

# Peculiarities of cloud computing use in the process of the first-year students' adaptive potential development

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## Abstract

Technologies based on cloud computing is one of the demanded and actively developing areas of the modern information world. Cloud computing refers to an innovative technology that allows you to combine IT resources of various hardware platforms into a single whole and provide the user with access to them via a local network or the global Internet. Cloud services from various providers offer users access to their resources via the Internet via free or shareware cloud applications, the hardware and software requirements of which do not imply that the user has high-performance and resource-consuming computers. Cloud technologies represent a new way of organizing the educational process and offers an alternative to traditional methods of organizing the educational process, creates an opportunity for personal learning, collective teaching, interactive classes, and the organization of psychological support. The scientific article is devoted to the problem of integrating cloud technologies not only in the process of training highly qualified specialists, but also in the formation of professionally important personality traits. The article describes the experience of introducing cloud technologies into the process of forming the adaptive potential of students in conditions of social constraints caused by the COVID-19 pandemic.

## Keywords

cloud technologies, adaptive potential, information technology, group interaction, individualization of training

## 1. Introduction

The introduction of cloud computing into the modern world is a necessary condition for the progressive development of the society. The results of the research, conducted in 2018 by Gartner, IDG and RightScale, prove that cloud computing use has become a widespread practice around the world. According to the RightScale survey, publicly available cloud infrastructures are in the lead in terms of implementation: 81% of companies choose a multi-cloud strategy that uses up to five clouds on average. The hybrid strategy, which is a combination of public

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and private cloud infrastructures, is followed by 51% of respondents, and 75% of organizations use private clouds. Increasing competition between cloud service providers promotes greater availability of services and helps to expand the capabilities of analytics and integration of cloud computing into various areas of public practice. Global changes in social interaction and communication, growing need for social isolation, caused by the COVID-19 pandemic conditions, actualize the search for optimal ways of indirect interaction, communication and learning [1, 2].

Higher education, like many other areas of human activity, has been involved in the process of transformation, caused by the need to meet the realities of today and actively explore the heuristic possibilities of digital reality, generated by the Internet environment development. First of all, it is resulted in the formation of a digital educational environment [3] and development of distance and e-learning [4, 5]. At the same time, traditional methods of getting higher education have not lost their relevance, they are still in demand, but in the digital age (era of digital technology dominance) they acquire new features, determined by the formation of a new type of learning – blended, which integrates traditional and e-learning [6]. This is primarily happens due to a transfer of a part of educational process in a cloud environment, which is a result of a free distribution of tools and software services in the academic environment provided by these products manufacturers. Informatization and improvement of cloud computing learning occupies one of the main places among numerous new areas of education [7, 8]. The relevance of new information technology use in education is based on the fact that they serve as a tool, which can solve certain psychological and pedagogical problems. They also provide education with qualitatively new learning opportunities; contribute to the development of independent learning skills. There also appear the opportunities for internalization of theoretical knowledge and practice-oriented experience, as they stimulate the development of didactics and methodology, contribute to the creation of new forms of learning [9]. With the development of computer tools and introduction of cloud computing into the educational process, its participants receive new opportunities, because new approaches are being implemented.

One of the main problems of modern higher education is a choice of optimal combination between the best traditions of current educational system and tools of information and communication technology, modern pedagogical innovations and trends. An urgent problem today is a need to find the most effective cloud computing tools that take into account dynamic changes in the educational environment and are focused on the development of various forms of thinking, creativity, high social and adaptive capabilities of higher education applicant.

## **2. Related work**

The history of cloud computing is presented in [10]. Since the 1990s cloud computing is viewed as a new computer paradigm where the boundaries of computer technology itself are blurred. Consequently, there appeared new economic opportunities of the computer technical tools use. At that time cloud computing was actively used by commercial companies. In 1999, Salesforce first used the Internet to provide access to its software. In 2002, Amazon introduced the first web service using cloud computing for the retail sale of consumer goods [11]. Since 2008 “cloud computing” has occupied its place in the educational process of many countries.

Badger et al. [12] defined cloud computing as a model provides easy network access to a shared pool with con-figured computing resources (for example, networks, servers, storage systems, programs, services). Cloud model promotes accessibility and is characterized by the following main elements (on-demand self-service, wide network access, pooled resource, independent location, fast flexibility, measurable services).

