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## VIRTUAL TEAM BUILDING IN AN INTELLIGENT COLLABORATIVE LEARNING ENVIRONMENT

Maria Kuznetsova *	I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russian Federation	<a href="mailto:kuznetsova_m_yu@staff.sechenov.ru">kuznetsova_m_yu@staff.sechenov.ru</a>
Dmitry Gura	Kuban State Technological University, Krasnodar, Russian Federation Kuban State Agrarian University, Krasnodar, Russian Federation	<a href="mailto:gda-kuban@mail.ru">gda-kuban@mail.ru</a>
Lubov Vorona-Slivinskaya	Saint Petersburg State University of Architecture and Civil Engineering, Saint Petersburg, Russian Federation	<a href="mailto:Ly161@yandex.ru">Ly161@yandex.ru</a>

\* Corresponding author

### ABSTRACT

Aim/Purpose	The main purpose is to study the experience of using virtual team building as a means of forming educational and research teams in the context of the development of online education and its effect among students and teachers of higher educational institutions.
Background	Methods ensuring effective engagement of students in learning are critical to the success of online education. The most obvious problems in higher educational institutions are procrastination, academic dishonesty due to easy access to electronic resources, decreased attendance, and insufficient interaction between teachers and students.
Methodology	The research methodology is based on an empirical approach, which is a research survey using a questionnaire to collect data based on closed-ended questions. For quantitative analysis, the independent sample t-test was used. The survey was conducted among students and teachers of two educational institutions in the Russian Federation.
Contribution	This study is of practical and scientific importance as it can contribute to the introduction of virtual team building in the modern education system.

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Findings	Based on the analysis of the data obtained, it can be concluded that students and teachers approximately equally assess the impact of team building on the ability to get to know each other better, improve communication skills, and psycho-emotional intimacy. Despite the need and sometimes no alternative to virtual team building (for example, during a pandemic), half of the sample of students (50.8%) agreed that team building was more effective in an offline environment while 64.3% of teachers believe that the effectiveness could have been higher in the offline environment. The respondents assessed the positive effect of team building on their interest and motivation to study or work.
Recommendations for Practitioners	These findings can contribute to a broader and faster implementation of virtual team-building practices in the education system of the Russian Federation and other countries of the world. The results of this study can be applied by higher educational institutions that are interested in increasing team cohesion, interest, and motivation to study or work, as well as the creation of closer and trusting relationships, and an atmosphere of psycho-emotional safety.
Recommendations for Researchers	This topic requires more observations to verify the influence of student personality on the effectiveness of virtual team building in intelligent collaborative learning environments.
Impact on Society	The study highlights the importance of communication between the student and the teacher, as well as between students, as psycho-emotional well-being in the micro-society results in a better academic performance.
Future Research	Further research can be aimed at studying the difference in the effectiveness of team building in online and offline learning environments, as well as the impact of team building on the teaching staff.
Keywords	collaborative learning, smart environment, virtual team building, virtual reality, online education

## INTRODUCTION

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The COVID-19 pandemic spread throughout the world, creating not only a unique challenge but also a potential opportunity for online education (Crawford et al., 2020; Mumford & Dikilitaş, 2020). Many online learning platforms, methods, as well as new approaches, are currently available for students who will undoubtedly benefit from the rapid acquisition of knowledge and information (Hwang & Chen, 2019; Lu et al., 2017; Vorona-Slivinskaya et al., 2020). However, many studies show that students use these electronic resources with limited assimilation and integration into their learning processes (Bozkurt & Sharma, 2020; Goksel & Bozkurt, 2019; Losh, 2014; Sana et al., 2013). Thus, methods ensuring effective engagement of students into learning are critical to the success of online education. The most obvious problems in higher educational institutions are procrastination, academic dishonesty due to easy access to electronic resources, decreased attendance, and insufficient interaction between teachers and students (Bell, 2018; Patrzek et al., 2015).

The most common understanding of team building involves the process of leading a group of people to work together more effectively as teams, especially through special activities and events held to increase motivation and support cooperation (Zhu & Wang, 2020). Virtual team building, for the purposes of this study, involves the above activities partly, predominantly, or exclusively, online thanks to electronic communication tools, social networks, and other Internet technologies (Saviom, 2021).

Virtual team building can be an important tool in a smart digital collaborative learning environment. This is a set of actions in learning environment among members of learning project or research

group that build trust, develop participants, bring cohesion to the team, clarify team norms, promote understanding of the work of virtual colleagues. and conduct effective meetings in a virtual environment. To keep members engaged, leaders must regularly reassess the needs of their team and develop relevant team building activities (Gartner, 2021).

Team building encourages member involvement and helps newcomers to break down barriers while creating a relaxed atmosphere for socializing and communicating. In an educational context, these aspects of teamwork are especially important because they reduce anxiety, improve cognition, and promote academic achievement (Zhang et al., 2020). However, some team members in a team building exercise may think about negative aspects: time wasted, unwillingness to engage in activities of any kind, and consideration of team building as a burden (Hazley, 2019).

