CHAPTER 6
METHODOLOGICAL APPROACHES TO THE DEVELOPMENT AND USE OF AN EDUCATIONAL CHATBOT IN SHAPING THE ENVIRONMENTAL WORLDVIEW OF STUDENTS

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Modern education is developing in the context of active digitalization, the integration of information and communication technologies, and the widespread use of artificial intelligence tools. In this context, innovative digital learning tools are gaining particular importance, among which educational chatbots occupy a significant place. They are increasingly used to support the learning process, ensure interactivity, and personalize learning, opening up new opportunities for organizing the educational environment, particularly in the field of environmental education.

The relevance of this study is determined by the need to form an environmental worldview among students as an essential component of their overall culture and responsible attitude toward the environment. In the context of global environmental challenges, the search for effective pedagogical tools becomes especially important, as they ensure not only the acquisition of environmental knowledge but also the development of value orientations and patterns of environmentally responsible behavior.

An educational chatbot, as a digital tool, can serve as an effective means of supporting learning due to its functional capabilities: interactivity, immediate feedback, adaptability to the individual needs of learners, and the ability to organize learning in a convenient format. At the same time, its effective use

requires scientifically grounded methodological approaches to its design, development, and implementation in the educational process.

The aim of the article is to substantiate methodological approaches to the development and use of an educational chatbot as a means of forming an environmental worldview among students.

The research objectives include:

– defining the essence of an educational chatbot as a pedagogical tool;

– substantiating the principles of its design and development;

– characterizing the stages of chatbot creation;

– outlining the methodological features of its application in environmental education.

An educational chatbot should be considered as a software tool that ensures automated interaction with users in a dialogic format and performs educational and informational functions. Its use is based on the principles of interactive learning, individualization of the educational process, and the activation of students' cognitive activity.

In the context of environmental education, a chatbot can perform functions related to presenting learning material, organizing independent work, assessing knowledge, and developing practical skills. Through the modeling of dialogic scenarios, it promotes active engagement of students with educational content, which enhances knowledge acquisition and contributes to the development of environmental thinking.

An environmental worldview, as an integrative characteristic of an individual, encompasses a system of knowledge, values, beliefs, and behavioral attitudes aimed at harmonious interaction between humans and the natural environment. Its formation requires the application of pedagogical approaches that ensure not only the transmission of information but also the involvement of students in activities, reflection, and the making of environmentally responsible decisions.

Within the scope of the study, the educational chatbot «EcoMind Bot» was developed as an interactive tool for learning, knowledge assessment, and motivation toward environmentally responsible behavior, aimed at shaping the environmental worldview of students. Achieving this goal necessitated the development and implementation of an appropriate step-by-step methodology for designing and using an educational chatbot in the formation of students' environmental worldview.

First and foremost, its aim and main objectives are defined. The aim is to design and implement the educational chatbot «EcoMind Bot» as an innovative digital tool for shaping the environmental worldview of students. In line with this aim, the following key objectives are identified: the formation of environmental knowledge and understanding of the natural environment; the development of environmental thinking and responsible behavior; increasing motivation to study environmental issues; and engaging students in active interaction with educational content.

The development of an educational chatbot involves adherence to a set of methodological principles, among which interactivity, accessibility, clarity, consistency, personalization, and practical orientation are the key ones. Their implementation ensures the effective functioning of the chatbot as a pedagogical tool.

The process of creating a chatbot should be carried out in stages:

1. At the analytical stage, the target audience, the level of students' environmental awareness, and their educational needs are identified. It is important to take into account the age characteristics of learners and the specifics of forming an environmental worldview.

2. The design stage involves developing the chatbot's structure, its operational logic, and interaction scenarios. It is essential to consider the age characteristics of learners and the specifics of forming an environmental worldview.