We have analyzed research works on the implementation of cloud services into the educational process, and come to the conclusion that scientific description of the development of basic web application <http://cloudcomputingreview.muhammadsuhaib.com> for data collection is quite a priority. Suhaib [13] emphasizes that cloud computing use in educational institutions provides many benefits with minimal costs, so many institutions in Asian countries are adapting to this digital service. Most scholars focus their research on the priority areas of cloud services implementation into higher education.

Allam et al. [14] highlight the benefits and challenges, discuss potential strategic issues and demonstrate the results of surveys of both higher education applicants and IT experts.

Kumar and Sharma [15] consider cloud computing useful for modeling and prototyping for various STEM subjects, analyze the benefits of using cloud computing for students pursuing a career in STEM, and describe case studies of successful cloud computing implementations in STEM courses.

Within the framework of empirical practice-oriented research, Lu [16] gives a quantitative assessment and analysis of cloud computing integration into the curriculum. The scholar conducts a comparative study of traditional teaching and that, which is carried out by means of cloud computing use.

Marienko et al. [17] offer a general model of adaptive cloud system of education and professional development of teachers, methods of using adaptive systems (Google Docs, IBM Box, Microsoft Office 365) in order to support cooperation in virtual teams. They also describe a methodology of supporting the processes of adaptive creation and use of electronic educational resources (WPadV4, AWS).

Nosenko et al. [18] research the issues of using adaptive cloud computing of the education system (ACLS) in the modern high-tech educational environment and offer to expand an access to them as they become the tools of educational and research activities in higher educational institutions of Ukraine. Scientists pay special attention to the analysis of the conceptual apparatus of application and design of adaptive learning systems, based on cloud computing; reveal their main characteristics; describe the ways of their pedagogical application. In the context of empirical research, the authors analyze the experience of Institute of Information Technologies and Learning Tools of NAES of Ukraine in terms of the design and application of the cloud environment for learning and research.

Markova et al. [19] demonstrate ways to implement models of cloud services SaaS, PaaS, IaaS, which should be used in the academic courses of mathematical, scientific cycles and in the future specialists' professional and practical training in the field of information technology, on the example of software engineering, computer science and computer engineering. Researchers identify and analyze the most significant benefits of cloud computing use in the training of future information technology experts, namely they research a possibility of using modern parallel programming tools as the basis for cloud computing.

Taking into account the pandemic conditions of higher education transformation and intro-

duction of cloud computing into the educational environment, the issue of using available cloud computing tools in the process of psychological support and development of students' adaptive potential remains uncovered.

### 3. Research methods

Interdisciplinary research was conducted as part of research work, carried out at the expense of the state budget general fund: "Adaptive system for individualization and personalization of future professionals' training in the conditions of blended learning", number of state registration 0120U101970. Taking into account the pandemic conditions and social isolation, from 2019 to 2020, it was proposed to implement the program "The first-year students' adaptive capacity development in a modern educational institution". This program, which was based on the cloud computing elements use, was implemented in Bohdan Khmelnytsky Melitopol State Pedagogical University with the support of University Psychological Center. Methods used in the research process: method of theoretical analysis of literature sources on the introduction of cloud computing into the educational process of higher education, analysis of modern experience of psychological and pedagogical support of the integrative process of the first-year students' adaptive potential development, analysis of practical implementation of Google Workspace for Education Edition into the process of the first-year students' adaptive potential development, a set of psychodiagnostic tests using Google Form.

