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DIDACTIC OPPORTUNITIES OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PRIMARY EDUCATION

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Abstract: This article examines the didactic opportunities of using artificial intelligence technologies in the primary education process, their role in increasing the effectiveness of teaching, and the issues of adapting educational content to the individual needs of learners. The possibilities of using artificial intelligence tools to develop learning materials, prepare differentiated tasks, consolidate learners' knowledge, and improve teachers' methodological activity are analyzed. In addition, attention is given to pedagogical appropriateness, information security, data reliability, and ensuring teacher oversight when applying these technologies in primary education.

Keywords: primary education, artificial intelligence, digital technologies, didactic opportunities, individualization, differentiated instruction, interactive tasks, digital pedagogy.

Introduction

The rapid development of digital technologies is introducing new opportunities for organizing the educational process, creating learning materials, and assessing learners' knowledge. In particular, artificial intelligence technologies are acquiring increasing importance in the field of education as tools used for processing information, generating text and images, preparing answers to questions, and performing various educational tasks [1].

Primary education is an important period that forms the knowledge, skills, and competencies learners need for subsequent stages of education. At this stage, it is especially important that learning materials be comprehensible, visual, and appropriate to learners' age characteristics, and that the level of difficulty of tasks be selected in accordance with learners' abilities. From this perspective, artificial intelligence tools can assist teachers in preparing tasks at different levels, explaining topics with simple examples, and presenting lesson materials in diverse forms [2].

The guidance on the use of generative artificial intelligence in education and research published by UNESCO in 2023 emphasizes the need to place human interests at the center, protect data privacy, and use technologies in an age-appropriate manner. The AI Competency Framework for Teachers, published in 2024, notes the importance of educators understanding technologies, applying them responsibly, and integrating them in accordance with educational objectives [3].

Therefore, the use of artificial intelligence in primary education should be studied not merely as a technical innovation but as a didactic issue related to educational content, methods, teachers' activity, and learners' developmental needs [4].

Artificial intelligence is a set of technologies designed to process data, identify certain patterns, develop recommendations, and perform some intellectual tasks. Generative artificial intelligence, in turn, can create text, images, and other types of content on the basis of given instructions.

In the educational process, the didactic opportunities of these technologies are determined by supporting the achievement of learning objectives, presenting materials in different forms, adapting tasks, and preparing pedagogical resources [5].

The use of artificial intelligence in primary education is significant in the following areas:

First, there is an opportunity to individualize educational materials. On the basis of a single topic, the teacher can prepare tasks at easy, intermediate, and complex levels and explain the topic with

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different examples. This helps to take into account differences in learners' levels of preparation and learning pace.

Second, the visual quality of learning materials can be enhanced. Explaining complex concepts through simple examples, short stories, diagrams, or images supports learners' comprehension of the topic. In this regard, the teacher must verify that the created materials are scientifically accurate and appropriate to learners' age characteristics [6].

Third, there is an opportunity to ease the teacher's methodological work. Artificial intelligence can assist in drafting lesson plans, developing questions, simplifying texts, and preparing assessment criteria in preliminary form. However, selecting, editing, and adapting the final material to the lesson objective remain the responsibility of the pedagogue.

Fourth, an opportunity arises to enrich the learning process. Various questions, problem situations, and practical tasks created with the help of artificial intelligence can support learners' interest in the topic. At the same time, the use of technology should not restrict learners' independent thinking and practical activity [7].

Methodology

When applying artificial intelligence technologies in primary education, the content and learning objectives of each subject must be taken into account. Technology should be regarded not as the aim of the lesson but as a tool that helps to achieve it.

In native language and reading literacy lessons, artificial intelligence can be used to prepare drafts of short age-appropriate texts, questions on text content, vocabulary exercises, and creative tasks. For example, on the topic "Let Us Protect Nature," it is possible to compose a short text for third-grade learners, develop comprehension questions based on the text, and prepare tasks aimed at identifying the main idea. The teacher compares these materials with the topic in the textbook and checks the vocabulary, content, and level of difficulty. In addition, learners' reading comprehension skills can be developed by composing questions at different levels on the basis of a single text. For example, at the first level, finding specific information in the text is required; at the second level, explaining the relationships between events; and at the third level, evaluating a character's actions on the basis of evidence. In this regard, texts generated by artificial intelligence should not fully replace textbooks and reliable sources but should be used as supplementary didactic material verified by the teacher.

In mathematics lessons, artificial intelligence can be used to prepare examples, problems, real-life situations, and consolidation exercises of varying complexity related to the same mathematical concept. For example, when studying the topic of multiplication, the teacher can develop simple calculation examples, word problems, and tasks aimed at explaining the solution, depending on learners' level of preparation. This enables learners to consolidate their knowledge through different activities within the same topic. Artificial intelligence can also be used for error analysis. The teacher can prepare additional exercises on the basis of errors commonly made by learners and develop explanations for each task. However, mathematical calculations and answers must always be verified, because artificial intelligence may sometimes provide an incorrect solution or explanation.

In natural science subjects, artificial intelligence can be used to explain concepts related to natural phenomena, plants, animals, and the environment in simple language, to prepare questions for observation, and to develop small research tasks. For example, on the topic of plant growth, the teacher gives learners the task of identifying the conditions necessary for a plant's development, comparing the importance of light and water, and recording the results of observation. Artificial intelligence can assist in preparing questions and a draft observation table on this topic. In such an approach, the main attention should be directed not at obtaining a ready-made answer but at the process of observing, putting forward hypotheses, comparing results, and drawing conclusions.

