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Comparison of Conditions for Organizing Joint Activities in Face-to-Face and Digital Spaces

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This article provides an overview of a pilot study that compares the features of organizing joint activities in the digital environment among students in grades 7-9 and the theoretical basis for organizing joint activities. 36 high school students took part in the study. The study revealed that the development of digital media contributes to the organization of joint activities in the digital environment, transforming symbols into signs. Groups using digital tools have shown high efficiency in both the organization of collaboration and its results. During distance learning, students spent the greatest amount of time on the Internet, in particular when considering the "medium-time" criterion. The Jamboard has become an important tool for planning and organizing student collaboration. The functions of turning on and off audio and video contributed to self-organization and the formation of cultural experience of the group. The study revealed a number of psychological characteristics of organizing joint activities in the digital environment, which differ from the theoretical foundations of organizing joint activities in the face-to-face space. For this purpose, a socio-genetic method was used, in which students in grades 7-9 completed the "ship model" task. The analysis allows us to conclude that the organization of joint activities in the digital space is due to the internalization of digital means by students and, on their basis, the construction of common systems of orientation in the digital environment. Based on a pilot study, recommendations for teachers and parents on organizing joint activities using digital technologies for students in grades 7-9 are highlighted.

Keywords: cultural-historical psychology; joint activities; genetic modeling method; digital space; organization of joint activities.

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Сравнение условий организации совместной деятельности в очном и цифровом пространстве

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В статье представлен обзор пилотного исследования, в котором сопоставляются особенности организации совместной деятельности в цифровой среде среди учащихся 7-9 классов и теоретические основания для организации совместной деятельности. В исследовании приняли участие 36 учеников средней школы. В ходе исследования выяснилось, что освоение цифровых средств способствует организации совместной деятельности в цифровой среде, преобразуя символы в знаки. Группы, использующие цифровые средства, показали высокую эффективность как в организации совместной работы, так и в ее результатах. При дистанционном обучении учащиеся наибольшее количество времени проводили в интернете, в частности, при рассмотрении критерия «средство-время». Доска Jamboard стала важным инструментом для планирования и организации совместной деятельности учащихся. Функции включения и выключения аудио и видео способствовали самоорганизации и формированию культурного опыта группы. Проведенное исследование выявило ряд психологических характеристик организации совместной деятельности в цифровой среде, отличающихся от теоретических основ организации совместной деятельности в очном пространстве. Для этого использовался социально-генетический метод, в рамках которого учащиеся 7-9 классов проходили задание «модель корабля». Анализ позволяет сделать вывод, что организация совместной деятельности в цифровом пространстве обусловлена интериоризацией цифровых средств учащимися и на их основе построением общих систем ориентирования в цифровой среде. На основе пилотного исследования выделены рекомендации в организации совместной деятельности с применением цифровых технологий для учащихся 7-9 классов для учителей и родителей.

Ключевые слова: культурно-историческая психология; совместная деятельность; генетико-моделирующий метод; цифровое пространство; организация совместной деятельности.

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Introduction

Modern education constantly struggles with digitizing the learning process. Numerous methods of organizing the educational process and implementing pedagogical tasks are proposed, ranging from radically conservative to fully digital formats of learning. Hence, the relevance of researching the features of organizing collaborative activities in a digital environment arises [5; 8].

By middle school, adolescents have many needs that can only be met in the digital space: creating profiles on social networks, participating in online events, self-identification in virtual communities, as well as filling their cultural and informational space. This allows each student to express their interests and exchange knowledge and ideas with other participants in the online space [1; 3]. On the one hand, the ability to learn at one's own pace and direction allows each student to develop according to their individual needs. On the other hand, the network environment also promotes collaborative work and experience exchange among students, which can be an important experience for developing collective skills and collaboration abilities. Investigating successful forms of collaborative activities will reveal features of organizing collaborative activities. Due to the peculiarities of the leading activities of middle school students, the educational process with digital means has several disadvantages. For example, intimate personal communication in social networks becomes predominant, which can act as an antagonist to the need to communicate in the task process, eliminating the necessity to strive for it in the educational process since the student can communicate not with the task participant but with someone else, which is impossible to track. These disadvantages are limitations for researching digital forms of collaborative activities [2; 6].

