Interactive Boards as Digital Tools in the Modern Educational Process

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Abstract — This article highlights the features of using interactive boards in higher education institutions. The expediency of incorporating interactive boards into the educational process is substantiated through the analysis of scientific publications. The most common practices of using interactive boards in distance learning are described. The results of a survey of educators from higher education institutions in the Sunny region regarding the selection of interactive boards for student education are presented. It is confirmed that the choice of interactive boards depends on the convenience of the interface and toolkit, the ability to organize group/project activities, and communication between the subjects of the educational process. Technical and pedagogical conditions for the application of interactive boards are characterized. The results of a comprehensive study of Padlet and Trello interactive boards are provided based on a series of indicators: clarity, adaptability to the educational process, security, feedback, and others. The comprehensive study was conducted based on a SWOT analysis in the directions of Strengths, Weaknesses, Opportunities, and Threats. The results of the SWOT analysis allowed for the identification of promising directions for the use of interactive boards, anticipating problems, and maximizing opportunities for improving student education organization.

Keywords - interactive boards; Padlet; Trello; SWOT analysis; educational process; digital technologies; interactive learning.

I. INTRODUCTION

The majority of modern economic sectors require professionals capable of virtual teamwork on collaborative projects. Such skills need to be developed during professional training. Educational programs typically include forming students’ skills in collaborative online work. Therefore, alongside mastering specific software, attention should be given to resources that serve as digital tools for organizing virtual teamwork, which have gained popularity and are in demand in certain industries. For organizing distance learning in Ukraine, educators commonly use interactive boards such as Padlet, Twiddla, Classroom Screen, etc., enabling the organization of collaborative tasks creation and editing, as well as visualizing the learning process. Meanwhile, in industries like production, IT, marketing, and trade, where there is a constant flow of tasks and adherence to deadlines is crucial, other interactive boards operating on the Kanban principle are successfully utilized for organizing and managing collective work. Among them are Worksection, Trello, and others, which are well-received by educators, proving to be versatile and effective for both distance learning [1] and mobile learning [2].

Researchers have identified organizational [3], technical [4], and pedagogical [5] conditions for using interactive boards. The methodological and theoretical-practical foundations of using virtual interactive boards in the educational process are discussed in scientific papers [6; 7; 8]. E. Nyemkova highlights the use of management methods in the training of modern cybersecurity professionals, particularly the application of the Kanban methodology in students’ research activities [9]. B. Miner explores collaborative work management tools in the Trello and Microsoft Planner environments, analyzing their advantages and disadvantages [4]. Project-based learning using the Trello service and its impact on students' social skills have been investigated by A. Ali [10], A. Alves, C. Leão, and F. Moreira [11]. The use of the resource in organizing robotics competitions is examined in the research of A. Eguchi [12]. In Ukrainian educational practice, researchers M. Kozir [13], O. Shchetinina, and I. Komar [14] study the possibilities of applying Trello in distance learning, in conducting qualification improvement courses, and in organizing group work for educators. The potential of using Padlet in distance learning is discussed in the works of Zh. Qiao, S. Mu [15]. The use of Padlet as an educational tool was explored at the Association for Computing Machinery's Educational Technology and Computers Conference [16] and the International IEEE Conference on Educational Digital Innovations [15]. However, a systematic review of scientific results indicates a lack of comparative studies on the effectiveness of virtual boards (advantages and disadvantages of digital boards and their tools, technical and pedagogical conditions for their use, etc.). Such a comparison is crucial for educators who use interactive boards for administration and organizing the educational process based on the goals and characteristics of educational disciplines.

The aims of the article are:

- To analyze the experience of using interactive boards in the educational process and the attitudes of educators towards interactive boards;

- To compare the interactive boards Padlet and Trello and conduct their SWOT analysis.
To address the set tasks, we surveyed teachers, analyzed the experience of using interactive boards in the educational process, and identified attitudes toward them. Additionally, through the survey, we gathered students' opinions on the use of boards in learning. Based on the survey results, we compared the most popular boards, Padlet and Trello, conducted a SWOT analysis, and provided recommendations for their use depending on educational goals.

II. ANALYSIS OF EXPERIENCE IN USING INTERACTIVE BOARDS IN THE EDUCATIONAL PROCESS AND INSTRUCTORS' ATTITUDES TOWARDS INTERACTIVE BOARDS

Before employing a specific interactive board to organize a course or recommending its implementation, it is essential to understand its actual usage by instructors and analyze their impressions from the gained experience. We aimed to find out: Is there a rationale for using interactive boards? Will the cognitive, time, and methodological efforts of the instructor be justified in achieving the planned learning outcomes when using an interactive board? Which board should be preferred?

We conducted 2 surveys of teachers working in universities and colleges in Ukraine. In November, the number of respondents was 48, and in March - 92. The second survey in March was supplemented with opened questions, which allowed us to understand the personal opinions of teachers about the methodological features of using interactive boards.

The survey questions, which included choosing an answer, and the results of the two surveys are presented in Table 1.

