



Развитие профессиональной коммуникативной толерантности будущих педагогов в практике разработки чат-ботов дидактического назначения

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АННОТАЦИЯ

Проблема и цель. Модернизация высшего образования открывает перспективы использования чат-ботов на основе искусственного интеллекта для повышения качества обучения наставников цифровой школы. Кроме того, приоритетными задачами программ подготовки являются: стимулирование культурного обмена, формирование убеждений и мировоззренческих позиций, развитие коммуникативной и цифровой компетентностей.

Цель исследования – выявить особенности организации практической деятельности будущих педагогов по проектированию чат-ботов дидактического назначения для развития их профессиональной коммуникативной толерантности.

Методы исследования. Чат-бот – программа, спроектированная в среде разработки и обладающая определённым дидактическим потенциалом. В эксперименте задействовано 70 студентов Вятского государственного университета (Российская Федерация). Программа подготовки: 44.04.01 Педагогическое образование. Информатизация образования (уровень – магистратура). Деятельность по проектированию чат-ботов реализована на занятиях дисциплины «Методология информатизации образования». Платформа для разработки и управления чат-ботами – сервис BotMan. Для оценки сформированности профессиональной коммуникативной толерантности применяется тест В. В. Бойко. Метод статистической обработки – критерий χ^2 (хи-квадрат) Пирсона.

Результаты. Работа магистрантов экспериментальной группы по проектированию чат-ботов для поддержки толерантности и мультязычной коммуникации включает: техническую реализацию, интеграцию ресурсов в социальную сеть, разработку основы сценария и доработку его по требованиям, тестирование приложения учебного назначения. Особенность предлагаемого информационного взаимодействия – адаптация содержания прикрепляемых к чат-боту информационных материалов под специфику направления подготовки. Выявлены статистически достоверные различия в качественных изменениях, произошедших в педагогической системе ($\chi^2 = 7.281$; $p < 0.05$).

Заключение. К особенностям деятельности по проектированию чат-ботов, обеспечивающих дополнительные условия для развития профессиональной коммуникативной толерантности, относятся: добровольный характер общения всех участников виртуального диалога; детальное изучение интерфейса и функциональных возможностей платформы разработки; возможность выразить своё мнение в выборе названия, оформления и сообщениях; наличие механизмов обратной связи.

КЛЮЧЕВЫЕ СЛОВА

информационное взаимодействие, искусственный интеллект, цифровая образовательная среда, поликультурность, приложение учебного назначения, сервис BotMan

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Лицензия «С указанием авторства — С сохранением условий». Позволяет перерабатывать, исправлять и развивать произведения при условии указания авторства и лицензирования производных работ на аналогичных условиях.



Developing Professional Communicative Tolerance in Future Teachers through the Development of Didactic Chatbots

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ABSTRACT

Problem and goal. The modernization of higher education offers the potential for AI-based chatbots to improve the quality of instruction for digital school teachers. Furthermore, the priority objectives of training programs include stimulating cultural exchange, developing beliefs and worldviews, and developing communicative and digital competencies. The goal of the study is to identify the specifics of organizing future teachers' practical activities in designing didactic chatbots to develop their professional communicative tolerance.

Research methods. A chatbot is a program designed in a development environment and possessing specific didactic potential. The experiment involved 70 students from Vyatka State University (Russian Federation). Training program: 44.04.01 Pedagogical Education. Informatization of Education (Master's degree). Chatbot design activities were implemented in the "Methodology of Informatization in Education" course. The platform for developing and managing chatbots is the BotMan service. V. V. Boyko's test was used to assess the development of professional communicative tolerance. The statistical analysis method was Pearson's chi-squared test.

Results. The work of the master's students of the experimental group on designing chatbots to support tolerance and multilingual communication includes: technical implementation, resource integration into a social network, development of a basic scenario and its refinement according to requirements, and testing of the application for educational purposes. A distinctive feature of the proposed information interaction is the adaptation of the content of information materials attached to the chatbot to the specifics of the training program. Statistically significant differences in the qualitative changes that occurred in the pedagogical system were identified ($\chi^2 = 7.281$; $p < 0.05$).

Conclusion. The specifics of chatbot design activities that provide additional conditions for the development of professional communicative tolerance include: voluntary participation by all members in the virtual dialogue; detailed study of the interface and functionality of the development platform; the ability to express one's opinion on the name, design, and messages; and the availability of feedback mechanisms.

