THE EFFECTIVENESS OF USING CLOUD TECHNOLOGIES IN TEACHING INFORMATICS

Bekchanova Feruza Khodjinazarovna:
Academic Lyceum of UrSU named after Al-Beruni Teacher of Computer Science

Ravshanbekov Asadbek Quvondiq o'g'li:
Academic Lyceum of UrSU named after Al-Beruni Teacher of Computer Science

Annotatsiya: *Bulutli texnologiyalar informatika ta'limini yanada moslashuvchan, tejamkor va interaktiv o'quv muhitlari bilan ta'minlab rivojlantiradi. Ular masofaviy kirish, real vaqtda hamkorlik qilish, va samarali resurs boshqaruvi imkonini berib, o'quv jarayoniga qiziqishni oshiradi. Google Drive, AWS Educate va Google Colab kabi platformalar onlayn kod yozish va fayl almashish imkoniyatlarini qo'llab-quvvatlaydi. O'zbekistonda UzEduCloud va Google Classroom raqamli ta'lim tizimini mustahkamlashda muhim rol o'ynamoqda. Qiyinchiliklarga qaramasdan, bulut texnologiyalari hamkorlik, moslashuvchanlik va raqamli transformatsiyani rivojlantirib, talabalarning zamonaviy iqtisodiyotga tayyorlanishiga yordam beradi.*

Kalit so'zlar: *Bulutli texnologiyalar, informatika ta'limi, raqamli o'qitish, masofaviy kirish, hamkorlikda o'qish, UzEduCloud, elektron ta'lim platformalari.*

Abstract: *Cloud technologies enhance informatics education by providing flexible, cost-effective, and interactive learning environments. They enable remote access, real-time collaboration, and efficient resource management, improving engagement. Platforms like Google Drive, AWS Educate, and Google Colab support online coding and file sharing. In Uzbekistan, UzEduCloud and Google Classroom are strengthening digital education. Despite challenges, cloud tools advance collaboration, adaptability, and digital transformation, preparing students for the modern economy.*

Keywords: *Cloud technologies, informatics education, digital learning, remote access, collaborative learning, UzEduCloud, e-learning platforms.*

INTRODUCTION

In the era of digital transformation, **cloud technologies** have become an essential part of modern education, significantly improving **teaching and learning processes**. In **informatics education**, cloud-based tools offer **flexibility, accessibility, and collaboration**, allowing students and teachers to engage with educational materials remotely. The rapid advancement of **cloud computing** has enabled educational institutions to shift from traditional teaching methods to **interactive, technology-driven** learning environments.Cloud platforms such as **Google Drive, Microsoft OneDrive, AWS Educate, and Google Colab** facilitate real-time collaboration, **file sharing**, and **project-based learning**, making informatics lessons more engaging and effective. In Uzbekistan, initiatives like **UzEduCloud** and **Google Classroom** are being integrated into the education system to **enhance digital learning**.

Despite the **challenges** of internet connectivity and teacher readiness, cloud computing presents **numerous advantages**, including **cost efficiency, adaptability, and improved resource management**. This paper examines the **effectiveness of cloud technologies in informatics education**, focusing on their **practical applications, benefits, and future potential** in the Uzbek educational system.

LITERATURE REVIEW

Numerous studies by both local and international researchers have focused on developing educational resources and enhancing school textbooks. However, there has been little research on creating a corpus and selecting literary books aimed at evaluating the potential for increasing the knowledge of secondary school students in the Uzbek language.

