TECHNOLOGY FOR ORGANIZING EXPERIMENTAL WORK TO DEVELOP COMMUNICATIVE SKILLS OF FUTURE ROAD ENGINEERS

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Annotation: *this article presents the technology for organizing experimental work aimed at developing and enhancing communication skills for students in the field of road engineering education. The main goal of the research is to develop communication, expression of ideas, and teamwork skills—key components of professional competence for future engineers—through the use of modern technologies in the educational process*
Keywords: *road engineer, communication skills, experimental work, educational technology, interactive method, digital tools.*
Annotatsiya: *ushbu maqolada yo‘l muhandisligi ta’lim yo‘nalishi talabalari uchun kommunikativ ko‘nikmalarni shakllantirish va rivojlantirishga doir tajriba-sinov ishlarini tashkil etish texnologiyasi bayon qilingan. Tadqiqotning asosiy maqsadi bo‘lajak muhandislarning kasbiy kompetensiyasida muhim o‘rin tutuvchi muloqotga kirishish, fikrni ifodalash va jamoada ishlash ko‘nikmalarini ta’lim jarayonida zamonaviy texnologiyalar asosida rivojlantirishdan iborat.*
Kalit so‘zlar: *yo‘l muhandisi, kommunikativ ko’nikma, tajriba-sinov, ta’lim texnologiyasi, interaktiv metod, raqamli vositalar.*
Аннотация: *В статье описывается технология организации опытно-экспериментальной работы по формированию и развитию коммуникативных умений у студентов направления подготовки «Инженер-дорожник». Основная цель исследования – развитие коммуникативных навыков, умения выражать свои мысли и работать в команде, которые являются важными в профессиональной компетентности будущих инженеров, с использованием современных технологий в образовательном процессе.*
Ключевые слова: *инженер-дорожник, коммуникативные навыки, эксперимент, образовательные технологии, интерактивный метод, цифровые инструменты.*

Introduction. In today’s era of globalization and digital transformation, specialists working in technical fields are required not only to possess high-level professional

knowledge and skills, but also strong communicative competence. This is especially relevant for engineers involved in the design, construction, and operation of highways, whose activities often necessitate effective interaction with other specialists, clients, project teams, and the public. Therefore, during the training process of future road engineers, special attention must be paid to developing and enhancing their communication skills.

Current educational curricula place primary emphasis on acquiring professional-technical knowledge. However, it is often observed that students receive insufficient preparation in areas such as communication culture, speech style, teamwork, and the ability to express ideas both orally and in writing. This lack of preparation leads to difficulties in their practical activities, such as solving problematic situations, presenting technical documents, or working efficiently in teams.

As a result, the development of modern approaches aimed at fostering the communicative competence of future road engineers—particularly through the creation of a practical technology based on experimental studies—has become a pressing scientific and practical issue.

This article specifically addresses the issue of developing communicative skills and presents a scientifically grounded explanation of the content, stages, and effectiveness of the technology for organizing experimental work aimed at this goal.

Today, the processes of designing, constructing, and operating highways demand a high level of both professional and communicative preparedness. A road engineer must not only be capable of solving technical problems but also of establishing effective communication with various specialists and clearly and concisely expressing their thoughts. Therefore, developing communication skills among students studying in the field of road engineering is one of the most urgent challenges.

The research problem lies in the fact that the current education system lacks sufficiently systematized methodological approaches for developing the communicative competence of future road engineers.

Methodology and literature used. Communication skills play a crucial role in the professional training of future road engineers. This is because modern engineering activities require not only technical knowledge, but also effective communication, teamwork, negotiation, and presentation skills. Therefore, addressing this issue is of high relevance for today’s educational system.

The problem has been widely studied within the fields of pedagogy and psychology by both international and local scholars. For example:

Russian educators such as V.A. Kan-Kalik, I.A. Zimnyaya, and E.G. Azimov have extensively analyzed pedagogical communication and the culture of professional dialogue.