An important aspect in this context is the development of a structural-functional model of the chatbot, which includes learning blocks, a feedback system, assessment mechanisms, and tools for adapting the learning content to the user's level of preparedness. A practical implementation of such a model is the chatbot «EcoMind Bot» which features an interactive structure and combines various educational elements: informational messages, quizzes, test tasks, situational questions, and practical environmental recommendations. The chatbot consists of the following blocks, which are shown in Figure 1:

Fig. 1. Structural blocks of the educational chatbot «EcoMind Bot»

An important component is the gamification system, which involves users earning achievement badges («Eco Explorer», «Eco Protector», «Eco Activist», «Eco Dreamer», «Eco Leader», «Eco Scout», «Eco Expert», «Planet Defender»), which contributes to increasing motivation for learning.

1. At the technological stage, the chatbot is directly implemented using the Telegram platform and the BotFather tool (Fig. 2). During this process, the main parameters are configured, dialog scenarios are created, and elements of nav- igation and user interaction are integrated. The Telegram platform was chosen for chatbot

development as one of the most widely used in Ukraine. Using the Bot-

Father service (the «/newbot» command), the bot's name and username are set, after which a unique access token is generated, and basic settings (description, profile image, etc.) are configured [7].

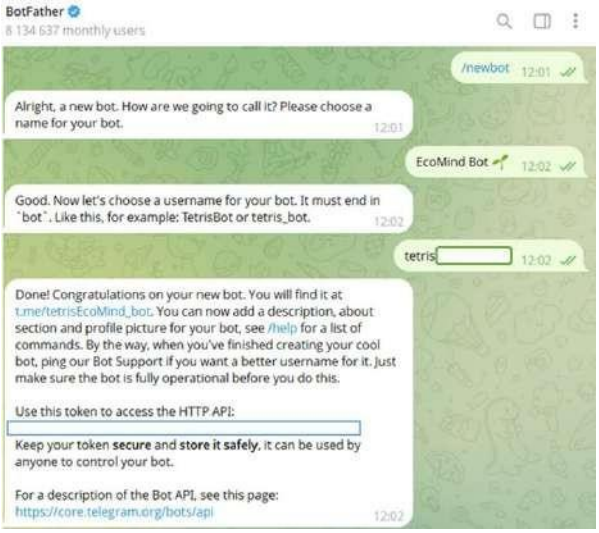

Fig. 2. Creation of the «EcoMind Bot» chatbot in the BotFather service

The obtained token is used to integrate the chatbot with the SendPulse platform, where further configuration is carried out through the constructor interface by adding the bot and connecting it to the Telegram messenger.

Figure 3 shows the platform interface during the chatbot connection process:

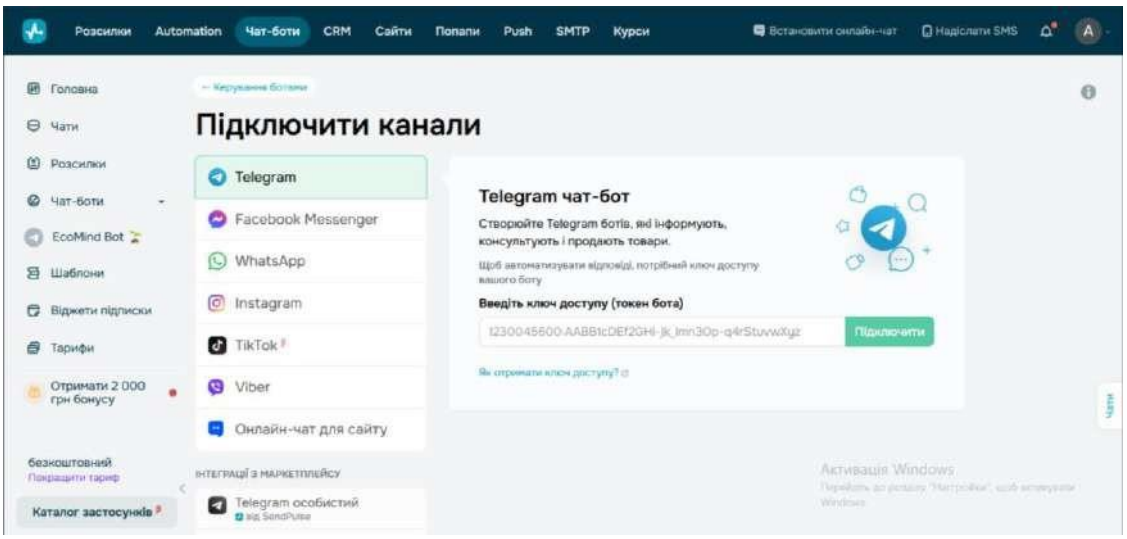

Fig. 3. Connecting the chatbot to the SendPulse platform

2. The content stage involves populating the chatbot with environmentally oriented learning materials. The content includes informational messages, interactive tasks, practical recommendations for environmentally responsible behavior, as well as elements of self-assessment and reflection. Figure 4 presents the SendPulse platform interface during the process of filling the «EcoMind Bot» chatbot with educational materials:

