flexibility in deadlines as primary contributors to procrastination. R4 stated, "I often feel lazy to do it, especially when the due date is still far away," confirming the trend seen in Item 15 of the survey, which showed that students tend to leave term papers until the last minute (M = 3.50). However, while survey responses imply that students generally attend classes (Item 19, M = 5.54), qualitative data reveal that attendance does not necessarily equate to engagement or task completion. This subtle divergence

suggests that procrastination is not merely behavioral, but also motivational, often rooted in emotional and cognitive states that are less apparent when assessed solely through quantitative scores.

Perfectionism

Survey results for perfectionism revealed that self-oriented perfectionism had a higher average (M = 4.17) compared to socially prescribed perfectionism (M = 4.10) and other-oriented perfectionism (M = 4.09). These quantitative results suggest a moderate tendency toward internal pressure to perform well. This was confirmed in the FGD, where several participants admitted to delaying submissions not due to disinterest, but because they were unsatisfied with their output. For instance, R12 said, "I'm still able to submit on time, but I'm just not sure if the quality of my answers is good enough," reflecting the highest-rated survey item on perfectionism (Item 46: "I cannot relax until it's perfect"). Interestingly, many respondents indicated that they were not overly concerned with achieving top grades, but rather wanted to meet a minimum acceptable standard—a form of adaptive perfectionism that still contributes to delay. The data suggest that self-oriented perfectionism is more prevalent than socially driven standards, implying that internal psychological pressure plays a larger role in academic procrastination than external expectations.

Parental Authority

The survey indicated moderate support from parents, with an overall mean of 4.09 ("Occasionally True"). However, qualitative data presented a more nuanced view. While some students (e.g., R3) reported supportive environments where they were not asked to do chores during classes, others described emotionally taxing household situations, a lack of study space, poor internet connectivity, and limited access to digital devices. For example, R14 shared, "My gadget's specs aren't that good... I can't do both research and compile code at the same time." This divergence suggests that quantitative scores may mask inequality in students' home learning environments. Although general perceptions of parental authority were positive, the quality and consistency of support varied significantly, affecting students' ability to stay focused and manage their time effectively, two critical factors that influence procrastination.

Self-Efficacy

Self-efficacy scored an average of 4.32, which indicates a moderate level of confidence among respondents in their academic abilities. However, the FGD revealed that many students struggled with task initiation due to a lack of motivation, distractions, or anxiety. R9 admitted, "Sometimes I think there's always tomorrow to do it, plus I'm at home where there are so many distractions." These accounts support the notion that low to moderate self-efficacy contributes to procrastination, particularly when combined with external challenges, such as the lack of instructor feedback and reduced peer interaction. While students reported some belief in their capacity to succeed (as shown in Item 94, M = 4.50), their actions did not always align with this perception, underscoring the gap between perceived and actual self-efficacy. This finding aligns with existing literature (e.g., Klassen et al., 2010), which links self-efficacy deficits to procrastinative behavior in remote learning.

The integration of quantitative and qualitative findings in this study provides a comprehensive understanding of academic procrastination within the context of online learning, directly addressing the research questions. First, regarding the level of academic procrastination and related psychological traits among students, the quantitative data revealed that procrastination, particularly in academic tasks, was rated as "Often True" (M = 4.48). In contrast, related traits such as self-efficacy,

perfectionism, and parental authority were rated at moderate levels. This suggests that while students may not consistently identify as chronic procrastinators, they frequently delay academic tasks, especially in the less structured online learning environment. These numerical patterns were further supported by qualitative data from the focus group discussion, where participants expressed personal experiences of emotional fatigue, internal pressure to perform, and inconsistent motivation. Several students admitted to postponing assignments due to mental exhaustion or fear of producing substandard work, highlighting emotional and psychological dimensions not fully captured by survey scores alone. These insights imply that self-reported levels may underestimate the complexity of procrastination, which often involves deeper struggles with self-worth, emotional regulation, and academic confidence.

In terms of identifying the causes of academic procrastination, both data sets point to overlapping and reinforcing factors. The survey data indicated that low self-efficacy, self-oriented perfectionism, and environmental distractions were present among students to a moderate degree. However, the qualitative data enriched these findings by revealing how these variables manifested in real-life contexts. For instance, students shared stories about poor internet access, lack of study space, household responsibilities, and emotional stress as key triggers for academic delays. While quantitative responses suggested a generally supportive parental environment, the focus group narratives revealed disparities in students' home learning conditions, with some receiving strong family support. In contrast, others faced emotional neglect or financial limitations. These inconsistencies suggest that while many students benefit from a positive home atmosphere, a significant portion deal with conditions that hinder academic productivity. Therefore, the integration of findings emphasizes that academic procrastination is not solely an individual issue, but is influenced by external structures and social circumstances, particularly during periods of crisis, such as the pandemic.

Finally, regarding how students experience and interpret procrastination during online learning, qualitative findings played a crucial role in extending understanding beyond surface-level behaviors. While procrastination is often attributed to laziness or poor time management, student narratives revealed a more nuanced picture: procrastination was frequently employed as a coping mechanism to manage anxiety, pressure, and overwhelming workloads. Some participants described delaying tasks because they feared they could not meet their own standards of performance, while others described feeling emotionally numb, hopeless, or mentally overloaded. This insight challenges traditional interpretations of procrastination as a purely volitional act, instead framing it as a form of emotional self-protection in uncertain times. The implications for interventions are significant support systems must address not only behavioral skills, such as time management, but also emotional well-being and resilience. Teachers and academic institutions must understand that behind delayed submissions are often students grappling with invisible emotional burdens.

In summary, the integration of quantitative and qualitative findings offers a more layered understanding of the phenomenon. It confirms that procrastination in online learning is a multidimensional issue rooted in personal, psychological, and environmental factors. These findings reinforce the need for multi-faceted interventions—ones that strengthen students' self-efficacy, foster realistic personal standards, ensure equitable learning environments at home, and provide mental health support to help students navigate the demands of academic life in a digital setting.

4. Conclusion

This study explored the triggers and consequences of academic procrastination among college students within the context of remote learning during the COVID-19 pandemic. Utilizing a mixed-methods approach, the research examined how self-efficacy, perfectionism, and parental authority influenced students' procrastination behaviors. Quantitative findings revealed moderate to high levels of academic procrastination, with students often delaying academic tasks despite recognizing potential negative consequences. Self-efficacy was found to be moderate, suggesting that while students believed in their capabilities to some extent, this belief was not always strong enough to overcome challenges posed by online learning. Perfectionism, particularly of the self-oriented type, also contributed to procrastination, as students reported delaying tasks due to fear of imperfection and dissatisfaction with their work. Parental authority was rated moderately, with many students acknowledging support but still experiencing varying degrees of environmental and emotional challenges at home.

The qualitative data provided deeper insight into these behaviors, uncovering emotional factors such as anxiety, low motivation, mental fatigue, and stress as underlying reasons for procrastination. Students shared how remote learning exacerbated these issues, especially in environments where family support, stable internet, and personal devices were lacking. These findings suggest that procrastination during the pandemic was not merely a matter of poor time management or laziness but a reflection of students' emotional responses to academic and environmental pressures. The integration of both quantitative and qualitative results emphasized that academic procrastination is a complex, multifaceted behavior influenced by internal psychological traits and external circumstances.

In conclusion, the study highlights that academic procrastination among students during online learning is shaped by a combination of self-belief, perfectionist tendencies, and the quality of support they receive at home. To mitigate this issue, educational institutions must adopt a holistic approach one that includes fostering emotional resilience, promoting realistic academic standards, ensuring equitable access to technology, and engaging families in supporting students' learning journeys. As remote and hybrid learning models continue to evolve, addressing the root causes of procrastination will be crucial in enhancing student well-being and academic success.

5. Recommendation

Based on the study's findings, it is recommended that interventions be implemented to strengthen students' academic self-efficacy. The quantitative data revealed that self-efficacy had interpreted as "Occasionally True," while qualitative responses indicated that many students experience self-doubt, particularly when faced with difficult academic tasks. To address this, instructors should integrate confidence-building strategies such as scaffolded assignments, where students gradually tackle complex tasks with guided support, and success journaling to help them reflect on progress. Additionally, academic institutions may develop peer mentoring programs or workshops on self-efficacy, where students can share challenges and effective strategies for overcoming academic hurdles.

- In response to the relatively high level of self-oriented perfectionism, which was identified as a significant contributor to procrastination, educators are encouraged to cultivate a classroom environment that values progress over perfection. Students in the focus group reported delaying

submissions due to dissatisfaction with their output or fear of submitting work that was not "good enough." Faculty can mitigate this by allowing draft submissions with formative feedback and encouraging reflective activities where students focus on learning growth rather than flawless results. This shift can help reduce performance anxiety and promote timely task completion.

- Time management challenges were evident in both the quantitative and qualitative data, with academic procrastination rated as "Often True". Students frequently delayed assignments, particularly in subjects they found uninteresting or overwhelming. To address this, instructors should provide structured assignment timelines that break large tasks into smaller, more manageable parts. Integrating digital productivity tools, such as Notion or Trello, into course activities, along with optional weekly planning templates, can also support students in organizing their responsibilities and tracking their academic progress.
- Parental authority was rated moderately, but the focus group discussions revealed a more nuanced reality: some students had supportive home environments. In contrast, others faced significant limitations in internet connectivity, access to learning devices, and emotional support. In light of this, schools should implement virtual parent orientation sessions to help families understand their role in supporting students' learning at home. Furthermore, partnerships with local government units or NGOs can be pursued to provide practical assistance, such as lending gadgets, establishing community Wi-Fi zones, or implementing subsidy programs to support students' learning needs, especially in underserved areas.
- Mental health emerged as a key underlying factor of academic procrastination. Students described feelings of anxiety, hopelessness, and emotional burnout, which led them to delay tasks as a coping mechanism. In response, schools should establish regular virtual wellness check-ins, such as online "*Kamustahan*" or "Mental Health Fridays," to offer emotional support. In addition, embedding brief mental health modules focused on emotional regulation, resilience, and self-compassion into the curriculum can help students manage stress more effectively and reduce the psychological burden that contributes to procrastination.
- Finally, students expressed a strong preference for interactive, peer-based learning. Many reported that they were more motivated when working with others, whereas isolation during online classes led to disengagement and procrastination. Instructors are encouraged to implement flipped classroom techniques, where students prepare content asynchronously and engage in collaborative discussions or tasks during synchronous sessions. Additionally, schools may offer optional virtual co-working or "study with me" sessions, which create a shared academic space for students to feel supported, accountable, and connected, even while studying remotely.

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Integrating Quillbot to Enhance Students' Academic Writing: Opportunities and Challenges

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ABSTRACT

With the rise of AI tools, QuillBot has been widely used in academic writing, especially among EFL students. Although its application has been widely studied, existing research lacks a systematic summary of its strengths and limitations. This study critically reviewed 15 peer-reviewed articles published between 2020 and 2024 to comprehensively evaluate the role of QuillBot in academic writing. Through qualitative thematic analysis, this paper derived four key themes: (1) emotional and behavioral impact, (2) effectiveness in skill building, (3) user experience and accessibility, and (4) ethical issues and challenges. The results show that QuillBot can enhance paraphrasing, grammar correction, and vocabulary acquisition while reducing anxiety and improving learning motivation. However, challenges such as over-reliance, reduced creativity, and unequal resource allocation due to language barriers and technology differences remain. It is worth noting that the existing research has methodological limitations, including reliance on subjective feedback, inconsistent tool versions, and insufficient long-term or cross-cultural data. Future research should prioritize longitudinal studies, explore language and cultural adaptability, and explore ethical implications. This study provides practical recommendations for educators, policymakers, and developers on how to effectively integrate QuillBot into instruction while strategically mitigating associated risks.

Keywords: AI-assisted writing, EFL learners, Technology integration in education

1. Introduction

In the era of globalization, English academic writing has become an indispensable skill for students worldwide, especially for EFL learners (Tran & Nguyen, 2022). Academic writing requires learners to master grammar, rewriting skills and logical organization skills (Badenhorst, 2010), while EFL learners also need to overcome difficulties such as imprecise language expression and misunderstandings caused by cultural differences. At the same time, technical assistance represented by AI tools provides innovative solutions for academic writing (Onesi-Ozigagun et al., 2024; Zhang & Lu, 2021). Among many AI tools, QuillBot stands out for its functions, such as rewriting, grammar checking, and text summarization (Dale, 2020). Notably, the rewriting function, which instantly replaces vocabulary or reorganizes sentences, is widely welcomed by students (Zulfa et al., 2023).

However, although QuillBot has received much attention and is widely used in academic writing assistance, existing research still has significant deficiencies. Nurullah et al. (2024) noted that current research lacks a comprehensive, systematic, and in-depth analysis of the advantages and limitations of QuillBot, and the views are relatively scattered. Although some studies have shown that QuillBot can alleviate writing anxiety and improve rewriting and grammar skills (Bailey & Almusharraf, 2022; Waluyo et al., 2023; Laila & Daulay, 2024), these studies mostly rely on subjective feedback and lack systematic evaluation and subject classification. Gozali et al. (2024) further emphasized that existing research has not fully considered multilingual and multicultural backgrounds, resulting in doubts about the universality of research conclusions. More importantly, the existing literature has failed to integrate technology acceptance, learner psychological mechanisms and knowledge construction theories, making it difficult to explain the deep mechanism of QuillBot's impact on writing ability (Marikyan & Papagiannidis, 2024; Taoufiq, 2024). This limitation makes it difficult for people to accurately understand the actual effects and application boundaries of QuillBot in various educational environments, which significantly restricts its in-depth application in education. Considering the differences between EFL learners and native learners in academic writing, as well as the diversity of various academic writing tasks, existing research has neglected these aspects, making it difficult to accurately understand the real role of QuillBot in different learners and writing situations.

Based on the above research gaps, this study aims to comprehensively explore the impact of QuillBot on the academic writing of EFL learners and propose effective strategies to address its challenges.

To achieve this goal, this study sets the following research questions:

1. How does QuillBot affect EFL learners' academic writing in multiple dimensions, including emotional behavioral responses, skill development, and user experience?
2. How does the technology acceptance model, self-perception theory, and connectivism theory jointly explain the mechanism of QuillBot, especially the interrelationships between key variables?
3. What evidence-based strategies can address the challenges posed by QuillBot at the instructional, policy, and technical levels?

Methodologically, this study employs thematic analysis (Nowell et al., 2017) to extract key variables from 15 articles through open coding, thereby avoiding the interference of theoretical assumptions on data classification and ensuring that the analysis results accurately reflect the actual research trends.

2. Literature Review

This literature review will examine the impact of QuillBot on academic writing, encompassing its emotional and behavioral effects, effectiveness in enhancing writing skills, user experience and accessibility, as well as the challenges and concerns associated with it.

