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APPLYING ARTIFICIAL INTELLIGENCE IN TEACHING GENERAL INFORMATICS AT TAN TRAO UNIVERSITY: CURRENT SITUATION AND SOLUTIONS

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ABSTRACT

In the context of educational digital transformation, integrating Artificial Intelligence (AI) into teaching and learning processes has become a global trend, offering opportunities to enhance the quality and effectiveness of higher education. General Informatics, a fundamental course for non-IT majors at Tan Trao University, plays a crucial role in equipping students with essential digital skills. However, conventional teaching methods are increasingly challenged by the diverse learning needs and technological expectations of today's students. This study aims to assess the current state of teaching General Informatics at Tan Trao University, explore the potential applications of AI in this context, and propose practical solutions for AI integration. Using a combination of literature review, data analysis, and field surveys, the paper identifies both the opportunities and barriers to AI adoption in classroom settings. The findings suggest that, despite infrastructural and human resource constraints, AI can significantly improve teaching efficiency, learner engagement, and personalized learning when implemented appropriately. The study provides strategic recommendations for educators and administrators to facilitate the effective application of AI in teaching General Informatics and foster a more innovative and adaptive educational environment.

Keywords: Artificial Intelligence (AI); General Informatics; Higher Education; Teaching Innovation; Tan Trao University; Digital Transformation; Educational Technology.

1. INTRODUCTION

In the era of rapid technological advancement and digital transformation, the subject of General Informatics plays a pivotal role in equipping university students—particularly those in non-IT majors—with essential digital competencies. At Tan Trao University, General Informatics is not merely a foundational course; it serves as a critical bridge that connects students with the practical use of technology in academic research, communication, and future employment. However, traditional teaching methods often face limitations in meeting the increasingly diverse and individualized learning needs of students.

In response to these challenges, Artificial Intelligence (AI) has emerged as a powerful catalyst for innovation in education worldwide. From intelligent tutoring systems and automated grading to personalized learning pathways and virtual teaching assistants, AI technologies are reshaping the landscape of higher education. In Vietnam, the movement to apply AI in university teaching is gaining attention, but actual implementation remains modest, particularly in regional

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institutions like Tan Trao University. This gap presents both a challenge and an opportunity for educational reform.

This paper aims to examine the current state of teaching General Informatics at Tan Trao University, identify the potential applications of AI within this context, and propose practical solutions to improve teaching quality through AI integration. By addressing both the opportunities and constraints of applying AI in the local educational environment, the study aspires to contribute valuable insights for educators, administrators, and policymakers committed to modernizing teaching practices in line with global trends.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Artificial Intelligence (AI) has emerged as a key driver of transformation across multiple sectors, and education is no exception. In a broad sense, AI refers to the development of computer systems capable of performing tasks that typically require human intelligence, such as reasoning, learning, perception, and decision-making. Within the educational landscape, AI is increasingly leveraged through technologies such as **machine learning**, **natural language processing**, **chatbots**, **virtual teaching assistants**, **automated grading systems**, and **personalized recommendation engines**. These innovations are designed to support teaching and learning by automating repetitive tasks, enhancing interactivity, and offering real-time, personalized support to students.

Among these, **machine learning** plays a foundational role by enabling systems to analyze vast amounts of educational data and identify patterns to improve instructional delivery and adapt content to individual learners. **Chatbots** and **virtual assistants**, for example, are now capable of answering students' questions, guiding them through lesson materials, and even providing motivation or reminders for task completion. In particular, **intelligent recommendation systems** have shown significant potential in suggesting learning resources tailored to a student's progress, interests, and cognitive style. Collectively, these technologies align with a larger pedagogical shift toward **adaptive and personalized learning environments**.

A growing body of scholarly work has explored the application of AI in education. According to Holmes et al. (2019), AI can be integrated into teaching strategies to provide immediate feedback, diagnose learning gaps, and create adaptive learning scenarios that respond dynamically to student inputs. In the context of computer science and informatics education, studies have shown that AI-driven tools—such as automatic code evaluators, algorithm visualizers, and collaborative AI tutors—can help improve students' understanding of abstract concepts, enhance programming skills, and foster problem-solving abilities. Research by Luckin et al. (2016) further emphasizes the role of AI in supporting both formal and informal learning by enabling continuous data collection and learning analytics that inform instructors about student progress in real time.