Digital transformation is not a new phenomenon, and it has been accompanying the activities of higher educational institutions for several years (Kopp et al., 2019; Leszczyński et al., 2018). The digital transformation of higher educational institutions is a pressing issue of education stakeholders. At the moment, there are opportunities for the application of IT technologies in all spheres of life, so universities must solve the problem of training potential professionals (Abad-Segura et al., 2020; Bond et al., 2018; Sandkuhl & Lehmann, 2017). Digital transformation in the context of higher education can be seen as the collection of all digital processes required for the transformation process implementation, which enables higher educational institutions to make optimal and positive use of digital technologies (Kopp et al., 2019).

With due regard to the Sustainable Development Goals (SDGs), especially the goal of ensuring inclusive and equitable quality education and the promotion of lifelong learning opportunities for all, and the goal of building resilient infrastructure for innovation, virtual team building is a progressive research area. Moreover, taking into account the prospects and difficulties that educational institutions face when introducing virtual team building into a digital collaborative learning environment, the research topic is relevant. In addition, this research is one of the few and reflective study of the effect of virtual team building on different aspects of student life in the context of a higher educational institution (Lapina & Prakasha, 2022; Sumtsova et al., 2018).

The most important problem for higher education institutions during virtual team building is the high complexity of the proposed team building software tools and the need for regular monitoring and mentoring of this process (Zhang et al., 2020; Zhu & Wang, 2020). The problem is even more difficult, especially in conditions of remote or online learning, as was the case under lockdown restrictions (Crawford et al., 2020; Hodges et al., 2020). The contribution of this study is to demonstrate the availability and ease of implementation of team building tools to support online learning in a university context. The methods proposed in this study include organizational tools and communicative game-based easy to implement in terms of involving computer applications, online learning methods or other elements of the digital environment. The proposed methods include minimal game-based team building techniques that allow to abandon the close teachers' and administrative control throughout the team building process.

This study is of practical and scientific importance as it can contribute to the introduction of virtual team building in the modern education system. Team building can be seen as a fun activity that can help students and teachers build their interpersonal connections and maintain social relationships, not only in the context of offline education but also in the course of a remote educational process when personal contact is not possible (Modolin & Grace, 2018).

## ***LITERATURE REVIEW***

In the practice of university education, approaches associated with practical training and training focused on solving real world problems are widespread (Yuberti et al., 2019). Many methods for implementing these approaches involve the use of simulations of real situations and problems in compa-

nies in which graduates will have to work. In this case, researchers point to the high efficiency of using game-oriented teaching methods (Jacobson et al., 2016; Maratou et al., 2016; Sandkuhl & Lehmann, 2017). The involvement of virtualization tools and the Internet makes it possible to make the gaming approach also virtualized.

Virtual immersive learning research is viewed as an innovative model for the study of important scientific knowledge and new practices for the implementation of educational processes. This approach involves the use of a playful virtual world to help learners experience virtual sensation modeling combined with the use of an agent-based computer model to perform computational research activities (Jacobson et al., 2016).

There is widespread research on role-playing games focused on software project management (SPM) in a 3D multiplayer virtual world, necessarily involving the construction of virtual teams by the players. Various platforms are used to create a virtual environment that facilitates collaboration and realistic student interaction. Through the simulation of a real company activity, the game approach aims to develop skills for real world problem solutions. It improves the experimental study of problems related to people, communication, and collaboration of members that are not easily taught with the help of standard teaching methods (Hodges et al., 2020). Students are assigned roles to overcome challenges initiated by non-game units (software-controlled units) and at the same time to collaborate with other students and the teacher.

The instructor, who plays the key role in the game, can monitor players, intervene, and dynamically change certain parameters of the game scenario while adapting it to the difficulties faced by the player (Maratou et al., 2016). It is important for teachers to overcome difficulties in mastering and implementing online methods and elements of the digital environment in educational activities (Hone & El Said, 2016; Kang & Zhang, 2020). The presence of these obstacles makes it important to study the opinion and assessment of teachers of the experience of virtual team building (Ghahramani et al., 2022; Sumtsova et al., 2018).

The issue of increasing student involvement and motivation is being given a lot of attention in educational practices (Azevedo, 2015; Christenson et al., 2012). Online collaborative learning and the creation of virtual learning communities is common practice (Dockerty, 2019). The Internet helps to reshape formal and informal education in the digital age, giving instruments for virtual learning and research team formation (Harasim, 2017).

Online learning, including e-learning and massive open online courses, is widely studied in the field of education or information technology. Available research provides evidence to explain the results or effectiveness of online learning (Burden et al., 2016; H. M. Dai et al., 2020; Hone & El Said, 2016). However, most of them do not consider the difficulties that students experience when they join online courses. In particular, students may feel more anxious and burdened as the intervention involves active involvement, personal interest, and dedication.

