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Published in the USA

European Journal of Contemporary Education
E-ISSN 2305-6746
2022. 11(2): 432-445
DOI: 10.13187/ejced.2022.2.432
<https://ejce.cherkasgu.press>

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Forming Project Management Skills by Collaborating with Students in Smartsheet

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Abstract

Important requirements imposed on modern employees are project thinking, team work in order to solve a socially significant problem and the ability to apply principles of self-management. In addition, these supra-professional skills are fundamental in the concept of soft skills. The authors suggest using Smartsheet tools as a digital resource to form these in-demand skills.

The research methodology is based on the technology of collaborative learning, group work methods (comments, talks, providing cards, defending projects). The software tool is the Smartsheet service. The authors have used standard methods of mathematical statistics to process empirical data.

Research results. The authors describe features of organizing collaboration in the Smartsheet environment to form project management skills: determining the minimum required range of tools for mandatory use, including elements of mini-research, understanding the content of the task and options for its development, distribution to teams as a random event, etc. The authors evaluate levels of formation of project management skills and statistically significant differences in the qualitative changes that occurred in the pedagogical system.

Finally, they come to the conclusion that working with Smartsheet tools for exporting data from ready-made spreadsheets, delimiting access rights and allocating resources, tracking comments, adding files, and team introspection provide additional conditions for the formation of high-demanded competencies in the theory and practice of project management.

Keywords: employers' requirements, supra-professional competencies, soft skills, collaboration, teamwork, online interaction.

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1. Introduction

1.1. The relevance of the problem

The study is relevant due to the following factors:

1. The processes of globalization and automation of society have led to transforming forms and content of labor activity. Intellectual work, which implies using creativity, initiative, collaboration, information interaction, is becoming predominant in many sectors of the economy (Soboleva et al., 2020). There are new types of jobs, and flexible working hours become widespread. At the same time requirements for the timing of implementation and the quality of work performance also increase.

According to H. Kapoor, J.C. Kaufman, the situation with COVID-19 also makes its own changes. Organizations, including educational institutions, have to reorganize extremely quickly the usual form of activity into a new one, determined by sanitary and epidemiological conditions (Kapoor, Kaufman, 2020). The changes affect also official and professional duties and requirements for employees. Despite provisions in professional standards, the quasi-professional experience of an employee becomes important for the employer. L.N. Stepanova, E.F. Zeer determine that during an interview, employers often check not only professional skills but additional knowledge and skills that you cannot get at university. Scientists use the term “soft skills” to designate a complex of cross-professional skills (Stepanova, Zeer, 2019). I.A. Shcheglova notes that project management and collaboration are the most demanded competencies in the modern labor market (Shcheglova, 2019).

2. According to E.A. Neretina, A.B. Makarets (Neretina, Makarets, 2013), the basis of the project work is the system that satisfies the requirements for the quality of the results, limited time due to the limit of spending funds and resources, and the specifics of the system.

Project management in a digital society involves not only applying knowledge, skills, tools and management methods to collaboration activities. There are scientific, methodological and technical problems related to the choice of information technology for decision support, coordination of the work of all team members, tracking the deadlines for submitting subtasks, receiving feedback (Sergeeva et al., 2021). In other words, many scientists agree that using digital technologies is necessary for successful project management.

3. In a wide range of software tools, mobile services and platforms have a special place. In the educational space, m-learning is a priority (Klimentyev, Klimentyeva, 2018). The transition to remote work, online interaction in the “24/7” mode also contribute to the development of mobile learning methods and resources. Smartsheet is a didactic software tool that allows to combine the capabilities of mobile services for information communication, cognitive activity, interactivity, and the resources of traditional digital technologies for project management.

Thus, it becomes necessary to study the functionality of the Smartsheet software tool:

1) to apply them in the enrichment of methods, forms of project management as a significant direction in the modern digital economy;

2) to form competencies in the field of project management, organization of teamwork in online mode as demanded skills of the labor exchange.

1.2. Objectives and tasks of the research

The need to use innovative software tools for collaborative learning in order to improve the quality of training highly qualified specialists who are able to perform project activities as an important soft skills has determined the purpose of the research.