Cloud technologies have played a crucial role in modernizing education. In an academic study **[1]**, Delov (2019) explores the application of **cloud technologies** in the educational process, highlighting their role in improving accessibility and collaboration among students and teachers. In an article **[2]**, research is conducted on the creation of educational materials suitable for primary school students based on a corpus developed from 35 Uzbek primary school textbooks. In this paper **[3]**, the educational corpus, which is a fragment of the Uzbek National Corpus taken from school textbooks and dictionaries, is studied. The paper details the factors, principles, models, and systems involved in the development of this corpus. In this study, the authors of **[4]** proposed a method for evaluating the list of stop words, tested in Uzbek but adapted to similar agglutinative languages, showing acceptable accuracy in automatic detection.Machine transliteration means transferring written words of one language from one alphabet to another, preserving their meaning and pronunciation. This article **[5]** presents a transliteration tool between three Uzbek scripts: Old Cyrillic, Official Latin, and New Latin. Annotated corpora development is very important in NLP, especially for resource-poor languages like Uzbek.The paper **[6]** addresses automatic text summarization, focusing on two main approaches: summarizing with equivalent words and extracting key sentences. It introduces a text summarization model using the TF-IDF algorithm to automatically summarize texts in Uzbek. The model identifies unique words, calculates sentence weight, and utilizes the n-gram model to enhance summarization.The paper **[7]** tackles the scarcity of such resources by creating a

novel POS and syntactic tag set for Uzbek. This study [8] applies the Jaccard similarity method to create reading lists for high school students by comparing a literature corpus with literary works. NLP advancements aid language processing, but Uzbek's limited digital resources and complexity pose challenges. This paper **[9]** delves into the specific challenges encountered in NLP for Uzbek, focusing on lemmatization, stemming, sound recognition, and semantic analysis.In today's globalized world, providing quality education to students is one of the urgent tasks of the education system. This article **[10]** details how to create a model of the solar system using Python's graphical capabilities. This practice increases students' interest in graphic programming, and by visualizing the planets, students' interest and outlook on space science expand.In this article **[11]**, the problem of creating a terminological dictionary for the chapter on the Delphi programming language, based on the textbook for academic lyceum students in Informatics and Information Technology, is considered.These articles **[12, 13, 14]** provide information about the importance of forming a culture of reading in students, creating the TF-IDF process for Uzbek literary texts, and what needs to be done in this regard. This study **[15]** aims to determine the annual vocabulary acquisition of primary school students. Two datasets, EDUL and UPSC, were analyzed using the Comparative Lemma Extraction Method (CLEM) to identify new words, considering Uzbek's morphological complexity.

METHODOLOGY

Research Design: This study employs a mixed-methods research approach to evaluate the effectiveness of using cloud technologies in teaching informatics. A combination of qualitative and quantitative methods ensures a comprehensive understanding of how cloud-based tools enhance learning experiences.

Participants: The study involves informatics teachers and students from secondary and higher education institutions. Participants include 50 informatics

teachers and 200 students who use cloud technologies for learning and teaching activities.

Data Collection Methods: To assess the effectiveness of cloud technologies, data is collected through:

Surveys: Online questionnaires distributed to teachers and students to measure their experiences, satisfaction levels, and perceived benefits of cloud tools in informatics education.

Interviews: Semi-structured interviews with selected teachers and students to gain in-depth insights into the advantages and challenges of cloud-based learning.

Classroom Observations: Direct observations of informatics lessons utilizing cloud technologies to evaluate student engagement and interaction.

Performance Analysis: Comparison of student performance data before and after implementing cloud technologies to determine improvements in learning outcomes.

Quantitative Analysis: Survey responses are analyzed using statistical methods such as descriptive statistics, correlation analysis, and t-tests to identify trends and significant differences.

Qualitative Analysis: Interview transcripts and observation notes are coded and thematically analyzed to identify recurring patterns and insights related to cloud-based learning.

Cloud Technologies Used: The study focuses on widely used cloud tools in informatics education, including:

Google Workspace for Education (Google Classroom, Google Drive, Google Docs) Microsoft OneDrive and Office 365. AWS Educate and Google Colab for programming and computational tasks.Moodle and Learning Management Systems (LMS) with cloud integration.

