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DEVELOPMENT OF PROFESSIONAL COMPETENCIES OF ACADEMIC LYCEUM STUDENTS THROUGH VOCATIONAL- ORIENTED INFORMATICS EDUCATION USING TELECOMMUNICATION TECHNOLOGIES

Choriyev Bekzod Abdirakhmonovich
Teacher of Nuristan Academic Lyceum

Abdurakhmonov Mukhtor Khujayarovich
Associate Professor of Samarkand State Pedagogical Institute

Abstract

The development of professional competencies among students is one of the important objectives of modern education, especially in the context of rapid digital transformation. Informatics education plays a significant role in preparing students for future professional activities by developing their digital literacy, problem-solving skills, and ability to apply information technologies in practical situations. This research examines the effectiveness of vocational-oriented teaching of informatics based on the application of telecommunication technologies among academic lyceum students. The research employed diagnostic questionnaires, pedagogical observation, practical assignments, independent learning activities, and statistical analysis methods. The level of professional competence formation was evaluated according to motivational, cognitive, activity-based, and reflective criteria.

Keywords: Informatics education, professional competence, telecommunication technologies, vocational orientation, academic lyceum students, digital learning, pedagogical experiment.



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1. Introduction

In the modern educational environment, digital technologies have become one of the main factors influencing the transformation of teaching and learning processes. The rapid development of information technologies requires educational institutions to reconsider traditional approaches and introduce innovative methods aimed at preparing students for professional activities. In this context, informatics education is not limited to teaching computer literacy but serves as an important tool for developing analytical thinking, creativity, and professional competencies.

Academic lyceums occupy a significant position in the national education system because they provide students with specialized knowledge and prepare them for further professional education. Therefore, improving the content and methodology of informatics teaching in academic lyceums is an important pedagogical task.

Professional competence formation requires not only theoretical knowledge but also the ability to apply acquired knowledge in practical situations. In informatics education, this means students should be able to use software tools, work with digital resources, solve professional problems, and independently develop technological solutions.

The use of telecommunication technologies provides new opportunities for organizing educational activities. Through digital platforms, online resources, and communication technologies, students can access educational materials, collaborate, and develop independent learning skills. Such technologies contribute to increasing students' motivation and improving the connection between theoretical knowledge and practical activities.

The problem of developing professional competencies among students through informatics education has been studied by many researchers. However, the issue



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of organizing vocational-oriented informatics education in academic lyceums through systematic integration of telecommunication technologies remains relevant.

The purpose of this study is to determine the effectiveness of a vocational-oriented informatics teaching methodology based on telecommunication technologies and to analyze its influence on the formation of students' professional competencies.

To achieve this goal, the following objectives were defined:

- to analyze the theoretical foundations of vocational-oriented informatics education;
- to identify criteria for evaluating students' professional competencies;
- to organize pedagogical experiments in academic lyceums;
- to analyze experimental results and determine the effectiveness of the proposed methodology.

2. Materials and Methods. The research was conducted using theoretical analysis, pedagogical experiment, observation, questionnaire survey, and statistical processing methods.

The experimental activities were organized during the 2022–2023, 2023–2024, and 2024–2025 academic years. The research process consisted of three main stages: diagnostic, exploratory, and formative stages. The collected data were processed using mathematical and statistical methods, including analysis through Microsoft Excel software.

The experimental base included three academic lyceums:

- Academic Lyceum of Bukhara State Pedagogical University;
- Academic Lyceum of Samarkand Institute of Economics and Service;
- Nuriston Academic Lyceum under Karshi State Technical University.



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A total of 396 respondents participated in the study. The experimental group consisted of 199 students, while the control group included 197 students.

To evaluate the formation of professional competencies, four main criteria were selected.

The motivational criterion reflected students' interest in acquiring new knowledge and their professional orientation. The cognitive criterion assessed the level of theoretical informatics knowledge. The activity-based criterion focused on students' ability to apply acquired knowledge in practical tasks. The reflective criterion evaluated students' ability for self-development and self-assessment.

During the experiment, students studied selected informatics modules using telecommunication technologies. Their knowledge development, practical abilities, and professional competence indicators were measured before and after the implementation of the methodology.