The objectives of the research are:

- to analyze the experience of using collaborative training tools while preparing specialists for implementing project activities;

- to clarify the concepts "educational project", "project management", "competencies in the field of project management" in order to describe the cycle of implementation of an educational project;

- to identify the didactic potential of mobile applications in order to provide joint online access within the framework of project management;

- to describe procedures and principles for measuring the formation of students' competencies when performing project activities by means of m-learning;

- to experimentally confirm the effectiveness of the proposed educational and cognitive activities for forming competencies in the field of project management, organization of teamwork in online mode.

2. Relevance

2.1. Literature review

2.1.1. Review of Russian scientific and pedagogical literature

According to L.N. Stepanova, E.F. Zeer, “soft skills” are personality traits that allow to effectively and harmoniously interact with other people (Stepanova, Zeer, 2019). G.P. Baibekova notes that we should understand transprofessional experience as the acquisition of such knowledge and skills that provide graduates with awareness of the process of their own education and real results (Baibekova, 2021).

I.A. Shcheglova highlights the following characteristics of "soft skills": multifunctionality; oversubjectivity and interdisciplinarity; intellectual development (abstract thinking, reflection, determination of one's own position, self-esteem, critical thinking, etc.); multidimensionality (various mental processes and intellectual skills) (Shcheglova, 2019).

A.M. Lukashenko offers the following classification of “soft skills” (Lukashenko, 2021): communicative (contributing to the development of relationships with people, helping to maintain a conversation, behave effectively in critical situations); social (helping to make one's own life and work as balanced as possible); self-management (allowing to control your condition and correctly allocate time); management and research. V. A. Chernov et al. understand a project as a purposeful activity of a temporary nature designed to create a unique product or service (Chernov, 2020). O.V. Dubinina, L.D. Hrytsiak highlight the following skills that, in their opinion, are most important for a project manager (Dubinina, Hrytsiak, 2018):

- understanding real needs of the customer or client;
- ability to plan, decompose and cascade large goals into understandable tasks that can be completed within a specified time frame;
- understanding principles of resource management: what resources (human, financial, time, etc.) are necessary to implement the project, and the ability to obtain them;
- risk management (the ability to predict possible scenarios for the development of events).

E.A. Neretina, A.B. Makarets note that with the help of special software, you can easily manage all tasks – both project and personal; control the activities of the team and achieve more with less time and resources (Neretina, Makarets, 2013).

Research data presented by O. V. Dubinina, L. D. Hrytsiak show that the practical use of electronic tools and information technologies in project management can significantly increase the effectiveness of the relevant activities. They describe the potential of MS Project (Dubinina, Hrytsiak, 2018). V. A. Chernov and similar studies actively use Scrum tools (Chernov, 2020).

According to A. A. Mikhailova, the introduction of a multifunctional and informative management system into project activities will provide a wide range of positive effects (Mikhailova, 2019).

E.V. Soboleva et al. underline that using mobile services and platforms in education provides a wide range of opportunities to improve the quality of education (Soboleva et al., 2020). Among these opportunities are resources for organizing teamwork, interactive interaction, and operational feedback. Their research presents a version of the project based on a mobile service for managing automated devices, developing skills in energy-saving production. Zh.E. Temirgaliev use mobile systems to calculate distances between objects, build a route, i.e. for behavior management (Temirgaliev, 2019).

According to D.D. Klimentyev, V.V. Klimentyeva, using m-learning technologies allows "updating students' knowledge, engaging them in an active dialogue, learning to express their point of view, demonstrating their skills and developing certain skills" (Klimentyev, Klimentyeva, 2018). This circumstance is especially important for training and practice of solving future professional problems, reaching the level of professional competence. While using m-learning tools in project activities, students learn to build effective partnerships (listen, ask and answer questions, resolve emerging problems, regulate interpersonal conflicts, overcome their complexes and barriers). Future specialists develop the skills of self-organization, purposefulness, strategic thinking.

2.1.2. Analysis of foreign studies

Research of S. Noor et al. in European countries show that 93 % of employers consider “soft skills” to be as important as their professional skills (Noor et al., 2018). The analysis of the questionnaires performed by the authors allows to conclude that a modern teacher needs to have the following supra-professional skills: communicative literacy, time management, project management, emotional intelligence, etc. A high level of development of these competencies leads to success and professional self-realization (Du, 2021).

According to M. Groten, S. Gallego-García, supra-professional skills are the ability to establish connections between knowledge and a real situation, to carry out the adoption of the right educational direction and develop an algorithm of actions for its implementation in conditions of uncertainty (Groten, Gallego-García, 2021).