Fig. 4. SendPulse interface during the creation of the «EcoMind Bot» chatbot content

5. At the evaluation stage, the chatbot is tested and the effectiveness of its use is assessed. The evaluation of results involves determining the level of environmental knowledge acquisition, the development of environmental thinking, as well as changes in students' motivational sphere. Figure 5 shows the chatbot interface in the Telegram messenger in its mobile version:

Fig. 5. The «EcoMind Bot» chatbot interface in the Telegram messenger (mobile version)

An effective approach to organizing chatbot-based learning is the use of a multi-level learning structure. Within the «EcoMind Bot» model, three levels of complexity (A, B, C) are provided.

Level A is aimed at forming basic environmental knowledge. At this stage, students become familiar with fundamental ecological concepts, develop initial understandings of interrelationships in nature, and recognize the role of humans in environmental conservation. They learn the principles of responsible interaction with the environment, including waste sorting, rational use of water resources, and energy efficiency, which contributes to the development of environmentally responsible behavior.

Level B involves the deepening of knowledge and the development of environmental thinking. Students expand and systematize their knowledge, analyze current environmental issues, and explore examples of their solutions at both local and global levels. Completing interactive tasks and participating in thematic quizzes support the development of critical thinking, information processing skills, and the ability to make informed decisions.

Level C is focused on fostering environmental responsibility and active civic engagement. At this level, students engage in more complex analytical and creative tasks, investigate problematic environmental situations, establish cause- and-effect relationships, and propose their own solutions to environmental challenges. This contributes to the development of independence, initiative, and a responsible attitude toward the environment.

The use of a chatbot in environmental education involves its integration into the educational process as a supporting tool that contributes to increasing learners' engagement and independence. The methodology of its use includes the organization of various forms of learning activities, such as dialogic interactions, completion of test tasks, participation in quizzes, solving problem-based situations, and receiving practical environmental recommendations. Due to its interactive nature, the chatbot enables the individualization of learning, provides immediate feedback, and allows for repeated review of learning materials in a user-friendly format. In addition, the use of gamified learning scenarios enhances learners' motivation, promotes better knowledge acquisition, and supports the development of environmentally responsible behavior. The chatbot can also function as a navigation and information resource, helping to structure learning materials and provide access to additional sources, thereby making the educational process more flexible, adaptive, and modern.

The effectiveness of chatbot implementation depends on a number of pedagogical conditions: a clearly defined didactic goal, alignment of content with learners' age characteristics, systematic use, motivation support, and an adequate level of digital competence among participants in the educational process. It is also important to ensure feedback, which allows learners to assess their own performance and adjust their learning activities accordingly.

Thus, as a result of the study, the essence of an educational chatbot has been defined as a pedagogical tool that ensures automated dialogic interaction and performs instructional, informational, organizational, and assessment functions. It

has been substantiated that its use contributes to the individualization of learning, enhances students' motivation, and activates their cognitive activity.

Within the framework of the study, the «EcoMind Bot» chatbot was developed as an interactive tool for learning, knowledge assessment, and motivation toward environmentally responsible behavior, aimed at shaping the environmental worldview of students.

The key principles of its development have been identified (interactivity, accessibility, clarity, consistency, personalization, and practical orientation), adherence to which ensures the effective functioning of the chatbot. The stages of its development (analytical, design, technological, content, and evaluation) and the methodological features of its application in environmental education have been characterized.

Thus, the feasibility of using educational chatbots as an effective tool for modernizing environmental education and shaping the environmental worldview of students has been demonstrated.

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