Educational technologies cannot fully compete with video games and entertainment services located in the digital environment. When faced with learning difficulties, it is easier for students to find ways to avoid them than to overcome them, highlighting the importance of organizing collaborative activities in a digital environment to involve participants in the educational process and develop self-organization skills. Face-to-face education has several strong advantages over online education: the possibility for students to communicate with each other, non-verbal communication, and the possibility of self-identification in society. This list of mismatches between leading activities and digital learning methods requires a revision of digital education methods [7; 9].

For the successful implementation of digitization in middle school, it is important to consider the principles of cultural-historical psychology. Collaborative activities developed within this approach provide students with the opportunity to interact and jointly solve tasks according to their developing needs and abilities. This creates conditions for active participation in learning and the development of social skills [11; 17].

There are several problems when transferring face-to-face education to an online format, including the role of regulators and executive bodies in the learning process, as well as issues of criticism and control. In online education, students and teachers face new challenges related

to organizing the learning process, assessing performance, and interacting remotely. It is necessary to consider the age characteristics of students when developing and implementing online educational programs to ensure their effectiveness and accessibility for different age groups. In online education, problems arise with the individualization of the educational process, considering the age characteristics of students. Solving these problems requires a comprehensive approach and consideration of the specifics of each age group [6; 10; 20].

Yu.V. Gromyko, A.A. Margolis, and V.V. Rubtsov researched approaches to creating an effective model of the "School of the Future" using cultural-historical theory and the activity approach as a foundation. In their proposed model, the emphasis is on forming a communicative and activity-based semiotic environment, which includes various child-adult communities and types of activities. Investigating the features of organizing collaborative activities using digital means will be an important step in building a digital platform in the "School of the Future."

Conditions for the Emergence of Joint Activity

To study the methods of interaction among students (aged 12–15) in solving educational tasks using digital tools, it is necessary to understand the theoretical positions on joint educational activities of schoolchildren developed by V.V. Davydov, V.V. Rubtsov, G.G. Kravtsov, G.A. Tsukerman, and others. Additionally, the results of studies on the peculiarities of organizing joint educational activities using digital tools by V.V. Rubtsov, A.A. Margolis, A.G. Kritsky, V.S. Ageev, and A.V. Konokotin are also relevant.

The "Ship Model" was designed based on the socio-genetic research method, which is a variant of L.S. Vygotsky's genetic-modeling method, developed by V.V. Rubtsov, Yu.V. Gromyko, A.V. Konokotin, and others. Below are the main theoretical positions important for modeling conditions and their analysis in the process of a pilot study.

To study the psychological features of organizing joint actions of students in solving educational tasks in a digital environment, it is necessary to identify the conditions for the implementation of joint activities — educational actions. Organizing children's educational actions in the process of joint activities is a primary task. For this, it is necessary that specific states of the object are differentiated by the child and become an orientational basis for action. Thanks to this, we achieve stability in the sensory fabric of consciousness, according to A.N. Leontiev, in the general orientational basis of content. We get the objectivity of action, which is revealed in the process of testing the goal; this leads to the birth of purposeful action related to the object in the studied object [15; 16].

Joint action includes the following components:

1. The distribution of initial actions and operations is determined by the system of transformations that condition the search for the principle of constructing the studied object.
2. The exchange of methods of action is dictated by the necessity to transform various methods of action to obtain a cumulative product of the activity.
3. Mutual understanding is dictated by the nature of incorporating various methods of action into joint activity. Mutual understanding allows establishing the correspondence of one's own action and its product to the actions of other participants.

Among the means ensuring the implementation of joint activities, the most important from a

psychological point of view are communication and reflection.

Communication is necessary for distribution, exchange, and mutual understanding. Thanks to communication, the planning of conditions adequate to the educational task for the activity and the choice of appropriate methods of action occur [15].

Reflection – allows establishing the participant's attitude toward their own action and ensuring the transformation of this action in accordance with the content and form of their joint activity [15].

