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THE POTENTIAL OF VISUAL ARTIFICIAL INTELLIGENCE IN ORGANIZING INTERACTIVE AND VISUAL LEARNING

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Abstract: This article analyzes the didactic potential of visual artificial intelligence in organizing interactive and visual learning. It highlights the pedagogical significance of using visual AI to create images, infographics, diagrams, concept maps, and other multimodal materials, and proposes the VIZAR model for their effective pedagogical integration. The article also addresses visual-content verification, academic integrity, and teacher oversight.

Keywords: artificial intelligence, visual artificial intelligence, interactive learning, visual learning, visualization, multimodal learning.

Introduction

Digital transformation is reshaping the content, methods, and tools of modern education, requiring teachers not merely to transmit information but to design it in forms that are comprehensible, visually accessible, and conducive to active learning. In this context, generative and multimodal artificial intelligence technologies are becoming particularly significant. Their capabilities extend beyond text generation to the creation and modification of images, diagrams, infographics, concept maps, presentations, animated scenarios, and other visual objects.

In Uzbekistan’s education system, the integration of artificial intelligence and digital platforms has likewise become a topical area of scientific and pedagogical research. Panjiyeva analyzes the potential of AI-based adaptive instruction and digital platforms in the educational process, while Azimova and Badalxodjayev highlight aspects of AI use in education related to personalized learning, virtual assistants, and adaptive approaches. Mamatqulova, in turn, specifically identifies individualization, automated assessment, and ethical issues in the relationship between artificial intelligence and pedagogy. These studies illuminate the general pedagogical potential of AI technologies; however, there remains a need to systematize mechanisms for integrating visual AI tools specifically with interactive and visual learning.

The aim of the study is to identify the didactic potential of visual artificial intelligence in organizing interactive and visual learning, systematize its pedagogical functions, and propose a methodological model for its implementation in educational practice. The scientific novelty of the study lies in interpreting a visual AI product not as a ready-made visual aid, but as a dynamic didactic object that organizes learners’ activities of analysis, comparison, verification, and reflection, as well as in substantiating the integrative VIZAR model.

Research Methodology

The study employed systematic and comparative analysis, content analysis of scholarly literature, pedagogical modeling, generalization, and interpretation. Perspectives presented in national and international academic sources on the integration of artificial intelligence into education, multimodal instruction, generative content, visual literacy, and pedagogical oversight were compared.

In this article, “visual artificial intelligence” is understood as a set of AI technologies capable of generating images from a user’s textual or multimodal prompt, modifying existing images, transforming information into visual form, and analyzing visual objects. The principal methodological premise is that technology should be evaluated not as an end in

itself but as a means of solving a didactic task. Accordingly, the primary criteria are not the aesthetic appeal of visual material, but its alignment with learning objectives, scientific accuracy, and capacity to activate learners' cognitive activity.

Results And Discussion

Visuality is one of the fundamental principles of didactics, enabling learners to perceive educational material through the senses and connect abstract content with concrete representations. In digital education, visuality is shifting from static images and tables toward dynamic, adaptable, and interactive visual content. Visual AI constitutes one of the technological foundations of this transition.

The analysis identified five principal didactic functions of visual AI. The first is the visualization function: representing complex or abstract concepts through images, schemes, diagrams, and infographics. The second is the generative function: creating new content tailored to a specific lesson objective, age group, or professional context. The third is the transformational function: converting text into a visual model, a process into an algorithmic scheme, or theoretical content into a concept map. The fourth is the interactive function: engaging learners in prompt construction, image analysis, error detection, and the creation of alternative versions. The fifth is the adaptive function: adjusting the complexity of material and the form of presentation to learners' level of preparedness.

The pedagogical value of visual AI lies not in the speed with which it produces ready-made images, but in its capacity to enable new forms of learning activity. For example, when a teacher displays an AI-generated technical diagram, it strengthens visual presentation. When learners use the same diagram to identify errors, compare it with an authentic standard, and justify a correct version, the material becomes an interactive task. Thus, the didactic potential of an AI product is fully realized only when it is transformed from a passive demonstration tool into a problem-based learning object.

In vocational-school settings, visual AI is particularly suitable for professional education. In specialized subjects, it can be used to visualize stages of a mechanism or technological process, create problem situations related to safety regulations, identify professional errors in images, and represent production processes through simplified models. In language and general-education subjects, transforming a communicative situation, historical setting, biological process, or geographical phenomenon into a visual scenario can facilitate the contextual acquisition of learning material.

