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Development of an Interactive Method for Training It Students on The Topic Of "Website Optimization"

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Abstract: The article presents the development and testing of an interactive teaching method for students on the topic of "Website Performance Optimization." The method is focused on a practice-oriented approach, active student involvement, and the use of professional audit tools. The proposed methodology combines the use of real-life cases, digital simulators, gamification, and independent solution design. The results of implementing the method demonstrate an increase in technical competence and motivation among students to study complex topics in web development.

Keywords: Interactive method, IT student training, website optimization, PageSpeed, Web Vitals, Lighthouse, educational technologies, practice-oriented training.

Introduction: Modern training of specialists in the field of web development requires not only the study of theoretical foundations, but also the formation of solid practical skills in working with real digital tools. Topics related to optimizing the performance of web applications are becoming particularly relevant, as they directly affect user experience, SEO metrics, and business results.

However, traditional teaching methods for these topics are often limited to passive information absorption. This reduces student engagement and complicates the formation of a systematic approach to web optimization. This paper proposes an interactive teaching method in which students not only study but also implement optimization approaches in practice. The goal of this study is to develop and implement an interactive teaching method for students on the topic of “Website Optimization,” focused on active practice,

group interaction, and digital analytics [1-3].

Research by foreign psychologists and educators (B.S. Gershunsky, E.S. Polat, L.G. Sandakova, S.A. Khristochevsky, E.N. Yastrebtsova) in the field of information and communication technologies in education confirm that the key tasks of interactive communication between teachers and students are: facilitation as management of the information exchange process; identifying and utilizing the diversity of students' points of view and personal experiences; stimulating students' cognitive activity; integrating theoretical knowledge with practical activities; mutually enriching educational experiences; ensuring optimal perception and assimilation of educational material; developing mutual understanding and supporting students' creative expressions.

Thus, the problem of interactive communication between teachers and students, its nature, essence, functional and organizational characteristics, has become a subject of research in philosophy, psychology, and pedagogy (V.V. Arkhipova, Yu.K. Babansky, S.L. Bratchenko, V.V. Davydov, A.N. Leontiev, V.F. Shatalov, N.E. Shchurkova, D.B. Elkonin, and others). One of the ways to solve this problem is to search for innovative forms of education. Among them, Internet-based learning is of particular importance, as it is considered a modern way of implementing the educational process, ensuring the transition from a reproductive model of knowledge acquisition to an active one, as well as the formation of education based on constructive joint activities of all participants in the educational process (A.A. Andreev, M.N. Skatkin, V.I. Soldatkin, G.M. Troyan, et al.) [4, 11, 12].

Research Methods

Modern Internet technologies are geared toward ensuring educational interaction between teachers and students in a convenient, fast, continuous, and psychologically comfortable form (O.N. Arestova, L.N. Babanin, A.E. Voiskunsky). Their use implies broad access for students to information resources, the opportunity to independently master educational and practical materials in an interactive mode, participation in the exchange of information and discussions on the subject being studied, receiving advice and support from the teacher (tutor), as well as passing various forms of knowledge assessment.

In recent years, research aimed at developing systems capable of supporting the educational process in universities and other educational institutions has intensified. Among them are such developments as Prometheus, Avanta, HyperMethod, Orox, Open Business and Economics Courses, the Hydra testing system, as well as the WebCT (Web Course Tools) distance learning system, etc. However, most of the existing solutions do not cover the entire technological chain of organizing and supporting Internet-based learning: they provide limited analysis of the learning process and do not fully support interactive communication between students and teachers, focusing primarily on the creation of educational complexes rather than learning support systems. At the same time, users are deprived of the opportunity to flexibly optimize such systems to their own needs. These studies do not sufficiently reveal the methods and means that ensure full-fledged interactive communication [5-7].

Consequently, there is a contradiction between the obvious need for widespread use of interactive educational interaction in online learning and the insufficient development of the psychological, pedagogical, and technical conditions for its implementation. Methods and tools that can optimize and ensure the effective implementation of interactive interaction in the educational process via the Internet are of key importance here.

In recent years, web technologies have become key in the digital space, forming the basis for creating multifunctional and scalable applications used in various fields, from business to education. The ever-growing demand for online services has led to web applications replacing traditional desktop solutions, which has driven the rapid development of the architectural and technical aspects of their implementation. Modern websites and applications are highly complex: they are built on a multi-level and often distributed architecture, include extensive client and server components, and actively use third-party APIs and dynamic content. This makes performance and reliability issues critically important—both for users and developers. Even minor delays in page loading can lead to traffic loss, a poor user experience, and lower search engine rankings. In addition, technical complexity creates a high probability of software errors, improper resource optimization, and architectural bottlenecks. All this requires specialists not only to master modern tools, but also to be able to systematically approach the analysis, audit, and improvement of web resource performance [8].