Foreign literature describes the experience of preparing specialists who develop programs for developing individual cognitive skills (for example, memory, concentration, reading speed, mental arithmetic, etc.) (Noor et al., 2018). These projects are implemented with the help of special programs and devices that take into account the characteristics of the psychotype and the interests of the user. For example, on the basis of the Mind Fitness Training Institute, an intensive course was created to develop the competencies of systemic, analytical thinking. Essentially, innovative educators have designed and run a project to promote soft skills.

S. Tan, I. Huet indicate that a project is a set of time-limited activities with a common goal: creating a new product or service, achieving certain results (Tan, Huet, 2021).

According to Y. Tung, F. Chia, F.Y. Yan-Yan, project management is a way to organize work fulfilling all project requirements (Tung et al., 2021): for example, to do tasks, meet deadlines and meet budget. To be successful, a manager needs technical project knowledge, managerial skills, problem solving, and teamwork.

R. D. Vlahov, M. Klindžić, M. Radujković suggest using interactive technologies for project management technology (Vlahov et al., 2019). M. Elphik considers the possibilities of mobile technologies in terms of increasing the creative potential of students (Elphik, 2018). P. Cabrera-Solano et al. substantiate that when organizing active/interactive forms of learning using mobile applications, we should take into account the following requirements: respect for contextuality and realism, self-development and the diversity of students’ needs, participants’ activity, step-by-step and controllability of the educational process (Cabrera-Solano et al., 2020).

G. E. Putrawan, B. Riadi explore the potential of m-learning specifically for the modern educational space (Putrawan, Riadi, 2020).

At present, project management based on digital technologies becomes an independent direction of management activity. According to T.M. Algeo, C. Algeo, project management has its own methodology and tools (Algeo, Algeo, 2016). A.A. Ibrahim, M.S. Abdalla agree here and prove that it was the emergence of electronic systems that was of great importance for developing the art of project management (Ibrahim, Abdalla, 2017). In a single information space, the project manager receives qualitatively new resources for controlling all aspects of joint activities.

A.J. Gilbert Silvius, R.P.J. Schipper point out that the main possibilities of using such tools include: data analysis, correlation of the required data and selected information, distribution of roles for participants, selection of technologies for implementation, registration of the result of project activities (Silvius, Schipper, 2018). Digital tools help to define the boundaries of responsibility for each team member (Picatoste et al., 2018). At the same time, it is possible to control the workload and productivity of performers. The main thing that gives the project team the introduction of digital technology is the ability to obtain control mechanisms, feedback and management of all project tasks. As a result, the efficiency of the entire team increases, and, consequently, the work is more effective.

Therefore, in the system of supra-professional competencies, the skill of project management is of great interest. It is due to the circumstance of “double entry”: on the one hand, it is a structural component of the “soft skills” paradigm; on the other hand, project management is an effective methodology for the modern economy (Khanna, 2021). Digital technologies have the necessary potential to include mobile applications in the process of providing joint online access to project management systems, creating dashboards accessible through tablets, smartphones, and desktop computers.

3. Materials and methods

3.1. Theoretical and empirical methods

We used the following methods in our research: theoretical analysis and generalization of scientific literature on the problems of determining the importance of project skills for a professional of the future, organization of teamwork in a digital environment, and the use of mobile applications in education. The technology of collaborative learning is implemented when the participants plan the stages of work on the project, organize operational information interaction in the software environment, formulate the topics of projects for the distribution of roles and resources at the stage of additional study of Smartsheet tools, discussion of results and reflection.

We used group work methods (comments, conversations, providing cards, protecting projects) to organize constant access to up-to-date information, materials for solving a problem, and synchronization. The demonstration method allows to study the functionality of the service online, to form a general idea of the rules for working on project files. The method of frontal laboratory work is used at the stage of forming skills and abilities of information interaction with a collective virtual wall in solving specific educational problems. The method of independent laboratory work supports the organization of students' research activities.

We used empirical methods (observation, analysis of the results of work on the project using Smartsheet tools) to obtain up-to-date information about real qualitative changes in planning and goal-setting skills; management of emotions, stress, conflicts; information interaction in a team, interpersonal communication; initiative; reflection, use of feedback mechanisms; protection of the results of the decision.

Tests, as a research method, give an opportunity to assess the level of mathematical training of the subject's research with the help of specially selected exercises. An initial control was organized to form the experimental and control group.