KEYWORDS

information interaction, artificial intelligence, digital educational environment, multiculturalism, educational application, BotMan service

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INTRODUCTION

According to the UNESCO Charter, the global community should be based on the principles of intellectual and moral solidarity among its members [1]. The international organization outlines its aspirations for effective joint activities among different peoples and nations, multiculturalism, and equality. According to H. Kalmykov et al., many of the stated global goals are expected to be achieved through the development of intercultural communication and interaction in the fields of education, culture, and science [2].

R. Hasyim, N. Nomi, and S. Nur indicate that an information environment focused on supporting tolerance and intercultural communication in education requires that teachers (mentors) have the appropriate, well-developed competencies. In particular, these include the skills to create and maintain an atmosphere conducive to the development of honesty and openness, encouragement and leadership, and the full consent and trust of students [3]. In other words, learning through communication, according to the findings of V. V. Boyko, determines the importance of developing communicative tolerance [4]. C. Espinal and J. Pichardo reflect on how new technologies (e. g., AI) are changing traditional spaces of socialization (particularly during the learning process) [5]. Z. Liu, Q. Wang point out that the application of AI in the educational environment is one of the latest challenges for educators and policymakers in the field of international education [6].

A. Sarwari et al. agree with R. Srinivasan, S. Aithal, that AI has a significant impact on various aspects of human life [7], especially communication between people. Conversational AI opens up new possibilities for alternative and innovative ICT tools (e. g., AI-powered chatbots) [8]. E. A. Mamaeva et al. describe the stages of designing an educational chatbot, the content of which is determined by the specific training of IT specialists [9]. The researchers clarify the features, possibilities, and limitations of using such chatbots in the didactic process. Furthermore, the authors point to the need for specialized training for higher education teachers themselves in integrating AI elements into their professional work. However, as R. Srinivasan, S. Aithal note, the use of automated responses changes communication style and the role of communication in activities. Furthermore, a new system of social relations is formed [8]. The authors point out that the speed of communication, the range of facts and arguments presented, the emotionality of statements, and the procedure for evaluating interlocutors all change. In particular, participants in a chatbot interaction are much more likely to agree with the biases embedded in the virtual assistant, even if their initial opinion was different. Thus, although AI can increase the speed of communication and improve interpersonal perception, the identified negative consequences should also be considered.

So, on the one hand, AI tools (e. g., chatbots) are quite actively used in everyday communication. However, the implications of its use for social interaction and the implementation of multiculturalism and tolerance as international priorities remain insufficiently studied. On the other hand, the use of chatbots in informational pedagogical interaction requires specialized training for the instructors themselves. The following hypothesis is put forward in this study: the development of communicative tolerance in future teachers through the development of educational chatbots will be effective if the didactic capabilities of AI resources are appropriately utilized and considered at all stages of communicative tolerance development (from training to expressing an active position in the information environment).

This study aims to identify and substantiate the potential of practical activities in developing didactic chatbots for developing professional communicative tolerance in future teachers.

Research objectives: to clarify the content and identify the levels of development of professional communicative tolerance; to determine the capabilities of chatbots, the use of which will create additional resources for developing professional communicative tolerance in future teachers; to identify and substantiate pedagogical conditions that most effectively promote the development of professional communicative tolerance in students through the development of didactic chatbots; to experimentally test the effectiveness of the proposed system.

MATERIALS AND METHODS

A didactic chatbot is a program that not only provides students with personalized assistance and prompt support but also facilitates interpersonal interactions with all participants in the educational process. The development and use of didactic chatbots to foster professional communicative tolerance were implemented among students majoring in 44.04.01 Pedagogical Education. Informatization of Education (Master's degree). The experimental activity was applied during classes in the "Methodology of Informatization in Education" course. The experiment was conducted at Vyatka State University. Seventy first-year master's students participated. The average age was 22 years. 60% of the participants were female and 40% male. The specificity of the sample was determined by the specific nature of the pedagogical training profile.

The future teachers used MIT App Inventor cloud tools to develop didactic chatbots. During the selection process, the authors evaluated the potential of the following services: BorisBot, Chatfuel, ManyChat, Flow XO, Tilda, BotMan, and others. Selection criteria: required programming basics, integration with messengers; interface languages; set of built-in components; free trial; branching logic and dialogue scenarios; analytics (statistics and reports); level of natural language processing, i.e., the chatbot's ability to understand user requests.