With the increasing load on web infrastructure and growing demands for response speed and scalability, there is an urgent need to train qualified IT specialists who can effectively solve optimization problems. At the same time, traditional forms of presenting educational material often do not provide students with a sufficient level of practical training. This highlights the relevance of introducing interactive teaching methods focused on project activities, digital auditing, and the use of real

performance evaluation tools. Thus, effective teaching of web application optimization requires going beyond the lecture format and involves the active participation of students in the analysis, evaluation, and practical improvement of website performance. This necessitates the development of an interactive method focused on the formation of professional competencies in a real digital context[9, 10].

Interactive teaching methods meet the requirements of modern pedagogy, focusing on students' active cognitive activity, their involvement in the decision-making process, and independence. The distinctive feature of the proposed approach is that students are not given abstract tasks, but practical cases modeled on real-life web application performance issues. This allows them not only to develop technical skills, but also to form systematic thinking and the ability to work with modern analytical tools. In addition, thanks to the use of digital feedback (Web Vitals metrics, Lighthouse reports), students receive an objective visualization of the results of their work, which increases their motivation and understanding of cause-and-effect relationships in web development [13-15].

Structure and logic of the interactive method implementation. The interactive method is implemented through a modular structure, where each block includes the following components:

1. Knowledge update and introduction to the topic

Introductory video or mini-lecture with a case study ("Why is loading speed important?"), accompanied by a short quiz.

2. Website analysis and diagnostics

Use of tools: Google Lighthouse, GTmetrix, WebPageTest, with recording of baseline metrics (LCP, FID, CLS, TTI, etc.).

3. Hypothesis formation and optimization actions

Working in small groups to propose solutions: image optimization, lazy loading implementation, resource compression, caching, etc.

4. Implementation and verification of changes

Applying changes to the training project with re-checking of results. Reflection on what worked, what didn't, and why.

5. Presentation and group discussion

Each group defends its case in front of the class, compares "before and after" metrics, and receives questions and recommendations.

6. Gamified feedback

Point system, badges, interactive ranking of solutions followed by discussion and suggestions for best practices.