### 4. Research results

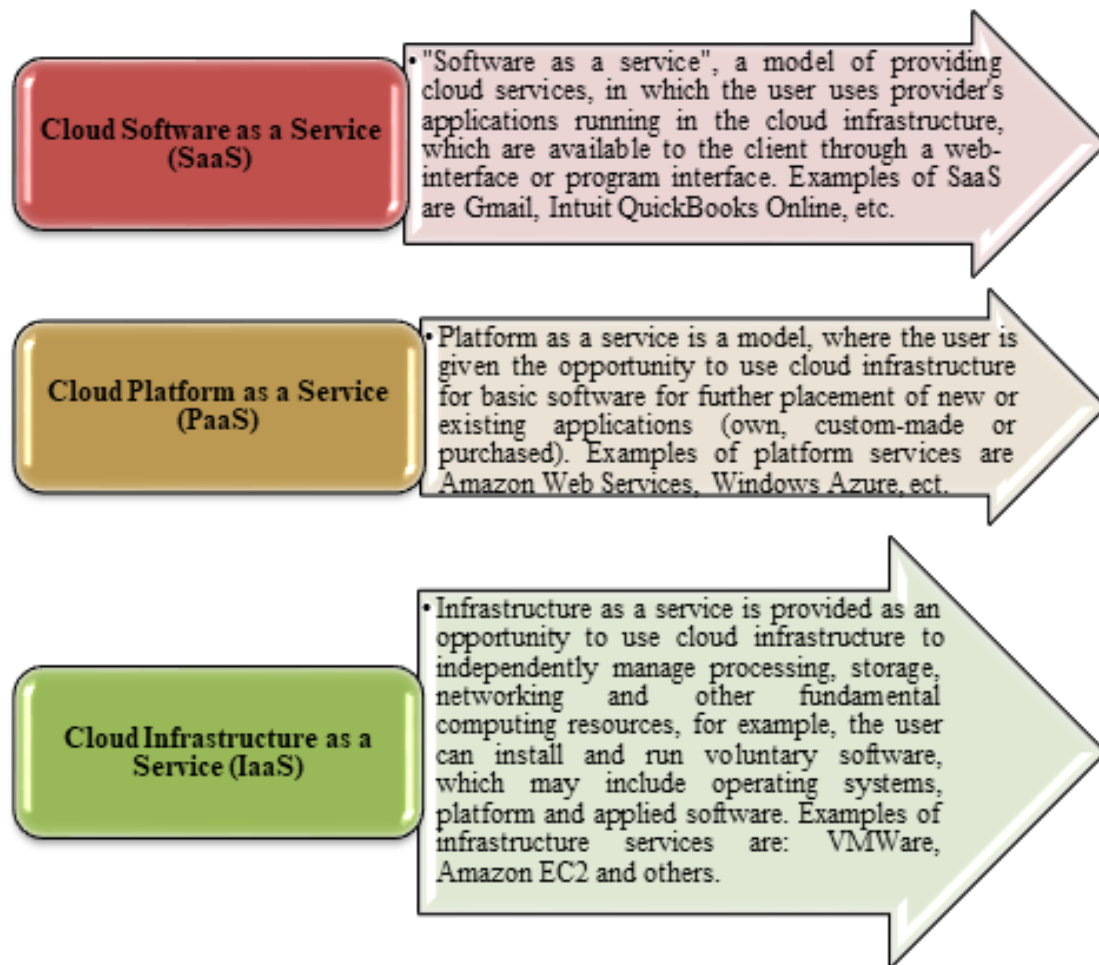
#### 4.1. Theoretical foundations

In the study of the National Institute of Standards and Technology there are 3 models of cloud services (figure 1).

Recommendations for the effective use of cloud computing in universities are given in the technical report of the research group of the University of California at Berkeley [20]. This report presents 10 obstacles and 10 opportunities that clouds provide to businesses, including educational institutions. Cloud providers, which own data centers, use cloud utilities to enable cloud users and SaaS providers to use web-based "Software as a Service" (SaaS).

The analysis allowed us to identify the following advantages of using cloud computing in the educational environment:

- *economic*: the main advantage for many educational institutions is cost effectiveness. This is especially noticeable when services, such as e-mail, are provided for free by external providers. Equipment for these services may be used for other purposes;
- *technical*: minimum hardware requirements (the only one condition is access to the Internet);
- *technological*: most high-level cloud services are either fairly easy to use or require minimal support;
- *didactic*: a wide range of online tools and services that provide a secure connection and opportunities for cooperation between teachers and students;