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**Table 1:** Survey Results of University Instructors Regarding the Experience and Attitude Towards Virtual Interactive Boards

<table>
<thead>
<tr>
<th>Question</th>
<th>November 2023</th>
<th>April 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you use virtual interactive boards in student education? (Choose one answer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Yes</td>
<td>36</td>
<td>75.00%</td>
</tr>
<tr>
<td>- No</td>
<td>12</td>
<td>25.00%</td>
</tr>
<tr>
<td>2. If yes, what is the purpose of their use? (Choose multiple answers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- organization of educational courses</td>
<td>6</td>
<td>12.50%</td>
</tr>
<tr>
<td>- organization of extracurricular activities</td>
<td>18</td>
<td>37.50%</td>
</tr>
<tr>
<td>- collaboration on joint projects</td>
<td>15</td>
<td>31.25%</td>
</tr>
<tr>
<td>- your answer</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Which boards have you worked with? (Choose multiple answers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Padlet</td>
<td>25</td>
<td>52.08%</td>
</tr>
<tr>
<td>- Trello</td>
<td>11</td>
<td>22.92%</td>
</tr>
<tr>
<td>- Twiddla</td>
<td>3</td>
<td>6.25%</td>
</tr>
<tr>
<td>- WikiWall</td>
<td>7</td>
<td>14.58%</td>
</tr>
<tr>
<td>- others</td>
<td>4</td>
<td>8.33%</td>
</tr>
<tr>
<td>- None</td>
<td>12</td>
<td>25.00%</td>
</tr>
</tbody>
</table>

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The results of responses to question No. 1 demonstrate a slight increase in the usage of virtual interactive boards in March (by 5.43%), which is associated with the continuation of remote learning in Ukraine and the improvement of forms and methods used by teachers. As shown by the responses to question No2, boards are most frequently used for extracurricular activities, with their usage increasing by 7.07% in March (from 37.5% in November to 44.57% in March), and least used for managing the educational course (12.5% and 13.05%, respectively). We were interested in the purposes for which instructors use boards, so in question No. 2 of the repeat survey, an option to express their opinion was added. Analysis of open-ended responses revealed that teachers use boards for communication with students and reflection, conducting competitions and contests, entertainment, and storing educational materials and student data. According to popularity (question No. 3), the distribution of boards was almost the same in both surveys, with Padlet and Trello identified as the most popular boards.

Since the analysis of responses showed a certain percentage of teachers who do not use boards, we were interested in the reasons for non-use (question No4). In the repeat survey, teachers were offered to select a response option or express their own opinions. According to the results of the analysis of responses, a small percentage lacks the necessary knowledge (November - 10.42%, March - 14.13%); a larger number does not understand the relevance of their usage (November - 14.59%, March - 17.39%). Among the self-reported reasons provided by teachers, the most common were: "I don't know which one to prefer," "technical difficulties," and "lack of time for learning how to work with boards." Teachers also noted: "I am a physical education (history, literature, etc.) instructor, interactive boards are not needed for my course.”

The repeat survey in March was supplemented with open-ended questions regarding the methodological value, problems, and prospects of using interactive boards. In response to the question "What pedagogical methods do you manage to implement using interactive boards?” teachers mentioned brainstorming, conducting games, testing, and visualization of exercise performance. Among the problems accompanying the use of digital interactive boards, unreliable protection of personal data, limited capabilities of free versions, and technical components were named. It is important to focus attention on the
question "Do you plan to expand the possibilities of using interactive boards in your pedagogical activities?" 60.87% answered "Yes," and 22.83% - "Yes, provided that I improve my skills in using them."

Thus, it can be argued that teachers are positively inclined towards expanding the possibilities, strive to learn, and see the importance of using digital interactive boards.

We were interested in students' attitudes toward using boards in classes. We surveyed 125 university and college students. It is important to note that 96% enjoy working on interactive boards.

The results of the response to the question "Do you like working with interactive boards in classes?" are demonstrated in Figure 1. Among the most popular boards, students also most frequently mentioned Padlet and Trello.

Figure 1. Distribution of students' responses to the question "Do you like working with interactive boards in classes?"

Therefore, both teachers and students show a high interest in using interactive digital boards. Considering the lack of time for independent analysis, mastering the capabilities, and advantages of the most popular boards, Padlet and Trello, we have decided to conduct a thorough analysis of them and, based on its results, create recommendations for using Padlet and Trello.

When choosing the pedagogical conditions that determine the use of interactive boards, we relied on the experience of O. Chaikovska, who experimentally confirmed their expediency and effectiveness. In her work [17], the author highlights conceptual approaches to the development of the information-digital environment and recommends adhering to the following pedagogical conditions.

The author recommends the following pedagogical conditions: understanding the purpose of using the digital tool (discussion, collaboration, idea collection, completion of educational tasks and projects, etc.); timely familiarization with the basic functions of the digital board to perform assigned tasks; clear instructions on using the digital tool; defining expected outcomes; establishing assessment criteria; setting up a reporting system to track student participation and the success of collaborative work. Adherence to these conditions forms the basis for the effective use of interactive virtual boards in the educational process.

