

ICT's Impact on Teaching Information Technologies in Albanian Secondary Schools Through an Empirical Study

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ABSTRACT: *This study presents an empirical investigation into the effects of Information and Communication Technology (ICT) integration in the pedagogical approaches adopted by secondary school teachers in Albania, specifically focusing on the teaching of information technologies. Through a meticulously designed assessment, data was collected and analyzed to ascertain the impact of ICT utilization on teaching methodologies. The research involved a cohort of secondary school teachers actively engaging with ICT tools and platforms to deliver information technologies education. Findings revealed noteworthy enhancements in instructional delivery, resource accessibility, and interactive learning experiences resulting from ICT integration. Furthermore, the study identified challenges and areas requiring further attention to optimize ICT's potential in fostering enriched learning environments. The outcomes of this research provide valuable insights and implications for teachers, policymakers, and stakeholders seeking to advance educational practices by leveraging ICT tools in teaching information technologies at the secondary level in Albania.*

KEYWORDS: ICT, Education, e-Learning platforms, teaching

INTRODUCTION

The education and preparation of young individuals represent pivotal aspects fundamental to the progress of any society. In our current digital epoch, the incessant advancements in information and communication technology have notably influenced our daily lives, professional landscapes, and educational paradigms. Albania has experienced significant strides in embracing technological innovations, particularly in the development of information systems crucial across diverse areas, including the natural sciences.

Recognizing the transformative power of technology in education, the integration of information technologies into the learning process emerges as a paramount endeavor. Students entering educational domains, especially in information technologies and programming, often exhibit limited familiarity, necessitating extended periods for adaptation. Notably, a bridge between pre-university education and technological exposure could substantially expedite this learning curve and enhance students' preparedness.

This scientific research project aims to construct an innovative instructional model leveraging Information and Communication Technologies (ICT) to teach information technologies. This project follows a systematic methodology, commencing with comprehensive data collection and analysis. Subsequent phases involve the development of a specialized platform, driven by empirical insights, designed explicitly to facilitate the teaching of information technologies. Through this comprehensive investigation, this study aims to contribute nuanced perspectives and practical insights to enhance the integration of technology into educational practices, specifically focusing on the culmination of this research paper.

RESEARCH METHODOLOGY

Research approach

The research methodology for this study encompassed a multifaceted approach aimed at comprehensively evaluating the existing teaching methods of information technologies using ICT. The initial phase involved organizing meetings with teachers to gather their perspectives, challenges, and current practices in teaching information technology subjects. Following these discussions, a detailed questionnaire was meticulously prepared and administered to collect quantitative and qualitative data. This questionnaire was instrumental in assessing the teachers' preferences and requirements regarding ICT platforms for teaching information technology subjects. Simultaneously, an in-depth investigation was conducted to research the platforms currently used for similar educational objectives. This exploration sought to understand the strengths, weaknesses, and functionalities of existing platforms in the context of teaching information technology subjects using ICT.

Based on insights derived from both the questionnaire responses and the platform research, a range of platform options were proposed. The selection process involved a thorough analysis of these options, considering their capabilities in optimizing the teaching process for information technology subjects. The aim was to choose a platform that effectively addressed identified challenges, streamlined content

Publication of the European Centre for Research Training and Development-UK delivery, and aligned closely with the teachers' educational objectives. Ultimately, the chosen platform aimed to serve as an efficient and engaging tool to enhance the pedagogical approach for teaching information technology subjects using ICT.

Sampling methodology

The process of determining an appropriate sample size for the questionnaire utilized in this study followed the Cochran formula (Nundy, 2022), specifically designed for populations with large volumes and aiming for a reliability coefficient of 95%. The formula used is as follows:

$$n_0 = \frac{0.25z^2}{e^2}$$

Where:

- z represents the z-value, which denotes the tabular value of the normal distribution and is 1.96 for a confidence level of 95%.
- e denotes the margin of error, set at 5% or 0.05.
- n_0 signifies the initial sample size calculation based on these parameters.

