

# Assessment of the current situation and proposals for improving the teaching quality of linear algebra for the information technology department at Tra Vinh University

*Tran Quang Ha*

*Master Tra Vinh University*

*Received: 2/12/2024; Accepted: 9/12/2024; Published: 12/12/2024*

**Abstract:** *This article focuses on assessing the current situation and proposing solutions to improve the teaching quality of Linear Algebra for the Information Technology Department at Tra Vinh University. Currently, traditional teaching methods, limited infrastructure, and insufficient learning materials are the main challenges. To address these issues, it is necessary to innovate teaching methods by integrating information technology tools such as Maple and GeoGebra while encouraging active learning. Additionally, increasing investment in infrastructure, developing online learning resources, and enhancing the qualifications of lecturers through specialized training and international exchange programs are essential.*

**Keywords:** *Linear algebra, information technology, Teaching Quality*

## 1. Introduction

Linear Algebra is a crucial subject in the university curriculum, particularly in the field of Information Technology. However, teaching and learning this subject face numerous challenges, including difficulties in accessing theoretical content, the dryness of lessons, and the lack of resources for independent study. In this article, I will assess the current situation and propose solutions to improve the teaching quality of Linear Algebra for the Information Technology Department at Tra Vinh University.

## 2. Research Content

### 2.1. Current State of Teaching Linear Algebra

#### *Traditional Teaching Methods*

Many instructors still rely on traditional teaching methods, focusing on delivering theoretical content and assigning academic exercises. This approach is primarily implemented through classroom sessions, where the instructor is the central figure delivering one-way knowledge. Meanwhile, students passively absorb information through note-taking and completing assignments given by the instructor.

Although traditional methods provide systematic knowledge, they lack flexibility and interactivity in the learning process. Students tend to passively receive information without being encouraged to engage in critical thinking or propose creative problem-solving methods. This situation often leads to boredom, a loss

of motivation, and difficulty in seeing the practical applications of the subject.

#### *Limitations in Infrastructure and Technology*

Currently, Tra Vinh University has invested in infrastructure to support modern teaching methods, but certain aspects related to mathematics in general and Linear Algebra in particular remain underdeveloped. Investments in infrastructure and teaching support technology are not yet comprehensive or consistent. Visual aids such as specialized software, interactive boards, or other teaching aids remain limited. This affects the effectiveness of lessons, as students lack opportunities to engage with modern learning tools.

Moreover, the inconsistency in learning resources is a significant issue. Students often rely solely on classroom lecture materials and a few limited outlines, without access to diverse resources like tutorial videos, online lectures, or interactive visualization tools. This limitation reduces students' ability to study independently and conduct research.

#### *Student Challenges*

Students frequently face challenges in understanding abstract and specialized concepts, such as vector spaces, matrices, determinants, and homogeneous equations. These topics require a high level of logical thinking and interdisciplinary skills, which many students are not adequately prepared for.

Additionally, many students lack motivation in

their studies. The monotony of traditional teaching methods and the lack of clear practical applications of the subject result in less effective learning. Over time, this situation negatively affects academic performance and the ability to apply knowledge in future careers.

## **2.2. Solutions to Improve the Teaching Quality of Linear Algebra**

Nguyen Van Cuong (2009) emphasized, “Vietnam is undergoing a fundamental and comprehensive reform of education. In this process, teachers play a pivotal role, as they are directly responsible for guiding and managing learning processes. The question arises: How can subjects contribute to teachers’ efforts in educational innovation?”

Educational innovation is always necessary to align with the advancements in science, technology, and socioeconomic development. Below are some proposed solutions to enhance the overall quality of teaching and specifically the teaching of Linear Algebra.

### ***Innovating Teaching Methods***

#### ***Integrating Information Technology:***

The integration of information technology in teaching Linear Algebra has become an essential trend in the context of digital transformation. Software tools such as Matlab, Maple, and GeoGebra provide powerful utilities for visually illustrating concepts like vector spaces, matrices, and linear equations. These tools not only help students deeply understand the subject but also encourage creative thinking in proposing new approaches.

#### ***Active Learning:***

Active learning methods encourage students to actively participate in the learning process through group exercises, discussions, and small projects. This approach allows students to gain knowledge not only from lecturers but also from peers and real-life situations.

#### ***Examples:***

**Matrix Problem-Solving Workshop:** Students are assigned to construct a large matrix using economic data and calculate its inverse using Maple. For example, students may collect revenue data from companies over several years, represent it as a matrix, and then analyze its inverse to understand the impact of various factors on revenue. This helps students practice skills like data collection, processing, and applying mathematical concepts in real-life contexts.

**Vector Analysis in Geology:** In this project,

students analyze vectors in a geological environment using GeoGebra. The vectors may represent attributes such as drilling directions, pressure, or stress levels. Students use simulated data to construct vectors for each geological layer and create graphical illustrations of vector distribution in 3D space.

**Python Programming for Linear Systems:** Students develop Python programs to solve systems of linear equations and visualize results using charts.

Such activities not only help students connect with the practical applications of the subject but also improve their logical thinking, teamwork, and independent research skills.