Team building, and the use of teamwork rather than just peer interrelations, is becoming increasingly important in the context of pragmatically problem-solving real-life learning (Popta et al., 2017; Yuberti et al., 2019). Within the framework of project-based and practice-oriented learning, classmates and students of the same discipline form project teams and research groups, united by a common internal regulation, common goals, and distribution of functions and tasks within the project. This approach to learning enhances the skills of both future employees and future scientists (Zhu & Wang, 2020). Innovation management and company intellectual property management processes also include the adequate functioning of teams as a mandatory aspect and it should be mastered by future employees while still studying at the university (Voskresenskaya et al., 2020).

Team building plays an important role in creating a positive learning environment and has many benefits ranging from being inspired by learning to understanding the strengths and weaknesses of each participant so that everyone can be understood and supported. A significant bonus of team building

can be an increase in mutual respect, elimination of conflicts between group members, and the creation of more trusting relationships (Y. Dai et al., 2019). Team building activities can be used to improve communication and time management, as well as strengthen connections between the members when they compete with each other or collaborate to defeat opposing teams (Hazley, 2019).

In the field of virtual team building, events help employees quickly adapt to the new teleworking lifestyle. In the field of pedagogy, students are facilitating their process of collaborating on learning and research projects in teams through virtual team building in an era of gradual dominance of online learning. This can help minimize negative impacts of online culture in the workplace, such as the inability to separate work from home, loneliness, and added stress (Saviom, 2021). A study that found that virtual team-building exercises increased employee productivity and decreased absenteeism, and they improved profitability by 41% and 21% respectively (Hickman & Robison, 2020).

Modern team building offers ample opportunities for the development of technology programs using unusual gadgets while taking team building away from purely physical or intellectual tasks to a purely digital approach. The use of a game approach in teaching and the formation of communication and group skills, which include team building, encourages the development of a variety of skills, including strategic thinking, time management, and innovation. However, the participants may perceive it as entertainment immersing themselves in the fun process of solving puzzles rather than as another exercise. Team building in virtual reality makes it possible to place the team into a digital world that is not subject to the laws of the real world. In VR games, players can easily fly, climb a mountain, and even be transported into the future – the potential has no boundaries (Hazley, 2019).

Team building in the context of university education can lead to the creation of closer business and educational ties of graduates with the university and contribute to their further successful interaction in university teaching and research projects. The specific psychological bonds formed by team experiences differ from those of peers and cannot be formed in the course of generally accepted practices of students' classes (EFSOL, 2018).

The issues of increasing student motivation and collaboration are widely discussed (Lee et al., 2019; Park & Kim, 2022; Visser et al., 2019). The proposed approaches and tools are effective but are more focused on improving the process of mastering knowledge and cooperation in the learning process. At the same time, several skills required in teamwork when dividing the functions and areas of activity of participants cannot be obtained, and the process of virtual team building can be a solution to this problem (Y. Dai et al., 2019). The experience of using team building in business is little used in the university environment, despite the great potential for preparing future graduates for work in companies (Ghahramani et al., 2022). This study is intended to partly close this gap.

### ***SETTING OBJECTIVES***

The motive for conducting the study is the need to obtain subjective assessment data on the impact of virtual team building in an intelligent collaborative learning environment in the context of higher educational institutions. The research question can be formulated as follows:

*Is it possible to significantly improve the subjective assessment and effect of team building in a student and at the same time teaching audience using the easy game-based tools for providing a team building experience?*

It is necessary to find out whether virtual team building can develop mutual respect in the micro-society, raise morale, eliminate internal conflicts, and help to stay in touch with colleagues, and encourage them to work closely together. It can increase the efficiency of collaboration and allow people to interact, as well as exchange and receive constructive feedback. Thus, when the participants look at the problem through the prism of innovation, they become more involved in the achievement of long-term goals. A common goal motivates people to work hard to achieve it, which in turn leads to a higher productivity index with no burnout. Also, virtual team building exercises can help build meaningful relationships and connections between geographically dispersed team members.

The main purpose of the research is to study the experience of using virtual team building and its effect among students and teachers of higher educational institutions. The study attempts to prove that the introduction of virtual team building activities makes the learning process more effective which, in addition to being informative, also has emotional significance for students and teachers to create the feeling of a real 'team'.

The research objectives are as follows:

- 1) To investigate the impact of the easy implemented game-based virtual team building tools on improvement of the evaluation of the team building experience in a digital collaborative learning environment on the Zoom platform.
- 2) To identify the effectiveness and degree of satisfaction from the implementation of virtual team building by conducting a survey among students and teachers of higher educational institutions.
- 3) To carry out a comparative analysis of the results of a teacher survey and a student survey in order to identify which of these groups received more benefits from the implementation of virtual team building activities.

The team building mechanism at universities in Russia and many developing countries, as far as it is possible to assess, is either not used, or only its limited elements are used; for example, some types of team building games described above (Lapina & Prakasha, 2022; Sumtsova et al., 2018). An obstacle to the implementation of this method is ignorance about it, doubts about the need for its implementation, uncertainty about its effectiveness and the goals it achieves (Ghahramani et al., 2022; Yuberti et al., 2019). Another barrier is the difficulty in implementing online project team building and team building tools (Modolin & Grace, 2018). The results presented in the proposed study allow us to evaluate the experience gained by students and teachers and present their subjective assessment of changes as a result of the implementation of virtual team building. Real and simple team building tools are also presented, the implementation of which is maximally simplified and accessible to universities. The presented experience and assessment should help other universities to quickly decide on the implementation of this method to deepen the integration of student learning with real business practices and business processes after graduation and contribute to a wider implementation of this method in many universities in Russia and other countries.