The authors used V. V. Boyko's test to assess the development of communicative tolerance. Its advantages: the mentor can identify the respondent's weaknesses; identification of behavioral responses, strategies, and attitudes that need to be adjusted to make the communication process effective. The test consists of 45 questions, divided into 9 blocks. Each block represents a behavioral characteristic in communication. The rating scale is an integer value from 0 to 3 points. The respondent's scoring system was as follows: 0 points – not applicable; 1 point – sometimes applied to a minor extent; 2 points – applied significantly; 3 points – applied to the maximum extent. The maximum number of points was 135, with 15 points for each block. Since all participants in the experiment were students pursuing a master's degree in education and pedagogy, it was decided to introduce three levels of communicative tolerance: high (from 1 to 45 points), average (45-85 points), and low (85-135 points). Thus, the "complete rejection" level was combined with the "low" level. According to V. V. Boyko's methodology, the level is an integrated indicator for all blocks. In statistical data processing, the Pearson's chi-squared test was used.

LITERATURE REVIEW

L. Tran et al. rightly note that geopolitics shapes the landscape of international education [10]. Traditionally, international education has been used as a tool for developing transnational cooperation, strengthening multilateral and global ties, and reducing tensions between countries. However, according to the authors' conclusions, this role has recently been artificially minimized. International education is becoming a weapon in the hands of politicians (for example, tensions in the Indo-Pacific region). L. Tran et al. analyze opinions among the Australian international education sector and universities regarding emerging geopolitical tensions. Based on their findings, recommendations were developed for creating an interconnected, coordinated international education sector to reduce geopolitical risks and ensure communicative tolerance. A. G. Asmolov notes that communicative tolerance presupposes a highly moral motivation in communication, a tolerant consciousness, and a desire for effective intercultural dialogue [11].

Intercultural learning, in the context of M. Xu and A. Shapii's research, is the process of developing intercultural competence, or a set of cognitive and communicative skills, along with the values and beliefs necessary for effective interaction with representatives of different cultural and linguistic backgrounds [12]. A. Almukhambetova et al. evaluate changes in student behavior in the context of military tension [13]. The authors identify factors influencing students' mobility decisions in a complex geopolitical situation. The results indicate that in military-related contexts, students studying information technology and mathematics most often make decisions after assessing all the circumstances (both internal and external aspects of the communication conflict). B. Muszynska and M. Stewart focus on how Polish teachers interact with Ukrainian refugees [14]. The authors note that the teachers conducted classes in which they used information technology to share their experiences with students, inviting them to do the same in Polish and their native languages. This study demonstrates

that the information environment of schools attended by refugee children and youth has a significant impact on the development of personal qualities such as multiculturalism and tolerance.

M. Hakimi et al. believe that the speed with which new digital technologies change the intensity and direction of information flows affects many aspects of the communication process [15]. The authors examine the impact of new digital communication technologies across the following vectors: human behavior in the virtual and real world; user perception and relationships online and in society. M. Hakimi et al. call for consideration of the quality of interactions that have replaced face-to-face communication. The researchers call for a balance between the use of technological advances for communication and the development of an individual's information and communication culture.

S. Nisa, H. Mohamed, and M. Yamkasikorn examine the influence of the social network TikTok on the quality of students' social interactions. In particular, the issue of balancing the conflicting and converging interests of users in the virtual space is highlighted [16]. According to the authors' conclusions, parents and mentors are advised to monitor and track students' social media activity to ensure it remains positive and constructive. L. Piccerillo and S. Digennaro base their research on the following facts: emotional intelligence is a sought-after skill in today's digital society; adolescents' use of social media is an important part of their communication with peers [17]. L. Piccerillo and S. Digennaro suggest that the use of social media for educational purposes is only possible if all potential risks (such as the spread of stereotypes and the distortion of reality and cultural perceptions) are taken into account [17].

E. Choi, J. Kim, and N. Park note that the low level of digital literacy in multicultural societies requires additional efforts to overcome the digital divide [18]. C. Espinal and J. Pichardo note that developed critical thinking and digital literacy are essential skills in modern society [5]. They are important conditions for addressing the social impact of new ICTs on social interaction for several reasons: promoting creativity and innovation, responsibility and integrity, respect for the interlocutor, and others. Improving the quality of teacher training is a critical element in the corresponding improvement of the educational process. C. Han et al. examine the development of teachers' understanding of how to accommodate students with behavioral challenges. According to the researchers' justified conclusions, these students have the same right to inclusive education as other students. The main conclusion: a shift from external control to student engagement in learning activities is necessary, for example, through the use of AI tools [19].