An experimental study was conducted on the basis of the Vyatka State University while studying the course "Digital Technologies in Education". The experiment involved 89 first-second year students, the direction 44.03.02 Psychological and Pedagogical Education (bachelor's degree). The average age of the respondents was 20 years (80 % of girls and 20 % of boys).

When characterizing the relationships of the features, we used nonparametric statistical criteria, in particular, the Pearson's chi-square coefficient – χ^2 .

3.2. The base of research

The main goal of the experiment was to test the potential of Smartsheet tools to help students develop in-demand project management competencies. 89 students studied the course "Digital technologies in education", the direction 44.03.02 Psychological and pedagogical education (bachelor's degree). The average age of the respondents was 20 years (80 % of girls and 20 % of boys).

We used the Smartsheet service (<https://app.smartsheet.com/>) as a software tool to support online collaboration and project work. The tools of this service allow to manipulate tables, project files in shared access mode and support the mobile application format.

The sample was not random. With the help of the results of the entrance test, we collected the required initial data on students. To fulfill the rules of probabilistic selection, the same teacher supervised the practical activities of all students. He also formulated the systems of educational tasks, directed information interaction in the process of solving project management tasks using Smartsheet tools. Working with Smartsheet resources (in particular, exporting data from ready-made sheets, separating access rights and resource allocation, tracking comments, adding files, team introspection, and protecting projects) was in the same classrooms, on the same hardware and software. The authors developed materials for the test in accordance with the current standard of higher education in the field of study.

3.3. Stages of research

The experiment had three stages.

At the preparatory stage of the experiment, we considered and analyzed various digital technologies for project management (Todoist, Microsoft To Do, Google Tasks, Asana, Any.do, etc.). We studied the didactic potential of Smartsheet tools for systematic professionally oriented

student education, forming project management skills in organizing collective online activities. To assess the input conditions, we used materials specially developed for the test.

For the test the student could get from 0 to 19 points. According to the measurement results, the levels were the following: from 15 (inclusive) to 19 points – "high", from 6 (inclusive) to 14 – "average", for other cases – "low". Thus, it was possible to collect data on 89 students and to form the experimental (44 students) and control (45 students) groups. The sample was not random.

The second stage of the study was the determination of the directions for including Smartsheet tools in online information interaction, the collective activity of students.

The third stage included the experiential teaching and application of Smartsheet tools in student education to form in-demand competencies in the theory and practice of project management.

4. Results

4.1. Clarification of the essence of basic concepts

Within the framework of the present study, a project activity is participation in the labor process, which involves obtaining a result (material, intellectual, etc.), occurring at certain stages at a certain time interval, and supported by specific resources. This approach is consistent with the materials of M.C. Bekker (Bekker, 2015).

Considering the educational project, we adhere to the position that this is a complete cycle of pedagogical and educational innovations at any level - from a single lesson to the modernization of the entire digital educational environment. The goal of designing and implementing innovations is to solve a specific problem that is significant for all participants in the educational process (Morris, Gerald, 2011).

Project management is the process of planning, monitoring and controlling all aspects of solving a problem within time limits and resources, motivating those involved in achieving project goals. The cycle of implementing the educational project was carried out in accordance with all stages of management: from the development of the project concept for the provision of services and its justification to receiving feedback from the customer upon the fact of the decision. You can get the best results by choosing the appropriate project management technologies, composition, characteristics and assignment of resources for implementing educational projects. To manage resources, it is necessary to provide an effective organizational structure for project management, communication management, etc.

The formation of competencies in the field of project management is ability to apply knowledge, skills, tools and management methods in the process of joint activities on solving a common problem to meet the requirements for the project.

4.2. Educational and cognitive activity on using Smartsheet resources in order to get project management and teamwork skills

As we have noted in our research, mastering the functionality of Smartsheet for obtaining project management skills in organizing the teamwork plays a special role. Smartsheet is an online tool for collaborating on a project. The service has a form of spreadsheets. In addition, shared access to files is implemented in its environment. The application interface has a form of tables. You can attach files to projects, set up notifications, view diagrams, and so on. You can add attachments from your computer, as well as from cloud storage.