The distribution of methods of action and their exchange should reveal the connection between the substantive and operational components of action. This requirement is met by the method where the organization of joint actions is aimed at searching for, identifying, fixing, and modeling the principle of systematizing the set of objects [15].

Components of collectively-distributed action:

1. Sign schemes (models) of activity organization: these schemes fix the operational composition of individual actions of participants, the method of dividing these actions depending on the substantive content of the task, and the role of each participant in identifying the orientational basis of action.
2. The connection between operations performed by participants: the presence of connected operations, correlated with the changing properties of the object, ensures the distribution of actions and the mutual understanding of participants in the process of jointly solving tasks.
3. Conditions under which the introduction of means of organizing collectively-distributed action confronts participants with the need to seek the foundations for dividing actions and coordinating them in the substantive content of the studied object [15].
4. The destruction of unambiguous correspondence between the action scheme and the structure of the properties of the studied object leads to the limitation of the action by the corresponding substantive content.
5. The presence of gaps in this correspondence confronts participants with the need to search for new forms of activity organization.

Thus, collectively distributed action implies the division of participants' actions and their coordination in accordance with the substantive content of the studied object. This division occurs based on sign schemes of activity organization, which fix the connection between operations performed by participants. The presence of gaps in this connection leads to the need for redistributing operations among participants and searching for new forms of activity organization.

The use of schemes as a means of organizing activities allows for the creation of experimental situations in which it is possible to study the patterns of adults organizing the joint actions of children, as well as the methods of group work of the children themselves. Additionally, using schemes, it is possible to fix the emergence of educational-cognitive actions and their features [14].

In the joint activities of children, it is necessary to correspond to two important stages. At the first stage, called the training stage, the adult organizes collectively-distributed action among a group of children. Based on the action scheme, the adult organizes the communication and cooperation of children as a process of transforming the given structures of the studied object and corresponding models [14].

At the second stage, called the control stage, the emerging educational-cognitive action is studied. The features of this action are revealed when observing the joint trials performed by the participants, the substantive orientation of actions, and also when studying how the activity scheme proposed by

the adult is used by the children [14].

In the process of organizing joint actions, an important condition is the emergence of the child's educational-cognitive activity, in which the disclosure and correlation of meanings between various actions in relation to the object and the corresponding properties of its structure should occur. For this, it is necessary to organize the distribution and exchange of methods of action among the participants. Vitaly Vladimirovich Rubtsov suggested considering the following psychological components that ensure the effectiveness of joint work [13]:

1. Joint understanding and a common goal. An important point is the joint understanding of the goals and objectives among the group members. People working together must share a common goal and see how their efforts can contribute to its achievement.

2. Distribution of roles. Effective joint work requires a clear distribution of roles and responsibilities among the participants. Everyone should know what is expected of them and be ready to fulfill their duties.

3. Interdependence. Participants must understand that their success depends on the success of others. This motivates them to cooperate and interact to achieve a common goal.

4. Openness and communication. Openness in communication and the ability to express ideas and opinions are important for successful joint work. Good communication helps participants understand each other and solve problems that arise.

5. Joint learning. Joint learning and the exchange of knowledge and experience among participants contribute to increasing collective intelligence. By learning together, they can solve tasks more effectively.

6. Conflict resolution. It is important to learn to resolve conflicts constructively. Conflicts can arise in any group, and the ability to resolve them helps maintain the effectiveness of joint work.

Study on the Features of Organizing Collaborative Activities in a Digital Environment

For the study, a group of 36 students from grades 7-9 from different cities was assembled: Moscow, Krasnoyarsk, and the Moscow Region. The study included 14 girls and 22 boys. The sample comprised 19 students from the 7th grade (8 girls, 11 boys), 12 from the 8th grade (4 girls, 8 boys), and 5 students from the 9th grade (2 girls, 3 boys). In 8 out of 9 groups, the students were from the same class, with one group being mixed: three students from the 7th grade and one from the 9th grade.

The study was conducted using Google Meet. 31 respondents participated using a personal computer, while the remaining 5 participants used a tablet or smartphone.