International research also associates the pedagogical use of generative AI in education with the development of creativity, critical thinking, and learner autonomy [5]. In a study by Bian and co-authors on visual arts education, the use of AI-generated images showed positive outcomes related to students' classroom engagement [6]. However, such findings cannot automatically be generalized to all subjects and levels of education; effectiveness depends on pedagogical design, the nature of the learning task, and the quality of oversight.

Uzbek researchers likewise note that, alongside the benefits of AI integration, issues of digital literacy, academic integrity, and pedagogical oversight must be addressed. Otaxonova and Alimqulov emphasize the importance of teachers' and learners' digital competence when introducing AI into the pedagogical process [4]. From this perspective, competence in working with visual AI should not be limited to writing prompts; it must also include the scientific and methodological verification of generated materials.

Within the study, the VIZAR model was proposed for integrating visual AI into lessons. "V" stands for defining the task: the intended learning outcome is identified first. "I" denotes intelligent visualization: with the assistance of AI, content is converted into a visual form aligned with the pedagogical objective. "Z" represents a cognitively demanding, problem-

based activity: the learner analyzes and compares the image, identifies errors, or creates an alternative solution. “A” refers to accuracy verification: AI-generated content is checked against a textbook, scholarly source, or expert judgment. “R” denotes reflection: the learner explains what knowledge has been acquired, what errors have been identified, and how the visual material could be improved.

Within the VIZAR model, the teacher’s role is not diminished. On the contrary, the teacher shifts from being a transmitter of information to acting as a pedagogical designer, moderator, and verifier. The teacher defines the learning objective, formulates an effective prompt, checks the generated material, adapts it to learners’ age and professional characteristics, connects it to a learning task, and evaluates the outcome. Consequently, the effectiveness of visual AI in education depends not only on the capabilities of the algorithm but also directly on the teacher’s methodological competence.

The risks associated with visual AI must also be taken into account. A generative model may produce an image that is anatomically, historically, technically, or factually incorrect while appearing highly plausible. In addition, stereotypical or culturally inappropriate representations may emerge. UNESCO stresses the need to apply generative AI in education through a human-centered, ethical, and safe approach while ensuring privacy and pedagogical oversight [7]. Therefore, the assumption that “AI generated it, so it must be correct” is pedagogically unacceptable.

Cognitive load is another important consideration in the use of visual content. Filling a lesson with numerous decorative elements, unnecessary icons, and images may not enhance visual learning; instead, it can distract learners from the core content. Each visual element should therefore be selected according to the criterion: “Which learning task does it help solve?” Decoration that does not clarify content cannot be regarded as a didactic tool.

The findings indicate that visual AI can be used in education at three levels. At the reproductive level, the teacher demonstrates ready-made AI material; at the active level, the learner analyzes and modifies it; and at the constructive level, the learner creates an original visual model based on pedagogical criteria, verifies it against sources, and justifies the choices made. The greatest pedagogical value emerges at the constructive level because the focus shifts from the visual product itself to the process of knowledge construction.

Practical Recommendations

When introducing visual AI into education, a clear learning outcome should first be defined, and only then should the technological tool be selected. For a new topic, a concept map showing relationships among concepts may be used; during consolidation, an image containing deliberately introduced errors may be appropriate; in group work, several visual solutions to the same problem may be compared; and for assessment, learners may create and explain their own infographics.

In vocational education, tasks such as “identify the safety error in the image,” “reconstruct the technological sequence,” “compare the AI-generated model with the standard,” and “explain the differences between two visual solutions using evidence” are particularly appropriate. Assessment should focus not on the aesthetic attractiveness of an image but on content accuracy, logical coherence, evidence-based reasoning, compliance with professional standards, and the learner’s independent explanation. When AI-generated material is used, explicitly acknowledging that it was produced with an AI tool strengthens a culture of academic integrity.

Conclusion

Visual artificial intelligence is a promising pedagogical tool that expands the possibilities of interactive and visual learning. Its didactic potential is determined not merely

by the rapid generation of images, but by its capacity to model abstract knowledge, design problem situations, engage learners in analysis and verification, and adapt learning materials to individual needs.

The study systematized the visualization, generative, transformational, interactive, and adaptive functions of visual AI. The proposed VIZAR model makes it possible to connect the use of technology with pedagogical objectives, active learning tasks, verification, and reflection. The central idea of the model is that an AI-generated image is not ready-made knowledge, but material for learners' thinking.

Methodological oversight by the teacher is crucial to the effective use of visual AI. Because of risks related to factual errors, algorithmic bias, excessive cognitive load, and academic integrity, every AI-generated product should undergo pedagogical and scientific verification. A promising direction for future research is the experimental testing of the VIZAR model across different subjects in vocational schools and the statistical assessment of its effects on learners' visual literacy and academic achievement.

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