A. Fernandez studies the development of dialogic interaction in students through vocabulary expansion [20]. The author suggests that communication in language education should go beyond the use of standard functions (information transfer) and include a variety of linguistic codes and forms of self-expression. A. Fernandez describes possible interventions aimed at stimulating students' reflection on violence and conflict resolution through the analysis and modeling of various linguistic constructs and visual representations. The author concludes that the use of communication training created a space for reflection on complex social and moral issues in the classroom, as well as issues of intercultural communication. G. Chura Quispe et al. substantiate the need to develop a system of skills for conducting scientific research among teachers [21]. The authors identify the following key skills: problem identification, information gathering, and hypothesis formulation; research skills; and report writing skills.

E. V. Soboleva et al. propose using mobile learning resources to develop intercultural competence in participants in the didactic process [22]. The authors argue that the design of mobile apps by future teachers (selecting and structuring educational content for their content, programming, and design) facilitates the acquisition of the knowledge necessary for engaging in intercultural communication. Students majoring in pedagogy apply this knowledge in various communication situations and identify signs of misunderstanding. In the context of the authors' study, a mobile app serves as a mediator between native and foreign cultures.

Ch-W. Tsai et al. determine that, given digitalization trends, educational institutions are increasingly introducing programming classes into the mandatory curriculum for students of all majors [23]. The authors note that students from different ethnic backgrounds often react differently to such activities. This is due to differences in cultural heritage (the environment in which they grew up) and perceptions of their future careers. Ch-W. Tsai et al. present an AI-based programming module that allowed the authors to compare differences between students at

multicultural colleges in terms of their theoretical and practical expectations, motivation, and learning effectiveness. The experiment involved 96 students from different ethnic backgrounds. M. Glickman and T. Sharot point out that AI technologies are developing very rapidly, expanding human capabilities in various fields (from finance to medicine) [24]. The authors are cautious about the negative impact of these new tools. Specifically, the fact that artificial intelligence systems are capable of adopting and amplifying human biases. This means that AI systems amplify biases that are then internalized by humans, causing a snowball effect where small errors in judgment escalate into much more serious ones. This can lead to problems with social tolerance. L. Truong, S. Lee, and N. Sawhney note that migrants often face difficulties accessing services and navigating the administrative procedures necessary for adapting and integrating into a new environment [25]. The authors demonstrate that the emergence of new AI-based communication tools can improve communication between migrants and counselors on many challenging issues, thereby alleviating many of the complexities of intercultural communication, contributing to an improvement in the quality of information exchange and the standard of living of migrants.

O. Sergeeva, M. Zheltukhina, and S. Demir study how Russian and Turkish students perceive and use AI in scientific communication during their academic assignments [26]. The authors demonstrate the similarities and differences between Turkish and Russian students' views on the role of AI in their educational environment. O. Sergeeva, M. Zheltukhina, and S. Demir note that students in both countries face ethical issues (plagiarism and the questionable authenticity of AI-generated content). However, scholars highlight the need for further analysis of the cultural factors influencing the use of AI in higher education.

S. Sh. Sundar and E-J. Lee examine the role of AI in communication [27]. The article emphasizes the importance of classifying AI's role in human communication based on traditional distinctions (in both mass and interpersonal communication). The authors describe how AI can function as a communicator or mediator in both contexts. N. Hernández López and X. Hu propose using AI to create musical works in which students can express their cultural ideas, interests, and needs [28]. According to the authors, music, as an important element of culture, has a significant impact on personality development, communication, and socialization. At the same time, AI not only enhances communication but also allows for a new interpretation of a musical work. Participants in the study conducted by A. Sarwari et al. included 115 graduate students from nine different countries [7]. According to the authors' findings, the majority of respondents believe that AI technologies bridge cultures, eliminate language and cultural barriers, and help people from different cultures interact and connect. N. Kerimbayev et al. point out that in order for educators to adequately respond to the rapid development and change in technology, they need to take a creative approach to teaching [29]. The authors hypothesize and experimentally prove that AI content and resources can be applied in educational practice. Furthermore, the incorporation of new intelligent tools into creatively organized lessons will contribute to increased student motivation and satisfaction.

M. Tabbu et al. propose using unmanned aerial vehicle (UAV) technology to implement culturally responsive learning [30]. The goal of the study was to create a multicultural educational environment using UAVs for students of different nationalities, based on the different thinking mechanisms conditioned by their cultures and environments. The authors believe that the proposed method improves the effectiveness of teaching programming to students from different ethnic groups, as well as to students with weaker programming skills. This method, according to the scientists, can also improve understanding of different cultures in a multicultural education setting. W. Sintawati and R. Shadiev developed their ideas for students to experience virtual visits to historical and culturally significant sites [31]. According to the author's findings, such excursions will help them understand the characteristics and uniqueness of people.

