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BILINGUAL MATHEMATICS AS A TRANSDISCIPLINARY PRACTICE IN ENGINEERING EDUCATION: A CASE STUDY FROM UKRAINE

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Abstract. The paper analyzes students' attitudes toward a bilingual higher mathematics course at a technical university. Based on a survey of 89 students, it explores motivation, challenges, and perceived benefits of learning mathematics in English. The study reveals high interest and motivation among students, identifies linguistic and methodological barriers, and suggests practical recommendations for effective implementation of bilingual mathematics instruction.

Keywords: bilingual education, higher mathematics, EMI (English as a Medium of Instruction), engineering education.

Rezumat. Lucrarea analizează atitudinea studenților față de un curs bilingv de matematică superioară într-o universitate tehnică. Pe baza unui sondaj realizat în rândul a 89 de studenți, sunt examinate motivația, dificultățile și avantajele percepute ale studiului matematicii în limba engleză. Studiul relevă interesul și motivația ridicată a studenților, identifică barierele lingvistice și metodologice și oferă recomandări practice pentru implementarea eficientă a instruirii bilingve la matematică.

Cuvinte cheie: învățământ bilingv, matematică superioară, EMI (Engleza ca mijloc de instruire), educație inginerească.

Introduction

Globalization and the internationalization of education demand a revision of teaching methods and learning environments in technical universities. English, as a global lingua franca, has become a vital component of professional competence for engineers. The Bologna Process encourages academic mobility and competitiveness of graduates, prompting Ukrainian universities to harmonize curricula with European standards.

Bilingual (English – Ukrainian) education offers an effective approach to developing intercultural and professional skills. In bilingual courses, English serves not only as a subject of study but as a medium of instruction (EMI – English as a Medium of Instruction). Although EMI in technical fields is still developing in Ukraine, we are seeing its growing importance and the need to adapt methodologies to local contexts[1; 2].

This study [3] focuses on students' perceptions of a bilingual higher mathematics course at the National University Zaporizhzhia Polytechnic. The aim is to identify the students' motivation, perceived advantages, and challenges of learning mathematics in English, and to formulate recommendations for improving bilingual instruction in technical education.

Methods

The research was conducted among 89 first-year students of the Electrical Engineering Faculty at Zaporizhzhia Polytechnic University during 2021–2024. Participants included both students enrolled in the bilingual (English-medium) higher mathematics course and those studying in Ukrainian.

Data were collected through surveys distributed via Google Forms and email. The questionnaire included multiple-choice, single-choice, open-ended questions, and Likert-scale items to assess motivation, attitudes, and perceived difficulties. Participation was voluntary and anonymous.

Quantitative data were analyzed descriptively, focusing on the distribution of responses across key indicators such as awareness of bilingual learning, motivation to enroll, self-assessed English proficiency, and evaluation of the bilingual course. Qualitative responses were grouped thematically to identify recurring trends and issues.

Results

The survey revealed a generally positive attitude toward bilingual learning. Over 92% of respondents were familiar with the concept of bilingual education, and 76% believed that bilingual instruction provides advantages for future professional careers. About 84% of students supported the idea of a bilingual mathematics course.

However, only 38% considered their English proficiency sufficient to study mathematics bilingually, reflecting a common concern about language barriers. Despite this, most students reported that initial difficulties diminished after several months of study.

The main motivations for enrolling in the bilingual course included:

– better career and educational opportunities (100% of bilingual group respondents),
– improvement of specialized English competence (82.7%),
– enhancement of general English proficiency (65.5%).

At the end of the course, nearly 90% of students described it as “interesting” or “very interesting”. They emphasized the value of developing both mathematical and linguistic competence. Students particularly enjoyed solving problems and communicating in English, learning terminology, and engaging with authentic materials.

The main challenges identified were:

– lack of mathematics textbooks in English suitable for Ukrainian students (82.8%),
– insufficient classroom hours due to slower pacing (48.3%),
– limited prior knowledge of subject-specific English (34.5%).

Discussion

The findings indicate that students recognize the value of bilingual mathematics education in enhancing both subject mastery and English-language skills. The dual focus supports their professional growth and international competitiveness.

Nevertheless, several structural and methodological issues hinder full implementation. The shortage of localized English-language resources makes it difficult to align international materials with the Ukrainian curriculum. Differences in mathematical notation, problem styles, and terminology require teachers to adapt materials carefully.

Effective bilingual instruction depends not only on language proficiency but also on the pedagogical expertise of mathematics instructors. Collaboration between mathematics and English teachers is essential [4]: while the former provide disciplinary knowledge, the latter enhance communicative and linguistic support.

Despite limitations such as the small sample size and the single-institution context, the study offers valuable insights. The results highlight the need for institutionally supported bilingual programs, professional development for instructors, and creation of specialized teaching materials that bridge linguistic and disciplinary gaps.

Conclusion

Bilingual instruction in higher mathematics at technical universities is both feasible and beneficial. Students show strong motivation and interest, recognizing the importance of English for their academic and professional success. Key challenges – such as limited resources and slower learning pace – can be mitigated through joint teaching strategies, improved materials, and teacher training.

Further research should expand the sample and explore long-term effects of bilingual mathematics learning on students' professional competence and subject knowledge [5]. Integrating EMI approaches across other technical disciplines could foster a more globally oriented and linguistically competent generation of engineers.

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