2.1. The Emotional Impact

Existing research shows that QuillBot has a significant impact on the emotional state of EFL learners, which can be explained from the perspective of self-cognition theory (Bem, 1967). This theory holds that individuals infer internal attitudes by observing their behavior (Mohebi & Bailey, 2020). In academic writing scenarios, when EFL learners use QuillBot to complete rewriting tasks, the successful experience prompts them to attribute the results to their improved abilities, thereby enhancing their self-confidence and reducing anxiety. This attribution process aligns with Bandura's (1997) self-efficacy theory, which posits that successful experiences with tools reinforce learners' beliefs in their capabilities, thereby enhancing their confidence and self-efficacy. Many studies support this mechanism. Ariyanti (2021) found through the FLE questionnaire that when students used QuillBot for rewriting tasks, their anxiety levels were significantly reduced, and their learning interests and participation were significantly improved. Similarly, Kramar et al. (2024) demonstrated in their interviews with Ukrainian doctoral students that QuillBot significantly enhanced their confidence in written English communication in the workplace. These findings jointly verify the applicability of self-cognition theory in AI-assisted tools for academic writing situations and provide a basis for educators to alleviate students' writing anxiety by using technological tools. However, existing research has obvious limitations in terms of the prevalence and persistence of emotional impact. Most studies have only confirmed short-term positive effects (Bailey & Almusharraf, 2022; Waluyo et al., 2023), and there is a lack of long-term follow-up studies.

In addition, Mohammad et al. (2024) specifically emphasized gender differences, noting that girls tend to show stronger motivation and benefits. However, another research team, Mohammad et al. (2024), also studied preparatory students at Najran University, and the results showed that the impact of gender differences was not obvious at a specific stage of education. This may be because the students in the two studies had different levels of knowledge, or they used different versions of QuillBot. This contradiction suggests that the emotional impact may be regulated by multiple factors, such as individual learner characteristics and the educational environment (Gozali et al., 2024), and further highlights the complexity of situational factors. To more comprehensively evaluate the long-term emotional effects of QuillBot, future research can adopt longitudinal tracking methods, such as measuring students' writing anxiety levels and changes in self-confidence at the beginning and end of the semester and combining them with objective assessments of writing ability to verify whether emotional improvements are truly transformed into ability improvements.

From the perspective of variable extraction, existing research primarily focuses on three key dimensions: alleviation of writing anxiety, increased self-confidence, and the impact of gender differences on usage motivation. These variables not only constitute the core elements of emotional impact but also provide an empirical basis for constructing subsequent research models. It is worth noting that the current research samples are primarily focused on skilled users in

resource-rich environments, and insufficient attention is paid to the emotional experiences of resource-constrained students or learners at different language levels, which may limit the generalizability of the research conclusions. In view of this limitation, future research can expand the sample range to include learners with different socioeconomic backgrounds, language proficiency, and technology accessibility, and adopt mixed research methods to more comprehensively capture the differences in the emotional impact of QuillBot in different groups.

Connectionist theory (Siemens, 2004) offers a complementary perspective for understanding these findings. This theory highlights the process of forming knowledge connections in a digital environment, and QuillBot helps learners incorporate new language knowledge into their existing cognitive systems through real-time feedback (Corbett & Spinello, 2020). This process of forming knowledge connections may indirectly enhance positive emotional experiences. For example, when students realize they can organize text logic more fluently with QuillBot, their sense of self-efficacy increases accordingly. However, this theoretical link has not been thoroughly explored in the current literature, as most studies only describe phenomena. To strengthen theoretical understanding, future research could design controlled experiments to compare students' ability to connect knowledge before and after using QuillBot, thereby empirically testing the application of connectionism theory in AI-assisted writing.

In summary, although existing studies have confirmed the positive impact of QuillBot on the emotions of EFL learners, several limitations exist. First, there is a lack of long-term tracking data, and it is impossible to determine whether emotional improvement will continue to translate into improved writing ability. Second, the sample diversity is insufficient, particularly in the absence of comparative studies on learners with varying language levels and cultural backgrounds. Finally, the theoretical integration is not deep enough, and it fails to systematically reveal the interaction between self-cognition and the knowledge connection mechanism. This is directly related to the core question of this study: how QuillBot affects writing ability and how to provide emotional support. To address these challenges, educational practitioners can design phased writing tasks in conjunction with QuillBot. First, let students complete the first draft independently. Then, use QuillBot to assist in revision. Finally, compare and analyze the differences to cultivate independent writing skills while reducing reliance on tools.

To present the relevant research more clearly, the researcher compiled Table 1.

Table 1: Summary of Research on the Impact of QuillBot on Emotions

Study	Key Constructs	Key Findings	Theoretical Linkage
Ariyanti (2021)	Writing anxiety, Learning motivation	QuillBot significantly reduced writing anxiety and increased learning participation.	Self-perception theory
Kramar et al. (2024)	Self-confidence	PhD students reported enhanced confidence in professional English communication.	Self-perception theory
Mohammad et al. (2024)	Gender-based motivation differences	Female learners showed higher motivation, but gender effects varied by educational level.	TAM (perceived usefulness)
Mohammad et al. (2024)	Gender impact at preparatory levels	Gender differences were negligible among preparatory-level students.	Connectivism theory

Table 1 summarizes the empirical evidence of QuillBot's impact on emotions, revealing four main constructs: anxiety reduction, increased self-confidence, and gender-adjusted motivation. The

results of the study collectively confirm the relevance of self-perception theory in the context of AI-assisted writing.

Based on existing research, it is found that the emotional impact of QuillBot on EFL learners is primarily reflected in three key variables: relief from writing anxiety, improvement in self-confidence, and changes in motivation, which are influenced by gender differences. These variables are explained by the "behavioral attribution" mechanism in the self-cognition theory (Bem, 1967). Learners attribute the successful writing experience using QuillBot to their ability improvement, thus forming a positive self-cognition. These variables collectively constitute the "emotional impact" dimension in the research framework, providing a theoretical basis for the subsequent analysis of the psychological mechanisms underlying tool use (Bem, 1967; Taoufiq, 2024). It is worth noting that existing research on the long-term emotional effects and the differences between learners from different cultural backgrounds remains insufficient, indicating a direction for future research.

2.2. The Effectiveness of Improving Writing Skills

Existing research generally suggests that QuillBot has significant value in enhancing core writing skills, which can be explained from the perspectives of connectionism theory (Siemens, 2004; Downes, 2007) and the Technology Acceptance Model (Davis, 1989). Connectionism emphasizes that knowledge is acquired and constructed through connections in a digital environment, and the real-time language feedback provided by QuillBot is consistent with this learning mechanism. Mustapha and Adam (2024) found that QuillBot has a significant effect on improving paraphrasing skills, vocabulary acquisition and correcting grammatical errors in their study of Malaysian ESL learners. Similarly, Mohammad et al. (2023) found through interviews with learners in the Najran preparatory class that QuillBot can effectively improve learners' paraphrasing skills, synonym mastery, and ability to learn complex grammatical structures. At the same time, Rafida et al. (2024) also came to similar conclusions in their interviews with EFL students. These findings align with the concept of "perceived usefulness" in the Technology Acceptance Model (Davis, 1989). When students believe that QuillBot can effectively improve their writing skills, they are more willing to use the tool in the writing process.

However, these studies primarily rely on subjective feedback and lack verification from standardized tests or objective evaluation methods. Hasnah (2024) confirmed the positive role of QuillBot in helping students identify grammatical errors and generate original rewritten content by analyzing the academic paper predictions of EFL students at Muhammadiyah University, making the research findings more representative. However, this study did not conduct an in-depth analysis of the differences in the applicability of QuillBot for students with different writing levels. In addition, Kurniati and Fithriani (2022) conducted a more comprehensive comparison of the effects of QuillBot and other AI tools, finding that English graduate students in North Sumatra believed QuillBot was particularly effective in improving vocabulary and grammar skills, while also helping them organize texts more logically. It is worth noting that the study deliberately selected students who were familiar with QuillBot as the research subjects, which may affect the generalizability of the research results.

Through an in-depth analysis of the above studies, we extracted a series of key variables, including "rewriting ability improvement", "vocabulary increase", "grammatical error correction rate" and "text logical organization optimization". These variables are crucial to evaluating the role of

QuillBot in improving students' writing skills. From the perspective of connectionism theory, QuillBot helps students connect scattered language knowledge into a more systematic knowledge system by providing new language knowledge and text organization methods, thereby improving comprehensive writing skills (Siemens, 2004). At the same time, students' positive feedback on the improvement effect of QuillBot in "rewriting ability" and "vocabulary" also fully reflects their recognition of the "perceived usefulness" of the tool (Davis, 1989), which is directly related to the "writing skills improvement" dimension in the research model.

However, there are still some limitations in the current research. Most studies lack long-term tracking, and it is unclear whether QuillBot's effect on improving students' writing skills can be sustained. Additionally, the study did not fully consider the impact of students' language backgrounds and varying levels of proficiency on the tool's effectiveness. In the case of individual differences among EFL students and differences in academic writing, the effect of QuillBot on writing in various subjects may also vary. For example, humanities subjects may rely more on rewriting skills, while science and engineering subjects may focus more on logical organization. Similarly, EFL students with different English proficiency levels may have different needs and improvement effects when using QuillBot.

Based on this, future research can develop in the following directions. On the one hand, a longitudinal research method should be adopted to track students' use of QuillBot over a prolonged period and regularly evaluate their changes in writing skills, thereby gaining a more accurate understanding of the long-term impact of QuillBot. On the other hand, full consideration should be given to students' diverse language backgrounds and varying levels of proficiency. Group studies should be conducted with students from diverse native language backgrounds and varying English proficiency levels to explore the applicability and effectiveness of QuillBot in different groups. At the same time, future research should adopt a more mixed-methods approach, combining pre-test and post-test comparisons of writing tests with qualitative interviews to comprehensively evaluate the educational value of QuillBot. Furthermore, future research should investigate targeted approaches to address the challenges posed by QuillBot. Education policymakers need to design teacher training programs that guide students in balancing the use of tools and developing independent writing skills. Quillbot developers need to develop subject-specific customization functions and optimize Quillbot's feedback logic to meet the writing needs of various subjects.

To present the relevant research more clearly, the researcher compiled Table 2.

Table 2: Summary of Research on QuillBot's Effectiveness in Improving Writing Skills

Study	Key Constructs	Key Findings	Theoretical Linkage
Mustapha & Adam (2024)	Paraphrasing, Vocabulary, Grammar	QuillBot improved paraphrasing skills, vocabulary acquisition, and grammar correction.	TAM (perceived usefulness)
Mohammad et al. (2023)	Synonym mastery, Grammar	Enhanced paraphrasing skills and understanding of complex grammatical structures.	Connectivism theory
Rafida et al. (2024)	Writing clarity, Vocabulary	Improved grammar, text structure, and vocabulary enrichment.	TAM (perceived ease of use)
Hasnah (2024)	Originality, Error detection	Helped identify errors and generate original paraphrasing while maintaining academic quality.	Self-perception theory
Kurniati & Fithriani (2022)	Text coherence, Language development	Enhanced vocabulary, grammar, and logical text organization.	Connectivism theory

Table 2 shows the effectiveness of QuillBot in core writing skills, including paraphrasing, vocabulary expansion, and grammatical accuracy. It is worth noting that these improvements are associated with “perceived usefulness” and connectivism in the Technology Acceptance Model.

Based on the existing research, it is found that the core variables of QuillBot in improving EFL learners' writing skills include enhanced rewriting ability, vocabulary expansion, and grammatical error correction. These variables can be interpreted from two theoretical perspectives. The "perceived usefulness" of the Technology Acceptance Model (Davis, 1989) explains why learners adopt these functions, while the "knowledge network construction" of the Connectionist Theory (Siemens, 2004) explains how QuillBot helps learners integrate language knowledge through instant feedback. These variables are integrated into the "writing skills improvement" dimension in the research framework.

2.3. User Experience and Accessibility

Existing research has emphasized the friendliness of QuillBot's user interface, while also revealing significant differences in technology accessibility among different user groups. From the perspective of the Technology Acceptance Model (Davis, 1989), users' acceptance of tools depends largely on their perceived usefulness and perceived ease of use. Pham (2024) found through a questionnaire survey of ELS graduate students that respondents generally believed QuillBot had a user-friendly interface and was easy to operate, which could effectively improve their rewriting ability. This finding confirms the key influence of "perceived ease of use" on tool adoption in TAM. However, Tamilselvi et al. (2023) noted that the functions of the free version of QuillBot are significantly limited compared to those of the paid version. This version difference will lead to different user experiences, which in turn affect the overall effectiveness of the tool. These findings highlight that in the process of technology acceptance, the design characteristics of the tool itself may become a key variable affecting user experience and echo the moderating role of "perceived usefulness" in TAM.

Differences in technology penetration and digital literacy further exacerbate the inequality of user experience. Narayan (2024) found significant differences in students' familiarity with QuillBot and the frequency of its use among MUIT students. Less than two-thirds of students believed that such tools could improve their writing skills, while nearly half of the students worried that they might hinder independent learning and mastery of grammar. This phenomenon can be explained by the digital divide theory (van Dijk, 2020), which posits that unequal access to technological resources leads to differences in the effects of usage. It is worth noting that the sample size of this study is small and may not fully reflect the actual situation of students in remote areas, suggesting that future research should expand the sample coverage to improve the generalizability of the conclusions.

Based on the above research, this study identified key variables to systematically evaluate the user experience and accessibility of QuillBot. The variables of "interface friendliness" and "improved rewriting ability" directly reflect the user's evaluation of the tool's "perceived ease of use", "influence of version differences" reflects the moderating effect of tool design on "perceived usefulness" in TAM, and variables such as "familiarity with the tool", "frequency of use", and "influence on autonomous learning" reveal how the external factor of technology accessibility affects the final use effect through the digital divide. The extraction of these variables provides an empirical basis for building a research model and a theoretical framework to understand the differences in the applicability of QuillBot across various environments.

However, there are some limitations to the current research. Most studies fail to fully consider the differences in usage among students in various regions and technical environments, which makes the applicability of the research conclusions in a broader context questionable. At the same time, the comparative study of different versions of QuillBot is still not in-depth enough, making it difficult for users to provide clear suggestions for version selection and hindering developers from carrying out targeted optimization. It is particularly worth noting that the writing tasks of different disciplines may have different requirements for QuillBot functions, and learners of different English proficiency levels may also have different reliance on version differences and auxiliary functions. These factors may affect the user experience.

Future research can focus on the following directions. First, strengthen comparative research across regions and technology environments, and systematically examine the differences in the use of QuillBot under different infrastructure conditions. Second, conduct a more detailed functional comparison analysis of various QuillBot versions to provide accurate usage suggestions for different user groups. Additionally, it is essential to investigate ways to enhance users' autonomous learning and problem-solving skills through digital literacy training, thereby improving the overall user experience. These research directions not only help deepen our understanding of the application rules of AI writing assistance tools but also provide important references for promoting equity in educational technology.