However, given that our study involves a finite population, the modified Cochran formula was employed to adjust the sample size accordingly:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

In this equation, \bar{n} represents the adjusted sample size for finite populations, while \bar{N} represents the actual population size.

By employing this methodology, we aimed to ascertain an optimal sample size that would ensure the survey results' reliability, maintaining a 95% confidence level with a 5% margin of error. This calculated sample size was crucial in ensuring that the obtained data was sufficiently representative of the entire population, thereby enhancing the validity and credibility of the research outcomes.

RESULTS

As part of the project's objectives aimed at evaluating the existing situation, extensive data collection was conducted through questionnaires administered to both teachers and students. The focus of this section revolves around the analysis of the information gathered from the teachers' questionnaire.

A total of 338 teachers actively participated by completing the questionnaire. This sample size, determined through rigorous sampling techniques aligned with the Cochran formula, was calculated to be sufficient for validating the results within an acceptable margin of error. The robustness of this sample size was carefully established to ensure the reliability and representativeness of the obtained data in reflecting the broader teacher population under study.

The analysis of the questionnaire reveals that 65% of respondents are female teachers, with the majority aged between 31-40 years (35%) and coming from districts like Fier, Korca, and Tirana (each around 20%). Approximately 60% teach in rural schools, while 40% teach in urban settings. Most teachers (85%) teach Grade X, and many also teach Grades XI and XII. Around 80% have attended training sessions, often self-financed (50%).

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Teachers commonly use Microsoft Office, Adobe Photoshop, Scratch, and Dev-C++ software. Teaching mainly occurs in labs, occasionally in classrooms. While appreciating the existing ICT curriculum, educators highlight the need for updates and more current resources.

They express interest in further training in programming languages, web programming, and databases, each with varying levels of interest.

DISCUSSION

Within the structured questionnaire distributed to teachers, a distinct section was exclusively dedicated to probing the application and utilization of Information and Communication Technology in the teaching process. This section sought to gain comprehensive insights into the extent and manner in which teachers integrated technological tools in their instructional practices, particularly concerning ICT-related subjects.

The questionnaire section focused on various dimensions related to ICT integration, encompassing the use of digital resources, software applications, online platforms, and collaborative tools in the teaching methodologies adopted by teachers. Specifically, it aimed to gauge the frequency and proficiency with which teachers utilized ICT for content delivery, resource sharing, collaborative project development, test creation, student evaluation, and overall classroom interaction.

Analysis of the responses revealed a consistent theme: a considerable gap existed in the active application of ICT tools and platforms within the teaching of ICT-related subjects. Teachers' feedback underscored challenges stemming from limited access to suitable technological solutions that could comprehensively address their multifaceted teaching needs.

This particular section's findings further reinforced the identified necessity for an integrated platform that could efficiently amalgamate various teaching activities under a single, user-friendly interface. The feedback obtained in this section played a pivotal role in steering the direction of the proposed solution—highlighting the urgent need for an optimal technological platform that could enhance teaching methodologies and address the prevailing limitations associated with ICT integration in the educational landscape.

In subsequent sections of this report, the examination and selection process of suitable platforms will be detailed, ensuring alignment with the specific needs and challenges identified through this crucial section of the questionnaire.

Implication to research and practice

The quest for an optimal solution to address the identified challenges surrounding the integration of Information and Communication Technology (ICT) in teaching ICT-related subjects led to an extensive research initiative. This research aimed to meticulously assess various available platforms, comparing their features and capabilities to identify the most suitable option.

A. Research for Suitable Platforms

A comprehensive research endeavor was undertaken to survey and scrutinize a spectrum of platforms available for educational purposes. This involved an in-depth exploration of renowned educational platforms, analysing their functionalities, usability, adaptability, and alignment with the specific requirements outlined in the questionnaire responses from teachers.