The students began their work on the project by determining the number of required tables, their content, and the links between them. The sheet is the main workflow element in Smartsheet. Moreover, it is a virtual storage space. How a user sets up a spreadsheet determines whether he can use a variety of Smartsheet features. By default, the table has a form of a familiar and understandable grid, where you can easily customize column types, set hierarchies, add attachments, and interact with collaborators. The tables and other elements created by the group were visible only to the members of this particular team, until one of them granted access to other users. Columns in Smartsheet are similar to columns in a regular spreadsheet, but they have a number of additional properties that make it easier to work with and expand the range of possibilities. With the help of column types, students controlled what data they were allowed to use when filling out. To ensure the consistency of the input data, certain types, standard and custom

columns were mainly used. Students put files of different types into a table, a line, a comment to fill in the project portfolio.

The tool "Conversations" is of particular value for providing feedback. This functionality in Smartsheet is a unique tool that actually manages the workflow. Through it, the working groups can discuss important production issues. Users respond directly from the email and don't waste time switching between apps. "Conversations" made it possible to manage workflows and discuss them.

Conditional formatting capabilities allow to create rules in the table, according to which the formatting of individual cells and entire rows change depending on the fulfillment of certain conditions.

The use of formulas makes it possible to perform calculations and search on several sheets at once. The formulas use numerical values that are directly put into the cells. Using formulas, students also automate the work of fields with symbols and drop-down lists.

The next important aspect of using Smartsheet is the Share tool. Thanks to these functions, all interested participants in the process kept track of the current version of the data.

With contact lists in Smartsheet, students assign tasks and share spreadsheets with their "customers", colleagues, and "vendors". They studied two kinds of contact lists: an account list managed by a system administrator; and a personal contact list ("My Smartsheet Contacts"). Smartsheet's personal contact list was used to grant access to anyone, including collaborators and "customers" outside the organization. Note that the Groups tool in Smartsheet made it easy and quick to manage access to spreadsheets and workspaces. It was with the help of it that new employees were added to the teams, those users who, after "leaving the organization", no longer needed access to this data and were deleted.

The fundamental functionality for project management is concentrated in the "Provision of cards" mode. Here the members of the working groups can see the projects. In this mode, they work together on projects using drag-and-drop cards to help organize and prioritize the process. Card View is part of an agile project management process that provides teams with a visual way to communicate and interact in Smartsheet. The main purpose of presenting cards is systematization and prioritization. The cards use columns with drop-down lists, symbols, and contact lists with multiple selection options. On this basis, we created stripes into which the cards were dragged. The field values on the cards provided information about the task. A card could have up to 10 fields: a title and 9 additional fields. The title of the card should always contain the value of the field of the main column of the table. If the task contains attachments and discussions, the corresponding icons appear on the card. If reminders are set for a task, the corresponding symbol is displayed on its card.

In the calendar view for Smartsheet, project members shared and overlaid the app's calendars with Google and iCal calendars in their respective Outlook and Apple services. At separate stages of the work, they used the Gantt representation (grid and Gantt chart).

The Smartsheet mobile app for iOS and Android has been heavily used for real-time access to Smartsheet data. The application also allowed to update the contents of an editable spreadsheet, track progress in real time using dashboards, or fill out forms to collect data. Also, project participants added images from a smartphone, viewed attached files, reacted to alerts, scanned barcodes, updated queries.

As one of the examples of an educational project implemented by students in the course of educational and cognitive work, we would like to present a home version of the intensive form for the development of cognitive skills.

Project 1. Mind fitness coach Avreliy, having worked in the profession for 5 years, accumulated start-up capital and decided to open his own center for the provision of services. All this time he rented a small room of 30 square meters with a monthly payment of 350 rubles/month per 1 m². Since the area of the premises was small, the specialist often had to travel to the customer's territory. For example, to organize collective trainings, if large groups were formed.

At the start of the business enterprise, Aurelius planned to rent a ready-made premises, larger in area. However, having learned more about the state support programs for small businesses, he decided to build his own premises with an area of 100 square meters. It is required to evaluate the economic efficiency of the project by performing calculations according to the following scheme:

1. Determine the costs required to start the project.
2. Make a forecast of the economic effect of the project implementation.
3. Calculate the economic performance of the project.

Then the students offered their options for developing the project, showed the ability to manage in the face of the uncertainty of the future.