## METHODS AND MATERIALS

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### *RESEARCH DESIGN*

The research methodology is based on the research survey using a questionnaire to collect data based on closed-ended questions. The survey is aimed at obtaining a subjective assessment of various aspects of team building in the context of online learning at the university by students and teachers. The assessment obtained will allow us to refine and improve the applied methods of team building and make it more attractive for participants and effective for preparing for the future work of university graduates. The survey was conducted among students and teachers after a certain time allotted for using the Zoom application as a virtual team building tool in accordance with the tasks, team building games, and initiatives described later in this section.

In 2020, Zoom has become one of the leading video conferencing applications. Zoom allows users to virtually interact with their colleagues when face-to-face meetings are not possible, and it has also proven to be effective in the context of public events (Tillman, 2021). The Zoom platform was chosen due to its maximum prevalence and use in most educational institutions around the world and free of charge. Since the goal of this study is to implement the easiest and most accessible team building tools for implementation, this platform seems to be the most appropriate.

Zoom is a cloud-based service that can be used for virtual meetings with other people either through video/audio conferencing or both; users can chat in real time and record sessions to be viewed later. This software is compatible with Windows and macOS and can be found on Android and iOS platforms. Zoom allows users to join meetings and share their screens. Conference participants can also tune their microphones, start or stop video stream, change account names, as well as invite other participants to a meeting (Tillman, 2021).

Team building methods for this study were taken from the studies reviewed in the literature review, as well as from sources provided in the references in the description of individual exercises. The main tasks of team building are based on the views common to many researchers (Ghahramani et al., 2022; Hazley, 2019; Modolin & Grace, 2018).

The student participants of the study were divided into project groups in accordance with the course in which they studied and within their own study group or together with students from several groups studying the same topic. The teachers accompanied this learning project process by guiding and supporting the participants in each individual project group. Each project group was considered within the framework of the study as a team for which team building classes were held. The team building sessions were separate from the training and project sessions and were devoted exclusively to the team building processes and related discussions on the work on the project, identifying leaders, distribution of responsibilities and administrative issues, as well as personal communication between the participants of each of the teams.

The researchers deliberately did not specialize or differentiate in any way the teams that worked on educational projects in various professions and disciplines in order to evaluate only those aspects that relate to team building, and not individual academic disciplines.

The important team building tasks were the tasks on which the work of the participants, both teachers and students, was concentrated during the team building meetings. The important team building tasks were as follows:

- 1) To find leaders to organize the process and make the participants take part in the general meeting of the team. The teachers in each of their groups and students selected by the students who they consider suitable participants became these leaders.
- 2) The meetings were held as weekly 80-minute videoconferences divided into two Zoom sessions for 18 weeks. The time of the lesson was determined by the teachers and agreed with the students independently. It is important to note that the group consisted of 8-10 people so that each participant had time to speak.
- 3) To determine a clear action plan at each meeting. The leaders found in the team in accordance with the 1st task in this list were clearly informed about the objectives of presented here research and each of them was given a plan of team building activities, described below. It included 9 activities, and each activity was performed twice.

The nine virtual team building games and initiatives included (Scavify, 2021):

- 1) Virtual team meetings
- 2) Shared virtual workspace
- 3) Peek into each other's homes
- 4) Desert island scenario
- 5) Discussion of global issues
- 6) Movie night
- 7) Casual conversation channel
- 8) Personal facts and guessing
- 9) Photo sharing.

## ***PARTICIPANTS***

The survey was conducted among the 372 students and 42 teachers of two educational institutions of the Russian Federation: Kuban State Agrarian University and Kuban State Technological University. The universities were chosen randomly, but in the same region, in order to expand the sample and for the convenience of the study. Participants among students were selected on the basis of a random sample; teachers were also selected on a random basis but limited by the fact that these teachers should currently teach those students who were already selected for participation in the study. Since the approach assumes the widest possible context and the use of team building for any specialties and any educational context, no additional selection filters were introduced. All participants gave consent to participate in the study. The team building practice lasted from March to July 2021. These practices included not only team meetings, but also specialized team building games and team building tasks as described above. This study involved students and teachers of higher educational institutions who took part in Zoom conferences with the introduction of team-building games.

The influence of gender and age characteristics was not investigated in the study and the participants were not asked to indicate their gender in the questionnaire. As a result, 372 students and 42 teachers were interviewed (a total of 414 people). More detailed information regarding the number of participants from each institution is given in Table 1.