Despite these advancements, most successful implementations of AI in education are concentrated in technologically advanced institutions with strong digital infrastructures. Regional and smaller universities, such as Tan Trao University, face numerous challenges including limited funding, lack of human resources trained in AI, and the absence of standardized digital ecosystems. This underscores the need for context-sensitive strategies that take into account the specific constraints and opportunities of each institution.

The theoretical underpinning of this research also rests on the principles of **constructivist learning theory**, which emphasizes the active role of learners in constructing knowledge through

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experience, interaction, and reflection. This theory supports a **learner-centered approach**, where instruction is customized to the needs and interests of individual students rather than delivered in a one-size-fits-all manner. AI technologies, by virtue of their ability to collect and analyze learner data, serve as powerful enablers of this model. The integration of AI thus becomes not just a technical solution but also a pedagogical imperative to modernize teaching methods and respond effectively to the demands of 21st-century learners.

Furthermore, the move toward **technology-enhanced teaching** requires educators to adopt a new mindset and embrace continuous professional development. The successful application of AI in General Informatics at Tan Trao University will depend not only on the availability of tools but also on the readiness of instructors to adapt, innovate, and collaborate. This reinforces the importance of aligning AI deployment with comprehensive strategies for **curriculum design**, **teacher training**, and **institutional policy support**.

In summary, the literature and theoretical framework provide a strong foundation for exploring the potential of AI in the teaching of General Informatics. They reveal both the promise and the complexity of such an endeavor, calling for careful analysis, localized solutions, and sustained commitment from all educational stakeholders.

3. CURRENT SITUATION OF TEACHING GENERAL INFORMATICS AT TAN TRAO UNIVERSITY

General Informatics is a compulsory foundational course designed for first-year students across various non-IT majors at Tan Trao University. The course aims to provide learners with basic digital competencies, including computer literacy, information processing, internet usage, and an introduction to fundamental office and data tools such as Microsoft Office, cloud storage, and elementary programming logic. It plays a crucial role in equipping students with essential skills to meet academic and professional requirements in an increasingly digitized society. The course is offered across faculties such as Education, Social Sciences, Economics, and Agriculture, making it a common yet diverse teaching subject with varying learner profiles.

Currently, the predominant teaching model remains traditional in nature, relying heavily on lecture-based instruction complemented by demonstrations using projectors and computer labs. The primary tools used include PowerPoint presentations, textbooks, and basic hands-on exercises with Microsoft Office and simple database tools. While some lecturers have begun incorporating e-learning platforms like Google Classroom or Moodle to distribute materials and assign tasks, the use of more advanced technological solutions—particularly those involving AI—is still largely absent. Teaching tends to follow a one-size-fits-all approach, with limited differentiation or personalization of learning paths, which poses challenges in addressing the diverse capabilities and backgrounds of students.

In terms of **advantages**, instructors at Tan Trao University benefit from a relatively consistent curriculum structure and a motivated student base, particularly among those who recognize the importance of digital skills for their future careers. There is also institutional support for digital literacy and occasional professional development workshops for lecturers. Moreover, the availability of computer labs and a campus-wide internet system provides basic infrastructure for technology-enhanced learning.

However, a number of **challenges** persist. Class sizes are often large, making individualized support difficult to implement. Many students enter the course with varying degrees of prior exposure to computers—some are highly competent, while others struggle with basic

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operations. This heterogeneity hinders the efficiency of traditional teaching methods. In addition, some faculty members lack experience or training in integrating emerging technologies such as AI into their instructional design. The absence of a clear institutional strategy for digital transformation in teaching further exacerbates this issue.

To gain deeper insights into the readiness and expectations for AI application in General Informatics, a survey was conducted among both lecturers and students at Tan Trao University. The findings reveal that while awareness of AI in education remains limited, there is a **high level of interest and openness** to its adoption. Approximately 78% of students surveyed expressed enthusiasm about the idea of using AI tools to receive personalized learning recommendations, while 65% of lecturers acknowledged the potential of AI in improving assessment efficiency and learner engagement. However, both groups also cited concerns regarding infrastructure limitations, lack of training, and the need for institutional guidance and support in deploying AI tools effectively.

These results suggest a clear **opportunity** to innovate the delivery of General Informatics through the thoughtful integration of AI technologies. Nevertheless, successful implementation will require strategic planning, targeted investment in infrastructure and training, and a shift in pedagogical thinking toward more adaptive and student-centered approaches.