To present the relevant research more clearly, the researcher compiled Table 3.

Table 3: Summary of Research on User Experience and Accessibility of QuillBot

Study	Key Constructs	Key Findings	Theoretical Linkage
Pham (2024)	Interface friendliness, Time management	User-friendly interface improved paraphrasing efficiency and time management.	TAM (perceived ease of use)
Tamilselvi et al. (2023)	Version disparities, Real-time feedback	Free version limitations negatively impacted user experience despite grammar/style benefits.	TAM (perceived usefulness)
Narayan (2024)	Technology access, Dependency risks	Low-tech environments showed uneven adoption, with concerns about over-reliance.	Connectivism theory

Table 3 reveals the differences in accessibility and user experience of QuillBot, with interface design and version restrictions having a significant impact on adoption. Additionally, the digital divide in low-tech environments further underscores the importance of equitable knowledge networks.

Based on existing research, the user experience variables revealed in this section include interface friendliness, version function differences, and inequality in technology accessibility. These variables directly correspond to the "perceived ease of use" construct of the Technology Acceptance Model (Davis, 1989). They are moderated by differences in resource allocation, as outlined in the Digital Divide Theory (van Dijk, 2020). In the research framework, these variables are classified as the "user experience and accessibility" dimension, which reflects the technical characteristics of tool design and highlights the restrictive role of the social environment on the effect of technology application (Selwyn, 2004). Current research does not adequately address cross-cultural differences in user experience, and the diversity of samples needs to be expanded in the future.

2.4. Concerns and Challenges

The existing literature reveals a series of problems and challenges encountered when using QuillBot. From the perspectives of TAM (Marikyan & Papagiannidis, 2024), self-perception theory (Bem, 1967), and connectionist theory (Siemens, 2004), these problems reveal the deeper impact mechanism of AI writing assistance tools on EFL academic writing. Mohammad et al. (2024) found through interviews with preparatory students at Najran University that students with low English proficiency often felt confused when using QuillBot, indicating that language barriers have become a key factor affecting the effectiveness of tool use. Additionally, students expressed concerns that QuillBot may limit their creativity and believed that ready-made solutions could weaken their ability to think independently (Franklin, 2024). This finding is consistent with the view of self-perception theory, which posits that when students rely too heavily on external tools, they may underestimate their abilities, which in turn affects their learning motivation (Bem, 1967).

Academic integrity issues are also a challenge that cannot be ignored when using QuillBot. Narayan (2024) found that students generally believed that overreliance on AI tools, such as QuillBot, could lead to lazy behavior and pose a threat to academic integrity. In addition, Thangthong et al. (2024) reported that two respondents mentioned that although the content was original, it was still judged as potential plagiarism by teachers and the Turnitin system, which caused them great distress. This phenomenon aligns with academic integrity frameworks (Bretag, 2016), which suggest that AI-generated content may blur the boundaries between original and assisted writing, thereby raising ethical concerns about authorship and accountability. From the perspective of connectionist theory, this technical limitation may hinder students from effectively building language knowledge networks through digital environments (Siemens, 2004).

Through an in-depth analysis of the above studies, this study identified key variables, including "language barrier impact", "over-reliance leads to reduced ability", "academic integrity threat", "learning inertia tendency", "risk of being misjudged as plagiarism", and "generated content errors". These variables are crucial to fully understand the challenges of using QuillBot. From the perspective of self-cognition theory (Bem, 1967), "over-reliance leads to reduced ability" and "learning inertia tendency" reflect that students may form negative cognitions about their writing ability due to their dependence on tools; while connectionism theory (Siemens, 2004) helps us understand how "language barrier impact" and "generated content errors" hinder students from effectively building language knowledge connections through digital environments. From the TAM perspective, "language barrier impact", "risk of being misjudged as plagiarism," and "generated content errors" affect students' perception of the usefulness of QuillBot.

There are some obvious limitations to the current research. Most studies only highlight the existence of these problems but lack in-depth discussions on how to effectively address them, making it difficult for educators, education policymakers, and tool developers to provide practical solutions. More importantly, given the differences in norms and requirements of academic writing across various disciplines, this will cause EFL students to face varying degrees of challenges when using QuillBot. For example, original thinking, as emphasized in the humanities, may be more susceptible to AI tools than standardized expressions in the natural sciences (Mohammad et al., 2024). Additionally, EFL students with varying English proficiency levels also exhibit different abilities to cope with these challenges. Students with lower English proficiency may find it more challenging to identify and correct errors in QuillBot-generated content, thereby increasing their risk of academic misconduct (Fitria, 2022).

To present the relevant research more clearly, the researcher compiled Table 4.

Table 4: Summary of Research on Concerns and Challenges of Using QuillBot

Study	Key Constructs	Key Findings	Theoretical Linkage
Mohammad et al. (2024)	Creativity limitations	EFL students reported language barriers and concerns about reduced creativity.	Self-perception theory
Thangthong et al. (2024)	Academic misconduct risks	QuillBot-generated content was sometimes misidentified as plagiarism despite original input.	Academic integrity framework
Narayan (2024)	Over-reliance, Motivation decline	Dependency risks included "lazy learning" tendencies and threats to independent learning.	TAM (perceived usefulness)
Franklin (2024)	Critical thinking hindrance	Overuse impeded critical thinking and organic writing skill development.	Connectivism theory
Fitria (2022)	Content inaccuracy	Output occasionally contained grammatical errors and nonsensical phrasing.	TAM

Table 4 lists systematic risks, including misidentification of plagiarism, creativity inhibition, and accuracy limitations. This multi-theoretical framework reveals how these challenges violate the principles of self-cognition, connectionism, and technology acceptance models. This suggests that these issues need to be addressed in the future.

Based on existing research, the main challenge variables identified include overdependence risk, creativity inhibition, and language barriers. These variables require explanation by combining three theories. Self-cognition theory (Bem, 1967) explains how dependent behavior weakens self-efficacy, connectionism theory (Siemens, 2004) highlights that technological limitations can hinder knowledge connections, and the Technology Acceptance Model (Davis, 1989) offers suggestions for improving tool design. These challenge variables constitute the unique "problem and challenge" dimension in the research framework, and their multi-theoretical explanatory characteristics also reflect the complexity of AI writing assistance tools (Cooperman and Brandão, 2024). To address these challenges, future research should focus on developing intervention strategies that strike a balance between technological convenience and learning autonomy.

3. Research Model

This study integrates the Technology Acceptance Model (Davis, 1989), Self-Perception Theory (Bem, 1967), and Connectivism (Siemens, 2004) to analyze the role of QuillBot in English foreign language academic writing. Previous studies have primarily explored isolated aspects of AI tools (Zawacki-Richter et al., 2019). In contrast, this study's multidimensional framework bridges the gap by unifying user behavior, cognitive mechanisms, and knowledge construction. The model encompasses writing skill improvement, emotional impact, user experience, accessibility, concerns, and challenges. Together, these dimensions answer the research questions of this study and reveal how QuillBot shapes learners' cognitive processes, emotional states, and practical outcomes. By connecting disciplinary theories, this approach enhances the understanding of the pedagogical significance of AI tools, providing educators and developers with practical insights.

3.1. Technology Acceptance Model

The Technology Acceptance Model was proposed by Davis in 1989, and its core variables are "Perceived Usefulness" and "Perceived Ease of Use" (Davis, 1989). The model believes that PU

and PEOU jointly determine users' acceptance of technology. In subsequent studies, Venkatesh et al. (2003) further expanded TAM. They proposed an integrated technology acceptance model, emphasizing the moderating role of social influence and convenience conditions on user behavior (Venkatesh et al., 2003). This theoretical development provides an important framework for understanding the multidimensional adoption mechanism of digital tools, particularly in analyzing user acceptance behavior of AI writing tools.

In this study, TAM provides direct theoretical support for explaining EFL learners' acceptance of QuillBot. PU corresponds to students' recognition of QuillBot's improvement of writing skills, while PEOU is reflected in users' evaluation of its interface friendliness and ease of operation (Marikyan & Papagiannidis, 2024). For example, Pham (2024) found through a questionnaire survey of ELS graduate students that respondents generally believed QuillBot's interface was intuitive and its rewrite function practical, which also reflected the dual driving role of PU and PEOU in tool adoption. In addition, the relevance of TAM extends to the dimension of "user experience and accessibility". Tamilselvi et al. (2023) pointed out that the functional differences between the free version and the paid version would weaken users' perception of PEOU, thereby affecting the overall willingness to use. This finding shows that the technical characteristics of tool design and social resource allocation jointly regulate the core variables of TAM.

At the methodological level, TAM guided the data collection and analysis design of this study. When screening the literature, the researchers prioritized empirical studies that focused on users' evaluation of QuillBot's "usefulness" and "ease of use" to ensure consistency with the theoretical focus of the research model. During the coding process, variables such as "interface friendliness" and "rewriting efficiency" were classified as PEOU, while "grammatical error correction effect" and "vocabulary expansion ability" were mapped to PU, thus closely combining the theoretical framework with thematic analysis.

It is worth noting that there is room for synergistic interpretation between TAM and connectionist theory. When users frequently use QuillBot due to high PU, the real-time feedback provided by the tool can accelerate the construction of language knowledge networks (Siemens, 2004). For example, Kurniati and Fithriani (2022) found that North Sumatran graduate students systematized scattered knowledge points through QuillBot's vocabulary replacement function, which not only reflects the impact of PU on behavior but also confirms the knowledge integration mechanism of connectionism.

3.2. Self-Perception Theory

Self-cognition theory was proposed by Bem in 1967. Its core idea is that individuals infer internal attitudes and motivations by observing their behavior (Bem, 1967). This theory emphasizes the feedback effect of external behavior on self-evaluation. For example, when students complete writing tasks by using tools, they will attribute the results to their ability improvement, thereby enhancing their self-confidence (Mohebi & Bailey, 2020). Subsequent studies have further expanded the application scenarios of this theory. For example, Taoufiq (2024) found that in digital learning environments, the immediate feedback of tools may trigger "attribution bias", that is, students may misjudge high-quality texts generated by AI as a reflection of their abilities. In this study, self-cognition theory provides a key framework for understanding the impact of QuillBot on the emotions and behaviors of EFL learners. Specifically, when students complete rewriting tasks using QuillBot, their behavioral results will strengthen their sense of self-efficacy through

"mastery experience" (Bandura, 1997), thereby reducing writing anxiety and changing learning motivation. For example, Ariyanti (2021) found through the FLE questionnaire that students' anxiety levels significantly decreased, and their learning participation increased after using QuillBot. This finding directly confirms the role of behavioral attribution in shaping emotional states. In addition, the study of functional characteristics.

At the methodological level, self-cognition theory guided the qualitative data analysis direction of this study. In the process of literature coding, the researchers focused on the self-evaluation statements of students after using QuillBot, and classified such data into sub-themes of "confidence enhancement" or "anxiety relief" (Nowell et al., 2017). For example, when analyzing the interview data of Ukrainian doctoral students by Kramar et al. (2024), the statement "After using QuillBot, I am more confident in workplace English communication" was coded as "self-efficacy improvement", reflecting the theory-driven analysis logic.

It is worth noting that there is a synergistic interpretation space between self-cognition theory and TAM. When students continue to use QuillBot due to its high "perceived usefulness", their successful experience will further strengthen their positive evaluation of the tool through self-attribution, forming a virtuous cycle of "tool adoption, behavioral feedback, and cognitive reinforcement" (Taoufiq, 2024). For example, Pham (2024) found that ELS graduate students' recognition of the ease of use of QuillBot's interface was significantly positively correlated with the increase in their confidence gained through the tool, indicating that TAM and self-cognition theory work together on the multi-level mechanism of user behavior.

3.3. Connectivism Theory

Connectivism theory was first proposed by Siemens in 2004 and further expanded by Downes in 2007. Its core view emphasizes the importance of building knowledge networks through node connections in digital environments (Siemens, 2004; Downes, 2007). The theory believes that learning is not an isolated accumulation of knowledge, but a cross-network knowledge integration formed through technical tools, social platforms, and dynamic information flows. In subsequent research, Dabbagh and Kitsantas (2012) proposed the "Personal Learning Environment" framework, applied connectivism to educational technology design, and emphasized that learners can autonomously construct cognitive systems through tool interaction (Dabbagh & Kitsantas, 2012). This development provides a theoretical basis for analyzing how AI writing tools promote knowledge networking. In this study, connectivist theory offers a key perspective for understanding how QuillBot enhances the writing skills of EFL learners. QuillBot helps students connect fragmented language knowledge points into a systematic knowledge network through real-time feedback. For example, Kurniati and Fithriani (2022) found in their study of English postgraduates in North Sumatra that students effectively integrated knowledge points, such as synonyms and complex syntactic structures, through QuillBot's paraphrasing function, significantly improving the logical coherence of their texts. This process directly reflects the core mechanism of connectivism. In addition, Hasnah's (2024) longitudinal study further verified the long-term effect of knowledge connection, and students who continued to use QuillBot showed stronger knowledge transfer ability in academic writing.

At the methodological level, the connectionist theory guided the design of coding rules in the theme analysis of this study. The researchers extracted initial labels such as "lexical networking" and "grammatical integration" through open coding and classified them into sub-themes of the

"writing skills improvement" dimension (Braun & Clarke, 2006). For example, when analyzing the quantitative data of Mustapha and Adam (2024), "students discovered the connection between grammatical rules through QuillBot" was coded as "knowledge connection strengthening", highlighting the direct impact of connectionism on data analysis.

It is worth noting that there is a synergistic interpretation space between connectionism and TAM. When students frequently use QuillBot due to its high "perceived usefulness", the technical mediation of the tool accelerates the dynamic expansion of the knowledge network (Siemens, 2004). For example, Rafida et al. (2024) found that EFL learners' reliance on QuillBot's grammar-checking function was significantly positively correlated with the syntactic knowledge network they built through the tool, reflecting the complementarity of TAM and connectionism in explaining user behavior.

3.4. Conceptual Framework

The conceptual framework of this study is based on the integration of the Technology Acceptance Model, Self-Perception Theory, and Connectionism Theory, and a systematic analytical model is constructed to comprehensively evaluate the multidimensional impact of QuillBot in EFL academic writing. The framework contains four core dimensions, each of which is directly related to at least one theoretical foundation.

In the dimension of writing skill improvement, TAM's "perceived usefulness" (Davis, 1989) and connectionism theory (Siemens, 2004) jointly explain how QuillBot promotes language proficiency development through instant feedback and knowledge networking. Research shows that QuillBot improves language proficiency through instant feedback, a process that reflects both the usefulness of the tool (Mustapha & Adam, 2024) and the construction of knowledge networks (Kurniati & Fithriani, 2022). It is worth noting that different disciplines have different requirements for writing skills. The humanities and social sciences emphasize the ability to interpret, while the natural sciences focus more on logical rigor (Tran & Nguyen, 2022), requiring the tool functions to be adaptable to the discipline.