**Table 1. Data on the number of participants from each educational institution**

<b>Educational institution</b>	<b>Students</b>	<b>Teachers</b>
Kuban State Agrarian University	183	19
Kuban State Technological University	189	23
<b>Total people</b>	372	42
<b>Total %</b>	89.8	10.2

## ***RESEARCH INSTRUMENTS***

With the help of the Survio database, an online questionnaire (Appendix) was sent to the participants via email; the email addresses were provided by the administration of the educational institutions. The database provided access to filling out the questionnaire to each participant using the access keys sent to them and helped to store and manage the received completed questionnaires during their processing. This also ensured the uniqueness of each questionnaire and the preservation of the anonymity of the participants. Those willing to participate anonymously filled in an online form, which guaranteed their data confidentiality. The respondents who took part in the survey were automatically considered to be the research participants. All questionnaires were filled out correctly and found suitable for further statistical processing.

The respondents were asked to indicate how much they agree with the statements on a 4-point Likert scale, where:

- 1 - Strongly agree (SA)
- 2 - Agree (A)
- 3 - Disagree (D)
- 4 - Strongly disagree (SD) (Appendix)

The questionnaire contains 13 questions. The first three questions define the respondent's profile: age, status, university. Next, there is a list of 10 statements aimed at assessing the effectiveness of virtual team building.



The questionnaire was created by the author based on the experience of team building research and the content of the surveys described in the research literature mentioned in this article. Internal consistency and reliability were tested using the Cronbach Alpha method. To do this, the responses were encoded with numbers, as indicated above. The result obtained is  $\alpha = 0.701$ , which suggests that the reliability of the questionnaire is high enough for its use. Validity was checked by a survey of experts. Fifteen teachers from both universities were invited, whose students took part in the survey, 8 and 7 teachers, respectively, who did not take part in the survey. All of them have at least 2 publications in peer-reviewed journals on the topic of team building and have been dealing with problems of university pedagogy in various fields for at least 5 years, as well as teaching students for at least 7 years each. They were asked to assess the compliance of the questionnaire with the scope and objectives of the study on a 5-point Likert scale, where 1 point is “almost does not correspond” and 5 points is “completely corresponds”. A mean score of 4.27 was obtained ( $SD = 0.31$ ). Thus, it can be assumed that the questionnaire has sufficient validity for the purposes of the study.

### ***DATA ANALYSIS***

Descriptive statistics are used to analyze the results obtained according to the percentage of responses. For quantitative analysis, the independent sample t-test was used. The data on the frequency, mean, and standard deviation were used to describe the statistics to determine the degree of influence with the use of the t-test. The t-test was used to compare the mean by identifying significant differences at the 0.05 level. The mean values obtained in response to each of the questions separately for teachers and for students were compared with other questions to determine the presence of statistically significant differences. Thus, the validity and internal relativity of the proposed questionnaire were tested. In fact, the hypothesis was tested that there are no statistically significant differences in the respondents' answers to the questions, which can be interpreted as the fact that the corresponding questions do not contain significant valid and independent values (variables) to be measured. In relation to all mutual pairs, the question received a value of  $p \leq 0.05$  (Table 2, Note). Accordingly, as a result of the study, this hypothesis was rejected in relation to all questions of the questionnaire. Corresponding tabular data is omitted to save space. The data obtained were analyzed in SPSS Statistic.

### ***RESEARCH LIMITATIONS***

This study has certain limitations. The research sample included students and teachers from only two universities. Data representing the entire student and academic population of the country were not collected, which may not accurately reflect the effectiveness of virtual team building. Further research should focus on educational institutions across the country for a more reliable generalization of results. Moreover, research can be conducted not only among students, but also among teachers to improve their teamwork.

Also, the limiting factor is the curators of the study (teachers), who were different in each student group, which could indirectly have an effect on the final result. However, within the framework of the research design, it would not have been possible to avoid this. In addition, this can be offset by the fact that there was one program of team building games for all participants.

It is worth noting that tendencies towards independence or extroversion can influence student perception of team building assignments. Introverts may be less active as they have difficulty in social interactions, including virtual ones. More research is needed to verify the influence of student personality on the effectiveness of virtual team building in intelligent collaborative learning environments.

## RESULTS

The results of the survey regarding the impressions of students and teachers and the subsequent effectiveness of the implementation of the virtual team building program are presented in Table 2. The survey results show that both students and teachers were satisfied with their participation in team building activities (Statement No. 1). Thus, the total percentage of SA and A options is 84% and 73.8% among the students and the teachers, respectively. Also, 89.8% of teachers and 88.1% of students reported that participation in videoconferences helped them get to know each other better (Statement No. 2). These values show that the closer acquaintance effect obtained in the course of team-building activities is significant for both students and teachers.

The results of Statement No. 3 show that 73.4% of students and 81.0% of teachers believe that the group has become more cohesive. In this case, there is a slight prevalence of teachers, which can be explained by the subjective perception of the group leader while the group itself is less homogeneous and has more complex and broader social interactions.

It should be noted that 90.9% of students and 88.1% of teachers believe that virtual team building has a positive impact on their team (Statement No. 4). At the same time, 89.2% of students and 88.1% of teachers think that team building is a good way to improve communication skills and the psycho-emotional atmosphere in the team (Statement No. 5).