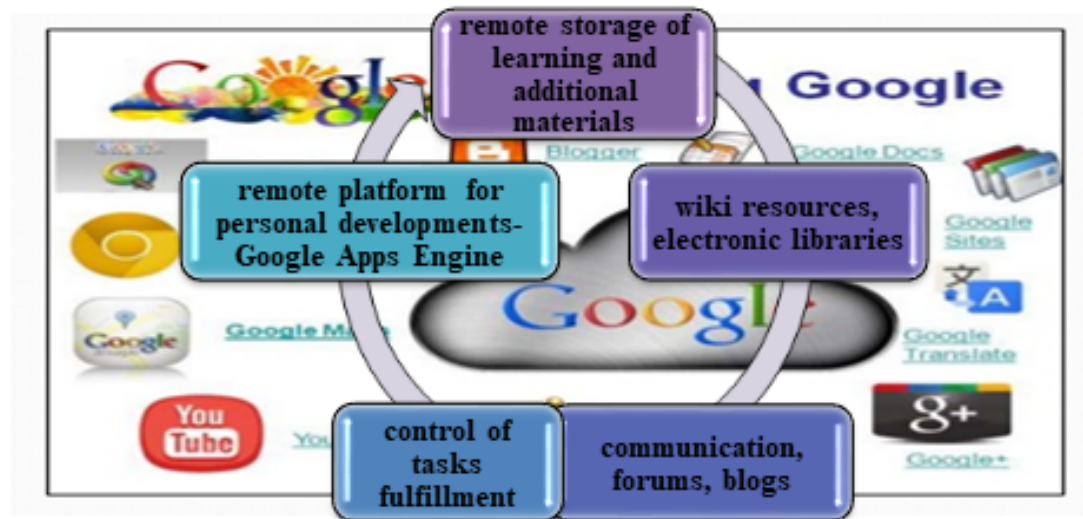


**Figure 1:** Architectural components of “clouds”.

- *health-saving*: in pandemic conditions support and possibility of continuous educational activities are provided, even in the conditions of self-isolation.

Currently, the major providers for educational institutions in Ukraine are Microsoft and Google, which provide clouds and SaaS to schools, colleges and universities on a free basis. In addition, cloud computing challenges software developers and this fact is connected with a merge of new generation of software applications [21]. The use of cloud computing in the educational process allows educational institutions to use computing resources and software applications as a service via the Internet. It also allows to intensify and improve the learning process. Examples of modern services for education, based on cloud computing, are Office 365 Education from Microsoft and Google Workspace for Education. When using the Google Workspace for Education cloud platform, students and teachers can use the following basic tools: Gmail with support for text, voice (Google Talk) and video chat; Google Drive (a storage size is 15 GB by default) for saving files and providing access rights to them; Google Docs –

a tool for creating documents, spreadsheets and presentations of any complexity with the ability to use templates; safe, an additional tool of Google Workspace for Education, which allows you to manage information, i.e. to organize a quick search for necessary information, archive and export e-mail message to standard formats; organize protection of information from accidental or intentional deletion; create databases on user's activity and data history [22]. Google Workspace for Education have been constantly expanding a range of services for educational institutions, creating additional services such as Apps Marketplace (implementation and integration of web services compatible with Google Workspace for Education); Google Moderator (a service for creating categories of questions for discussion), etc. [23] (figure 2).



**Figure 2:** Functional opportunities of Google Workspace for Education.

Given that future specialists use information technology in almost any activity, and taking into account huge popularity and versatility of Google, the use of educational resources, created on its basis, allows us to organize the learning process in such a way that students actively and enthusiastically master the educational materials. In these terms the Google Classroom, a learning management system, is especially convenient (figure 3).

This system has many advantages:

- access to materials from any place;
- creation of a task and distribution of its individual copy for each student;
- joint work on tasks, implementation of project activities;
- real-time communication;
- possibility of conducting interactive classes online;
- tasks assessment.

Currently, in order to work with the service, you need only an Internet connection, a browser, and any freely available operating system. The only condition is to register your own mailbox



**Figure 3:** Advantages of Google Classroom implementation into the educational process.

in Gmail and get the access key, which is generated by Google Classroom for each class. It should be noted that in order to use Google Class in your school, you have to create a free account in Google Workspace for Education. The Google Classroom can contain not only tasks to be performed during the lessons, but also links to useful resources, including a discipline site, created by means of Google service. It is advisable to fill the course with lectures, practical classes, individual tasks for students and links to information resources that may be needed while doing a course: textbooks, manuals, regulations, Internet resources, videos, etc. Such availability of teaching aids, opportunity to review and look through them again and again provide necessary conditions for the internalization of the learning materials. The Google Classroom e-learning environment also allows users to import elements from other services, including small interactive LearningApps.org modules, which can be used directly as educational or training resources and allow students to learn the most important categories of the course in a form of a game. The advantages of cloud computing in the educational environment provide an opportunity to consider them as a deterministic component of the impact on professionally important and personality-oriented competencies development [24].