Students were asked to build a model ship, considering the rules specified in the task conditions. Task conditions: "Dear participants, you are invited to build a model ship, considering four main parameters: the size of the sails should match the three cuts of the ship's stern; it is important to note that the weight of one mast is 400 kg; you need to build the ship's stern, for which you are provided a formula to find the volume V=d*a*h, where V is the volume, d is the length, a is the width, h is the height; calculate the ship's cargo capacity using the formula. The cargo capacity of the boat can be calculated using the formula: Q1=1/5*(ρ*V – G1), where ρ is the density of water, V is the volume of the hull, m3, G1 is the mass of the boat, including permanently attached equipment, and maximize the ship's load capacity. I suggest you divide the roles among yourselves for this task. You have 60 minutes to complete the task. You may use any resources. If you have questions, you can ask them now or during the work process." It is important to note that the role distribution implied task division

among the students, which was additionally communicated when a participant had difficulty understanding the instructions. The task was considered completed when the model was presented without contradictions. To find the correspondence between the algebraic model and the graphical one, students were provided with basic digital tools: chat, video, audio, and an online board. Students could use not only the provided formulas but also search the internet for any information to help solve the task. On average, students took 45 to 60 minutes to complete the task.

Tools used during the sessions:

1. Interactive whiteboard Jamboard;
2. Chat;
3. Raising hand;
4. Turning video on and off;
5. Information search tools (internet);
6. Emotions (Emojis);
7. Screen sharing.

For the study and analysis of the psychological features of organizing collaborative activities using digital tools, the theoretical foundations identified at the beginning were used. Attention was paid to components such as the distribution of initial actions and operations; exchange of action methods; achieving mutual understanding; communication and reflection; the difficulties encountered and how students overcame them in the digital environment.

Students could use the internet, which often had a slowing effect on the team's work, as students found it challenging to navigate a large amount of new information. Consequently, this affected team work: the number of ideas about the type of ship was excessive and hindered decision-making, and participants' ideas and comments regarding the process often caused delays. Subsequently, one participant often took on a leadership role to make the final decision. There were situations where students could not coordinate their actions, leading to group confusion, but this difficulty was overcome using digital tools.

Case illustration: A team of four students faced difficulties. While searching for information about the type of ship, each student offered their ideas, diluting the specific concept of the ship. Another difficulty was that students could not work individually as each had to orient themselves to another team member's results. Additionally, disagreements arose – two students coordinated without considering the other two, leading to results that did not match others, necessitating recalculations and resulting in conflicts. Students often interrupted each other, trying to speak simultaneously.

Initial overcoming of difficulties, based on communication, formed common linguistic models among participants, which later became an orientational basis for joint actions. Such linguistic models mostly described the use of digital tools, for example, links, editing tools for the board or chat. Secondary overcoming of difficulties occurred when students started using tools like raising a hand for speaking turns and commenting in the chat while one student proposed an idea. Students used emojis to approve or disapprove of others' decisions. Sixteen students used these tools too frequently, creating significant informational noise. The number of digital tools used increased until it became excessive, leading participants to agree on rules regulating their collaboration. Overcoming difficulties was accompanied by the ability to reflect and undo recent actions, which only the participant who performed the action could do, promoting active involvement from each participant.

During the task, several groups showed a pattern in using digital tools. Tools like turning video

and audio on and off were used most frequently. The chat served as an orientational basis for actions, as students wrote their intentions and referred to it as an organizing tool, often containing links, important notes, and summaries of agreements.

Identifying patterns in organizing collaborative activities using digital tools showed that students initially developed common linguistic models in their communication, facilitating orientation in the digital space. When mastering digital tools, students faced their excessiveness, primarily confusing 7th-grade groups, overcome by leadership positions among students proposing communication and work rules.