It was interesting to find out whether the respondents thought that team building was just a waste of time, especially the teachers, who were required not only to participate but also to lead all the processes, which increased their workload (Statement No. 6). Thus, 74.7% of students and 64.3% of teachers appreciated the time they spent on virtual team building activities. Among the teachers, the percentage is lower, which may be due to their extracurricular activity.

**Table 2. Results of the survey on the effectiveness of the implementation of virtual team building\***

Question	Students			Teachers		
	Option	Frequency	Percentage	Option	Frequency	Percentage
1. Generally, I was pleased with the participation in team building activities.	SA	101	27.2	SA	9	21.4
	A	198	53.2	A	22	52.4
	D	54	14.5	D	8	19.0
	SD	19	5.1	SD	3	7.1
2. Participation in video conferences with my classmates and teacher (students) helped me get to know them better.	SA	150	40.3	SA	8	19.0
	A	184	49.5	A	29	69.0
	D	28	7.5	D	4	9.5
	SD	10	2.7	SD	1	2.4
3. Team building has made my group more cohesive.	SA	104	28.0	SA	10	23.8
	A	169	45.4	A	24	57.1
	D	68	18.3	D	5	11.9
	SD	31	8.3	SD	3	7.1
	SA	142	38.2	SA	10	23.8
	A	196	52.7	A	27	64.3

Question	Students			Teachers		
	Option	Frequency	Percentage	Option	Frequency	Percentage
4. I think virtual team building has had a positive impact on my team.	D	22	5.9	D	5	11.9
	SD	12	3.2	SD	0	0.0
5. Team building is a good way to improve communication skills and the psycho-emotional atmosphere in the team.	SA	143	38.4	SA	18	42.9
	A	189	50.8	A	19	45.2
	D	29	7.8	D	3	7.1
	SD	11	3.0	SD	2	4.8
6. I believe that team building was not just a waste of time.	SA	120	32.3	SA	8	19.0
	A	158	42.5	A	19	45.2
	D	74	19.9	D	12	28.6
	SD	20	5.4	SD	3	7.1
7. It seems to me that team building would have been more effective in an offline environment than in a virtual one.	SA	52	14.0	SA	5	11.9
	A	137	36.8	A	10	23.8
	D	115	30.9	D	18	42.9
	SD	68	18.3	SD	9	21.4
8. Team building helped me build relationships with some people (students) from my group.	SA	54	14.5	SA	5	11.9
	A	103	27.7	A	10	23.8
	D	140	37.6	D	17	40.5
	SD	75	20.2	SD	10	23.8
9. Team building has developed my deep attachment to my educational institution.	SA	132	35.5	SA	6	14.3
	A	189	50.8	A	21	50.0
	D	31	8.3	D	10	23.8
	SD	20	5.4	SD	5	11.9
10. Team building has had a positive effect on my interest and motivation to study/work.	SA	154	41.4	SA	10	23.8
	A	167	44.9	A	20	47.6
	D	33	8.9	D	8	19.0
	SD	18	4.8	SD	4	9.5

Note: SA - strongly agree; A - agree; D - disagree; SD - strongly disagree;  $p < 0.05$

It was extremely important to find out whether the respondents think that team building would have been more effective in an offline environment than in a virtual one as there is personal contact with people (Statement No. 7). Thus, 50.8% of students believe that the effectiveness of team building in an offline environment would not have increased in contrast to 49.2% of learners who do not share

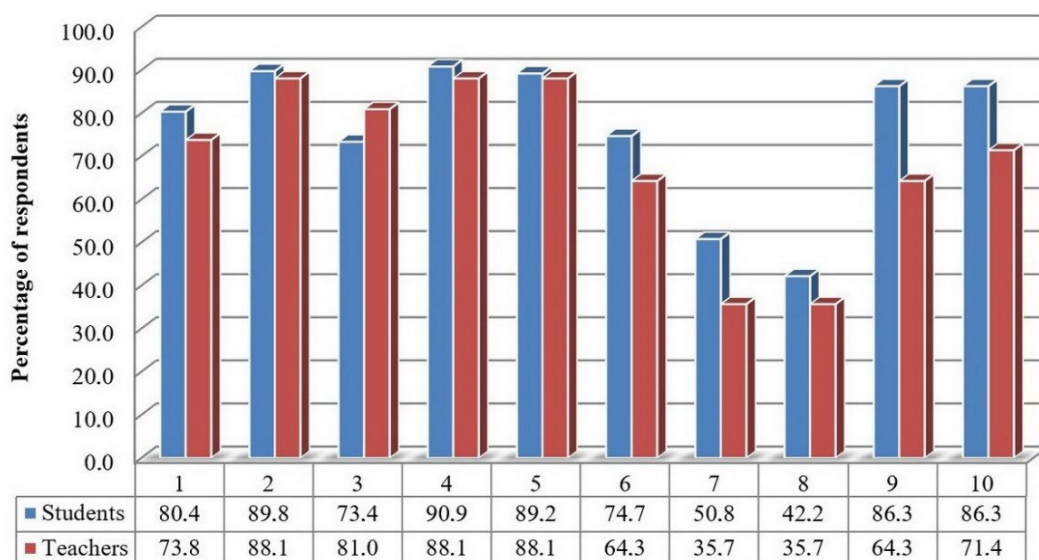
this point of view. As for teachers, only 35.7% believe that team building in a virtual environment is more beneficial than in the real one. These results can be explained by the fact that students are younger than teachers and, therefore, virtual reality is perceived by them much more easily and is considered more acceptable.