Z. Liu, Q. Wang present a case study of an educational chatbot designed to teach cultural content to high school students in a foreign language (English or French) [6]. The experimental results allow Z. Liu, Q. Wang, to conclude that the use of AI-powered chatbot technology for interactive ICT-based learning is suitable for both foreign language learning and intercultural dialogue. The aim of T. Hastomo et al.'s study is to explore the use of AI-powered chatbots in foreign language teaching and identify their potential for stimulating students' emotional, behavioral, communicative, and cognitive engagement [32]. The authors note that the scientific community has recently shown increased interest in using chatbots in teaching foreign language writing.

Thus, most researchers believe that AI is a powerful tool in language education and interaction between representatives of different nationalities. However, the need for changes in teacher training programs is equally clear. The mentor should not only use AI resources to enhance communication and increase motivation, but also to achieve the global goals set by UNESCO.

RESEARCH PROGRAM

The first stage analyzed the significance of fostering communicative tolerance in a digital society. The limitations and potential impact of chatbots on the didactic process were identified and analyzed in the context of developing a multicultural personality. The provisions of the federal standard for the training program were defined. The areas of educational, training, and future professional activities in which digital school mentors can use chatbots to foster multicultural tolerance in students were clarified. An analysis of chatbot design software (BorisBot, Chatfuel, ManyChat, Flow XO, Tilda, BotMan, and others) was also conducted. It was found that when choosing a chatbot creation tool, various factors must be considered, including ease of use, functionality, cost, and developer technical qualifications.

For example, it was clarified that Chatfuel is ideal for beginners and small educational projects that require a quick start and minimal technical knowledge. However, larger projects and complex scenarios will require additional resources and investment. Various psychological approaches to assessing communicative tolerance were studied, including the "Tolerance Index" (G. Soldatova, O. Kravtsova, O. Khukhlaeva, L. Shaigerova) and the Uncertainty Tolerance Assessment (S. Badner); the Communicative Tolerance Test (V. Boyko), among others. It was decided to use V. Boyko's test as the methodology for the study (the reasons for this choice are stated previously). Using the test, all respondents were divided into an experimental and a control group (35 master's students each). It was decided that the "Methodology of Informatization in Education" course would include one hour of lecture and two hours of hands-on training to develop students' understanding of the capabilities, limitations, and design stages of chatbots. Later, as part of their educational practice, students used the developed chatbots to organize information interaction between students.

During the second stage, master's students studied the course materials according to the university's approved curriculum.

In the third stage of the study, pedagogical conditions were identified that contribute to the effective development of communicative tolerance in future teachers through practical activities related to the development and use of didactic chatbots.

RESEARCH RESULTS

During the first stage of the study, the authors found that the BotMan platform is an excellent choice for those wanting to launch their own chatbot without extensive technical knowledge. Its simplicity and ease of use make it attractive to startups and organizations looking to automate information exchange processes. However, it is important to consider the limitations of customization and the potential costs of maintaining and developing the bot in the future.

Master's students in both groups studied the concept of a chatbot, its didactic capabilities and limitations for education, existing effective examples of chatbots, and corresponding software solutions. Participants in the experimental group thoroughly examined and analyzed the previously mentioned services (Chatfuel, ManyChat, Flow XO, Tilda, BotMan, etc.). The experimental group decided to implement a didactic chatbot using BotMan (a platform for developing and managing chatbots). BotMan allows to create bots with virtually no programming, using visual tools for constructing dialogues and business processes. The course instructor and mentors from the digital school detailed the key features of the BotMan service:

- scenario creation: a user-friendly graphical environment for constructing user-bot communication routes, including conditional transitions, integration of external services, and execution of actions;

- integration with external systems, analytics, security;
- scalability: support for a large number of simultaneous communication sessions, load balancing, and a fail-safe solution for continuous bot operation;
- cloud hosting and a ready-made infrastructure for chatbot deployment;
- availability of ready-made templates and scripts for a quick start.

The authors of the study developed step-by-step instructions for creating a didactic chatbot, which was then implemented in messenger. The proposed approach supports the development of user communicative tolerance in two ways: during information exchange during the design of the chatbot in a virtual environment, and during the selection and design of methodological materials – the content of the chatbot. Each instruction includes a detailed description of each step and visual examples. All you need is a browser, a personal messenger account, and an account on the BotMan service. No additional equipment is required.

Stage I. Technical Implementation. First, log in to your messenger profile and go to the chatbot creator, BotFather (@BotFather). This bot allows you to create, edit, and customize your bot.