B. Comparative Analysis

Platforms meeting the predefined criteria underwent a rigorous comparative analysis. This phase involved a systematic evaluation of their features, including content sharing capabilities, collaborative project development tools, test creation functionalities, student assessment modules, supporting of programming languages, infrastructure that they need for the implementation and overall suitability in addressing the identified challenges faced by teachers.

C. Selection of the Most Suitable Platform

Following an exhaustive evaluation and comparison process, a platform emerged as the most suitable candidate. This selection was predicated on its ability to effectively bridge the gap identified in the teaching process of ICT-related subjects. The chosen platform demonstrated unparalleled functionalities, offering a holistic suite of tools aimed at enhancing pedagogical practices and fostering an environment conducive to interactive and modern teaching methodologies.

D. Rationale for Platform Selection

The selection of this platform was guided by its comprehensive feature set, aligning seamlessly with the specific needs delineated by teachers in the questionnaire responses. Its versatility, user-friendly interface, and robust functionalities stood out as pivotal factors in the decision-making process, ensuring an optimal solution to elevate the teaching of ICT-related subjects to new heights.

Table 1. Platforms comparison

No	Platform	Programming languages	Infrastructure (cloud or not)	Cost	Comments regarding the implementation
1	YPS	Object-oriented	No	Free	Manually, adding users and every update requires management
2	Github classroom (Hsing, 2019)	Object-oriented	Yes	Free	Easy, requires support for the staff
3	Code Accademy	All	Yes	Yes	Easy, requires support for the staff
4	Replit	All	Yes	Free for education	Only editor
5	Codeaid	All	Yes	Yes	Requires Visual Studio
6	AlgoExpert	Object-oriented	Yes	Yes	Easy, requires support for the staff

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7	Coderpad	All	Yes	Yes	Easy, requires support for the staff
8	Codility	All	Yes	Yes	Easy, requires support for the staff
9	Codeboard	All	Yes	Free	Easy, requires training for teachers
10	Codesignal	All	Yes	Yes	Easy, requires training for teachers
11	Canvas LMS	LMS	Yes	Free-trial	Easy, user-friendly
12	Kahoot	LMS	Yes	Yes	For assessment

Platform testing and implementation

After a thorough evaluation process, the Codeboard platform emerged as the chosen solution for addressing the identified gaps in teaching ICT-related subjects. Several decisive factors contributed to the selection of Codeboard for implementation:

- Cost-effectiveness - Codeboard, being a free platform, aligned with the project's budgetary constraints without compromising essential functionalities.
- User-Friendly Interface - Its intuitive interface ensured ease of use, facilitating teachers' adaptation to the platform's features.
- Cloud-Based Infrastructure - Codeboard's cloud-based nature eliminated the necessity for specific physical infrastructure, allowing seamless access from any device with internet connectivity.

To facilitate a smooth transition and ensure effective utilization of the Codeboard platform, a series of preparatory measures were undertaken:

- Individual accounts were configured for participating teachers, granting them access to the Codeboard platform.
- Comprehensive training session was conducted to familiarize teachers with the platform's functionalities and navigation.
- A detailed manual was meticulously prepared, serving as a comprehensive guide for using Codeboard. This resource was tailored to assist teachers in navigating the platform, ensuring they could refer to it for guidance even after the training sessions.

Recognizing the varying levels of technological familiarity among teachers, particular emphasis was placed on the clarity and comprehensiveness of the training sessions. The manual was structured systematically, offering step-by-step instructions and visual aids to aid understanding, empowering teachers to leverage the platform effectively.

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This comprehensive approach aimed not only to introduce teachers to the platform but also to equip them with the necessary skills and resources to integrate Codeboard seamlessly into their teaching methodologies.

In the subsequent sections, the outcomes of the testing phase and the impact of Codeboard on the teaching process will be analyzed, shedding light on its effectiveness in enhancing the teaching of ICT-related subjects.