### ***Enhancing Infrastructure and Resources***

#### ***Developing Learning Resources:***

Building a comprehensive and rich digital resource repository significantly contributes to improving teaching quality. These resources may include online lecture videos, electronic references, and practice exercises for self-study.

The repository should be designed to be flexible and user-friendly. Online lecture videos should include dynamic illustrations, logical structures, and systematic content to attract and engage learners. References should include specialized textbooks, research papers, summaries, and regularly updated materials to ensure utility.

Additionally, investing in storage platforms and learning management systems (LMS) enhances the distribution and accessibility of resources. LMS platforms also allow lecturers to monitor students’ learning progress, helping to improve teaching methods accordingly.

#### ***Equipping Modern Facilities:***

Equipping classrooms with modern facilities is a critical factor in meeting the demands of digital learning.

Smart classrooms equipped with interactive boards, multimedia devices, and advanced presentation tools encourage interaction and innovation in teaching methods.

Specialized labs with professional software and modern equipment are essential for practical courses in Information Technology, natural sciences, and engineering.

Such facilities allow students to practice, explore, and apply theoretical knowledge in real-life situations.

#### ***Enhancing Faculty Capacity***

Improving faculty capacity is one of the most critical tasks for every educational institution. In

the context of educational reform, lecturers not only need to enhance their professional expertise but also master modern teaching methods, apply information technology, and stay updated with international trends.

#### *Specialized Training:*

Specialized training programs for lecturers are necessary to ensure they meet the requirements of teaching in the digital era. Short-term training courses on modern teaching methods are an effective way to improve communication skills and foster creative thinking in classrooms. These courses should include techniques such as flipped classrooms, project-based learning, and blended teaching methods.

#### *Experience Sharing:*

Creating opportunities for lecturers to share experiences through professional activities is equally important.

Participation in domestic and international seminars helps lecturers stay updated on educational trends and exchange knowledge with experts.

Faculty exchange programs with other universities at home and abroad provide lecturers with new insights and innovative teaching practices.

#### *Collaborative Research:*

Engaging in collaborative research projects at home and abroad helps lecturers improve their expertise, develop teamwork skills, and build professional relationships. These activities also connect lecturers with research organizations and industries, fostering future collaboration opportunities.

#### ***The following are the results of the experimental class conducted by the author:***

The results of the first assessment of academic performance for the two classes, DA24TTA and DA24TTB, before applying active teaching methods to improve teaching quality are as follows: Excellent 0%, Good 7%, Fair 15%, Average Good 23%, Average 50%, Poor 5%.

The results of the second assessment of academic performance for the two classes, DA24TTA and DA24TTB, after applying active teaching methods to improve teaching quality are as follows: Excellent 9%, Good 17%, Fair 25%, Average Good 27%, Average 22%, Poor 0%.

In summary, enhancing faculty capacity is a long-term effort that requires a combination of specialized training and experience sharing. When equipped with both modern teaching methods and advanced professional skills, lecturers become key contributors to the educational reform process.

### **3. Conclusion**

Improving the quality of Linear Algebra instruction requires a synchronized approach that combines innovative teaching methods, enhanced infrastructure investment, and the professional development of lecturers. These solutions play a vital role in meeting the increasing learning demands and helping students achieve optimal academic outcomes.

Teaching methods need to be improved to encourage analytical thinking and self-directed learning among students. Modern classrooms should be equipped with interactive devices to facilitate effective learning. Additionally, a rich digital resource repository, including lectures, videos, and online exercises, enhances students' ability to learn independently.

Lecturers should participate in training programs on modern teaching methods and information technology skills.

By implementing these solutions in a coordinated manner, students will not only gain a solid understanding of knowledge but also develop essential professional skills for their future careers.

### **References**

1. Bui Xuan Hai, Tran Ngoc Hoi, Trinh Thanh Deo, Le Van Luyen (2010). *Linear Algebra and Applications*. Ho Chi Minh City National University Publishing House.
2. Beites, P. D. and A. P. Nicolás (2013). *Peer Instruction in Linear Algebra*. In *Proceedings of ICERI2013 Conference, Seville*, pp. 6629–6639
3. Berry, F. C., P. S. DiPiazza, and S. L. Sauer (2003). *The future of electrical and computer engineering education*. *IEEE Transactions on Education*. 46(4): 467–476.
4. Hershkovitz, A., Noster, N., Siller, S., & Tabach, M. (2024). *Learning analytics in mathematics education: The case of feedback use in a digital classification task on reflective symmetry*. *Zdm*, 56(4).
5. Love, B., A. Hodge, N. Grandgenett, and A. Swift. 2014. Student learning and perceptions in a flipped linear algebra course. *International Journal of Mathematical Education in Science and Technology*. 45(3): 317–324.
6. Nguyen Van Cuong (2009). *Modern Educational Theory*. Pedagogical University Publishing House.
7. Nguyen Thi Minh Phuong, Pham Thi Thuy, Le Viet Chung (2022). *Handbook of Pedagogical Methods*. General Publishing House of Ho Chi Minh City.