Guideline 1. One way to develop communicative tolerance with this chatbot is that it's entirely in English. To get started, click the "Start" button. After launching the bot, you need to choose what you want to do. In this case, you want to create your own chatbot. Select the `/newbot` command. The bot will then ask you to choose a name for the chatbot.

Guideline 2. Since the bot will be related to developments for rising communicative tolerance, it's recommended to think of a suitable name. For example, "Dialogue of Cultures" or "Interlocutor". Now that the chatbot has a name, you need to create a unique username that users can use to find it in general searches. Important note: the username must end with `"_bot."` Once the username has been selected, BotFather will provide a unique token. Using a token on the BotMan service, you can edit the bot and monitor its statistics.

Before adding a token to the service, you can access the chatbot interface editing sections using the `/mybots` command. After entering the command, BotFather provides a selection of all the bots you've previously created. To begin editing, select the bot you're designing from the list.

After selecting the desired chatbot, a series of commands for editing the chatbot will appear on the screen. Since we plan to edit the chatbot interface specifically, select "Edit Bot" from all the provided commands.

After using the "Edit Bot" command, a series of additional commands for editing the chatbot interface will appear. All these commands are also listed in the message. Some commands are marked with a smiley face, indicating that the bot doesn't support these commands. We'll select only the ones we really need for editing: the "Edit Botpic" command edits the chatbot's main photo, or "avatar"; the "Edit Description" command edits the description that appears immediately when opening a chat with our bot. For user convenience, you can include the sentence "To launch the bot, click 'Start' or `/start`" in this description; the "Edit Description Picture" command edits the picture that appears immediately when opening a chat with the bot. This picture has a unique feature: it can only be attached in one size: 640x320. If you like the picture but it doesn't fit the specified size, you can use the additional information resource to resize it; the "Back to Bot" command returns you to the list of commands.

To use one of the commands, you must first select it. Then send a message to the chat corresponding to the command. For example, the description is text, the bot's main picture is an image, and so on.

Guideline 3. Description and image selection are also ways for graduate students to demonstrate their communication principles, interests, and communication styles. After editing the interface (by navigating to the username), see what the initial page of the chatbot being designed now looks like. Next, you can begin attaching the chatbot to the BotMan service.

Stage II. Integrating the resource into a social network. Upon opening the website, you'll need to register. One of the most convenient registration methods is to log in with a Google account. Before

using the BotMan service, you need to select the social network/messenger in which you created the chatbot. To find your bot's token, return to the BotFather dialog containing the token. After connecting the bot to the service, you can begin editing it. In other words, begin developing the "script" for educational purposes. To go to the main page, click "Done". On the main page, you can see that the chatbot is attached.

Stage III. Developing the script base. To do this, click the area (block) under "Bot Scripts". You've now entered the "Designer" mode. Here you can add various commands (transitions between them), attach files in different formats, and so on. To get the bot up and running, the designer has already provided you with the initial "Start" command, which you can use to begin sequencing the commands. To create a sequence of actions, click the gray "+" in the lower right corner of the start command and draw a line to any available space on the screen. This will create "virtual steps" in your digital space. Start by selecting the "Message" step. The next step, "Message 1," will now be available.

In this step, you should greet users and enter the following text: "Hi, I'm [Your first and last name]". Here you can find materials on the topic you're interested in! Select the class you need!"

Guideline 4. Choosing a greeting and the structure of phrases for exchanging messages is also an option for learning activities with the potential to develop communicative tolerance. Next, highlight the phrase "Hi, I'm a bot" in bold and italics. Add a link to your messenger profile to your first and last name. Without leaving the "Message 1" step, add buttons with the listed classes. The button name is limited to 25 characters. Each button also has gray "+" signs, which can be used to link to the next "step." To understand the mechanism, follow these steps: link from the "Class 11" button and also add the "Message" "step." In this "step," enter the text: "Excellent! Select the topic you need additional material on!" Also, add three buttons with the topic names. For example, "Russia", "China", and "France".

In addition to the topic buttons, add a "Back" button. This is necessary in case the bot user selects the wrong class. Each button has a type. In this case, you need to return to the previous step, so the button type should be "Go to Step." Next, select the step you want the button to take you to. In our case, it's "Message 1". You can also manually drag the arrow from the gray "+" on the "Back" button to the left edge of the area next to the "Message 1" step. The "Message" step also allows you to attach files in various formats. For example, select the "China" button and attach a "*.pdf file". This file could contain material on Chinese culture for the participant in the virtual dialogue. Also, add a caption under the file and insert the text: "Material on Chinese culture".