The emotional impact dimension is mainly supported by the theory of self-cognition (Bem, 1967). When students complete writing tasks using QuillBot, they attribute this success to the improvement of their abilities, thereby increasing their confidence and reducing anxiety (Ariyanti, 2021). This impact varies among students of different English proficiency levels. Beginner learners are more easily motivated by tool feedback, while advanced learners may be more concerned with autonomy (Mohammad et al., 2024). It is worth noting that this dimension interacts with the improvement of writing skills, and emotional improvement may further motivate students to use the tool more actively, forming a virtuous circle.

The user experience and accessibility dimension is mainly based on TAM's "perceived ease of use" (Davis, 1989) but is also influenced by the concept of "technology-mediated environment" in connectionist theory. The study found that interface friendliness and technology accessibility jointly determine the user experience, and the functional differences between the free and paid versions may exacerbate the problem of resource inequality. This dimension pays special attention to the barriers to use in areas with low technology penetration. These findings together reveal the complex relationship between tool design and the socio-technical environment.

The problem and challenge dimension integrates the perspectives of three theories. Self-cognition theory explains the risk of capability degradation caused by over-dependence, connectionism theory analyzes the obstacles to knowledge construction caused by technological limitations, and TAM provides ideas for solving user acceptance barriers. This multi-theoretical integration enables the framework to comprehensively capture the potential problems in the QuillBot application.

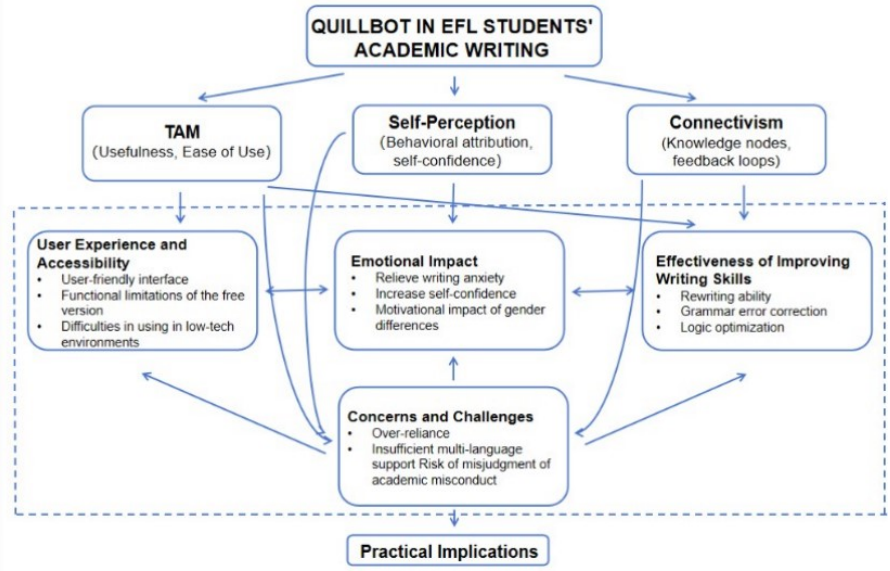

Figure 1: Theoretical framework of this study

Figure 1 illustrates the conceptual framework of this study, which integrates the Technology Acceptance Model, Self-Perception Theory, and Connectivism Theory to analyze the multidimensional impact of QuillBot on EFL academic writing. The four core dimensions of writing skill improvement, emotional impact, user experience, accessibility, and concerns and challenges, are dynamically related. A positive user experience can enhance skill development, while over-reliance may weaken self-perception abilities. The framework emphasizes both theoretical synergies and practical contradictions. The model offers a comprehensive perspective for thematic analysis and aligns with the research objectives.

The innovation of this framework lies in the first integration of three theoretical systems for analyzing AI writing tools, clarifying the dynamic relationship between dimensions, and providing operational measurement dimensions for subsequent research. These characteristics enable it to transcend the limitations of the previous single theoretical perspective and provide richer theoretical guidance for the integration of AI tools in EFL education.

3.5. Summary

This study integrates the technology acceptance model, self-perception theory and connectionism theory to construct a multidimensional framework to systematically analyze the impact of QuillBot on EFL academic writing. TAM explains users' evaluation of QuillBot's functional practicality and ease of operation from the perspective of tool adoption, while self-perception theory reveals how tool use reshapes students' writing confidence and anxiety levels through behavioral attribution mechanisms (Bem, 1967; Davis, 1989). Connectionism theory further explains how QuillBot promotes the networked integration of language knowledge through real-time feedback. It is worth

noting that the synergy of the three theories is particularly significant in the "challenge" dimension. Users with high technology acceptance may weaken their ability to construct autonomous knowledge due to over-reliance on tools (Franklin, 2024), which reflects the contradiction and balance needs between theories.

The innovation of this framework lies in the integration of tool adoption, psychological mechanisms and knowledge construction theory for the first time, clarifying the dynamic relationship of "skill improvement-emotional support-technical constraints". Interface friendliness increases the frequency of use, thereby accelerating knowledge networking; however, excessive use may lead to self-perception bias. This provides a theoretical basis for the educational integration of AI writing tools. Future research can further explore the boundary conditions of theoretical synergy, such as the difference in the weight of TAM and connectionism among students of different language proficiency levels.

4. Methodology

Based on the research model, the researcher designed the research methods of this study. Through a research design that included data sampling, data collection, and analysis, the researcher examined 15 peer-reviewed studies to explore the advantages and limitations of QuillBot in academic writing, thereby achieving the research objectives.

4.1. Research Design

This study employs a qualitative research design, utilizing the critical literature review and thematic analysis methods, to thoroughly explore the impact of QuillBot on EFL academic writing (Creswell & Creswell, 2017). The primary reason for choosing qualitative methods is that they can explore the deep meaning and complex relationships underlying the phenomenon (Nowell et al., 2017), which is particularly suitable for examining students' and teachers' subjective experiences, emotional changes, and behavioral feedback on QuillBot (Sovacool et al., 2023).

This study strictly follows the six-stage process of thematic analysis proposed by Braun and Clarke (2006) and incorporates a theoretically driven framework to enhance the depth of analysis.

1. 15 high-quality articles focusing on QuillBot and EFL academic writing from 2020 to 2024 were selected through purposive sampling.
2. The content of the articles was line-by-line coded, and initial labels such as "writing anxiety relief" and "version difference impact" were extracted from the original data.
3. The labels were clustered into four major themes, including "emotional impact" and "user experience," through an inductive approach.
4. Check whether the extracted themes are consistent with the presupposed dimensions of the Technology Acceptance Model, Self-Perception Theory, and Connectionist Theory.

To improve the credibility of the research, this study uses investigator triangulation. All coded data were archived in Excel spreadsheets and marked with original literature page numbers to ensure that the analysis process was traceable and reviewable (Nowell et al., 2017). Although qualitative analysis software such as NVivo was not used, the risk of subjective bias was significantly reduced by manually checking the coding item by item and verifying it with other researchers.

The limitation of the research design is that there is a gap between the efficiency of manual coding and software tools; however, some measures are taken to compensate for this. First, the researcher regularly reviewed the coding table to correct the classification inconsistencies. Second, the researcher directly quoted the original literature to support the generation of themes. Finally, the researcher shared the results of the data analysis with a tutor for review.

4.2. Data Sampling

This study adopted a purposive sampling method, strictly limiting the publication time of the literature to 2020 to 2024, and following the four stages of the PRISMA framework (Moher et al., 2009):

1. Preliminary screening. Through Google Scholar, 40 articles were obtained by searching with the keywords "QuillBot", "academic writing", and "EFL".
2. Database screening. Literature from non-authoritative databases was excluded, and 26 articles were retained.
3. Title and abstract screening. Literature that did not focus on the core functions of QuillBot was eliminated, and 22 articles were retained.
4. Full-text content evaluation. Literature with "research conclusions are too repetitive" was eliminated, and 15 high-quality papers were finally retained.

Literature screening process (PRISMA framework)	
① Initial screening records (n=40)	Database search results
↓	
② Database evaluation (n=26)	Reasons to exclude: • Low quality database (n=12)
↓	
③ Title and abstract screening (n=20)	Reasons to exclude: • Non- QuillBot studies (n=6)
↓	
④ Full-text content evaluation (n=15)	Reasons to exclude: • The research conclusions are too repetitive (n=5)
↓	
⑤ Final sample (n=15)	

Figure 2: PRISMA Flow Chart

The sampling criteria are divided into two categories, inclusion and exclusion. The inclusion criteria emphasize:

1. The research topic must directly analyze the advantages and limitations of QuillBot.
2. The methodology must include qualitative, quantitative or mixed methods.
3. The publication time is limited to the past five years to reflect the latest developments in technology.

The exclusion criteria exclude:

1. Literature that only studies other AI tools.
2. Papers that are not included in high-impact databases.
3. Studies with repeated conclusions or no new insights.

To enhance the representativeness of the sample, this study focuses on disciplinary diversity, encompassing students from both the liberal arts and the sciences. This study also examines the

differences in English proficiency among EFL students, encompassing both beginner and advanced learners. More importantly, this study focuses on regions covering multilingual environments, such as Asia and the Middle East.

Although some literature was lost due to data management issues in the early stage, the repeated sampling process ensured that the final sample could still fully reflect the multidimensional impact of QuillBot.

However, this study still has limitations. The small sample size of 15 articles may affect the generalizability of the conclusions (Nurmayanti & Suryadi, 2023). However, the purposeful sampling compensated for the lack of quantity by providing in-depth coverage of the core research questions (Nowell et al., 2017). Future research can expand the sample size to verify cross-cultural applicability (Rafida et al., 2024).

Table 5: Summary of Database Sources for Reviewed Literature

No.	Writer	Indexed databases
1	Ariyanti (2021)	Sinta, Crossref
2	Kramar et al. (2024)	Scopus, Eric, DOAJ, Crossref
3	Mohammad et al. (2024)	CNKI, ResearchGate, Scopus
4	Mohammad et al., (2024)	Scopus
5	Mustapha and Adam (2024)	Web of Science, DOAJ, ProQuest
6	Mohammad et al. (2023)	Scopus, DOAJ, Eric, ProQuest
7	Rafida et al. (2024)	Scopus, Web of Science, ResearchGate
8	Hasnah (2024)	Sinta, DOAJ, Crossref
9	Kurniati and Fithriani (2022)	Sinta, Crossref
10	Pham (2024)	Crossref, ResearchGate
11	Tamilselvi et al. (2023)	IEEE Xplore
12	Narayan (2024)	Scopus, Eric (Garuda)
13	Thangthong et al. (2024)	Eric
14	Franklin (2024)	ProQuest
15	Fitria (2022)	Sinta, DOAJ, Crossref

Table 5 summarizes the 15 high-quality, relevant studies that the researcher selected from many search results after rigorous screening. These articles are included in multiple influential authoritative databases, including Scopus, Web of Science, ERIC, CNKI, etc., ensuring the authority of the literature review.

4.3. Data Collection and Analysis

During the data collection phase, the researchers systematically searched for literature from 2020 to 2024 through Google Scholar, using keyword combinations such as "QuillBot", "academic writing", and "EFL" to initially screen out 40 relevant articles (Xuyen, 2023). Subsequently, based on the pre-established inclusion and exclusion criteria, 15 articles were selected as the analysis sample through a journal quality review, title and abstract review, and full-text evaluation (Moher et al., 2009). To enhance transparency, the reasons for selecting each article were fully recorded and archived for future reference. It is worth noting that, although the research model is guided by the Technology Acceptance Model, Self-Cognition Theory, and Connectionist Theory, the data analysis process strictly follows the openness principle of thematic analysis (Braun & Clarke, 2006).

Coding is divided into three stages:

1. The open coding stage extracts original labels line by line to avoid theoretical presuppositions.
2. The axial coding stage summarizes initial labels into 14 primary categories, at which time

only the patterns naturally presented by the data are observed.

3. The selective coding stage maps categories to the four dimensions of the theoretical framework. This process ensures that the themes reflect both actual data and can dialogue with the theory (Nowell et al., 2017).

   To minimize subjective bias, the researcher selected 15 articles at two-week intervals. The final coding was reviewed and determined by a researcher, and the original coding table was retained for review.

4.4. Data trustworthiness

To ensure the rigor of this study, the researchers strengthened the credibility of the literature review through the following measures:

1. External Audit. Invite a researcher to review the logical consistency of the topic classification and the classification of representative literature and modify the coding framework based on feedback.
2. Audit Trail. All coded data are archived in Excel spreadsheets, with the original literature source and extracted sentences marked. Ensure that the analysis process is transparent and can be reviewed by a third party (Lincoln & Guba, 1985).
3. Systematic literature screening. Strictly follow the PRISMA framework (Moher et al., 2009), record the complete process from initial screening to final inclusion, and avoid selection bias.
4. Dynamic calibration of theory. During the coding process, if unpredicted sub-themes are found, the concept of "digital divide" in connectionist theory is used to supplement the explanation, rather than forcibly classifying them into the original framework. This strategy balances the flexibility of theory guidance and data-driven (Braun & Clarke, 2006).

The limitations of this study include the potential for publication bias due to reliance on published literature, the limited sample size that restricts in-depth analysis of different groups, and the possibility of subtle errors in manual coding. Future research can further enhance the reliability and validity of the study by increasing the sample size, employing mixed methods, and utilizing qualitative analysis software.

4.5. Summary

This study employed thematic analysis to systematically examine 15 peer-reviewed articles, aiming to reveal the impact of QuillBot on EFL academic writing. Based on the research model, the researcher identified content related to four core research dimensions in the literature review. During the data analysis process, the researcher manually coded and summarized key variables through continuous comparative analysis to ensure the consistency between the research objectives and the research methods.

In summary, the research methods employed in this study provide a reliable and effective framework for achieving the research objectives. The researcher can understand the educational potential of QuillBot and the challenges that need to be addressed, and then make appropriate suggestions based on this, while also clarifying specific future research directions.

5. Discussion

5.1. Critical Discussion of the Emotional Impact

Based on a horizontal comparison of literature from 2020 to 2024, this thematic study found that QuillBot has a significant impact on the emotional and behavioral aspects of EFL learners. Based on self-cognition theory (Bem, 1967), when students complete writing tasks using QuillBot, they are likely to attribute their success to the improvement of their abilities, thereby enhancing self-confidence and reducing anxiety (Ariyanti, 2021; Kramar et al., 2024). This confirms the core idea of self-cognition theory, which posits that the successful experience of tool use will reshape learners' cognition of their abilities (Bem, 1967).