First development option. The project for the construction of the Center was successfully completed. Aurelius decided that part of the Center's area could be rented out for offices or creative studios. Perform an assessment of the economic efficiency of this project using a similar methodology: determine the costs for starting the project (for example, the construction of partitions, a separate entrance, etc.); complete the forecast of the economic effect (one of its components can be considered rental income or payment of part of utility bills by the tenant); calculate economic performance. In addition, choose the values of interest rates and the project term in such a way that it is really beneficial for the organizer.

The second development option. The project for the construction of the Center was successfully completed, the Aurelius business brought a good income and attracted new visitors. He had to even refuse some clients. Therefore, the entrepreneur decided to expand his staff and take another coach. It is required to evaluate the economic efficiency of the project according to a similar methodology: determine the costs required at the start of the project (for example, lay the wage fund for a specialist, organize his workplace, etc.); fulfill the forecast of economic effect (for example, an increase in the price of services and the volume of sales of services); calculate the economic impact of the project; select the values of interest rates and project term to get real benefits.

Another project to be implemented by means of digital technology is the Atlas of Emerging Jobs.

Project 2. The client formulated a task for a group of specialists: to develop and implement a navigator for the professions of the future. The implementation of the project was divided into two parts: half of the group was engaged in the software and hardware development of the application (navigator); the other half was engaged in design, layout of the paper version of the atlas. Using the Project Budget template, you need to calculate the total cost of producing a brochure, application. Note: each specialist enters his costs in a separate sheet of the project.

It should be noted that in addition to standard and custom columns in the Table many students actively used additional parameters:

- "Attachments", which allow to implement the function of attaching files to the table from a computer or from the Internet;
- "Comments", which support the ability to add explanations that are displayed when clicking on the corresponding symbol;
- "Checking" for inviting a user with a valid email address to control work, writing a review;
- "Indicators" to implement the ability to add a reminder with a comment on a specific date.

When working with Smartsheet resources, students were encouraged to explore additional functionality. For example, some project participants became interested in the "smart strings" functionality. The tool allowed them to create hierarchies and easily organize, track, and move data. Students also noted the following possibility: using line indentation, you could also create a hierarchy in the table. The indented line became a child of the line above (the "parent" line). At the same time, the mentor drew attention to the fact that the hierarchy created relationships between lines, but did not control their formatting.

4.3. Experimental evaluation

4.3.1. The ascertaining stage of the experiment

At the first stage of the experiment, we used materials specially developed for the test to evaluate the input.

1. Vasily, an IT programmer, took part in a competitive selection for a large company during quarantine. The first stage involved solving a system of problems. On average, Vasily spent 5 minutes on each of them in extreme conditions. How long had Vasily been solving N problems since the first stage of the competitive selection started (the number of problems was entered from the keyboard)?

2. The second stage of the competitive selection took place intermittently, during which Vasily managed to watch a movie, walk the dog and order pizza. How much time did Vasily spend on rest (the number of minutes for each action was entered from the keyboard)?

3. At the third stage of selection, Vasily was given an order: to create a website for an online store of computer games. However, Vasily was strong only in programming. Therefore, the young specialist decided to attract familiar designers. The cost requested by the first of them was represented as a formula: $5000+100*(\text{number of images on the site})$. Services of the second one could be determined by the formula: $750*(\text{number of images on the site})$. The quality of services in both cases was the same. Vasily decided that he would choose a more economical option. What amount would Vasily pay the designer if there were N number of images on the site?

4. Vasily received the first order from the company-employer. But before proceeding with the order, Vasily decided to calculate the cost of developing the site, taking into account various options for selecting specialists. Write a program using an auxiliary algorithm that calculates the cost of a site for a customer in different cases. Data for each composition of specialists are in the table.

The first and second tasks involved testing the skills and abilities of self-management, i.e. self-management (the skill of rational planning of one's own resources, interpersonal communication, managing one's emotions, self-motivation, organization of feedback, etc.). For the correct solution of each problem in this group, the student received 4 points.

The third and fourth tasks were focused on a comprehensive test of skills in the field of project management (communicative competencies, foresight thinking, teamwork, conflict resolution, etc.). For the correct solution of the third task, the student received 5 points, and for the fourth – 6 points.

Students could get from 0 to 19 points for the test. According to the results, the levels were the following: from 15 (inclusive) to 19 points – "high", from 6 (inclusive) to 14 – "average", for other cases – "low".

4.3.2. Forming stage of the experiment

At this stage of the experiment, we determined the directions for including Smartsheet tools in online information interaction, the collective activity of students.