## 4.2. Empirical implementation

In the period of education reform, the problems of students' adaptation to new forms and conditions of life are becoming increasingly important. It causes the need to improve psychological support of educational process. The first-year students adaptation to higher education is one of the important issues, because it is a period of the most intensive flush of intellectual and moral forces of a person. Personal adaptive potential (as an integral feature of mental development) is viewed as personality's interconnected psychological features which determine the success of adaptation and provide a possibility of maintaining professional health. Characteristics of

personal adaptive potential can be obtained by assessing the level of behavioral regulation (BR), communicative potential (CP) and the level of moral norms (MN). Adaptive potential is considered to be a person's systemic feature, which determines the limits of his or her adaptive capabilities and reaction to the influence of certain factors and conditions of the environment. Adaptive abilities provide adequate fulfillment and high efficiency of work under the influence of psychogenic environmental factors. Under the sociopsychological adaptation, we understand the process and result of active human adaptation to the conditions and requirements of social environment through mastering and acceptance of the requirements, values, and norms of behavior which are common for this environment [25]. In this context, the main function of adaptation is a person's acceptance of norms and values of new social environment, forms of social interaction that have developed in it, formal and informal relationships, as well as forms of learning. Thus, taking into account the pandemic limitations, teachers of the Department of Psychology together with leading experts of the Department of Informatics and Cybernetics have developed and tested the program "Adaptive" using the functional opportunities of Google Workspace for Education. The program is designed for 10 days, 2 hours daily, and is carried out during the first weeks of September.

This adaptation program for the first-year students contributes to more intensive and purposeful habituation of students to university conditions, enhances team building, on the other hand it helps students and curators to establish interaction, create a friendly atmosphere in the group, form a positive internal motivation. The innovative information component of the program is its configuration and implementation through the cloud computing use in the conditions of social isolation, caused by the COVID-19 pandemic. In order to identify the effectiveness of the program "Adaptive", based on Google Workspace for Education, we conducted a comparative analysis of students' adaptive potential. There were two groups: control group (28 people) – the first-year students (future psychologists) who participated in the traditional program "Adaptive" in 2019 without the use of cloud computing; and experimental group (30 people) – the first-year students (future psychologists) who participated in the program "Adaptive", implemented on the basis of cloud computing in 2020.

After the formative experiment, there was a tendency to an increase of the adaptive abilities of experimental group students (table 2).

Thus, as it can be seen from the table 2, the average level of adaptive abilities in the experimental group has increased by 13.33% (from 20.00% to 33.33%) due to a decrease of 26.67% in the number of students with a low level of this indicator (from 80.00% to 53.33%). This proves that first-year students have become less vulnerable to adaptation problems; they have developed the skills necessary for the adaptation to the new educational environment and acquired basic adaptation mechanisms. In addition, due to the work done in the experimental group, students with a high level of adaptive abilities (13.34%) were identified. They demonstrated the ability to successfully adapt to various requirements of new educational environment, they can easily and adequately orient in the new situation, quickly choose the strategy of their behavior and socialization, which is manifested in the use of certain adaptive mechanisms in the conditions of study in university. In contrast, the indicators of adaptive abilities of the control group students have remained almost unchanged (the percentage of students with a satisfactory level has increased from 25.00% to 28.57%, and a low level of this parameter has decreased by only 3.57%). These minor changes are insignificant. In addition, we didn't identify a high level of