However, the current study has three key limitations. First, Mohammad et al. (2024) found that gender differences may affect the universality of emotional effects; however, they did not explain whether this difference is related to subject background or language level. Second, most studies only focus on short-term effects and fail to verify the sustainability of emotional improvements. Finally, the emotional experiences of students in resource-poor areas have been neglected, and the connectionist theory (Siemens, 2004) suggests that differences in technology accessibility may lead to an uneven distribution of emotional effects.

Future research should combine a longitudinal design and cross-cultural samples, such as tracking students' emotional changes in using QuillBot over a school year or comparing behavioral differences among students in regions with varying technology penetration rates. In educational practice, teachers can design step-by-step tasks based on self-cognition mechanisms, first using QuillBot to complete low-difficulty rewriting and then gradually transitioning to independent writing, thereby balancing tool dependence and ability development (Bem, 1967).

5.2. Critical Discussion of the Effectiveness of Improving Writing Skills

Based on a horizontal comparison of literature from 2020 to 2024, this thematic study found that QuillBot's emotional and behavioral effects on EFL learners showed three significant characteristics, and these findings revealed deeper mechanisms through theoretical integration. Based on the "perceived usefulness" dimension of TAM (Davis, 1989), learners' positive evaluation of QuillBot in rewriting, grammar correction, and vocabulary expansion directly affects their willingness to use and actual effects. These findings confirm the core idea of TAM that when learners believe that technology tools are helpful to their learning goals, they are more likely to continue using them and obtain actual benefits (Davis, 1989).

However, there are three main limitations of current research. First, most studies rely on learners' subjective feedback, lacking objective evaluation methods, such as standardized writing tests. Second, although Kurniati and Fithriani (2022) compared the effects of QuillBot with other AI tools, the sample was limited to graduate students familiar with the tool, and the results may not be generalizable to a broader audience. Third, connectionist theory (Siemens, 2004) emphasizes the importance of knowledge network construction, but existing research has failed to fully explore how QuillBot helps learners build a systematic language knowledge network.

Future research should adopt a mixed-methods approach, combining quantitative analysis of pre-tests, post-tests, and qualitative feedback from learners, to more comprehensively evaluate the

actual effect of QuillBot. In terms of educational practice, it is recommended that teachers position QuillBot as a "writing aid tool", allowing students to complete the first draft independently, and then use QuillBot to modify and optimize it to balance the use of the tool with the development of ability.

5.3. Critical Discussion of User Experience and Accessibility

Based on a horizontal comparison of literature from 2020 to 2024, this topic study found that existing research generally focuses on QuillBot's performance in user experience and accessibility. Based on the "perceived ease of use" dimension in TAM (Davis, 1989), it was found that ELS graduate students generally believed that QuillBot had a friendly interface and was easy to operate. This positive user experience directly promoted the frequency and effectiveness of the tool's use. However, the functional differences between the free version and the paid version significantly affected the consistency of the user experience, which to some extent, weakened the positive impact of tool usability on willingness to use emphasized by TAM. The digital divide problem is particularly prominent in the use of QuillBot. In areas with low technology penetration, students have significant differences in familiarity and frequency of use of QuillBot. This finding confirms the view of connectionist theory (Siemens, 2004) that differences in the accessibility of technology tools will lead to unequal opportunities for knowledge acquisition. It is worth noting that learners with low English proficiency are more likely to be confused when using QuillBot, which shows that language barriers are also an important factor affecting tool accessibility.

However, there are three important limitations in the current research. First, for students in areas with low technology penetration, the digital divide will significantly affect their acceptance of QuillBot, but most studies do not consider this variable. Second, existing studies focus on short-term usage experience and lack tracking of interface adaptability and functional satisfaction in long-term use. Third, digital inclusion theory (Selwyn, 2004) emphasizes that technology tools should consider the needs of users with different language backgrounds, and QuillBot currently does not provide enough support for non-native English speakers.

Future research needs to adopt a longitudinal tracking method to examine the changes in users' experience of QuillBot at different learning stages. In practice, it is recommended for resource-poor areas to improve the accessibility of the tool (Venkatesh et al., 2003; Selwyn, 2004). Educators can conduct digital literacy training to help students overcome barriers to technology use.

5.4. Critical Discussion of Concerns and Challenges

Based on a horizontal comparison of literature from 2020 to 2024, this topic study found that although QuillBot provides many conveniences for EFL learners, existing research also reveals several issues and challenges that deserve attention. Based on the theory of academic integrity (Bretag, 2016), some EFL students were misjudged as plagiarists after rewriting texts using QuillBot, which highlights the potential risks of AI-assisted writing tools in academic norms. In addition, low-level English students are often confused by language barriers when using QuillBot, which confirms the view of the language cognitive load theory (Sweller, 2011) that when the complexity of tool operation exceeds the learner's language ability, it will increase cognitive burden.

However, there are three important limitations in the current research. First, although many studies have pointed out the risk that over-reliance on AI tools may weaken students' creativity, they have failed to propose specific preventive measures. Second, QuillBot occasionally generates sentences that do not conform to language rules, but there is a lack of systematic analysis of the types of errors. Third, the digital ethics framework (Cooperman and Brandão, 2024) emphasizes that technological tools should promote rather than replace human thinking, and existing research has not yet reached a consensus on how to balance the use of tools with academic autonomy.

Future research should establish a more comprehensive evaluation system, including the development of a dedicated plagiarism detection algorithm to distinguish between AI-assisted and plagiaristic behavior. At the practical level, it is recommended that educators design an "AI-assisted writing evaluation scale" to help students use QuillBot reasonably (Bretag, 2016). Tool developers should optimize the error prompt system and provide additional grammatical explanations for non-native users (Cooperman and Brandão, 2024). Addressing these challenges requires the collaborative efforts of developers, educators, and policymakers. Most importantly, the current research model falls short of fully explaining the issue of academic integrity, and in the future, it is necessary to integrate ethics-related theories to provide a more comprehensive analytical perspective.

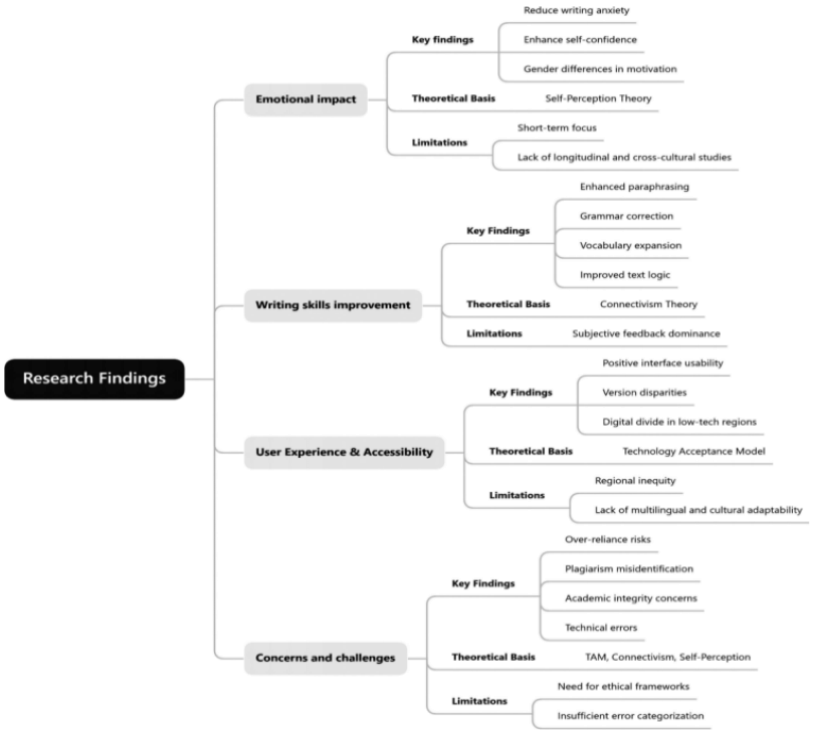

Figure 3: Summary of Research Findings

This figure systematically summarizes the four-dimensional impact of QuillBot on EFL academic writing, specifically its emotional impact, improvement of writing skills, user experience, and accessibility, as well as potential challenges. The chart clearly presents the key findings of each dimension and their interrelationships, providing a visual framework for understanding the comprehensive educational value of the tool.

6. Conclusion

6.1. Summary of Research Findings

This study systematically analyzed 15 papers published between 2020 and 2024 to reveal the multidimensional impact of QuillBot on EFL academic writing. First, for research question 1, the study found that QuillBot significantly alleviated learners' writing anxiety and improved their confidence at the emotional level, but individual characteristics moderated this effect. At the skill improvement level, the tool performed well in terms of rewriting ability, grammar correction, and vocabulary expansion; however, its effects varied depending on the user's English proficiency. User experience was polarized, and interface friendliness was widely recognized, but version differences and technology gaps constituted major obstacles. Second, for research question 2, theoretical integration showed that the "perceived usefulness" and "perceived ease of use" of the technology acceptance model explained user adoption behavior; self-cognition theory revealed how tool use reshaped self-efficacy through "behavioral attribution"; and connectionist theory explained how QuillBot promoted the networked integration of language knowledge through real-time feedback. Finally, for research question 3, academic integrity risks and over-dependence issues were the most prominent, requiring stakeholders to work together to address them. It is worth noting that the current study has limitations such as a small sample size and reliance on subjective feedback, which may affect the generalizability of the conclusions.

6.2. Implications

The theoretical significance of this study lies in deepening the explanation of the mechanism of action of AI writing tools. The technology acceptance model verifies that the user acceptance behavior of QuillBot is driven by both functional practicality and interface friendliness, while the self-cognition theory reveals how the successful experience of the tool enhances learner confidence through the "attribution mechanism". In addition, the connectionist theory fills the gap in the study of AI tools in knowledge construction, indicating that QuillBot can promote the systematic integration of language knowledge through real-time feedback.

At the practical level, based on the research findings, the study provides specific guidance for stakeholders. Educators can design a phased task of "independent draft, QuillBot optimization, autonomous revision" to balance tool assistance and capacity development. Developers need to optimize multilingual support and academic integrity marking functions to reduce the risk of misjudgment of plagiarism. Policymakers should promote the fair distribution of technology resources and provide infrastructure support for low-tech penetration areas.

6.3. Future Research Directions and Practical Suggestions

Future research needs to make further breakthroughs in the diversity of methods and objects. The current limitations of relying on subjective feedback and short-term effects can be compensated for by a longitudinal tracking design, such as evaluating the long-term impact of QuillBot through mixed methods. In addition, it is necessary to expand cross-cultural samples, especially focusing on the differences in learner use in areas with scarce technical resources, to verify the universality of the conclusions. At the technical evaluation level, it is recommended to develop a standardized AI writing tool evaluation scale that covers dimensions such as language accuracy, creativity retention, and academic norms.

For practical applications, the study provides actionable strategies through a multi-level.

At the technical level, developers should incorporate "academic integrity protection" features to

clearly attribute AI-generated content, thereby enhancing academic integrity and meeting diverse learner needs. In addition, developers should implement multilingual interface enhancements to meet the needs of non-native English speakers. In addition, developers can provide real-time grammatical explanations to help users understand the corrections, thereby promoting deeper learning.

At the teaching level, teachers can design a "from tool-assisted to autonomous writing" framework, where students first draft independently, then use QuillBot to revise, and finally complete the revision without AI assistance, thus balancing tool dependence and skill development. In addition, teachers should also provide clear training on the ethics of tool use, emphasizing the critical evaluation of AI-generated suggestions to reduce risks such as plagiarism or a decline in creativity. At the policy level, policymakers should commit their funding programs to the fair use of advanced versions of QuillBot in resource-limited areas to narrow the digital divide. Additionally, academic integrity policies should be updated to include specific provisions for AI, clarify acceptable use cases, and outline the consequences of misuse.

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The Application of ChatGPT in Translation Learning: A Case Study in Vietnam

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ABSTRACT

ChatGPT has been around for a relatively short time, but it has brought significant changes to education. This study explores how third-year English majored students perceive the use of ChatGPT in translation learning within the context of two advanced translation courses at a Vietnamese university. Adopting a mixed-methods design, the research first gathered quantitative data through a structured questionnaire (N = 119), followed by qualitative insights from workshop discussions (N = 15). The results show that ChatGPT plays a very useful role in facilitating students' learning process and contributing to the improvement of their translation products. Although ChatGPT is found to have potential in future education, some concerns, such as students' dependence on ChatGPT, need to be addressed. The study suggests integrating AI literacy into translation curricula and offering targeted training to promote the critical and responsible use of AI tools in translation education.

Keywords: Translation Process, Text Analysis, Students' Perceptions

1. Introduction

ChatGPT has been in use for a relatively short time, yet its emergence has been significantly changing the world in many fields. (Johinke et al., 2023; Kadwa & Alshenqeeti, 2020; Nikolopoulou, 2024; Rahman & Watanobe, 2023; Sallam, 2023). ChatGPT has proven to be an effective tool in facilitating the learning and teaching process, as it can provide a vast amount of information and help students quickly find answers to their inquiries. Numerous studies have been conducted to explore the application of ChatGPT in language learning, in general, and translation learning, in particular. ChatGPT offers an engaging, interactive, and effective language learning experience. (Baskara, 2023; Kohnke et al., 2023). Students can initiate discussions on any subject and receive immediate, human-like responses from ChatGPT on a range of language learning topics, including communication skills and language practice. ChatGPT can also translate materials or texts into students' native languages, providing more opportunities for language practice. (Ali et al., 2023). ChatGPT's accuracy in translation has also been appreciated. (Alkhawaja, 2024; Hidayati & Nihayah, 2024; Lau et al., 2024; Sahari et al., 2023; Salloum et al., 2024) and it has been introduced to students to improve their translation skills and knowledge (An et al., 2023; Fan at al., 2023).

There are some initial attempts to elicit students' ideas and comments on their use of ChatGPT in translation teaching; however, the studies are still limited in terms of number, methodology, and empirical evidence for English majors. There is a vast ground for investigating the use of ChatGPT in translation teaching at the tertiary level in general and learners' perceptions of it. In other words, further research is still needed to gain a deeper understanding of the application of ChatGPT in translation learning. To explore the use of ChatGPT in developing students' translation abilities, a study was conducted in 2024 at a public university in Vietnam. One hundred nineteen students were recruited from two Advanced Translation classes to participate in a three-hour workshop, where they were instructed on how to address their translation problems while completing a translation task with the support of ChatGPT. They then commented on their use of ChatGPT in translation, through questionnaire completion and interview attendance.

The research was conducted to address the following research questions:

1. How do students perceive the role of ChatGPT in the translation process?
2. How do students perceive the impact of ChatGPT on the translation product?
3. What are students' concerns over the use of ChatGPT in translation?
4. What are students' viewpoints towards the future use of ChatGPT?

The research also examines whether there is a difference in the opinions of male and female students regarding the application of ChatGPT for learning translation.