The initiator of the project activity carried out preliminary methodological work with all participants to master the functionality of Smartsheet. To organize joint work on the project in the e-learning format and constant access of students to relevant information, materials for solving the problem, the curator added the appropriate files, set up notifications, and updated diagrams. In addition, in order to synchronize work, he imported the necessary files from MS Project, MS Excel, Google spreadsheets. Available templates were tested (sales process, task plan for an event, product launch, adaptation to a project schedule or budget, task management, marketing calendar, etc.). The selected Smartsheet plans were: Unlimited Sheets, Frameless File Storage, Alerts, Changelog, Gantt Charts, Mobile, Technical Support, Web Forms, APIs, Reports, Resource and User Management, Single Sign-On with SAML, and etc. Students then used Smartsheet tools to publish their research projects, problem solving, glossaries, related images, information resources, and others.

We determined the level of skill formation based on the results of joint work in online mode in accordance with the following set of criteria: planning and goal setting; time management; management of emotions, stress, conflicts; information interaction in a team, interpersonal communication; energy, enthusiasm, perseverance, initiative; reflection, use of feedback mechanisms; presentation and defense of the solution results.

The "high" level means that: the student clearly identifies the problem, goal, task of the study; owns time management services; correctly searches, systematizes and summarizes the necessary information for the implementation of the project; applies reasonable methods of interpersonal communication and ways of organizing teamwork; owns conflict resolution methods; timely solves problems arising in the process of project activities; manifests himself as an energetic, proactive participant in the project; creates a significant product/sub-product and determines its further development; completes all stages of project implementation on time; systematically uses feedback mechanisms; while presenting the project, he shows the ability to explain, convince and argue his point of view.

The "average" level means that: the student does not clearly indicate the problem, goal, objectives of the study; owns a limited set of services for time management; his analysis of the necessary information is now always effective; interacts with all project participants, but overreacts emotionally to criticism; does not always notice and react to signs of conflict in the team, avoids discussing their causes; in the process of working on a project, he manifests himself as an energetic participant, but quickly loses interest in the task; creates a significant product/sub-product, but does not think about its further application; sometimes misses the deadline the project; uses feedback mechanisms; while presenting the project, he answers the questions quickly, but not always competently and reasonably.

The "low" level: the student cannot identify the problem, goal, objectives of the study; is not able to independently find and use up-to-date information for project activities; interacts with only one or two project participants; does not think about the presence of conflicts and problems in interpersonal communication, avoids discussing their causes; in the process of collective work he is passive, quickly loses interest in the task; cannot create his own significant product/sub-product; does not adhere to the deadlines for the implementation of the project; does not use feedback mechanisms; ignores team comments; makes various mistakes (technical, stylistic, spelling) while presenting the project.

Students in the control group studied the theory of project activities, time management, digital technologies for project management in the MS Project software environment.

4.3.3. Control stage of the experiment

Students were tested at the control stage of the experiment. The types of tasks, the principles of assessment corresponded to the tasks and the procedure of the input control event.

Table 1 presents information about the levels of formed skills in project management before and after the experiment (Table 1).

Table 1. The results of forming the level of the skill "project management"

Level	Groups			
	Experimental group (44 project participants)		Control group (45 project participants)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
High	4	12	4	4
Average	22	24	23	26
Low	18	18	18	15

We accepted the following statistical hypotheses:

Ho: the level of development of project management skills in the experimental group is statistically equal to the level of the control group;

H1: the level of the experimental group is higher than the level of the control group.

In the online resource <http://medstatistic.ru/calculators/calchit.html>. the values of the criterion were calculated before the experiment ($\chi_{2obs. 1}$) and after it ($\chi_{2obs. 2}$). For $\alpha = 0.05$, according to the distribution tables, χ_{2crit} is 5.99.

Thus, we get: $\chi_{2obs.1} < \chi_{2crit}$ ($0.06 < 5.99$), and $\chi_{2obs. 2} > \chi_{2crit}$ ($6.15 > 5.99$). Therefore, the shift towards an increase in the level of forming project management skills can be considered non-random.

In other words, practical work on studying, using Smartsheet capabilities to gain project management skills while organizing team work contributes to forming supra-professional competencies in students. Corresponding changes in the pedagogical system are not accidental, but natural.