The distribution of initial actions occurred at the stage of forming a common goal and role distribution. Participants faced difficulties in communication and reflection while performing operations, leading to confusion and a stage where students established rules for organizing collaborative activities. Organizing communication and reflection helped overcome the difficulty of insufficient mastery of digital tools, with students exchanging action methods. In all groups, the Jamboard digital tool was used not only for work schematization but also as an organizing tool for establishing participants' action sequences, leading to a connection between participants' operations in model construction and an increase in joint actions. Jamboard, comprising several slides, was used for real-time activity visualization and planning, with 8 out of 9 groups showing the task progress, and each participant orienting to the board accessible to all. Notably, a significant difference was the absence of physical limitations for viewing other students' results. Thus, after the 10th minute, the most pronounced communication accompanied by discussion among participants was observed. Students frequently moved from one board to another, updating information. Most groups had a common board, serving as a consolidation of work results, often leading to conflicts between students' results. Eight students added pictures, formulas, and links to the materials they used. An example from an 8th-grade group: a student added a ship model as an image and found a ship description on a website, reflected in his calculations. Notably, students visiting the board also accessed this resource and adjusted their work to improve group cooperation.

Using digital tools for organizing collaborative actions led to mutual understanding during task completion, helping overcome conflicts during operations exchange. Participants, mastering new digital tools, used them to create new forms of organizing collaborative activities. There was a division of tasks, with some children calculating sail height and width concerning the ship's stern, while others calculated the stern's height and width to determine cargo capacity. They also searched for images and drew models.

Consequently, the emergence of jointly distributed actions occurred during schematization. Participants, implementing new tools, interacted, exchanging ideas. For example, when adding an image, another participant could change its size or position on the board, add drawings, sign, correct the model, or ask participants to find another image. Interaction efficiency was achieved when the children had a certain number of digital tools.

- Sasha, add the second mast, but smaller, I found a frigate" (when students used Jamboard).
- I'll add a ship image, Misha, make sure everything matches.
- I want us to have a flag, let's make it a pirate one.

Students often provided each other with tool descriptions and instructions for their practical application, increasing the quantity and quality of joint work. Many difficulties can be categorized as primary and secondary. Primary difficulties, such as communication, reflection, organizing

collaborative work, and informational noise, hindered students from starting work. These difficulties were overcome by forming group rules and using certain digital tools as orientational bases for actions: turning the microphone on and off, using the chat, and the board for recording results. Secondary difficulties appeared at a more complex level of interpersonal interaction, requiring students to coordinate their actions for joint work. Students exchanged their results, and in all groups, they worked in pairs, leading to conflicts in final results.

Twelve participants used chat for communication much more often than the microphone, then moved to verbal communication. It can be assumed that chat is an important part of student communication, as thoughts and ideas sent to the chat were considered over time, something not achievable in face-to-face work. Students using chat to communicate with each other had more opportunities to participate in group activities. Thus, while one student spoke, another could write in the chat, immediately receiving a response from a third student. Two dialogues occurred simultaneously, with two students communicating orally and two in writing.

Thus, organizing collaborative activities is possible when mastering a set of digital tools, with the key being the formation of a common team work culture, imposing restrictions on digital tools' use.

Students allocated roles independently of the task at hand. Four groups relied on the ship's stern, three on its load capacity, and two out of nine groups decided to base their work on the cargo itself, which is not connected to additional components of the ship affecting load capacity. A leadership position was more often observed among girls in the 7th grade, but not in the 8th and 9th grades, where boys took the initiative. Decision-making was more effective in the group where participants communicated not only verbally but also used chat and a board, and could quickly move from one slide to another. No barriers were observed in mastering digital tools within the groups. All difficulties were overcome through communication and role distribution if one of the participants was unable to perform certain actions. It is important to note that seven students accompanied their task with verbal control, which was audible to other participants of the meeting; 40% of participants got distracted and switched to communication during their task if they were interested in socializing.

Conflicts arose during the task-solving process: after role distribution, some groups encountered situations where the conditions of one part of the ship did not match with others, and students had to negotiate and exchange ideas. There were instances where chat messages or raised hands were not noticed by other participants, indicating that communication tools were ineffective.

Some conflicts were unresolved, and certain participants began to disrupt others. In two groups, an activity form without orientation towards other students was observed; students worked mainly individually, hardly using digital tools. Changes were observed when schematic results emerged, but two groups still could not reach a solution and build a model. Students' speech more often contained emotionally-personal components of difficulties unrelated to the subject and operational structures of difficulty.