Guideline 5. This can (and should) be the most potentially significant stage of chatbot development. This is where graduate students can demonstrate their attitude toward representatives of other cultures (virtual interlocutors), evaluate their characteristics (originality), and express their position in a variety of ways (friendly or aggressive).

Stage IV. Testing. To test the constructor, click the "Test" button. If everything works in test mode, the chatbot script can be published using the "Publish" button.

Stage V. Expanding the Chatbot Script Framework for Didactic Purposes Based on Requirements. Now that all the main functions of this service have been reviewed, graduate students receive an individual assignment. Specifically, they must complete an expansion of the designed chatbot framework on a free topic. The chatbot must include: a customized interface (main image; description; image attached to the description); the first and last name of the chatbot creator in the "Message 1" step with a hyperlink to their personal messenger profile; at least 3 steps in the constructor, each with at least 2 buttons attached; "Back" buttons in steps where logically necessary; a step with an attached file of any available format and a signature for the file. After completing the basics and creating their chatbot, the master's students in the experimental group used it as part of their educational practice. For example, to organize a virtual discussion as part of the study of the topic "Number Systems." Information about specific ways of writing (representing) numbers in China, France, and Russia can be added to the supporting material.

During the theoretical discussion, the master's students identified the following advantages of using BotMan:

- 1) ease of bot creation: No need to delve deeply into programming,, thanks to the intuitive interface, even for novice users;
- 2) quick integration: the service connects to social networks and instant messaging apps, making it easier to launch a project;
- 3) adaptation to market needs: the service is tailored to local realities and supports specific organizational requirements;
- 4) low entry barrier: even a novice digital school teacher can quickly create their first chatbot thanks to ready-made scenarios and a simple interface;
- 5) support for multiple communication channels: users can interact with the bot through different channels simultaneously, increasing audience reach;
- 6) automation of routine processes: the bot can independently answer frequently asked questions and solve many other everyday tasks;
- 7) minimal load on IT infrastructure: using a cloud solution reduces the cost of maintaining your own infrastructure.

Limitations were also noted:

1. Limited customization options. Despite a wide range of tools, deeply customizing some aspects of the bot's behavior requires specific technical knowledge;
2. Dependence on third-party channels. If one of the supported messengers ceases operations or restricts API access, the bot's operation will be disrupted;
3. Price. The free version has significant limitations, and full functionality is only available in paid plans;
4. Lack of complete independence. The chatbot operates exclusively within the BotMan ecosystem, and migrating the ready-made solution to another platform will require significant effort.
5. Need for regular support. To keep the bot relevant and effective, regular script updates and system maintenance will be required;
6. Potential scalability issues. Large educational projects with high loads will require additional attention to system performance and optimization.

In the control group, participants were not involved in specific activities related to designing a didactic chatbot. They were instead engaged in, for example, developing an interactive electronic resource. Using hyperlinks, audio files, quizzes (and links to third-party resources), students presented information on the cultures of different countries. Or, for example, for the "Algorithmization and Programming" section. The digital school's mentors designed the following learning situation: students were asked to develop a program in a programming language to determine the most significant date from a given set of important events in a given country. Note: the significance of an event is determined by the year in which it occurred. This means you need to determine the latest year from the given dates. The idea: the user enters a list of countries and a set of different historical dates corresponding to important events. Using basic algorithmic constructs, arrays, and auxiliary algorithms, the students, under the guidance of graduate students, developed their algorithm in a hands-on environment.

Guideline 6. Selecting countries for the list and choosing historical dates, in this case, also allowed us to identify the intercultural communication characteristics of the control group participant.

The results of measuring the level of communicative tolerance of future teachers using V. V. Boyko's methodology before and after the chatbot development experience are presented in Table 1.

High level – the master's student understands the importance of active, creative work in a modern multicultural society that is intensively mastering and applying AI tools in interaction. In accordance

with the principle of tolerance, the student is able to independently select material for the chatbot. They accurately format the resource in digital form. They actively use the resulting chatbot to preserve their socio-cultural identity, understand other cultures, respect other cultural and ethnic communities, and support peace and harmony with representatives of different nationalities, races, and faiths.

Average level – the master's student, in most cases, understands and accepts the importance of active, creative work in a modern digital multicultural society. In accordance with the principle of tolerance, the student is able to select material for a didactic chatbot with minimal assistance from a mentor. They can digitally format it without significant technical or content errors. They strive to apply the developed information and educational solution to foster and support intercultural communication and combat intolerance, stereotypes, and discrimination.

Low level – the master's student rarely understands and accepts the importance of active, creative work in a modern, digital, multicultural society. In accordance with the principle of tolerance, they can select material for a didactic chatbot only with significant methodological assistance from a mentor. They can digitally format it with some technical and content errors. The student strives to learn how to apply the developed information and educational solution to support constructive dialogue.