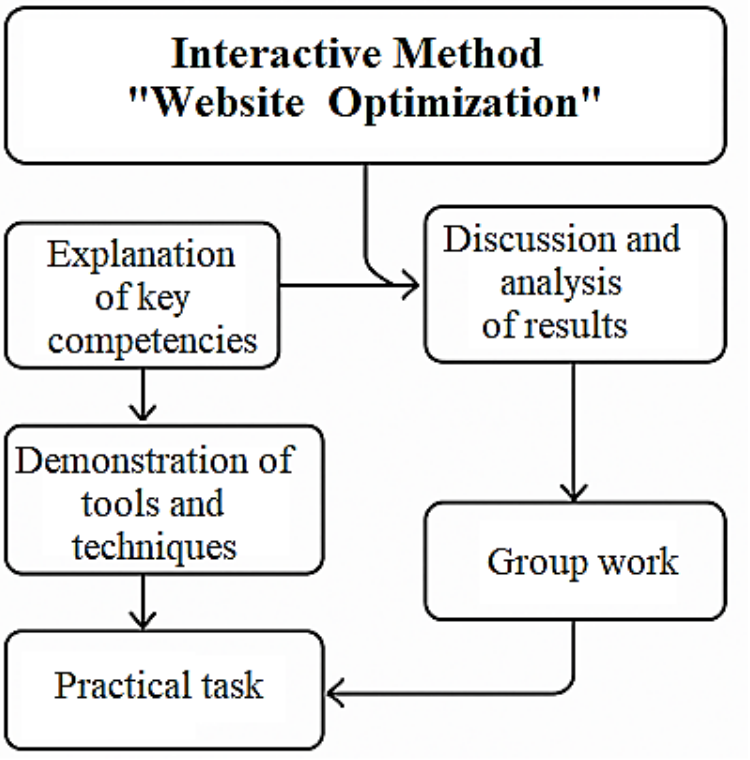

Figure-1. Structure of implementation of interactive methodology

Table-1

Structure of the training module for website optimization

Module stage	Stage content	Digital tools
1. Introduction to the topic	Mini-lecture or video with a case study; problem setting and testing of prior knowledge (quiz)	Kahoot!, Google Forms, Loom
2. Website diagnostics	Working with tools: Google Lighthouse, DevTools, GTmetrix; collecting basic performance metrics	Google Lighthouse, PageSpeed Insights, Chrome DevTools
3. Developing solutions	Group work: formulating hypotheses for optimization, analyzing bottlenecks, planning actions	Miro, Discord, Figma (при необходимости)
4. Implementation of changes	Making changes to the code or settings of the website; re-diagnosis and analysis of results	VS Code, GitHub, Netlify/Vercel
5. Case presentation	Project defense; comparison of 'before' and 'after' indicators; discussion of strategies	Google Slides, Canva, OBS Studio
6. Feedback	Gamified assessment; awards, badges, discussion of best solutions	Mentimeter, Padlet, Google Classroom

Implementation results. As part of this study, an interactive teaching method for the topic "Website Performance Optimization" was developed, implemented, and tested for IT students. The method is focused on developing applied skills in frontend and full-stack development and is based on the principles of practice-oriented, case-based, and digital learning.

The method was implemented as a training module consisting of six consecutive stages:

• introduction to the problem (based on a digital case study),

• diagnosis of web pages using professional tools (Google Lighthouse, DevTools, GTmetrix),

• formulation and testing of optimization hypotheses,

• implementation of proposed solutions,

• presentation and defense of the case study,

• feedback in the form of gamified assessment.

The learning process included working in small groups, digital collaboration (Miro, GitHub, Discord), and automated assessment of results based on key performance metrics (LCP, CLS, FID, TTI, etc.).

The method was implemented and tested in the educational environment of Andijan State Technical Institute among 2nd- and 3rd-year students majoring in Information Systems and Technologies (IS&T). The students were divided into control and experimental groups:

Table-2

Parameter	Control group	Experimental group
Number of students	27	30
Form of training	Traditional	Interactive (methodology)
Average score for the module	75,2	**90,4**
Level of involvement	3,1 / 5	**4,6 / 5**

The level of engagement was measured on an observation scale (activity, participation in discussions, independence in completing tasks).

Qualitative and quantitative effects:

• Increased cognitive activity: 82% of students in the experimental group noted that the module tasks were "practically significant" and "close to real professional activity."

• Improved understanding of performance metrics: before the module began, only 18% of students could explain the meaning of the CLS indicator; after the module, 91% could.

• Formation of sustainable skills in working with professional tools: students learned to use PageSpeed Insights, Lighthouse, and Chrome DevTools for comprehensive website auditing.

• Increased motivation for self-study: 73% of students began to study additional resources (Google documentation, Web.dev courses, GitHub repositories).

Teachers noted a reduction in the time spent explaining theoretical principles due to students' independent research activities. The methodology proved to be highly adaptable: it can be scaled to other topics (e.g., “Web Application Security,” “UX Optimization,” “SEO Analysis”).

Conclusion. The results of the study confirm that the introduction of an interactive teaching method on the topic of “Website Performance Optimization” is an effective tool for developing key professional competencies in IT students. The proposed method integrates theoretical knowledge and practical skills, promotes the formation of systematic thinking, and develops independence and the ability to perform technical analysis and design.

A distinctive feature of the developed method is its focus on practical tasks based on real cases and the use of professional tools (Google Lighthouse, Chrome DevTools, GTmetrix, PageSpeed Insights, etc.). This allows students not only to study the principles of web application optimization, but also to directly apply the knowledge they have gained in conditions close to a professional environment.

The interactive structure of the module, based on the principles of engaged learning, digital collaboration, and gamified feedback, boosts student motivation, encourages their active participation in the learning process, and promotes deeper understanding of the material. The multi-stage approach—from problem setting to collective defense and analysis of results—ensures the sustainability of the knowledge and skills acquired.

The methodology has been tested in disciplines related to web development and information technology and has shown high effectiveness in both cognitive and behavioral aspects of learning. It has also demonstrated flexibility and adaptability: its structure can be scaled to other topics in the field of information technology, including areas such as DevOps engineering, backend development, user interface (UI/UX), production web platforms, and e-learning systems.

Thus, the interactive method of website optimization can become the basis for building holistic educational trajectories within the framework of a modular, project-based, and problem-oriented learning model that meets the requirements of the digital transformation of the educational process.

The scientific and pedagogical significance of the proposed method lies in its ability to adapt to the specifics of technical disciplines, ensure the relevance of learning content, and develop students' digital and meta-subject competencies that are in demand in the modern labor market.

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