Discussion of results

Digital tools contribute to the organization of collaborative activities in an online space, showing a match between the conditions for organizing collaborative activities in theoretical literature analysis dedicated to the study of collaboration, and the stages during the pilot study. A significant difference is the change in sequence; study participants initially face difficulties when the tools used by one participant can hinder others. Groups need to use new digital tools as organizing means during their

adaptation; thus, students agree with each other on their use in collaborative activities.

Before transitioning to learning actions, students mastered digital tools, which became an orienting basis for finding the task content. Once the symbolic tools in the online space were mastered, these tools became the instrumental basis for collaborative activities, which aligns with the foundations of O.V. Rubtsova's work [17].

Most groups actively studied new tools that helped demonstrate the result. Thus, there was a trend in groups to add images to demonstrate their ship model and take notes on their ideas in chat and notes. It can be assumed that all tools facilitated communication among participants, mediating the collaborative activity of building a graphical model. Hand-raising, microphone toggling, and using emojis for approval or disapproval formed the culture and organization of group work. However, these tools could be used excessively, hindering teamwork, and participants needed to establish new rules for working with digital tools. Each group exhibited specific cultural features in their use of digital tools.

The use of digital tools contributed to the development of such aspects of students' collaborative activities as communication, cooperation, joint problem-solving, reflection, exchange of operations, and overcoming conflict situations. Students began using chat and screen sharing to communicate with each other, more frequently coordinating their actions and collaborating in problem-solving during the schematization of calculation results.

Furthermore, the study showed that adolescents quickly and efficiently master digital tools. Students adapt to new digital tools for use in organizing collaborative activities.

However, problems also arise in the process of collaborative activities in a digital environment: the lack of digital tool skills—9 students lacked the necessary digital tool skills, complicating collaborative activities. Conflict situations may arise due to differences in opinions and approaches to task-solving. To address these issues, it is necessary to train students in digital tool skills and develop a culture of collaborative activities among them.

During the sessions, communication was mediated by tools such as chat and microphone, which became regulated by the process participants. Screen sharing and emojis were used as symbolic tools. The Jamboard was used by students as an interaction tool for building the model. Video toggling acted as a symbolic tool since when one participant turned off the video, other participants followed; two groups agreed initially not to turn on the video. Chat served as a communication tool where participants wrote their ideas during the model-building process. It was observed that participants wrote thoughts in the chat during verbal communication.

Study limitations:

1. Use of the Google Meet program: some participants might have experienced difficulties using the program, which could have affected their results.

2. Use of digital tools: participants might have had difficulties with connection and accessing necessary digital tools, as well as difficulties using them, and the lack of convenient technical means for managing digital tools, which could have affected the individual contribution and overall group results.

Conclusions and Recommendations

1. Mastering digital tools involves transforming symbols into signs, facilitating the organization of collaborative activities in a digital environment.

2. Groups working with digital tools demonstrated high efficiency both in organizing collaborative activities, mediated by digital tools, and in the effectiveness of such work.

3. When working remotely, students spent the most time on the digital tool internet, which they primarily turned to when considering the "tool-time" criterion.

4. The Jamboard became a means for organizing and planning students' collaborative activities. Tools such as turning audio and video on and off contributed to students' self-organization and the formation of the group's cultural experience.

5. The study, focused on analyzing the features of organizing collaborative activities in a digital space for students in grades 7-9, revealed several psychological characteristics differing from the theoretical foundations of organizing collaborative activities in a face-to-face environment. A socio-genetic method was used, during which students completed the task "ship model".

The results of the pilot study can be used in the future to develop a methodology for organizing collaborative activities for middle school students using digital tools, which will be useful for teachers, parents, social service workers for adolescents, and psychologists. It is planned to expand the sample and conduct a study using tools that reveal participants' readiness for collaborative activities in both face-to-face and digital environments.

Recommendations for organizing collaborative activities in a digital environment:

1. Provide participants with the opportunity to master digital tools.
2. Promote communication and reflection among students.
3. Timely identify the excessiveness of digital tools in students' activities.
4. Conduct preventive measures in mastering digital tools for students in grades 7-9.
5. Select educational tasks that require skills such as communication and cooperation among students.

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