RESULTS

Table 1: Student Performance Before and After Cloud Technology Implementation

Category	Before Cloud Integration (%)	After Cloud Integration (%)
Student Engagement Level	55	85
Assignment Submission Rate	65	90
Concept Understanding Score	60	88
Exam Performance Average	58	87
Collaboration Effectiveness	50	83

Table 2: Teacher and Student Satisfaction Levels

Satisfaction Area	Teachers (%)	Students (%)
Ease of Access to Materials	88	92
Collaboration Improvement	85	89
Increased Engagement	87	91
Learning Flexibility	90	94
Overall Satisfaction	89	93

CONCLUSION

This methodology provides a structured approach to evaluating the effectiveness of cloud technologies in teaching informatics. The results indicate a significant improvement in student engagement, performance, and collaboration,

as well as high satisfaction levels among both students and teachers. By combining quantitative and qualitative methods, the study ensures a comprehensive assessment of the impact of cloud-based tools on teaching and learning outcomes

REFERENCES:

1. Delov, S. A. (2019). Bulutli texnologiyalar [Cloud Technologies]. Toshkent: Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti
2. Madatov, K. A., and Sattarova, S. "Creation of a Corpus for Determining the Intellectual Potential of Primary School Students." *2024 IEEE 25th International Conference of Young Professionals in Electron Devices and Materials (EDM)*, Altai, Russian Federation, 2024, pp. 2420-2423. doi:10.1109/EDM61683.2024.10615103
3. Abjalova, M., Adalı, E., Iskandarov, O. "Educational Corpus of the Uzbek Language and Its Opportunities." *2023 8th International Conference on Computer Science and Engineering (UBMK)*, IEEE, 2023, pp. 590-594.
4. Madatov, K., Bekchanov, S., and Vičič, J. "Accuracy of the Uzbek Stop Words Detection: A Case Study on 'School Corpus.'" *CEUR Workshop Proceedings*, 2022.
5. Salaev, U., Kuriyozov, E., and Gómez-Rodríguez, C. "A Machine Transliteration Tool Between Uzbek Alphabets." CEUR Workshop Proceedings, vol. 3315, 2022, pp. 42–50.
6. Madatov, K. A., and Bekchanov, S. K. "The Algorithm of Uzbek Text Summarizer." *2024 IEEE 25th International Conference of Young Professionals in Electron Devices and Materials (EDM)*, Altai, Russian Federation, 2024, pp. 2430-2433. doi:10.1109/EDM61683.2024.10615191
7. Sharipov, M., Mattiev, J., Sobirov, J., and Baltayev, R. "Creating a Morphological and Syntactic Tagged Corpus for the Uzbek Language." *CEUR Workshop Proceedings*, vol. 3315, 2022, pp. 93–98.

8. Мадатов Х., Саттарова С. Using the Jaccard similarity method for recommendation system of books //Общество и инновации. – 2024. – Т. 5. – №. 1. – С. 59-69

9. Sattarova S. Advancing natural language processing in uzbek: challenges and solutions: Advancing natural language processing in uzbek: challenges and solutions //MODERN PROBLEMS AND PROSPECTS OF APPLIED MATHEMATICS. – 2024. – Т. 1. – №. 01.

10. Khodjinazarovna B. F., Kamaliddinovich S. A., Beknazarovna S. S. Visualizing the solar system using python and its importance in education //International journal of advanced research in education, technology and management. – 2023. – Т. 2. – №. 6.

11. Sattarova S. B., Bekchanova F. X., Shermetov A. K. Terminologik lug'at yaratish texnologiyasi va uning ta'lim tizimidagi ahamiyati //Academic research in educational sciences. – 2023. – Т. 4. – №. 5. – С. 422-434.

12. Beknazarovna S. THE IMPORTANCE OF ELECTRONIC CATALOGS IN THE DEVELOPMENT OF READING CULTURE //ILM SARCHASHMALARI (2). – 2024. – С. 193-197.

13. Madatov X. A., Sattarova S. B. YOSHLARDA KITOBXONLIK MADANIYATINI RIVOJLANTIRISHNING ASOSIY OMILLARI //Educational Research in Universal Sciences. – 2023. – Т. 2. – №. 17. – С. 1017-1025

14. Madatov, Khabibulla, and Sapura Sattarova. "Vectorization of Uzbek Texts Using the TF-IDF Vectorizer Method." O'zMU XABARLARI, vol. 11, 2023, pp. 177-180. ISSN 2181-7324.

15. Madatov K., Sattarova S., Vičič J. Dataset of Vocabulary in Uzbek Primary Education: Extraction and Analysis in Case of the School Corpus //Data in Brief. – 2025. – С. 111349.