Impact assessment and evaluation

The evaluation of the Codeboard platform's impact on teaching ICT-related subjects involved a structured approach to gauge its effectiveness in transforming teaching methodologies and enhancing student engagement. This section encapsulates the findings obtained from the testing phase, data analysis, and observations made during the implementation of the platform.

A. Testing Phase with Teachers

The testing phase served as a pivotal period for teachers to interact with the Codeboard platform, integrating its functionalities into their instructional practices. During this phase, teachers actively explored and utilized the platform's tools to facilitate teaching activities.

B. Data Collection and Analysis

Quantitative and qualitative data collection methods, including surveys, feedback forms, and structured observations, were employed to gather insights into the platform's impact. These data were subjected to rigorous analysis to derive meaningful interpretations regarding the platform's influence on teaching methodologies.

C. Analysis of Findings

The collected data underwent comprehensive analysis, focusing on key performance indicators such as content delivery efficiency, student engagement, learning outcomes, and overall satisfaction levels among teachers.

D. Impact on Teaching Methodologies

Initial assessments indicated a noticeable shift in teaching methodologies post-Codeboard implementation. Teachers reported increased efficiency in content delivery, enhanced collaborative project creation, and streamlined assessment processes enabled by the platform.

E. Student Engagement and Learning Outcomes

Observations highlighted a positive correlation between Codeboard usage and heightened student engagement. The interactive nature of the platform exhibited potential for fostering conducive learning environments, potentially impacting improved learning outcomes in ICT-related subjects.

F. Feedback and Suggestions

Valuable feedback from teachers provided insights into the platform's strengths and areas for enhancement. Suggestions were recorded to further optimize the platform's effectiveness in supporting teaching activities.

1 Conclusion

The comprehensive assessment undertaken in this study has shed light on critical areas warranting attention and improvement within the infrastructure and methodologies surrounding the teaching of ICT-related subjects in high schools.

Several key observations emerged from this study:

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- The study identified significant shortcomings in the infrastructure supporting the development of ICT subjects in high schools. Notably, deficiencies in functional laboratories were evident, with a substantial number of schools lacking these facilities altogether.
- Teachers demonstrated a clear need for additional training, particularly in specialized areas such as programming, web programming, and database management. The study highlighted a gap in the teachers' skill set, necessitating focused training programs to bridge these knowledge gaps effectively.
- Teachers expressed a need for supplementary literature and resources essential for lesson development. The study emphasized the importance of providing teachers with adequate resources to facilitate the creation and delivery of comprehensive ICT lessons.
- An inherent need for an online platform tailored specifically for teaching ICT subjects surfaced during the study. This demand underscores the necessity for a robust and user-friendly platform to enhance the teaching and learning experiences in ICT education.
- The study revealed the necessity of extending similar assessments and initiatives to encompass 9-year-old schools. This expansion seeks to address deficiencies and implement improvements in ICT education within a broader educational spectrum.

Future research

In summary, the findings from this study serve as a clarion call for immediate and strategic interventions. Addressing infrastructure inadequacies, providing targeted educator training, ensuring resource availability, and developing an online platform tailored for ICT education stand as imperative steps toward fostering a more robust and effective teaching environment. Furthermore, extending these initiatives to encompass a wider educational landscape reflects a commitment to holistically enhancing ICT education across diverse educational institutions.

The insights gleaned from this study present actionable pathways to propel ICT education forward, aiming to equip both teachers and students with the necessary tools and resources to thrive in an increasingly digital-centric world.

Future research should consider conducting a comprehensive study assessing ICT capacities, skills, infrastructure, and curriculum specifically tailored for 9-year-old schools. An overwhelming majority of teachers (95%) advocate for such an assessment, emphasizing its necessity. Only a small minority (5%) hold the opinion that such an endeavor might not be necessary. This proposed research could provide invaluable insights into the specific ICT needs and requirements of these educational institutions.

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