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In fine arts and technology lessons, artificial intelligence can be used to develop creative ideas, descriptions of visual tasks, and project topics. For example, learners are offered various creative assignments on topics such as “My Dream School,” “The Green City,” or “Protecting Nature.”

Learners carry out creative activity by drawing pictures based on their own imagination, preparing models, or developing projects. Even when artificial intelligence is used, learners’ independent development of ideas, creation of their own work, and explanation of their chosen solutions should remain central.

In primary grades, learners’ knowledge levels, interests, and pace of completing tasks may not be the same. For this reason, giving all learners tasks of the same complexity does not always fully address their needs. A differentiated approach makes it possible to select educational tasks appropriate to learners’ level of preparation. In this process, artificial intelligence can assist the teacher in preparing several task variants on a single topic, simplifying instructions, and developing additional examples. For example, in a reading literacy lesson, three different tasks are prepared on the basis of one text:

- First task: finding specific information in the text.
- Second task: explaining the cause-and-effect relationship between events.
- Third task: identifying the main idea of the text and explaining it with evidence.

The teacher selects these tasks in accordance with learners’ needs and modifies them as necessary. In doing so, it is important that the tasks do not keep the learner permanently at one level but lead them step by step toward more complex activity. At the same time, tasks prepared by artificial intelligence cannot be regarded as an independent and final means of drawing conclusions about learners’ actual abilities. To determine a learner’s development, the teacher’s observation, independent work, and various assessment methods must be used together.

Results

The introduction of artificial intelligence into the educational process does not abolish the teacher’s duties; rather, it makes it possible to organize some of their activities with the help of new tools. The teacher remains the main person responsible for setting the educational objective, verifying the reliability of the material, identifying learners’ needs, and assessing learning outcomes [8].

First, the pedagogue must formulate the instructions given to artificial intelligence clearly. For example, if the grade for which the material is intended, the topic, the type of task, and the expected outcome are specified, it becomes easier to adapt the preliminary material to the lesson.

Second, it is necessary to verify the generated content. In some cases, artificial intelligence may offer incorrect facts, logical errors, or examples that are inappropriate for learners’ age. Therefore, the teacher should compare the material with the textbook, the curriculum, and reliable sources.

Third, the use of technology should not restrict learners’ independent thinking and live communication with the teacher. Learners should have the opportunity to ask questions, explain their opinions, complete practical exercises, and demonstrate their knowledge independently [9].

Fourth, the pedagogue must understand the capabilities and limitations of artificial intelligence tools. UNESCO’s 2024 framework of artificial intelligence competencies for teachers likewise emphasizes the importance of aligning technology with pedagogical objectives, taking its ethical aspects into account, and preserving the teacher’s professional responsibility.

When working with primary school learners, the use of artificial intelligence is related not only to educational benefit but also to children’s rights, personal data, and safety. Therefore, the following requirements should be taken into account when applying the technology [10].

Protection of personal data. Learners’ full names, addresses, photographs, grades, or other personal data should not be entered into open artificial intelligence systems without appropriate permission.

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Age-appropriate use. When using any tool, its terms of service, age restrictions, and school rules must be taken into account. It is advisable that the use of artificial intelligence by primary school learners be organized under the supervision of the teacher and, where necessary, parents [11].

Reliability of information. The answers provided by artificial intelligence are not always correct. Therefore, learning materials should be verified, and disputed or doubtful information should be clarified through reliable sources.

Academic integrity. Artificial intelligence should be used not as a tool that performs all tasks in place of the learner but as a resource that supports understanding. The learner should complete the task independently, explain their opinion, and demonstrate their own knowledge [12].

Digital equity. Not all learners may have the same device or internet access. Therefore, the use of artificial intelligence should not completely replace traditional teaching methods, and, where necessary, offline materials should also be prepared to achieve the same educational objective.

These requirements help ensure that the use of technology is pedagogically grounded, safe, and responsible [13].

Discussion

The effectiveness of introducing artificial intelligence tools into lessons cannot be assessed solely by whether the lesson is interesting or whether materials are prepared quickly. The main criterion is what change occurs in learners' knowledge and skills and to what extent the teaching objectives are achieved.

The following criteria can be used to assess effectiveness:

1. Appropriateness of educational content — the conformity of the prepared material to the curriculum and lesson objectives.
2. Learners' mastery — the ability to demonstrate knowledge and skills on the topic through tasks.
3. Opportunity for individualization — the possibility of preparing suitable materials for learners at different levels.
4. Teacher's methodological activity — improvement in the process of developing and editing materials and planning lessons.
5. Safety and reliability — verification of the data used and protection of learners' personal data [14].

If the educational outcome of using an artificial intelligence tool is to be studied, clear criteria can be defined in advance and learners' initial and subsequent results can be compared. In this case, the research design, the composition of the learners, and other influencing factors must also be taken into account in order to confirm that the changes occurred precisely under the influence of the technology [15].

Conclusion

The use of artificial intelligence technologies in primary education offers certain didactic opportunities for preparing learning materials, differentiating tasks, creating visual resources, and supporting the teacher's methodological activity. These technologies can be used purposefully, especially in native language and reading literacy, mathematics, natural sciences, and creative activities. At the same time, the use of artificial intelligence does not by itself automatically improve the quality of education. Its outcome depends on the clarity of the pedagogical objective, the reliability of the materials, learners' active participation, and the teacher's professional oversight. Technology should not replace the teacher but should serve as a tool that expands the teacher's methodological capabilities.

In the process of introducing artificial intelligence into primary education, adherence to the principles of age-appropriateness, protection of personal data, digital equity, and academic integrity is of particular importance. Pedagogical activity organized on this basis can serve the rational use of the capabilities of artificial intelligence and the support of learners' educational needs.

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