Requirements for Designing Pedagogical Software Tools

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Abstract. This article highlights the application of pedagogical software tools in the educational process, presenting innovative approaches currently employed in higher education institutions. It outlines contemporary methods for training university instructors in the pedagogical use and design of software tools within their professional activities. The study examines pedagogical software tools and identifies necessary resources, drawing on relevant literature to support the analysis.

Keywords: software tool, digital technologies, design requirements, pedagogical software products, pedagogical standards.

At present, due to the advancement of digital technologies and the continuous improvement of digital educational tools, the development of students' knowledge, skills, competencies, and professional abilities in the design of pedagogical software tools remains a pressing issue. In this context, research has focused on enhancing the effectiveness of teaching through subjects such as pedagogical software, electronic learning resources, and virtual learning technologies, as well as on the principles and requirements for utilizing digital technologies and distance education in the learning process. These studies have been conducted in our country, the Commonwealth of Independent States, and abroad by scholars including A.A. Abduqodirov, U.Sh. Begimqulov, N.I. Tayloqov, M.H. Lutfillayev, R. Hamdamov, U.B. Baxodirova, R. Clark, S. Naidu, and R.E. Mayer.

Analysis of the scientific and methodological works of these researchers indicates that, in designing pedagogical software tools, particular attention should be paid to the following requirements. Pedagogical software tools include software products designed to achieve specific didactic objectives (a suite of programs), technical and methodological support, and additional auxiliary resources.

Requirements and Principles for Designing Pedagogical Software Tools

1.**Pedagogical Requirements.** These requirements emphasize the need to rely on scientific sources when organizing learning activities. They define the criteria for integrating design requirements into the educational process, ensuring that the

instructional content, methodological approaches, and students' development levels are appropriately aligned, while also supporting long-term learning outcomes.

2.**Functional Requirements**. Functional requirements specify the functions that the pedagogical software tool must perform. The software should execute all tasks accurately and in accordance with user expectations, covering all essential operations anticipated by the end-user.

3.**Non-Functional Requirements**. Non-functional requirements determine the quality of the software's operation. The system should function continuously, be resilient to errors, and deliver the expected results. Additionally, it should process data efficiently, respond promptly to user requests, and ensure data protection while preventing unauthorized access.

4.**User-Centered Requirements.** To optimize the user experience, the software should be intuitive and easy to navigate. The interface must be simple and user-friendly, while the tool should adapt to the needs of different user groups.

5.**Ergonomic Requirements.** These requirements focus on creating an environment conducive to student development. They consider how students interact with the software, the usability of the interface, and the aesthetic design of the tool.

6.**Aesthetic Requirements.** Aesthetic requirements pertain to the visual appearance, style, and visual harmony of the software. They aim to evoke positive emotions in students, avoid cognitive overload through excessive graphics, and enhance motivation and user satisfaction by complementing or distinguishing from the main content.

7.**Social and Economic Requirements.** These requirements ensure the widespread adoption and acceptance of the pedagogical software. The cost of development and usage should be reasonable, promoting accessibility for a broader audience.

Attention to these requirements enables the creation of high-quality, reliable, and user-oriented pedagogical software tools. They should be applied throughout all stages of development, including analysis, design, programming, testing, and deployment.

In addition to these requirements, attention must also be paid to the guiding principles of pedagogical software design. These principles define the key directions for producing a high-quality, functional, and effective educational product.

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