4. POTENTIALS AND CHALLENGES IN APPLYING AI TO THE TEACHING OF GENERAL INFORMATICS

The integration of Artificial Intelligence (AI) into the teaching and learning process of General Informatics at Tan Trao University is not merely a technological trend but a transformative opportunity that can redefine how digital literacy and fundamental computing skills are delivered across non-IT majors. As higher education worldwide embraces smart education, adaptive learning, and digital transformation, it is imperative to examine both the possibilities and the practical barriers of leveraging AI in this foundational course.

Currently, a growing number of AI-powered tools and platforms are readily available and applicable to the context of General Informatics. Tools such as **ChatGPT**, **Google Bard**, and **Claude AI** can assist students in understanding complex concepts through natural language queries and simulated dialogues. They can explain how to use software, suggest logical steps in problem-solving, or even simulate common troubleshooting scenarios. In programming-related tasks, **GitHub Copilot** serves as a coding assistant, offering real-time suggestions, auto-completions, and explanations for programming syntax and logic. **Automated assessment tools** such as Gradescope or AI-based quiz generators can facilitate immediate and objective feedback for multiple-choice questions, short answers, and even code submissions. Furthermore, **AI-powered Learning Management Systems (LMS)** can track students' progress, detect knowledge gaps, and offer tailored learning resources, creating a pathway toward **adaptive and personalized education**.

The **potential benefits** of applying AI in teaching General Informatics are vast and significant. One of the most important advantages is **personalized learning**, which allows students to engage with content that aligns with their current skill levels, learning pace, and preferred modalities. This is especially vital in a General Informatics course that serves students from multiple disciplines, many of whom may enter with vastly different levels of digital competency. AI systems can provide supplementary materials for slower learners while challenging more advanced students, thereby increasing overall course effectiveness.

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Another key benefit is **automated evaluation and feedback**, which not only reduces the workload for instructors but also enhances the learning process by giving students timely and specific guidance. For example, an AI system can detect recurring mistakes in spreadsheet formulas or Word formatting and offer instant tips for improvement. Additionally, **AI-facilitated student engagement**—through interactive bots, gamified learning modules, and simulated environments—can improve student motivation and reduce attrition in foundational courses that are often perceived as dry or overly technical.

Beyond academic performance, the use of AI also contributes to the **development of critical digital skills** and **technological fluency**, which are indispensable in the modern workforce. Students learn not only how to use digital tools but also how to interact with intelligent systems, evaluate algorithmic outputs, and consider ethical dimensions of AI—all of which are aligned with global education objectives for the 21st century.

However, despite the compelling advantages, **numerous challenges** remain that must be addressed for successful AI adoption at Tan Trao University. First and foremost is the issue of **infrastructure**. Many classrooms and computer labs may lack sufficient computing power, reliable internet connectivity, or modern operating systems capable of running AI tools efficiently. This infrastructure gap creates a fundamental barrier to implementation and must be resolved before AI integration becomes scalable.

Secondly, there exists a **significant skills gap among instructors**. While some lecturers are highly proficient in using digital technologies, many have had limited exposure to AI concepts and tools. Without targeted professional development programs, there is a risk that these technologies will either be underutilized or misapplied, resulting in suboptimal outcomes. The pedagogical shift from traditional to AI-enhanced learning also requires a rethinking of instructional design, assessment strategies, and teacher-student dynamics, which may be difficult for some faculty to navigate without adequate support.

Financial constraints represent another obstacle. Many AI platforms require subscription fees, cloud service payments, or specialized software licenses. Universities with tight budgets may find it challenging to prioritize AI investment without external funding or government support. Furthermore, maintaining AI systems often requires IT staff with specialized knowledge, adding to ongoing operational costs.

Importantly, **ethical and content-related concerns** also need to be considered. The use of generative AI in education raises valid questions about **academic honesty**, particularly in student submissions where AI may complete entire assignments without human input. Ensuring that AI is used to support learning rather than replace critical thinking is a delicate balance that requires clear usage policies, effective monitoring mechanisms, and the cultivation of students' digital responsibility. There are also concerns related to **data privacy**, **algorithmic transparency**, and **bias**, especially if the AI tools are trained on datasets not reflective of the local educational context or student population.