5. Limitations

We formed the experimental and control groups to guarantee the presence in each group of the same skills and personality traits that formed the basis of competencies in the field of project management, their identical distribution. The group of students was not probabilistic; therefore, experimental data cannot be generalized for the entire students' population.

For diagnostics, we took into account the results of the input control measure. The selection of participants for the experiment and the sample size were justified by the specifics of the study: the study of the theory of project activities, time management, digital technologies for project management, the use of mobile technologies for educational purposes. Throughout the experiment, the same teacher carried out practical activities in solving project management problems, supported by digital technologies, using the same software equipment in special classrooms. During the implementation, we considered the main principles and stages of the development of an educational project, the functionality of tools for programmatic project management.

6. Discussion

While discussing the results on the development and management of an educational project, the participants highlighted the possibilities available only in the mobile application: adding your location based on GPS data to a table or form field; creating a photo using the device, editing it and adding it directly to a table or form; scanning a barcode or QR code to update data in a table or search for it; quick access to forms from home tab or recent tab.

Performing a quantitative analysis of the above results, we can conclude that after the experiment, 27 % of the students in the experimental group had a high level of indicators reflecting the degree of development of project management skills (12 participants out of 44), while initially this percentage was 9 % (4 students out of 44). The number of students with a "low" level has significantly decreased from 41 % to 18 %.

In the control group, there were no changes in the "high" level. After the experiment, 58 % of students in the control group had an average level of project activity skills (26 participants out of 45). Initially, this percentage was 50 % (23 students out of 45). The indicator of a low level changed from 40 % to 33 %. So, there is the dynamics by levels in the control group, but it is less significant.

In general, the pedagogical experiment allows to conclude that using Smartsheet tools, presented both in the format of a mobile application and a traditional software tool on a computer, improves the quality of training in terms of forming skills that are the basis of supra-professional project management skills. It is this practical joint activity in the online mode of the software environment on a computer, supplemented by the team's work on the project with mobile application tools, that is maximally focused on forming demanded competencies. The results of the study detail the specific features of Smartsheet. Their implementation contributes to the development of the required qualities of the person and the team as a whole.

The research materials confirm the conclusions made by E.V. Soboleva et al. about the fact that the functionality of e-learning and m-learning can provide additional conditions for forming demanded skills of students (Soboleva et al., 2020). In addition, the presented results complement the conclusions of O.V. Dubinina, L.D. Hrytsiak on the potential of digital technologies to support project management activities (Dubinina, Hrytsiak, 2018).

7. Conclusion

In the context of digital transformation, automation and transition to online interaction, the requirements of employers are changing not only concerning the quality of graduate training, but also for the format of training.

The study presents a solution to the problem caused by the need to use innovative collaborative learning software tools in order to improve the quality of training highly qualified specialists to perform project activities as an important soft skills.

Many researchers consider project management skills in the concept of "soft skills" to be one of the main results of high-quality professional training. Scientific works of a pedagogical, socio-economic nature substantiate the need for additional studying the potential of virtual collaboration, operational feedback mechanisms, and the use of mobile services to develop skills that determine forming supra-professional experience in project management. Every year there are more and more innovative technologies for developing project management skills, organizing joint

activities (mobile applications, automated systems, decision support systems, Scrum, mind maps, etc.). In addition, digital services provide tools for centralized control, feedback and management of all project tasks. Smartsheet is an example of such services.

A significant result of the research is the use of Smartsheet tools, presented both in the format of a mobile application and a traditional software tool on a computer, to create additional conditions for developing in-demand project management skills. A mandatory element is a joint online activity to solve a problem (project) of educational purpose, supported by the tools of the software environment. The project involves not only the teamwork of students in the Smartsheet environment, but also the visualization of all stages using tables, comments, attached files, conversations, charts, and calendars. We highlight the following features of organizing online work on a project in the Smartsheet environment:

- determination of the minimum required range of tools for mandatory use. Additional features can be explored as part of project implementation;
- comprehension of the content of the task, options for its development. It is the task that guides students in learning, supports project management activities;
- distribution into teams is more efficient to carry out in a game form. For example, using the Wheel of Fortune online tool (<https://ru.piliapp.com/random/wheel/>). This option allows to simulate the randomness of events in an indefinite future, change the composition of teams, vary resources.

Despite the fact that the experiment deals with an educational project, such a collaboration can be organized and carried out to solve a wide range of socially significant tasks.

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