**Table 1**  
Design of the program “Adaptive” based on Google Workspace for Education services)

Stages of program implementation	Basic activities
Preparative unit	<ol style="list-style-type: none"> <li>1. Development and approval of the program “Adaptive”.</li> <li>2. Uploading elements and tasks of the program into the Google Classroom environment.</li> <li>3. Training of trainers (teachers of the Department of Practical Psychology), who are responsible for conducting Adaptive at the faculties.</li> <li>4. Training of group curators for the Adaptive use.</li> <li>5. Organizational work, carried out by heads of the program and people responsible for it at the faculties.</li> </ol>
Implementation of program “Adaptive”	first-year students’ acquaintance with peculiarities of work in Google Classroom environment and functional opportunities of Google Workspace for Education which will be used within the framework of the program; acquaintance with the legal framework of University; demonstration and discussion of “Checklist for the first-year students”; viewing and discussing 3D tours; acquaintance with the information base of the university site
Corrective-developmental unit	delivery of psychological transformation games, trainings aimed at the development of personal adaptive potential (for example, T-game “Wings”, “Our State”); group forum “We are a single team”, “Getting to know the world-views of group members”; group online quest “Close-knit team”; watching and discussing the video “Principles of team building”; creation of online art collages and presentations “My future profession”, “Learning to be together”; activities for interaction and communication; presentation of online projects of microgroups “Rules and values of our group”
Preventive unit	diagnosis of psychological personality traits, using the Google form, in order to identify the first-year students’ adaptive potential and prevent the manifestation of maladaptive forms of behavior; keeping online diaries “Emotional state map”, in order to prevent mental stress; Group discussion – “Successful communication”, 16 principles of building interpersonal communication, “Consilium”, “Live line”; corrective activities to prevent mental stress during the period of the first-year students’ adaptation
Reflexive unit	receive feedback using the Google Forms; diagnostics of levels of development of the first-year students’ adaptive abilities by means of the Google Forms; online presentations of the essay “I am a future specialist. My profession in 10 years”
Analytical stage	processing of the results of psychodiagnostic research; feedback survey analysis; making a list of “first-year students’ risk groups”, people, who demonstrate initial manifestations of maladaptation; development of a list of recommendations and a plan for psychological support of “risk groups”

**Table 2**

Quantitative indicators (%) of levels of adaptive abilities development of the first-year students of experimental ( $n = 30$ ) and control ( $n = 28$ ) groups after a formative experiment. Indicators in % (absolute number)

Level of adaptive abilities	Experimental group before	Experimental group after	Control group before	Control group after
High level	0	13.34(4)	0	0
Satisfactory level	20.00 (6)	33.33 (10)	25.00 (7)	28.57 (8)
Low level	80.00 (24)	53.33 (16)	75.00 (21)	71.43 (20)

adaptability among the students of the control group.

This work helped to increase *the neuropsychological stability* of students. According to the results of the formative experiment, there was an increase in the level of neuroemotional stability in both experimental and control groups. But more significant changes took place in the experimental group. In particular, a number of students with a low level of neuroemotional stability has decreased by 10% (from 66.66% to 56.66%) and a number of the first-year students with a high level of this indicator has increased by 10%. This states that participants have become more optimistic about reality in terms of adaptation, they realistically assess their role in a team and relationships, focus on compliance with generally accepted norms of behavior, adequately perceive new requirements of the intellectual and educational environment. The same changes in the control group were identified only partially (a number of students with a low level has only decreased by 3.57% and, accordingly, the percentage of students with a high level of neuro-emotional stability has increased).

The introduced system of psychological and pedagogical support has somewhat affected the indicators of development of the first-year students' *communicative skills*. Positive changes in the development of communicative skills are more significant among the first-year students of the experimental group. In particular, a high level of development of these skills in the experimental group has increased by 10% (3 63.33% to 73.33%) and, accordingly, the indicator of a low level of development of these skills has decreased by 10% (from 36.67% to 26.67%). Students became less conflicted, more open and tolerant to each other in the process of communication; it became easier for them to establish contacts with others. The work contributed to more effective interaction and mutual understanding in the process of joint intellectual activity. Due to the developed skills of effective communication of the experimental group students there was an improvement in relationships in the group and beyond. It has to be noted that there were also changes in the control group, but they were not so significant. The changes in the indicators of high and low levels of the development of communicative skills were only by 3.57%. This number of the first-year students was able to get rid of problems in establishing contacts with others in the process of joint intellectual activity.