III. INTERACTIVE BOARDS PADLET AND TRELLO AND THEIR SWOT ANALYSIS

Surveying revealed the highest popularity in the use of Padlet (https://padlet.com/) and Trello (https://trello.com) boards. Many educational goals are similar to production goals (complete tasks within a set deadline, master a topic, solve a test), Trello has become a useful tool in organizing learning. The use of Trello has gained popularity in the education of students in technical specialties, especially those who will work with the Kanban technology in their future professional activities. Figure 2 presents a Trello board implementing the course "Applied Information Technologies."

Figure 2. Fragment of the board with published tasks, course "Applied Information Technologies"

Analysis of educational practices in universities indicates the effectiveness of the Trello board for courses such as "Applied Information Technologies," "Web Technologies," "IT Project Management," "Systems Analysis," "Logistics," and "Production Management" [20].

Padlet is a service for hosting content in a cloud environment on created interactive boards [21]. In education, Padlet is used for publishing educational information, creating presentations, collaborating on tasks, and conducting interactive exercises. The service enables the activation of cognitive activities, and the development of communicative skills, and teaches students to interact in a team. Teachers with experience using the service have attested to its usefulness in conducting educational events, training sessions, as well as courses involving active collaboration among students. Figure 3 presents a Padlet board implementing the course "Information Literacy."

Figure 3. Fragment of the board for the course "Information Literacy"

Considering the popularity and active use of both boards, we compared them based on several indicators (Table 2).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Trello</th>
<th>Padlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of a free version</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarity of the interface</td>
<td>Intuitively understandable for task creation and tracking</td>
<td>Offers better interaction and visual appeal</td>
</tr>
</tbody>
</table>
A comparison of interactive board characteristics indicates that both programs have a limited free version, and their functional capabilities are generally sufficient for educational purposes. The boards are adapted to the educational process, ensuring confidentiality and security. There are differences in collaboration organization and task lists. The fundamental difference in Trello is its orientation towards Agile Management, while Padlet stands out for its ability to visually demonstrate educational materials, use collaboration tools with information sources in the form of text and multimedia objects, and create shared multimedia products.

A SWOT analysis was conducted for the boards. (Figures 3 and 4).

Based on the results of the SWOT analysis, the following conclusions and recommendations can be made regarding the choice of an interactive board for organizing and supporting the educational process. The Trello interactive board is advisable for organizing collaborative research or project activities; document flow management; planning and monitoring the results of practical, laboratory work within established deadlines; data storage, and operational communication. Trello is also worth applying for developing an individual educational trajectory with a fixation on terms and program results. The use of Trello will be effective in the education of future IT professionals, economists, logisticians, and managers, as the use of Trello as a tool for future professional activities is likely. Since only 10% of the surveyed teachers use the “organization and control of joint work” feature of the Trello board, it makes sense to develop and implement special courses/training/webinars for educational institution teachers to master the Trello board as a digital teaching tool, as well as methods of its use in the preparation of future professionals who use distance forms of work.

The Padlet interactive board is an effective digital tool for activating learning, reflection, organizing testing, reviewing learned material, self-study, and storing educational materials. It can be used as a message board when planning events. In distance learning, Padlet is advisable to use when studying disciplines where visualization, discussion, exchange of thoughts and creative ideas, methodological support, and research activities will be important.

It is worth noting that the use of interactive boards in student education may face several problems, including lack of experience or insufficient training of teachers in using digital tools; technical problems (lack of Internet or weak connection, lack of electricity, etc.); issues with confidentiality and security (interactive boards may contain confidential information, the protection of which requires additional requirements). To avoid or address these problems and maximize the impact of using interactive boards, it is necessary to provide teacher training, including sharing experiences, theoretical and practical training, thematic courses, and self-education. Technical problems should be anticipated, and alternative methods of Internet connection should be available. Issues with confidentiality and security are addressed by establishing encryption systems and configuring access control systems to restrict user rights.
IV. CONCLUSION

The results of the comparative study of the interactive boards Padlet and Trello have shown that both programs have a limited free version, but their functionality is mostly sufficient for achieving educational goals. The boards are adapted to the educational process, ensuring confidentiality and security. There are differences in the organization of collaborative work and task lists. Trello is characterized by its orientation towards Agile Management. The Padlet interactive board stands out with its ability to visually demonstrate educational materials, use collaborative tools with information sources (text, multimedia), and create joint multimedia products. The Trello virtual board has prospects in organizing collaborative research or project activities, document flow management, and developing an individual educational trajectory. The use of Trello will be effective in educating future IT professionals, economists, logicians, and managers. The strategy for using Padlet involves planning mass events and further enhancing features for activating learning, reflection, and organizing testing. In distance learning, Padlet is advisable for disciplines where visualization, discussion, exchange of thoughts and creative ideas, methodological support, and research activities are important. The knowledge of the characteristics, strengths, weaknesses, possibilities, and limitations of each board presented in the study is crucial for successful teaching.

The challenges of using interactive boards highlight future research directions: teacher preparation for using various types of virtual boards (training and experience exchange, theoretical and practical training, thematic courses); development of effective methodologies for using interactive boards in the study of specific disciplines.

REFERENCES