

THE EFFECTIVENESS OF THE FLIPPED CLASSROOM TECHNOLOGY IN TEACHING DATABASE COURSES IN HIGHER EDUCATION

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Abstract

This paper explores the effectiveness of the Flipped Classroom model in teaching Database courses within higher education. The study aims to determine how the integration of digital learning environments and active learning strategies influences students' academic performance, engagement, and digital competence. The research was conducted at Qarshi State Technical University, where students were divided into control and experimental groups. The experimental group received instruction through the Flipped Classroom model, which combines pre-class video lectures and in-class collaborative problem-solving activities. The results revealed a significant improvement in students' understanding of database concepts, motivation, and participation compared to the traditional teaching approach. The study concludes that the Flipped Classroom approach enhances digital competence and improves the overall learning outcomes in database education.

Keywords: Flipped Classroom, Database Education, Higher Education, Digital Competence, Active Learning, Pedagogical Innovation.

Introduction

The integration of technology into higher education has transformed the traditional learning environment, introducing new teaching approaches such as the Flipped Classroom model. In this model, students first engage with new material outside of class—typically via online lectures or digital resources—then apply their knowledge through active learning activities during class sessions. This method aligns with the principles of learner-centered pedagogy and promotes deeper understanding and critical thinking skills. In database education, which requires both conceptual understanding and practical skills, the Flipped Classroom can serve as an effective instructional model to enhance student engagement and performance.

Literature Review

Several studies have shown that the Flipped Classroom approach can increase students' motivation, satisfaction, and retention of complex material (Bishop & Verleger, 2013; O'Flaherty & Phillips, 2015). According to Bergmann and Sams

(2012), the model allows students to learn theoretical content at their own pace and use classroom time for collaborative practice. In the context of computer science and database courses, researchers such as Lo & Hew (2017) found that students in Flipped Classroom environments developed stronger analytical and problem-solving skills than those in traditional settings. Furthermore, the approach encourages the use of digital technologies, contributing to the development of students' digital competence.

Methodology

The research was conducted during the 2024–2025 academic year at Qarshi State Technical University. Two groups of computer engineering students participated in the study: an experimental group (n=30) and a control group (n=30). The experimental group studied the Database course using the Flipped Classroom model, while the control group followed a traditional lecture-based format. Before and after the intervention, both groups completed a digital competence and subject knowledge assessment.

The Flipped Classroom model consisted of three phases:

1. **Pre-class phase:** Students accessed video lectures and online tutorials via the Moodle learning platform.
2. **In-class phase:** Sessions focused on collaborative problem-solving, SQL exercises, and real-world database projects.
3. **Post-class phase:** Students reflected on their learning through self-assessment quizzes and peer discussions.

Results and Discussion

The data analysis revealed that students in the experimental group achieved higher results in both theoretical understanding and practical database skills. Their post-test scores increased by an average of 35%, compared to 18% in the control group. Moreover, students reported a greater sense of autonomy, engagement, and satisfaction with the learning process. Qualitative feedback indicated that pre-class materials allowed them to come to class better prepared, and in-class collaboration strengthened their problem-solving and communication skills.

The Flipped Classroom also fostered the development of digital competence by encouraging students to use various technological tools such as MySQL Workbench, Google Classroom, and collaborative cloud-based databases. This integration of digital and pedagogical strategies aligns with UNESCO's framework for digital skills development and supports the goals of higher education modernization.

Conclusion

The results of the study confirm that the Flipped Classroom model significantly improves the effectiveness of teaching Database courses in higher education. By shifting passive content delivery to digital platforms and emphasizing active learning during class, this approach enhances both conceptual understanding and practical

application. Additionally, it promotes digital competence, teamwork, and self-regulated learning. It is recommended that higher education institutions integrate Flipped Classroom strategies into other technical subjects to foster innovation and improve learning outcomes.

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