2. Literature Review

ChatGPT and Translation

ChatGPT is considered a generally effective tool for translation. Studies indicate that ChatGPT can perform human-like translations that are generally accurate and reliable. (Alkhawaja, 2024; Sahari et al., 2023). With appropriate prompts, ChatGPT can provide instant translations, which can benefit businesses and organizations. ChatGPT helps reduce initial translation time, allowing human

translators to focus on refining and ensuring accuracy (Sahari et al., 2023). Compared with other machine translation tools, ChatGPT generally achieves competitive results. For example, Hidayati and Nihayah (2024) found that AI-generated translations are more contextually accurate than those produced by Google Translate due to AI's natural language processing and AI's capability in academic writing. Similarly, Alkhawaja (2024) illustrated that ChatGPT "impressively" outdid Google Translate in terms of translation performance.

Despite ChatGPT's merits, there is room for improvement in the translation work of ChatGPT. ChatGPT can work well in translating texts with simple, straightforward content and often struggles with more complex structures and nuances. Lau et al. (2024) mentioned that AI translators cannot perceive poets' feelings and thoughts. In dealing with specific translation issues, including separable phrasal verbs (Alosaimi & Alawad, 2024) it has been identified that ChatGPT seems ineffective, although ChatGPT-generated translations are understandable. Besides, ChatGPT cannot translate culturally sensitive items that require context-rich processing data in religious texts. (Banat & Adla, 2023). Furthermore, Sahari et al. (2023) insist that ChatGPT is more efficient in mechanical tasks, such as writing and editing translated texts, than fine-tuning, which involves more critical thinking. Admittedly, studies scrutinizing the quality of ChatGPT translations do not deny the role of humans in producing high-quality translations. (Alkhawaja, 2024; Sahari et al., 2023) They maintained that, despite the promising translation capacities of ChatGPT, it could not match the level of human translators, whose intervention is necessary to ensure a high level of cohesion, fluency, and accuracy in a translation. Additionally, the use of ChatGPT in translation tasks can raise ethical concerns related to knowledge security and ideological bias, as seen in education and other areas. Fan et al. (2023) explained that ChatGPT cannot make moral judgments about the content that can be influence by Western discourse and ideologies.

The Use of ChatGPT in Translation Teaching

Similar to language teaching, which has witnessed students' personalized learning and pedagogical changes (Ali et al., 2023; Baskara, 2023; Hoang et al., 2023; Kohnke et al., 2023; Mohammed et al., 2023), ChatGPT introduces new ideas into traditional translation classes. Conventional translation classes tend to focus more on in-class interaction and the transmission of knowledge and concepts, rather than prioritizing students' critical thinking (An et al., 2023). Meanwhile, An et al. (2023) and Fan et al. (2023) are among the few scholars who have begun to consider incorporating ChatGPT into translation classes. They maintained that ChatGPT may allow more personalized learning opportunities. Students can be given modified instructions and instant feedback when they request the provision of different types of knowledge, ranging from translation theories to translation methods or when they have ChatGPT evaluate their translations. The authors insisted that ChatGPT can support teachers in developing their students' translation competence. For example, ChatGPT can help provide concepts of translation and explanation of vocabulary and sentence structures of a source text (ST). Students can refer to ChatGPT translation instantly after providing the ST or input. Alternatively, they can ask ChatGPT to analyze the strengths and weaknesses of their translations and improve them. Generally, ChatGPT gains teachers' favor as it helps reduce their workload in presenting translation-related knowledge, marking students' translations, tracking students' progress and engaging them in translation learning (Fan et al., 2023).

Some concerns are raised regarding the application of ChatGPT in translation teaching (Fan et al., 2023). The authors explained that students may become more dependent on the tool, as they can easily obtain automatic translations with minimal time and intellectual effort. They cannot evaluate

translation accuracy or eliminate culturally sensitive elements in ChatGPT-based translations. Therefore, it is essential to implement effective methods for utilizing ChatGPT in translation and translation education. Fan et al. (2023) emphasized the necessity of innovating teaching models and promoting learners' autonomy while maintaining ethical principles and enhancing students' digital literacy. They proposed that the role of translation teachers in the new teaching process remains irreplaceable, despite the enhanced position of ChatGPT. The teacher should enable learners to become more critical in translation tasks, thereby developing high-order thinking skills and avoiding ethical issues. While early attempts to incorporate ChatGPT in translation teaching can be acknowledged, pedagogical proposals are limited, and empirical evidence is lacking.

The main question of how to use ChatGPT in translation and translation teaching revolves around developing effective prompts that help improve ChatGPT (Shaolong Liu, 2024). ChatGPT can produce a better translation with proper prompts. Translation prompts should have translation task information and/or context domain information (including genre-related details). Effective prompts should contain contextual features that allow ChatGPT to act and think like a translator or train ChatGPT with the knowledge and skills of professional translators. This idea aligns with the concept of translation briefs as proposed by the functionalist approach to translation, which emphasizes the role of contextual features in the translation decision-making process.

Translation Process and Translation Product

The translation process commences when the translator analyzes the text and continues until they find the appropriate target text (TT) segment (Zabalbeascoa, 2000). More specifically, Gile's sequential model of Translation with a two-phase operation: comprehension of the ST and reformulation or production of the TT (Gile, 2009). The translator formulates the "meaning hypothesis" (or understanding of the meaning) of a translation unit or text segment (word, phrase, paragraph, or text) based on their linguistic and extralinguistic knowledge and ad hoc knowledge (or knowledge of a specific field or situation). If the meaning hypothesis is plausible, they proceed to formulate the meaning hypothesis in the TT. During this phase, the translator produces the provisional TT segment and determines whether it meets the requirements of the "fidelity test" (accuracy) or the "acceptability test" (i.e., it is acceptable to the TT readers) by drawing on their linguistic and extralinguistic knowledge.

Many studies demonstrate a tendency to focus on students' ability to make informed translation decisions in translation studies, incorporating the functionalist approach to enhance students' translation processes (Chen, 2010; Karoly, 2014; Nguyen, 2023a, 2023b). In the light of the functionalist approach to translation, which emphasizes the purpose of translation, the translator begins with the translation brief, which outlines why a translation is required, by whom, what the client needs, when, where the translation will be used, and who the translation addresses. In the pre-translation stage, they are also aware of the ST's features, including vocabulary, sentence structure, and topic or theme. It is also necessary to figure out translation problems, prioritizing pragmatic translation problems (related to differences in the situations of the ST and TT) over other cultural and linguistic translation problems. They can face translation problems in both phases: comprehending the ST and producing the TT. To address translation issues, the translator employs a range of strategies. Translation strategies are classified into comprehension and production/translation strategies (Chesterman, 1997). They can resort to resources, skills, and solutions, including dictionaries or translation tools, during the translation stage, which forms part of their instrumental competence (Kelly, 2005). After producing the translation, the translator checks whether the translation product is functionally appropriate (a translation meets the function of translation), accurate (a translation should

be coherent or have a relationship with its ST regarding the ST information transmitted to TT readers) or/and acceptable (a translation) is understandable to the readers.

This study views the translation process as a comprehensive term encompassing pre-translation (text analysis), translation, and post-translation (reflection on or revision of the translation) (Nguyen, 2023a, 2023b). ChatGPT was introduced into a translation class to assist students in their translation process. In other words, students were instructed to use ChatGPT to understand ST features, including vocabulary and structure, and to produce translations for their reference or revise their existing translations or translation products.

Translation product refers to the final translated text or output resulting from the translation process. It reflects the quality of the translation in relation to the original text. The quality of a translation product is often assessed based on factors or rules (Nord, 1997). The first and paramount rule is that the translation is determined by its skopos, or purpose, which means that a translation must fulfill its intended function or purpose. In addition, the "coherence rule" (internal textual coherence within the TT) stipulates that translation, which is intended to provide information, should make sense to TT readers or receivers. "Fidelity rule" or accuracy (the external textual coherence with the ST) maintains that a translation should be coherent or have a relationship with its ST in terms of the ST information transmitted to TT readers. Nguyen (2023) who applied these translation evaluation principles in a translation teaching context refers to functional appropriateness (the translation meets its function), stylistic appropriateness (the translation meets the requirements of the text type), accuracy (the content of the ST is maintained) and expression (the translation meets the TL norms) elicited from students' comments on their translation.

Perceptions of Students

While it is worthwhile to acknowledge some research on ChatGPT, including its translation quality, advantages, challenges, and other issues, studies on the use of ChatGPT in translation teaching are still scarce. Few studies have examined students' reactions or perceptions to determine whether there is any resistance to ChatGPT, allowing for further improvements to the tool or its usage. Shoufan (2023) highlighted the significance of investigating students' experiences with using ChatGPT and their perceptions of it. The author explained that students' perceptions can greatly impact their motivation, engagement, and performance. While positive attitudes can promote students' eagerness to learn and their academic achievement, negative views of ChatGPT can lead to disengagement, demotivation, and a limited chance of academic success.

User surveys indicate that ChatGPT is appreciated for its conversational abilities and ease of use. Hidayati and Nihayah (2024) aim to explore non-major English students' choices of translation tools, including Google Translate, ChatGPT, and Google Bard AI, uncovering the reasons for students' preferences for the tools. Data collected from interviews and documents indicate that while students continue to use Google Translate, they have shifted their preference to AI models, such as ChatGPT and Google Bard AI, because these models demonstrate improved translation accuracy, context sensitivity, and more coherent translations. The study suggested the increasing acceptance of AI-driven translation tools. They mentioned that students' preferences may depend on their experience, needs and language pairs. Although this mainly qualitative study lacks a methodologically rigorous approach (e.g., insufficient information about interviewing techniques or a lack of in-depth data analysis), it calls for further research into students' perceptions of ChatGPT use in translation and translation teaching, particularly between English and Vietnamese, a minority language pair.

Sahari et al. (2023) primarily explored the attitudes of Arabian translation teachers and students about the merits and demerits of ChatGPT, compared to Google Translate. Using a mixed-methods approach, the study was conducted among 19 teachers and 15 students across language-related disciplines. The main instruments were semi-structured interviews and projective techniques, the latter of which involved students' completion of incomplete sentences, allowing participants to reveal their positive and negative attitudes toward ChatGPT in translation. The results indicated that participants were highly satisfied with ChatGPT. While most teachers favoured Google Translate, most students preferred ChatGPT to Google Translate. Findings also indicated that ChatGPT can work well in writing and editing translated texts, which are mechanical processes. At the same time, there is considerable room for improvement in tasks that require critical thinking, such as fine-tuning and double-checking. Compared to Hidayati and Nihayah (2024), this study presents more reliable findings related to users' perceptions of ChatGPT in translation, due to its more stringent and rigorous research framework. However, students' negative and positive attitudes were not clearly defined, which may have affected the study's credibility.

Technology Acceptance Model

Many studies have explored college students' adoption of technology, including the use of Davis's (1993, 1989) Technology Acceptance Model (TAM) (Almusharraf & Bailey, 2023; Li et al., 2024; Koka, 2024; Salloum et al., 2024). These studies examine the factors influencing students' acceptance of technology and consistently find that perceived usefulness, perceived ease of use, and attitude toward use all play a crucial role in their willingness to adopt translation technologies. Students are more likely to use translation technologies if they believe these tools enhance their translation skills, effectiveness, and productivity (perceived usefulness). Additionally, when students find translation technologies user-friendly, they are more inclined to integrate them into their learning (ease of use). Ensuring students recognize the benefits of translation technologies and making these tools easy to use are essential for fostering a positive attitude and encouraging long-term adoption. To illustrate, Almusharraf and Bailey (2023) found that Saudi and Korean students reported high levels of TAM variables, indicating that they found translation tools both easy to use and beneficial for language learning, which positively impacted their attitude and future use.

Salloum et al. (2024) extended the TAM framework by incorporating experience and motivation, showing that users with more experience tend to perceive technology as more useful. In the context of machine translation, students who are already familiar with its functions are more likely to recognize its benefits and effectively apply it to their learning. Moreover, Almusharraf and Bailey (2023) highlighted the significant impact of cultural background on technology adoption. They noted that students from collectivistic cultures tend to place greater emphasis on social norms when deciding whether to use technology. If teachers, peers, or colleagues perceive a tool as useful and easy to use, students in these cultures are more likely to adopt it. Understanding these factors can help educators address students' concerns (negative attitudes) such as worries or barriers related to technology adoption, and support the effective integration of translation technologies into learning environments. This, in turn, can enhance students' learning experiences and increase the likelihood of continued technology use (behavioural intention).

While existing research acknowledges the potential of translation technologies to improve language learning and translation practices, it also highlights challenges related to user experience and the need for proper training and guidance. Future studies in Vietnam and other contexts should further investigate how different types of students perceive ChatGPT in the context of translation education.

Such research can provide deeper insights into the effectiveness of ChatGPT in translation teaching. Therefore, this study will investigate the perceptions of English major students regarding the use of ChatGPT in translation courses at the tertiary level in Vietnam, contributing to the growing body of research on technology in translation education.

In this study, the Technology Acceptance Model (TAM) serves as the theoretical foundation for examining students' perceptions of ChatGPT in the context of translation learning. Key constructs, perceived usefulness, perceived ease of use, and behavioral intention, inform the research questions and the design of the instrument.

The conceptual framework integrates:

1. The translation process framework (Nguyen, 2023a, 2023b; Nord, 1997), which defines the translation process in three stages (pre-translation, translation, post-translation) and evaluates the product based on skopos, coherence, and fidelity.
2. The TAM model (Davis, 1993, 1989), which explores students' perceptions of ChatGPT's usefulness and ease of use, along with concerns over academic integrity and dependency.

The study, therefore, addresses research question 1 (the usefulness of ChatGPT in translation stages), research question 2 (Ease of use and its impact on translation products), and research questions 3 and 4 (Concerns and behavioral attitudes toward future use).

3. Methods

Research Approach

This study employs an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2011), which involves the collection and analysis of quantitative data, followed by a qualitative inquiry to elaborate and explain the quantitative findings. This design was selected to gain both breadth and depth of understanding regarding students' use of ChatGPT in translation tasks.

The research was implemented in three key phases:

1. Pilot Phase (Qualitative Exploratory):

A preliminary qualitative study was conducted with 12 translation students to explore how they used ChatGPT during various stages of the translation process. These interviews were guided by theoretical frameworks related to translation phases, text analysis, translation, and post-translation (reflection on or revision of translation). Themes emerging from this phase, particularly those relating to the perceived usefulness and ease of use of ChatGPT, informed the development of the main quantitative instrument.

2. Phase 1 – Quantitative

A structured questionnaire, built upon themes identified in the pilot phase, was administered to 119 students enrolled in two advanced translation courses. The objective was to quantify perceptions and behaviors related to the use of ChatGPT in translation tasks.

3. Phase 2 – Qualitative (Explanatory)

Based on the survey results, 15 students were randomly selected for follow-up interviews to explain and enrich the quantitative findings. These interviews enabled a deeper understanding of the patterns observed in the data and provided valuable contextual insights.