It can also be noted that 42.2% of students and 35.7% of teachers managed to establish relationships with the help of team building activities (Statement No. 8). These indicators are not high, but it should be kept in mind that the majority of respondents probably did not initially have problem relationships with other team members.

The analysis of the manifestation of the attachment to the educational institution, which was observed in the course of team building activities, showed that 86.3% of students and 64.3% of teachers experienced this feeling (Statement No. 9). The indicator is higher among students, which can be explained by the subjective perception of student life at a young age.

Thus, the respondents noted a positive effect of team building on their interest and motivation to study and work: 86.3% of students and 71.4% of teachers agreed with the statement, which are also significant indicators.

To visualize the items under study, the data can be described in the form of a graph according to the criteria that relate to the positive effect of the introduction of team building activities (Figure 1).



**Figure 1. SA and A responses sum (from Table 2) reflecting the subjective assessment of the effect of introduction of team building**

Based on the analysis of the data obtained, it can be concluded that students and teachers approximately equally assess the impact of team building on the ability to get to know each other better, improve communication skills, and psycho-emotional intimacy (Statements Nos. 2, 4, 5). The fact that team building has increased the cohesion of the team was noted by a slightly larger number of teachers compared to students (Statement No. 3). The majority of the students and the teachers do not consider team building a waste of time, even though there were not many teachers who agreed with Statement No. 6. An approximately equal percentage of students and teachers managed to improve their relationships in the team, although 57.8% of students and 64.3% of teachers disagreed with Statement No. 8; this indicates that there is no effect of team building activities on conflict resolution or processes associated with building relationships. Team building also contributed to the deeper at-

tachment of students to the educational institution (Statement No. 9). This also applies to the assessment of the positive effect of team building on motivation and interest in learning; this indicator is higher by 14.9% among students compared to teachers.

## DISCUSSION

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The study highlights the importance of communication between the student and the teacher, as well as between students as psycho-emotional well-being in the micro-society results in better academic performance. A study by American researchers based on a two-year ethnographic analysis of global virtual teams (GVT) and involving six universities around the world (USA, China, South Korea, Germany, Israel, and India) demonstrated the fact that in a virtual environment, students are more actively involved in the learning process, can solve unforeseen problems and establish new ways of being, acting and thinking. This study highlights the dynamic nature of the team-building process design and provides important insights into how students can benefit from the implementation of programs based on virtual reality (Y. Dai et al., 2019).

Team building is a normative activity for most businesses, but it is practically not used in universities that train staff for business (Ghahramani et al., 2022). Team building tools can have an effect that significantly complements the project-based learning already implemented by many universities, learning based on solving real problems, and so forth (Lapina & Prakasha, 2022; Yuberti et al., 2019). The results of our study indicate a high appreciation by students and teachers of the results of this approach to learning, which can be relied upon to build the ability to work in a team after graduation in a new digital environment (Hazley, 2019; Lee et al., 2019).

Another study showed that, compared to traditional classroom learning, online learning on forums effectively increased student engagement and motivation, as well as reduced procrastination and plagiarism. Thus, online practices can be seen as a useful complementary approach to traditional classroom learning (Kang & Zhang, 2020). Supported by the survey data presented here, increased motivation and involvement in the online research and learning process can be enhanced by the team building process and stimulate online learning.

Australian researchers also described the results of a two-week intervention involving the use of a CSI approach in two groups, which demonstrated a considerable increase in student success (Jacobson et al., 2016). This overlaps with the findings obtained in the present paper. Thus, it can be stated that virtual team building has shown positive effects on student motivation and interest in learning (Modolin & Grace, 2018; Park & Kim, 2022).

An effective learning process can keep students engaged (Pehmer et al., 2015). Other studies have shown that an intelligent and adaptive learning platform combined with a well-designed team can deliver good results and that digital processes in higher education can increase student engagement in learning within the framework of a wide range of activities and contexts (Zhu & Wang, 2020). It is possible that the simpler and less technologically demanding team building tools are used in online interaction, the more stable results can be obtained, as indicated by the subjective assessments of students in our study (Maratou et al., 2016; Mumford & Dikilitaş, 2020).