3. Results

The results of the pedagogical experiment demonstrated that the application of vocational-oriented informatics education supported by telecommunication technologies contributed to the improvement of students' professional competencies.

During the initial diagnostic stage, the level of students' competencies in both experimental and control groups was analyzed. The obtained data indicated that a significant proportion of students had theoretical knowledge of informatics, but experienced difficulties in applying this knowledge to practical professional tasks. In particular, students demonstrated insufficient skills in independent problem-solving, effective use of digital resources, and practical application of telecommunication technologies.



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After the implementation of the developed teaching methodology, noticeable differences were observed between the experimental and control groups. Students involved in the experimental group demonstrated higher levels of professional competence formation due to the systematic use of interactive digital resources, practical assignments, and telecommunication-based educational activities.

The results showed that the integration of telecommunication technologies increased students' motivation toward informatics learning. Students became more interested in practical tasks related to information technologies, demonstrated greater independence in completing assignments, and showed a higher level of responsibility for their learning outcomes.

The cognitive indicators also improved significantly. Students who participated in the experimental methodology demonstrated better understanding of informatics concepts, digital technologies, and their professional applications. The use of electronic educational resources and online communication tools helped students consolidate theoretical knowledge through practical activities.

The activity-based criterion showed positive changes as well. Students improved their ability to work with software applications, analyze information, solve technical problems, and apply informatics knowledge in situations related to future professional activities.

The reflective criterion also demonstrated improvement. Students developed the ability to evaluate their own learning results, identify difficulties, and independently search for solutions. This indicates that the applied methodology contributed not only to knowledge acquisition but also to the development of students' self-learning skills.

According to the experimental results, the level of professional competence formation in the experimental group increased compared with the control group.



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The obtained indicators confirmed the effectiveness of using telecommunication technologies in vocational-oriented informatics education.

The analysis of practical training results showed that students in the experimental group achieved higher performance in laboratory activities. The methodology helped create conditions for combining theoretical knowledge with practical experience and developing professional skills necessary for future specialists.

4. Discussion

The obtained results confirm that vocational-oriented teaching of informatics through telecommunication technologies is an effective approach for developing students' professional competencies. The findings demonstrate that modern educational technologies can significantly influence students' motivation, cognitive activity, and practical abilities.

One of the important aspects identified during the research is that informatics education should not be limited to theoretical knowledge. In the conditions of digital transformation, students need to acquire practical skills that allow them to use information technologies for solving real professional problems. Therefore, the educational process should combine theoretical instruction with practical activities based on digital tools.

The use of telecommunication technologies creates additional opportunities for organizing interactive learning. Students can access educational materials, communicate with teachers and classmates, participate in online discussions, and complete practical assignments regardless of time and location. This contributes to the development of independent learning abilities and digital competence.

The research results also show that professional orientation in informatics education increases students' understanding of the practical significance of the



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subject. When students understand the connection between informatics knowledge and future professional activities, their motivation to learn increases. At the same time, the implementation of digital technologies requires appropriate pedagogical conditions. Teachers should have sufficient digital competence and methodological preparation to effectively integrate telecommunication technologies into the educational process. Without proper pedagogical organization, technology itself cannot guarantee educational effectiveness.

The obtained results are consistent with the general tendency of modern education development, where digital technologies are considered not only as technical tools but also as instruments for improving educational quality and developing students' professional abilities.

The study confirms that the proposed methodology can be effectively applied in academic lyceums to improve informatics education and prepare students for further professional development.

5. Conclusion

The conducted research demonstrated that vocational-oriented informatics education based on telecommunication technologies provides effective opportunities for developing professional competencies among academic lyceum students. The developed methodology contributes to strengthening the connection between informatics education and students' future professional activities. Through the use of telecommunication technologies, students gain opportunities to work with digital resources, solve practical problems, and develop competencies required in the modern labor market.

The research findings indicate that the modernization of informatics education should focus not only on introducing new technologies but also on developing effective teaching methods that ensure meaningful interaction between students,



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teachers, and digital learning environments. Therefore, the application of telecommunication technologies in vocational-oriented informatics education can be considered an important factor in preparing competitive, digitally competent specialists.

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