The following sections detail the sampling strategies, instruments, data collection procedures, and data analysis techniques used in each phase of the research.

The Setting and Participants

The research was conducted in early 2024, during the second semester of the academic year, in an English language program at a university in Vietnam. One hundred nineteen participants, including 105 females and 14 males, were enrolled in two Advanced Translation courses on legal translation. The study employed purposive sampling to select participants from two advanced-level translation courses, which are part of a wider set of translation offerings at the university. Although these two courses did not comprise the entire population of translation students, they reflected similar instructional content and learning outcomes as other advanced courses.

The third-year English major students were selected due to their advanced translation knowledge and skills, which they had developed through extensive academic training. Their expertise enables them to critically evaluate translation quality, making them well-suited to assess ChatGPT's performance in this domain. The students volunteered to join the research, and withdrawals had no impact on their course results. The great imbalance in the number of male and female students reflects the normal rate in the language education sector.

Research Procedure

The study was carried out during the Advanced Translation course. One hundred nineteen students from two classes of the Advanced Translation course were given the opportunity to discuss their experiences with translation and ChatGPT, as well as whether they had ever used it. They then participated in a three-hour workshop on ChatGPT in translation, followed by completion of a questionnaire. Fifteen students, out of the 119, were then invited to participate in a follow-up interview, where they further explained their experiences with using ChatGPT.

Workshop on ChatGPT in Translation

In the workshop, ChatGPT was introduced to enhance students' knowledge and understanding of the translation processes involved in legal translation. Specifically, they compared ChatGPT results generated by themselves with those obtained from using detailed prompts informed by the principles of functionalist approaches to translation. In terms of knowledge of legal translation, students used prompts that covered various aspects of the field, including types of legal texts, translation problems, translation strategies in legal contexts, and translation criteria in legal translation. Then, the author, the lecturer in the workshop, commented on ChatGPT's findings and further elaborated on the topic of legal translation.

Regarding the usefulness of ChatGPT in students' translation process, the students were guided to use ChatGPT in the English-Vietnamese translation of short extracts from the Australian text - "General Tenancy Agreement", using prompts informed by the functional approaches to translation. Specifically, prompts should contain contextual elements that provide helpful clues to boost ChatGPT's performance. After exploring the situational features of the ST, the students asked ChatGPT to explain the vocabulary and terminology of the ST. Some examples (in Vietnamese or English) included "Phân biệt 'Division, subdivision, item' trong cấu trúc văn bản" [Distinguish Division, subdivision, item' as parts of a document], "Entry condition report trong lĩnh vực thuê nhà

là gì?" [What does 'Entry condition report' mean in a tenancy in Australia?], and "Rental bond trong lĩnh vực thuê nhà ở Úc là gì?" [What does "rental bond" mean in a tenancy in Australia?].

Next, the students chose to have the ST translated by ChatGPT or have their translations revised by ChatGPT. In the former case, the students were instructed to include the text type and features of the ST, for example, "Translate into Vietnamese the following extract from an Australian General Tenancy Agreement into Vietnamese." In the latter, the students included specific criteria for a good translation. An example of this type of prompt is "Evaluate/Review the Vietnamese translation of an extract from an Australian General Tenancy Agreement (presented above) in terms of functional appropriateness, accuracy, and acceptability".

In the last part of the workshop, the students reflected on their translations and their use of ChatGPT. They were asked how they used ChatGPT during the translation of the Tenancy contract and what comments they had about ChatGPT in their translation process.

Before data collection, a workshop was held to clarify key evaluation criteria such as "accuracy" and "appropriateness". These terms were explained with examples to ensure a shared understanding among students, thereby reducing subjective variation and supporting more consistent and reliable evaluations.

Questionnaire

After the workshop, the students completed a questionnaire that elicited their perceptions about ChatGPT. The questionnaire was based on the TAM model, focusing on the perceived usefulness and ease of use of ChatGPT in aiding their translation process and improving their translation products, their concerns (or attitude) and future use (behavioural intention), which are specific to translation learning. The questionnaire began with questions on biodata before exploring students' ideas about how ChatGPT aided their translation process, including aspects such as text analysis (understanding text type, vocabulary, grammar, cultural words, and specialized terms), translation, and translation revision (students' comments on translation quality). The questionnaire also allowed the students to evaluate whether ChatGPT can maintain the quality of their translations. The next part of the questionnaire depicted students' concerns related to academic integrity and dependence on ChatGPT. The final section explored students' ideas on how they would use Chat GPT in the future and their additional comments.

Interviews

After completing the questionnaire, 15 students who used ChatGPT in the translation task were approached for interviews. The 15 participants were randomly selected for interviews to guarantee objectivity and representativeness. This supports the internal validity of the study by minimizing the influence of researcher bias in participant selection (Kumar, 2011). The students explained how they utilized ChatGPT in their translation process, either in English or Vietnamese. They were asked non-biased questions, including: Did you use ChatGPT in your translation? If yes, list what you did. What comments do you have regarding the use of ChatGPT in translation? What suggestions do you have for effectively using ChatGPT?

Data analysis

The study employed a three-phase design. In the Pilot Phase (qualitative exploratory), 12 semi-structured interviews were analyzed thematically using Braun and Clarke's (2006) method to examine students' experiences with ChatGPT across the translation stages. Key themes informed the design of the Phase 1 questionnaire.

In Phase 1 (quantitative), data from 119 students were analyzed using SPSS, employing descriptive statistics and cross-tabulations, with a focus on perceived usefulness, ease of use, concerns, and future intentions. The questionnaire demonstrated high internal reliability (Cronbach's alpha = .819–.933). The reliability level of the whole questionnaire is 0.933, which is excellent. The second part of the questionnaire has a reliability level of 0.926; the third part's level is 0.822; the fourth part is 0.819, and the final part has a reliability level of 0.888.

Phase 2 (explanatory qualitative) involved 15 follow-up interviews, thematically analyzed using both deductive and inductive coding to deepen the interpretation of the survey findings. To ensure the validity and trustworthiness of the qualitative data, member checking was conducted with selected participants to confirm the accuracy of interpretations. Triangulation was applied by comparing themes from both qualitative phases with the survey findings. A code-recode strategy was used to maintain consistency in coding over time, and peer debriefing with a colleague helped minimize subjectivity in theme development.

4. Findings

After the workshop, in which the students were introduced to ChatGPT's translation capabilities, they paid attention to ChatGPT. They provided numerous comments on its impact on their translation process and products, as well as their concerns and plans for using ChatGPT in translation.

ChatGPT and Translation Process

Table 1: ChatGPT and Its Effects on the Translation Process

Items	N	Minimum	Maximum	Mean	Std. Deviation
2.1. Chat GPT helps understand the text type of laws and administrative texts.	119	1	5	3.96	.848
2.2. Chat GPTs can explain my unknown vocabulary.	119	1	5	4.13	.892
2.3. Chat GPTs can explain technical terms satisfactorily.	119	1	5	3.82	.902
2.4. ChatGPT can explain difficult grammar structures.	119	1	5	3.60	1.060
2.5. Chat GPT can give adequate meanings of cultural words.	119	1	5	3.71	.922
2.6. ChatGPT helps understand contexts for translation	119	1	5	3.76	.980
2.7. Chat GPT can provide knowledge about different fields while translating law and administration.	119	1	5	3.79	.982
2.8. Chat GPT helps revise my translation effectively	119	1	5	3.83	.905
2.9. Chat GPT gives an appropriate revision of my translation.	119	1	5	3.80	.879
2.10. Chat GPT gives a creative revision of my translation.	119	1	5	3.76	.963
2.11. ChatGPT can offer multiple translations for the same text for my reference.	119	1	5	3.88	.894
2.12. Chat GPT can provide information more quickly than other tools.	119	1	5	4.12	.885
2.13. Chat GPT saves time in translation.	119	1	5	4.22	.875
Valid N (listwise)	119				

ChatGPT-more than a Dictionary but a Source of Information during the Text Analysis Phase: For most students, ChatGPT was used to check the meaning of vocabulary and specialized words that

are difficult to understand. ChatGPT can list the meanings and definitions of unknown words. "ChatGPT can present in detail the meanings of a word and its possible translations, providing some contextual clues to the understanding of the word", as cited by a student. One student showed satisfaction with ChatGPT when they compared ChatGPT's explanation of meanings with results from other tools: "It can provide many translation choices for a word immediately, with more advanced word choices than ordinary dictionaries".

Regarding grammar, the students resorted to ChatGPT when they encountered challenging grammatical structures. As legal texts feature complexities in grammar and structure, students must have encountered linguistic problems in translating the General Tenancy Agreement. "I asked ChatGPT to explain grammatical structures that were hard to understand. I only translated a sentence when I was able to understand its structure. Particularly, grammatical difficulty is one notable feature of legal text" (cited by a student).

ChatGPT was able to explain the text type and content related to the topic. The students reported that they used ChatGPT to seek information about features of "Tenancy contract" or any topic-related words and phrases. They said ChatGPT helped them understand specialized words. "Legal texts normally have abstract and challenging topic-related words and phrases, but I can translate the words more accurately with the help of ChatGPT", a student commented. Using ChatGPT, students can search for specialized topics more quickly and effectively than with other tools. For example, "ChatGPT's findings were more condensed than those of Google, and their answers seemed exact and brief. Take the phrase "Body corporate by-laws" for example. I searched this phrase throughout available websites. Still, the results were varying. I think ChatGPT gave me reasonable explanations so that I could make a good translation" (a student's reflection).

Findings obtained from the questionnaire also reflected students' satisfaction with the support from ChatGPT for their text analysis, as shown in Table 1. Difficult text types, such as laws and administrative texts, are explained well by ChatGPT, enabling students to gain a good understanding of the text for their translation (Item 2.1, mean = 3.96). Knowledge of such challenging fields was also provided, facilitating the translation process, as seen in item 2.7. (mean 3.79). In addition, technical terms, unfamiliar vocabulary, and cultural words or contexts are clarified to facilitate further explanation of the text, resulting in students' improved translation (items 2.3, 2.4, 2.5, 2.6).

ChatGPT - Quick and Reliable Translation Revision Tool: In addition to using ChatGPT to understand text features (vocabulary, grammar, and topic), students used ChatGPT to revise their translations. ChatGPT was recognized as a useful tool for students to revise their translations. ChatGPT was intended to provide quick, appropriate, and creative revisions of students' translation products, as indicated by items 2.8, 2.9, and 2.10, with means ranging from 3.76 to 3.83.

Students requested ChatGPT to edit words and grammatical structures to create an appropriate and accurate translation. A student said, "I had my translation go through ChatGPT and found that ChatGPT could fix my words and sentence structures with detailed comments". Expressions or stylistic choices suggested by ChatGPT could serve as a valuable source of reference for students in translation. Another student declared, "I learned more about ChatGPT's wording, which seemed better than mine. It has a more academic writing style and creative word choices." Cohesion created by ChatGPT was also appreciated by the students, who emphasized that ChatGPT could produce coherent linking words and cohesive devices, based on the context.

ChatGPT with Quick, Ready-made Translations for Reference: Some students used ChatGPT's ready-made translations as a reference to save time. "I used ChatGPT to produce translations for my

reference. I refined its translation if necessary because its translation sounded appropriate in terms of vocabulary and structures", as cited by a student. Some attempted to create ChatGPT-produced translations so that they could make comparisons among the texts before choosing their favorite one. As shown in Table 1, ChatGPT can generate multiple translations for the same text, and these various versions can serve as references for students to improve their translation products (item 2.11, mean = 3.88).

Generally, ChatGPT was a user-friendly tool that assisted students in their translation process. ChatGPT helped answer students' queries about unknown and complex vocabulary and specialized terms while reinforcing students' topic-related knowledge and vocabulary. It proposed many appropriate and diverse target equivalents, which made the translation process more convenient and easier. A student said, "The efficient wording of prompts promoted easy use and good translation. If we do not instruct them, we will have a rigid translation". The quick response helps save time in the translation process. Data obtained from items 1.2 and 1.3 of the questionnaire reflect students' viewpoints that ChatGPT contributes to saving time for translation and functions more quickly than other tools (means 4.12, 4.22, respectively).

Drawbacks of ChatGPT: Although the students acknowledged ChatGPT's usefulness in their translation process, some expressed dissatisfaction with ChatGPT use. They complained that some information generated by ChatGPT was not entirely accurate due to its limited understanding of the context. Therefore, it was recommended to compare ChatGPT's results with those found by other search tools, as it was not a perfect tool. "We should not allow ChatGPT to do all the translation because it is only a support tool. ChatGPT cannot understand all the meanings conveyed in the text. Therefore, if we have the text translated completely by ChatGPT, the translation may become 'unnatural'. Chat GPT cannot transfer metaphorical meanings, which can be only understood by referring to contextual clues", cited by a student.

ChatGPT and the Quality of Translation Product

Table 2: Quality of ChatGPT-Generated Products

Items	N	Minimum	Maximum	Mean	Std. Deviation
3.1. ChatGPT can provide accurate translation.	119	1	5	3.64	.810
3.2. ChatGPT can provide stylistically appropriate translation.	119	1	5	3.59	.807
3.3. Chat GPT can give a fluent or natural translation.	119	2	5	3.52	.842
3.4. Chat GPT can provide accurate translations of technical terms.	119	1	5	3.62	.873
Valid N (listwise)	119				

Only a few students presented relatively favorable attitudes toward the quality of translations produced by ChatGPT. ChatGPT can provide good translations with appropriate word choices and fluent language structures. "I can refer to ChatGPT's suggestions of words which are advanced, smooth and academic". "ChatGPT provided accurate translations, especially in translating specialized terms". In terms of accuracy, students estimated that ChatGPT's translations were 70-80 percent accurate, as ChatGPT had some difficulty understanding word meanings and context. Interestingly, the questionnaire data reveal a rather different perspective among students regarding the accuracy of ChatGPT's products. Items 3.1 and 3.4 reveal that most students agree that ChatGPT can generate accurate translations, especially of technical terms (means = 3.64 and 3.62, respectively). Maybe the 70-80 percent accuracy somehow satisfies students' expectations of ChatGPT translation.

However, there were more unfavorable comments on ChatGPT's performance. "I had to make some corrections to some words and expressions offered by ChatGPT because I was not satisfied with the accuracy of the information." Some students attributed the inaccuracy to ChatGPT's limited understanding of the context. "ChatGPT did not get the right meanings of words and expressions in the context". "Some ideas of the translated texts are not in line with the content of the text". These concerns also applied to the translation of technical terms. In the following example, the students mentioned context consideration as the main factor that ChatGPT's translation is lacking. Here is an example.