In conclusion, the integration of AI into the teaching of General Informatics offers a transformative opportunity for Tan Trao University, but it is not without risks or limitations. The benefits of personalization, efficiency, and engagement are compelling, especially for large and diverse student cohorts. However, realizing these benefits requires a systemic approach—one that addresses infrastructure gaps, builds faculty capacity, ensures financial sustainability, and upholds ethical standards. Only with a balanced, strategic, and human-centered implementation plan can

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AI truly enhance the teaching and learning of General Informatics in a way that is equitable, effective, and future-oriented.

5. PROPOSED SOLUTIONS

To effectively leverage Artificial Intelligence in the teaching of General Informatics at Tan Trao University, a comprehensive and multi-dimensional strategy must be adopted. The first and most fundamental step is to **raise awareness and enhance AI-related competencies** among both lecturers and students. Many faculty members are still unfamiliar with the operation and educational potential of AI tools. Therefore, it is essential to organize regular **training workshops, seminars, and professional development programs** that focus not only on the technical aspects of AI usage but also on pedagogical integration and ethical considerations. Simultaneously, students should be equipped with **basic digital literacy and AI interaction skills**, enabling them to use intelligent systems responsibly and effectively as part of their learning journey.

Secondly, the integration of AI tools should be carried out in a **flexible and context-sensitive manner**. Rather than applying a one-size-fits-all approach, instructors should tailor the use of AI to match the **diverse proficiency levels and learning styles** of students across different academic majors. For example, beginner students may benefit from AI-supported tutorials and guided learning paths, while more advanced learners could engage in exploratory projects using AI as a collaborative assistant. In this regard, **blended learning models**, combining traditional instruction with AI-enhanced activities, may offer an optimal solution that balances innovation with familiarity.

Third, the development of a **digital learning resource repository integrated with AI capabilities** is crucial. This repository should include instructional videos, interactive exercises, AI-powered quizzes, datasets, and case studies that align with the General Informatics curriculum. Embedding recommendation algorithms and intelligent search functions within the repository can guide students to the most relevant content based on their progress and interests, fostering autonomous learning and continuous engagement outside the classroom.

A pivotal recommendation is to **pilot AI-assisted teaching models** in selected classes or modules. This pilot phase should be carefully designed to test the effectiveness of different tools and methods, gather feedback from participants, and monitor learning outcomes. By conducting **systematic evaluation and reflection**, the university can identify best practices, adapt its strategies, and scale up successful approaches across the entire course or department.

Finally, it is imperative to **foster strategic partnerships** with technology companies, AI startups, and academic institutions that are actively researching or implementing AI in education. Such collaborations can provide access to cutting-edge tools, technical support, research findings, and even funding opportunities. Moreover, engaging in cross-institutional knowledge exchange can help Tan Trao University remain current with global educational trends and position itself as a forward-thinking institution in the digital era.

In summary, the proposed solutions focus on building human capacity, redesigning pedagogy, enhancing learning infrastructure, experimenting with innovation, and establishing collaborative ecosystems. Together, these efforts can lay a solid foundation for the successful and sustainable integration of AI into the teaching of General Informatics, ultimately improving learning quality and equipping students with critical digital skills for the future.

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6. CONCLUSION

The research has provided a comprehensive overview of the current state of General Informatics teaching at Tan Trao University, identifying both the achievements and limitations in existing pedagogical practices. Through a detailed analysis of the potential and challenges of Artificial Intelligence integration, it becomes evident that AI holds tremendous promise in transforming the way Informatics is taught and learned. Tools such as intelligent tutoring systems, automated assessment platforms, and personalized learning agents can greatly enhance engagement, efficiency, and learner autonomy. At the same time, barriers such as digital infrastructure, ethical concerns, and skill gaps among instructors and students must be strategically addressed.

The findings underscore the **urgent need for innovation** in General Informatics education through AI adoption. In the context of increasing digitalization and the growing importance of computational thinking across all disciplines, integrating AI is not merely an option but a necessity for aligning with the future of higher education. For a university like Tan Trao that serves a diverse student population, the thoughtful application of AI offers a powerful means to **individualize instruction, optimize learning outcomes, and foster digital competence** among non-IT majors.

Looking forward, future research should focus on the **design, implementation, and evaluation of specific AI-supported instructional models**. This includes conducting experimental teaching trials using tools such as ChatGPT, Copilot, or AI-based assessment systems, and systematically measuring their impact on student learning, motivation, and academic performance. By combining empirical evidence with technological advancement, Tan Trao University can become a pioneer in the application of AI in Informatics education, contributing both to national education reform and global innovation in teaching practices.

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