Contemporary education researchers like J. Hattie and R. Marzano emphasize in their studies that the quality of communication between teachers and students directly influences the effectiveness of education.

Among Uzbek scholars, D.Sh. Abdullayeva, B. Hasanov, M. Sa'dullayeva, and N. Akhmedova have developed both theoretical and practical approaches for fostering communicative skills through interactive methods.

However, there remains a lack of systematic technology specifically designed to develop professional communicative skills tailored to students in the field of road engineering. While general pedagogical approaches exist, they do not sufficiently consider the unique characteristics of road engineering education—such as working with technical terminology, presenting projects, writing technical reports, and collaborating within multidisciplinary teams.

Current educational programs at the undergraduate level rarely include lessons, training sessions, or specialized modules and assignments directly aimed at developing communication skills. As a result, students face challenges in engaging in effective communication during real-world professional activities.

Therefore, this research offers a novel approach focused on addressing these gaps by developing a technology for improving the communicative skills of future road engineers through experimental and trial-based practices.

Analysis and Results. The main objective of the experimental work was to determine the level of development of communication skills among students studying road engineering and to assess the effectiveness of educational and training activities based on interactive and digital technologies.

The experiment was conducted at the Faculty of Engineering at Namangan State University, involving 60 third-year students. The students were divided into two groups: the experimental group (30 students) and the control group (30 students).

At the beginning of the experiment, the following indicators of communicative competence among students were evaluated:

Table 1

Type of Skill	**Experimental Group (points)**	**Control Group (points)**
Clear expression of ideas	2.8	2.9

Explanation of technical concepts	2.5	2.6
Teamwork	2.6	2.7
Presentation skills	2.3	2.4

Average grade: 2.55

An 8-week special course was organized with the experimental group. The following methods were used in the lessons:

- Discuss technical problems in a group using pinboard and fishbone techniques;
- Deliver presentations in real communication situations by analyzing clusters and problem situations;
- Sharing ideas and preparing presentations using digital tools (Google Jamboard, Padlet, Mentimeter);

Reflection and analysis phases were introduced after each lesson.

According to the final assessment results, after 8 weeks of training, the final diagnosis showed the following results:

Table 2

Type of Skill	**Experimental Group (points)**	**Control Group (points)**
Clear expression of ideas	4.3	3.0
Explanation of technical concepts	4.1	2.8
Teamwork	4.4	3.1
Presentation skills	4.5	3.0

Average score: Experimental group — 4.33, Control group — 2.97

The results showed the following:

- Training sessions organized through interactive and digital approaches significantly improved students' communication skills, articulate their ideas, explain technical concepts in simple language, and give presentations;
- Group work, active participation in questions and answers, and discussion of different opinions served to increase the social activity of students.

In the control group, where traditional teaching methods were used, there was no significant increase in skills, which proves the superiority of modern methodological approaches.

Conclusion. The formation and development of communicative skills in the professional training of future road engineers is an integral part of modern engineering education. The results of the conducted experimental work showed that special training sessions organized on the basis of interactive and digital technologies led to a significant increase in students' communicative competence.

The study confirmed the following:

1. Methodological approaches aimed at developing communication skills are important in improving the skills of future road engineers, such as clearly and fluently explaining technical concepts, making presentations, and working with a team.
2. Teaching methods using pinboards, fishbone, role-playing, problem situations, and digital applications activate students and create conditions for them to express their thoughts freely and logically.
3. The effectiveness of lessons based on innovative technologies is higher than that of traditional approaches, indicating that these results can be widely applied in educational practice.

On this basis, to systematically develop the communication skills of future road engineers:

- Inclusion of special modules and tasks aimed at developing communicative competence in curricula;
- Organizing training sessions based on interactive and digital tools;
- It is advisable to introduce methodological approaches that allow students to actively participate in a communicative environment close to practical situations.

By implementing this technology in practice, not only will students' knowledge and skills be enriched, but their professional readiness and social adaptability in society will also increase.

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