ENHANCING THE TEACHING OF MICROSOFT EXCEL TO SECONDARY SCHOOL STUDENTS THROUGH LOCAL AREA NETWORK TECHNOLOGIES

Karimov Kayum Mamashayevich

Republic of Uzbekistan, Karshi State University,

Professor of the Department of Algorithms and Programming Technologies

Qayum_km@mail.ru

Annotation. *The rapid development of information and communication technologies (ICT) has significantly transformed modern education systems. This study investigates the pedagogical effectiveness of using Local Area Networks (LAN) in teaching Microsoft Excel to secondary school students. The research aims to evaluate how network-based learning environments improve students' practical skills, collaboration, and engagement. A quasi-experimental design was employed, involving control and experimental groups. The experimental group was taught using LAN-supported instruction, while the control group followed traditional teaching methods. Data were collected through observations, performance assessments, and student feedback. The findings reveal that LAN integration enhances interactive learning, accelerates skill acquisition, and fosters collaborative problem-solving. The study concludes that LAN-based teaching strategies are highly effective in improving students' digital literacy and recommends broader implementation in school curricula.*

Keywords. *Local Area Network (LAN), Microsoft Excel, secondary education, ICT integration, collaborative learning, digital competence, educational technology.*

Аннотация. *Быстрое развитие информационно-коммуникационных технологий (ИКТ) значительно изменило современные системы образования. В данном исследовании изучается педагогическая эффективность использования локальных сетей (ЛС) при обучении учащихся средних школ*

работе с Microsoft Excel. Цель исследования — оценить, как сетевые среды обучения улучшают практические навыки, навыки сотрудничества и вовлеченность учащихся. Использовался квазиэкспериментальный дизайн с контрольной и экспериментальной группами. Экспериментальная группа обучалась с использованием ЛС, в то время как контрольная группа следовала традиционным методам обучения. Данные собирались посредством наблюдений, оценки результатов и отзывов учащихся. Результаты показывают, что интеграция ЛС повышает интерактивность обучения, ускоряет приобретение навыков и способствует совместному решению проблем. Исследование приходит к выводу, что стратегии обучения на основе ЛС весьма эффективны в повышении цифровой грамотности учащихся и рекомендует более широкое внедрение в школьные программы.

Ключевые слова. *ЛС, Microsoft Excel, среднее образование, интеграция ИКТ, совместное обучение, цифровая компетентность, образовательные технологии*

Annotatsiya. *Axborot-kommunikatsiya texnologiyalarining (AKT) jadal rivojlanishi zamonaviy ta’lim tizimini sezilarli darajada o‘zgartirdi. Ushbu tadqiqot o'rta maktab o'quvchilariga Microsoft Excel dasturini o'rgatishda local tarmoqlardan (LAN) foydalanishning pedagogik samaradorligini o'rganadi. Tadqiqot tarmoqqa asoslangan o'quv muhiti o’quvchilarning amaliy ko'nikmalarini, hamkorlikni va faolligini qanday yaxshilashini baholashga qaratilgan. Nazorat va eksperimental guruhlarni o'z ichiga olgan kvazi-eksperimental dizayn qo'llanildi. Eksperimental guruh LAN-qo'llab-quvvatlanadigan ko'rsatmalar yordamida o'qitilgan, nazorat guruhi esa an'anaviy o'qitish usullariga amal qilgan. Ma'lumotlar kuzatishlar, ish faoliyatini baholash va o’quvchilarning fikr-mulohazalari orqali to'plangan. Natijalar shuni ko'rsatadiki, LAN integratsiyasi interaktiv ta'limni kuchaytiradi, ko'nikmalarni egallashni tezlashtiradi va muammolarni birgalikda hal qilishga yordam beradi. Tadqiqot LAN-ga asoslangan o'qitish strategiyalari o'quvchilarning raqamli savodxonligini oshirishda yuqori samarali degan xulosaga keldi va maktab o'quv dasturlariga kengroq joriy qilishni tavsiya qiladi.*

Kalit so'zlar. *Lokal tarmoq (LAN), Microsoft Excel, o'rta ta'lim, AKT integratsiyasi, hamkorlikda o'rganish, raqamli kompetentsiya, ta'lim texnologiyasi*

Introduction. The integration of ICT into education has become a fundamental requirement in the 21st century. Schools are increasingly expected to prepare students not only with theoretical knowledge but also with practical digital skills. Among essential digital tools, Microsoft Excel plays a critical role in data management, analysis, and visualization.

However, traditional teaching approaches often rely on passive instruction, limiting students' hands-on experience. In contrast, the use of Local Area Networks (LAN) enables a more interactive and collaborative learning environment. Through LAN, teachers can efficiently manage classroom activities, distribute resources, and monitor student progress in real time.

This study explores the role of LAN in improving the teaching and learning process of Microsoft Excel in secondary education.

The theoretical foundation of this research is based on constructivist learning theory and collaborative learning principles. Constructivism emphasizes that learners actively construct knowledge through experience and interaction. LAN-based environments support this by enabling students to engage in shared tasks and problem-solving activities.

Additionally, social learning theory suggests that students learn more effectively through interaction with peers. LAN facilitates communication and teamwork, making it an ideal tool for implementing collaborative learning strategies.

Numerous studies have examined the role of ICT in education. Research indicates that technology-enhanced learning environments improve student motivation and academic performance.

Key findings from previous studies include:

- ICT integration increases student engagement and participation;
- Collaborative learning improves problem-solving abilities;
- Network technologies enable efficient classroom management.

Despite these advancements, there is limited research specifically focusing on the use of LAN in teaching spreadsheet applications such as Microsoft Excel. This study aims to fill this gap.

Research Methodology.A quasi-experimental design was adopted, involving two groups:

- Control group: taught using traditional methods;
- Experimental group: taught using LAN-based instruction.

The study involved secondary school students aged 14–16. Both groups had similar academic backgrounds to ensure fairness.

The following methods were used to collect data:

- Classroom observations;
- Practical tests (Excel assignments);
- Questionnaires;
- Teacher feedback.

The LAN-based classroom included:

- A central teacher computer (server);
- Student workstations;
- Classroom management software;
- File-sharing systems.

The integration of LAN in teaching MS Excel was carried out through structured activities:

The lesson was organized by introducing the Excel interface and demonstrating formulas and functions.

Interactive methods of real-time screen sharing and rapid file distribution were used.

In the practical session, students completed tasks such as creating spreadsheets, applying formulas (SUM, AVERAGE, IF), and creating charts and graphs.

The comparative analysis showed significant differences between the two groups.

Students in the experimental group achieved higher scores in practical assessments. Their ability to apply Excel functions was notably improved.

LAN-based instruction increased student participation. Learners were more active and motivated during lessons.

Students developed teamwork skills by working on shared tasks and projects.The results confirm that LAN integration creates a more dynamic and effective learning environment. The ability to share resources instantly and monitor student activities enhances both teaching and learning processes.

However, some challenges were identified:

- Technical issues (network instability);
- Need for teacher training in ICT;
- Initial infrastructure costs.

Addressing these challenges is essential for successful implementation.

Conclusion. This study demonstrates that the use of Local Area Networks significantly enhances the teaching of Microsoft Excel in secondary schools. LAN-based instruction improves student engagement, practical skills, and collaborative abilities.

The research supports the broader adoption of ICT tools in education and highlights the importance of modernizing teaching methodologies to meet current educational demands.

Recommendations. Teachers should receive ICT training, Curriculum developers should include network-based learning strategies, Future research should explore integration with cloud technologies.

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