English version: The lessor may require the tenant to pay rent in advance only if the payment is not more than – (a) for a periodic agreement – 2 weeks' rent; or (b) for a fixed-term agreement – 1 month's rent

Some students consulted ChatGPT about the meanings and translations of "a periodic agreement" and "fixed-term agreement". Although the students were satisfied with ChatGPT's explanations for the terms, they preferred to use their translations after considering the context. "ChatGPT suggested 'thỏa thuận định kỳ' (for Periodic agreement) và 'thỏa thuận có thời hạn cố định' (for Fixed term agreement). These literal translations were fine, but readers may not be able to differentiate between the two terms. Based on the context, I thought of 'Hợp đồng ngắn hạn' (Short-term agreement) and 'Hợp đồng Dài hạn' (Long-term Agreement) respectively.

Students complained about ChatGPT's stylistic and cultural appropriateness. "ChatGPT is convenient, but its performance is still limited due to the lack of accuracy. Some translated texts are not appropriate to the conventional text type features". "In translating from English to Vietnamese, ChatGPT is limited in satisfying Vietnamese stylistic choices". Yet, based on the data from the questionnaire, it is evident that students believe ChatGPT can meet the basic demand for stylistic appropriateness in a translation, as indicated by the mean of item 3.2, which is 3.59.

Typically, many students showed little satisfaction with ChatGPT's translation of the term "a tribunal". ChatGPT used the word "tòa án" (or court), which may deter potential Vietnamese readers from engaging in the tenancy agreement, as they do not want to be in trouble with the courts. Instead, we may think of a more neutral equivalent like "cơ quan có thẩm quyền" (relevant authorities)."

English version: Subject to an order of *a tribunal*, the increased rent is payable from the day stated in the notice, and this agreement is taken to be amended accordingly.

ChatGPT version: Tuân theo quyết định của tòa án, tiền thuê tăng sẽ được trả từ ngày được ghi trong thông báo, và thỏa thuận này sẽ được sửa đổi tương ứng.

A student's proposed translation: Tùy vào yêu cầu của cơ quan có thẩm quyền, có thể trả tiền thuê tăng thêm kể từ ngày ghi trong thông báo và theo đó cần sửa các điều khoản tương ứng trong hợp đồng.

The students had many criticisms of the fluency or the naturalness of ChatGPT-generated translations. They believed ChatGPT translation needed to be more fluent and natural. The present translation products are still incomprehensible and "stiff". A student referred to ChatGPT's word and structural repetitions, while another was dissatisfied with the Vietnamese wording of ChatGPT. Although the naturalness of the translation generated by ChatGPT is not as expected, it is found to be relevant in the questionnaire data. Students agree that ChatGPT can provide fluent and natural translations, as shown in item 3.3 (mean = 3.52).

Among many of ChatGPT's unnatural translations, a student referred to the following example in which some of ChatGPT's wording is redundant. "I find that 'Thuế cho căn nhà' (taxes for the premises) is a bit clumsy due to the presence of 'cho căn nhà' (for the houses)", as cited by a student.

English version: The lessor must pay all charges, levies, premiums, rates or taxes for the premises, other than a service charge. *Examples Include Body corporate levies, council general rates, sewerage charges, environmental* levies, and land tax.

ChatCPT's version: "Bên cho thuê phải trả tất cả các khoản phí, lệ phí, bảo hiểm, thuế suất hoặc *thuế cho căn nhà*, trừ phí dịch vụ.Ví dụ: Lệ phí của ban quản lý tòa nhà, thuế suất chung của hội đồng, phí thoát nước, lệ phí môi trường, thuế đất."

A students' translation: Bên cho thuê phải trả tất cả các chi phí, phí bảo hiểm hay tiền thuế đất thay vì phí dịch vụ. Ví dụ: Thuế quản lý nhà/căn hộ, thuế theo quy định chung của thành phố, thuế rác thải, thuế môi trường, và thuế đất.

Concerns

Students expressed some concerns about the use of ChatGPT. Some students were concerned that they were overly reliant on ChatGPT, which could negatively impact their translation skills. "I am afraid that if I depend on the translation tool (ChatGPT) excessively, my translation skill may become rusty someday" (cited by a student). Even though ChatGPT was a good source for reference, many students insisted that it was not a perfect translation tool due to its rigid language and inaccurate translation if not much instruction was given. One student mentioned that they did not use ChatGPT but other tools like Gemini.

Table 3. Students' Concerns about the Use of ChatGPT in Translation

Items	N	Minimum	Maximum	Mean	Std. Deviation
4.1. ChatGPT will make academic cheating easier.	119	1	5	3.40	1.152
4.2. ChatGPT negatively affects learning about translation because I can easily find ready-made translations without effort.	119	1	5	3.32	1.057
4.3. The language of ChatGPT's translation is unnatural or rigid.	119	1	5	2.71	1.187
4.4. Using ChatGPT can make me dependent on the tool.	119	1	5	2.89	1.048
4.5. I do not use ChatGPT, but I do use other tools in regard to effectiveness.	119	1	5	2.82	1.226
Valid N (listwise)	119				

Findings from the questionnaire indicate that ChatGPT has a negative impact on students' learning process, despite its useful functions in translation. Item 4.1 has a mean of 3.40, denoting that students agree that ChatGPT makes cheating easier. In addition, with a mean of 3.32, item 4.2 reflects the negative effects of ChatGPT on students' learning process in translation. As a result, students become increasingly dependent on ChatGPT in their learning (item 4.4, mean = 2.89). Interestingly, students hold neutral opinions regarding the quality of products generated by ChatGPT, as indicated by item 4.3, with a mean of 2.71. Additionally, they demonstrate a lack of understanding regarding whether they would utilize ChatGPT or other tools when evaluating their effectiveness (item 4.5, mean = 2.82).

Future Use

The students enthusiastically discussed their future use, offering numerous recommendations on how to utilize ChatGPT effectively. They found that ChatGPT was a useful tool that answered almost all their questions instantly and quickly. This may promote a favorable environment for students' learning. However, they said they must use ChatGPT carefully by selecting appropriate suggestions from

ChatGPT. Instead of relying too heavily on ChatGPT as the sole premium tool, students should consider using other tools, such as dictionaries, to complement ChatGPT's limitations. Furthermore, the students were aware of the importance of instructions or prompts for effective use of ChatGPT. They insisted that instructions should be as detailed as possible to provide contextual hints, allowing ChatGPT to produce better translations. Lastly, students proposed that ChatGPT should learn to personalize its translations by making appropriate adjustments to them.

"I think we should translate a text by ourselves before consulting ChatGPT translation. We may also compare our translation with ChatGPT to choose the best solution. If ChatGPT is used in the translation classroom, it is necessary to have methods to personalise translation and avoid dependence on ChatGPT...We should clarify our requirements for ChatGPT if we want a satisfactory answer." (said by a student)

The findings from the questionnaire, completed by 119 students who used ChatGPT for studying translation, reveal very similar ideas regarding students' future use of ChatGPT. As shown in Table 4, the students view ChatGPT as a comfortable environment for their translation study, and they find it motivating to use ChatGPT for translation, with means of 3.71 and 3.71 for items 5.1 and 5.2, respectively. This indicates that most students agree with the viewpoints expressed in items 1 and 2. Yet, students express their concerns about their future use regarding items 5.3, 5.4, 5.5, 5.6, 5.7, and 5.8. The range of means is from 3.42 to 4.21, indicating that students are concerned about their future use of ChatGPT. Students find that they need to be more careful with their application of ChatGPT to learning translation, particularly in regards to following instructions (item 5.3) and selecting information generated by ChatGPT (item 5.4). They also consider their use of ChatGPT to minimize dependence on IT tools and utilize it as a source of reference and in a personalized manner (items 5.4, 5.5, 5.6, 5.7, and 5.8), thereby making ChatGPT more useful and reducing the negative effects.

Table 4. Students' View on the Future Use of ChatGPT

N.	Items	N	Minimum	Maximum	Mean	Std. Deviation
5.1	The chatbot is a comfortable environment for translation.	119	1	5	3.71	.815
5.2	I feel motivated to use ChatGPT for translation more.	119	1	5	3.71	.913
5.3	I will need to provide ChatGPT with more precise and relevant instructions.	119	1	5	3.88	.885
5.4	I will select the information provided by ChatGPT more carefully.	119	1	5	4.08	.865
5.5	I will combine ChatGPT with other tools.	119	2	5	4.21	.812
5.6	I will use ChatGPT's translation for reference only.	119	1	5	3.42	1.037
5.7	I will adjust the translation created by ChatGPT in a personalized way.	119	1	5	3.88	.894
5.8	I will avoid dependence on ChatGPT in translation.	119	2	5	4.08	.869
	Valid N (listwise)	119				

5. Discussion

ChatGPT- a Tutor and Facilitator in the Translation Process

The data showed that ChatGPT was believed to play a key role in the students' translation process. The students relied on ChatGPT in dealing with various problems related to ST comprehension, translation, and revision of translations. They reported that ChatGPT provided satisfactory topic-related knowledge and fully explained problematic vocabulary and sentence structures during their ST analysis. ChatGPT could also provide its translations as sources of reference for students who find its

translations accurate and appropriate. Alternatively, the students also had their translations revised by ChatGPT with certain positive attitudes. In fact, by combining a large amount of textual data, ChatGPT may function as a tutor (Rahman and Watanabe, 2023) that provides intelligent and contextually appropriate responses to students' questions that arise during their translation process. According to Lund and Wang (2023), ChatGPT can provide clarifications, respond to factual inquiries, and generate innovative ideas. Jeon and Lee (2023), who examined the complementary functions that ChatGPT and teachers play in the classroom, noted that ChatGPT can serve four roles: assistance, assessor, interlocutor, and content supplier. Similarly, in teaching translation, ChatGPT can modify translation classroom routines, enabling more personalized and autonomous learning.

In this study, students were taught how to utilize ChatGPT's capabilities in providing translation-related knowledge by crafting effective prompts and providing relevant contextual clues to ChatGPT. Numerous studies have demonstrated the role of prompts in producing accurate translations. (Gao et al., 2023; Shaolong Liu, 2024). They advocate that an effective prompt should contain a brief translation that provides sufficient information for ChatGPT to process users' commands. This aligns with the principle of the functional approach to translation in translation teaching (Nguyen, 2023a, 2023b). This approach also holds value in translation in AI-supportive teaching contexts.

Room for ChatGPT's Translation Quality Improvement

While the students have highly favorable attitudes about the role of ChatGPT in facilitating their translation process, they showed divided opinions or even some suspicion of the quality of translations produced by ChatGPT. Some students acknowledged that ChatGPT translations, particularly those related to terminologies, were accurate, smooth, academic and advanced. However, the students claimed that ChatGPT translations were approximately 70-80 percent accurate, indicating that ChatGPT was not a perfect tool for producing accurate translations. The students explained this may have been due to ChatGPT's lack of attention to the context. Even though the students were trained to produce prompts with contextual clues, they may not have been proficient enough in creating more effective prompts due to short exposure time. Another claim could be related to ChatGPT's limited capabilities in translation, which was also reported in some studies (Alosaimi & Alawad, 2024; Lau et al., 2024). Translation into a low-resource language may require more improvement.

Another issue with ChatGPT's translation quality involves its ability to address stylistic and cultural translation challenges. ChatGPT still falls short in seeking stylistically and culturally appropriate solutions. Although ChatGPT can provide answers related to cultural aspects, including idioms, customs, and social norms, it may lack the cultural awareness necessary to comprehend human language, particularly abstract and complex ideas (Baskara, 2023). This may help explain why ChatGPT could not fully comprehend culture-embedded items in translation, which involves intricate aspects of language processing and meaning transfer. The inability of ChatGPT in cultural translation in this study aligns with the findings of Banat and Adla (2023), which indicate the need for translator intervention in translations, particularly those with cultural issues (Banat & Adla, 2023; Fan et al., 2023).

Students' Moderate Concerns about ChatGPT

In this study, students expressed moderate concerns about incorporating ChatGPT into their translation efforts. Some students tended to refrain from using it, opting instead for other, more efficient tools. Sahari et al. (2023) noted that those who reported similar concerns about students effectively using ChatGPT in their learning explained that ChatGPT cannot be compared to humans in terms of fine-

tuning and double-checking, which require critical thinking. The students were also concerned that the use of ChatGPT might have impacted their translation skill development and academic integrity.

In this study, ChatGPT was introduced to students with advanced translation skills who may enter the translation market after graduation. Technology skills can be an advantage for them in the technological era. Technological resistance is common among students who have not received formal training in translation technology. However, it is highly recommended that students be kept informed about translation technologies to stay up-to-date with changes in the field. This may have significant implications for integrating technology into the curriculum.

Students' Future Use with Prudence

Students' concerns about ChatGPT seemed to be linked to their intention of future use of ChatGPT. While they were excited and motivated to incorporate ChatGPT into their translation process, they demonstrated prudence in many aspects. They proposed that translator students should not depend on ChatGPT's results involving accuracy and expressions. Instead, they can cross-check with other tools or use effective prompts to produce better translations. In other words, ChatGPT and other tools should be considered as sources of reference. They said they should refine their translations in their own way, and that their translations should be personalised. They insisted that the role of human translation should not diminish, as humans can help address complex issues related to stylistic and cultural meanings. This finding is congruent with many studies that emphasise the irreplaceable role of humans in translation (Alkhawaja, 2024; Alosaimi & Alawad, 2024; Lau et al., 2024).

6. Conclusion and Implications

In general, the study demonstrated that ChatGPT is a valuable tool for enhancing students' translation skills and abilities. Students highly appreciate the application of ChatGPT in learning translation. Specifically, ChatGPT facilitates students' translation process and contributes to the production of high-quality translational products. However, concerns are recognized when ChatGPT is still a machine that may not be fully developed in terms of stylistics or accuracy. In addition, as ChatGPT can generate responses quickly and effectively, dependence and cheating are unavoidable when students use it in their translation learning. Therefore, teachers need to exercise caution when applying ChatGPT to teach translation.

Based on the research objectives, the findings indicate that ChatGPT can support translation learning, particularly in drafting and enhancing translation quality. However, differences in students' skills and perceptions highlight the need for clear guidance to ensure effective and ethical use. Concerns about accuracy and overreliance on AI emphasize the importance of fostering critical thinking and evaluative skills.

In light of these insights, it is recommended that AI literacy be integrated into translation curricula, supported by clear instructional guidelines. Workshops should be offered to train students in both the technical use and critical evaluation of AI tools, such as ChatGPT.

In summary, this study contributes to a growing understanding of the potential role of ChatGPT in translation learning. As an exploratory investigation, it offers initial insights and can be seen as a pioneering effort in this emerging field. However, this study is limited by its focus on two advanced translation courses, which were selected from a broader range of translation offerings at the university. Consequently, the findings should not be generalized to all translation students or learners at different

proficiency levels. Therefore, further research is necessary to enable educators and learners to integrate ChatGPT more effectively into translation instruction.

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