Table 1 Results of the impact of student involvement in chatbot development on their level of communicative tolerance

Level	Groups			
	Experimental (35 master's students)		Control (35 master's students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
High	4 (11%)	15 (43%)	5 (14%)	5 (14%)
Average	21 (60%)	16 (46%)	20 (57%)	22 (63%)
Low	10 (29%)	4 (11%)	10 (29%)	8 (23%)

The following hypotheses were accepted: H0 – the level of communicative tolerance of future teachers in the control and experimental groups is statistically equal; H1 – the level in the experimental group exceeds that of the control group. For $\alpha = 0.05$, χ^2_{crit} is 5.991. It was found that $\chi^2_{obs.1} < \chi^2_{crit}$ ($0.136 < 5.991$), and $\chi^2_{obs.2} > \chi^2_{crit}$ ($7.281 > 5.991$). Thus, the difference in communicative tolerance levels between the experimental and control groups can be considered non-random. Let's analyze the changes in training levels:

1. The most significant positive changes (11 people, or 32%) were observed in the experimental group at the "high" level. In the control group, there was no increase.
2. In the control group, significant positive changes were recorded at the "average" and "low" levels. In both cases, 22 people, or 6% of the group, were observed.
3. The experimental group showed the smallest changes at the "average" level. In our opinion, this is due to the fact that the number of students whose level of communicative tolerance changed to "high" is almost twice as high as the number of other changes.

DISCUSSION OF RESULTS

This study reflects the ideas of the international organization UNESCO on the need to consider and implement principles of respect, acceptance, and understanding of cultural diversity, forms of self-expression, and modes of human individuality in the information and educational environment. In selecting a tool to achieve the formulated hypothesis, the authors considered the findings of R. Srinivasan and S. Aithal, who found that the use of automated responses influences communication style and interaction in the information interaction environment [8]. As revealed during the conversation between the instructor of the "Methodology of Informatization in Education" course

and participants in the experimental group, the designed didactic chatbots do indeed make it possible to change the speed of communication, the emotionality of the arguments used, and the intensity of feedback.

The materials of this article are a logical continuation of the work of E. A. Mamaeva et al. on the need to train education IT specialists to develop chatbots [9] and the work of E. V. Soboleva et al. on the potential of mobile learning resources for developing intercultural competence in participants in the didactic process [22]. Options for developing the findings of this study: a comprehensive analysis of reports on the results of master's students' internships and the use of chatbots in schools, taking into account their teaching experience and adjusting the course content; choosing an alternative means of implementing chatbots and comparing the results.

CONCLUSION

Thus, the integration of AI tools into the organization of information interaction within a digital educational environment can be realized by selecting a didactic chatbot. Based on the results of the study, it can be objectively concluded that the use of AI-based chatbots allows for a new presentation of material: for motivation, for learning new thematic content, for systematization, and reinforcement. However, as also confirmed by analytical work and subsequent experimental work, the introduction of chatbots into the communication process of participants in didactic interactions has the following significant impact on: the manner of written and oral speech (a logical consequence of the previous aspect); opinions and judgments because the automated system inadvertently reflects points of view prevailing on the internet; empathy and emotional intelligence of interlocutors due to the ability to read/understand the content, words, and overall tone of a message.

All of these factors, as identified in the literature review, define the essence of communicative tolerance. The practical implementation of these factors occurs thanks to the following chatbot capabilities: automation of routine processes, interactive format, imitation of real dialogue, setting up notifications/reminders, intensified feedback, etc. Let's outline the practical aspects of designing didactic chatbots identified by study participants: the need to study the interface and functionality of services, most of which do not support the Russian language; the ability to express one's opinion, judgment, and position not only in the wording of the message but also in choosing the name, design, and content of the chatbot itself; the voluntary nature of communication among all participants in a virtual intercultural dialogue. The most important key pedagogical conditions that maximally supported the development of communicative tolerance among digital school mentors included: the motivation and attitude of participants in the virtual dialogue, the sequence of stages, the formulation of methodological recommendations, and the use of the designed chatbot during educational/industrial training. Challenges were also identified: configuring certain aspects of the chatbot's behavior requires specific technical knowledge; dependence on third-party websites (resources); the need to register and provide personal information on multiple services; limitations of free versions, etc.

The obtained research results are planned to be used to improve training programs for digital school mentors, as well as to integrate elements of the work on creating educational chatbots into continuing professional education programs offered at the university.

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