Personalized instructional interventions such as team building can effectively improve student behavior, attitudes, motivation, and academic performance in a blended learning environment (Branch & Dousay, 2015; Zhang et al., 2020). Online peer and teacher feedback has potential benefits for student learning in terms of better relationships and an atmosphere of psycho-emotional safety (Popta et al., 2017). Some researchers argue that peer feedback may play a more important role in online learning compared to traditional learning (Ramdani & Widodo, 2019). The subjective assessment of teachers and students equally in our study confirms the improvement in the emotional climate and well-being in the team. In this case, the team, as a new organizational structure, looks more prosperous from the point of view of its members than a regular study group, which is also confirmed by some researchers (Popta et al., 2017; Sumtsova et al., 2018).

## CONCLUSIONS

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Based on the results of the survey regarding the experience of students and teachers and the subsequent effectiveness of the implementation of the virtual team-building program, it can be concluded that both students and teachers were satisfied with their participation in team-building activities (84% and 73.8% among the students and the teachers, respectively). It was found that 89.8% of teachers and 88.1% of students reported that participation in videoconferences helped them get to know each other better. The statement that team building has made the group more cohesive was confirmed by 73.4% of students and 81.0% of teachers. It should be noted that 90.9% of students and 88.1% of teachers believe that virtual team building had a positive impact on their team and 89.2% of students and 88.1% of teachers think that team building is a good way to improve communication skills and the psycho-emotional atmosphere in the team. Team building tools received a high subjective assessment of students and teachers and demonstrate their readiness for this form of activity in addition to the main training. This opens up opportunities to prepare students for teamwork in business after graduation.

Also, 74.7% of students and 64.3% of teachers appreciated the time they spent on virtual team building activities. In addition, 50.8% of students believed that the effectiveness of team building in an offline environment would not have increased in contrast to 49.2% of learners who did not share this point of view. As for teachers, only 35.7% believed that team building in a virtual environment is more beneficial than in the real one. It is the virtual team building experience that can enhance and support the experience of online learning and the use of a digital environment for learning and work.

It can also be noted that 42.2% of students and 35.7% of teachers managed to establish relationships with the help of team building activities. The analysis of the manifestation of the attachment to the educational institution, which was observed in the course of team building activities, showed that 86.3% of students and 64.3% of teachers experienced this feeling. In fact, the respondents noted a positive effect of team building on their interest and motivation to study and work: 86.3% of students and 71.4% of teachers agreed with the statement; the indicator of students exceeds that of teachers by 14.9%. Accordingly, team building can be isolated from other goals of its implementation only to improve the emotional state of teams and relations between students and teachers.

This study is of practical value as it demonstrates the positive impact of virtual team building in the university educational context. This fact can contribute to a broader and faster implementation of virtual team-building practices with simple instruments in the education system of the Russian Federation and other countries of the world. The results of this study can be applied specifically for implementation easy game-based team building meetings by higher educational institutions that are interested in increasing team cohesion, interest and motivation to study or work, as well as the creation of closer and trusting relationships and an atmosphere of psycho-emotional safety. In addition, the data obtained in the study can be used by researchers conducting studies on related topics.

Further research can be aimed at studying the difference in the effectiveness of team building in online and offline learning environments, as well as the impact of team building on the teaching staff as university teachers also need the positive effects of team building, which in turn can contribute to the effectiveness of their teaching practices. In addition, further research requires more observations to verify the influence of student personality on the effectiveness of virtual team building in intelligent collaborative learning environments.

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## Appendix

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### Questionnaire

#### Personal information of the participant

1. Which university do you work/study at?
  - Kuban State Agrarian University
  - Kuban State Technological University
2. How old are you?  under 18  over 18
3. What is your status in the educational institution?  student  teacher

*Please agree/ disagree with the statements on a four-point scale:*

*1 - Strongly agree (SA)*

*2 - Agree (A)*

*3 - Disagree (D)*

*4 - Strongly disagree (SD)*

1. Generally, I was pleased with the participation in team building activities.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
2. Participation in video conferences with my classmates and teacher (students) helped me get to know them better.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
3. Team building has made my group more cohesive.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
4. I think virtual team building has had a positive impact on my team.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
5. Team building is a good way to improve communication skills and the psycho-emotional atmosphere in the team.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
6. I believe that team building was not just a waste of time.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
7. It seems to me that team building would have been more effective in an offline environment than in a virtual one.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
8. Team building helped me build relationships with some people (students) from my group.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
9. Team building has developed my deep attachment to my educational institution.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree
10. Team building has had a positive effect on my interest and motivation to study/work.
  - 1. Strongly agree  2. Agree  3. Disagree  4. Strongly disagree

## AUTHORS

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**Maria Kuznetsova** is a PhD in Medicine, Professor of the Department of Propaedeutics of Dental Diseases of the Institute of Dentistry, I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russian Federation.



**Dmitry Gura** is a PhD in Technology, Associate Professor of the Department of Cadastre and Geoengineering, Kuban State Technological University, Krasnodar, Russian Federation and Associate Professor of the Department of Geodesy, Kuban State Agrarian University, Krasnodar, Russian Federation.



**Lubov Vorona-Slivinskaya** is a DSc in Economics, Professor of the Department of Construction Production Technology, Saint Petersburg State University of Architecture and Civil Engineering, Saint Petersburg, Russian Federation.