The conducted work also had a positive impact on the indicators of moral norms of the first-year students. Positive changes in the indicators of *moral norms* are present only in the experimental group, but they are also insignificant. A number of students with a high level has

increased only by 3.34% (from 90.00% to 93.34%) and, accordingly, a number of respondents with a low level of development of moral norms has decreased by 3.34% (10.00% to 6.66%). Thanks to the acquired skills of adaptive behavior, the first-year students learned to accept the proposed new social role, moral and ethical norms of behavior and requirements of the new intellectual and educational environment. In the control group, these indicators, according to the formative experiment results, remained constant. In our opinion, this is due to the fact that students have not experienced adaptive behavior, they haven't been aware of the ways to overcome difficult situations, and therefore they can not always clearly assess their place and role in a team. These students do not even try to stick to generally accepted moral and ethical norms of behavior and new educational environment requirements.

The students of the experimental group have also shown positive changes in the indicators of the level of adaptability (table 3).

**Table 3**

Quantitative indicators (%) of levels of adaptability of the first-year students of experimental ( $n = 30$ ) and control ( $n = 28$ ) groups after a formative experiment. Indicators in % (absolute number)

Level of adaptability	Experimental group before	Experimental group after	Control group before	Control group after
adaptability	43.33 (13)	63.33 (19)	46.43 (13)	50.00 (14)
maladaptability	56.67 (17)	36.67 (11)	53.57(15)	50.00 (14)

Table 3 shows that a number of experimental group students, who became more adaptive, increased by 20.00% (from 43.33% to 63.33%). This indicates that students have become more able to adapt to the changing conditions of the educational environment, they analyze and adequately perceive it, maintain their integrity and avoid destructiveness under the influence of change, correlate their goals and outcomes. While participating in the program, they learned to orient more adequately in a new learning situation, while maintaining the optimal level of their mental capacity. Due to this fact, a number of people, who showed maladaptation, has decreased by 20.00% (from 56.67% to 36.67%) and all of them show unsuccessful attempts to achieve the goal, they demonstrate some contradictions between their intentions and actions, plans and their implementation, motivation for action and its results. The results of the control group are almost unchanged, in this sample the level of maladaptability has decreased only by 3.57%.

It should also be noted that our program "Adaptive", based on the use of cloud computing, has influenced the level of the first-year students' *acceptance of others*. The experimental group underwent the most qualitative changes in the levels of the first-year students' acceptance of others. It should be noted that a number of students who have become more able to accept other people as they are has increased by 6.67% (from 86.67% to 93.34%). They have learned to respect the uniqueness of others and their right to be themselves, they have also learned to accept the unconditional value of other people and be able to trust them. The experimental work contributed to the first-year students' acceptance of the inner world, the essence and abilities of other people. Accordingly, a number of respondents, for whom another person is not a unique

person capable of their own changes and possessions, has decreased by 6.67% (from 13.33% to 6.66%). According to the formative experiment results there were also some changes in the control group, but they are not so significant. In particular, only 3.57% (from 89.29% to 92.89%) of the first-year students have undergone qualitative changes in the degree of their acceptance of other people. The reason for it we see in a lack of students' experience of understanding the inner world of others, their uniqueness and individuality, presence of inflated self-esteem.

Formative experiment results indicate positive changes in the indicators of *emotional comfort* in a new intellectual and educational environment. Based on the obtained data, it can be stated that a number of the experimental group students, for whom higher education is associated with emotional comfort, has increased by 13.33% (from 96.67% to 83.34%). It proves the fact that students have become more confident in themselves and others, feel more secure and calm in the new intellectual and educational environment, they have lost the feeling of anxiety in a new learning situation. Accordingly, a number of respondents of the experimental group, for whom the new educational space is associated with discomfort and emotional experience of learning situation as an unpleasant and difficult one, has decreased by 13.33% (16.66% to 3.33%). It disrupts their normal learning and mental activity. Formative experiment results indicate some slight changes in the above mentioned indicators among students of the control group. In particular, the difference between the indicators before and after the experimental work in this sample is only 3.57%. The lack of adaptive mechanisms does not allow first-year students to get rid of anxiety, worry and fear associated with a new learning and mental activity. It negatively affects their functioning, confidence and mental capacity.

Indicators of *dominance and subordination* in the first-year students relations according to the results of the formative experiment show that qualitative changes in this indicator are found out only among the experimental group students, but they are insignificant. In particular, a number of respondents for whom dominance is a characteristic feature in the relationship, has increased by 3.34% (from 80.00% to 83.34%). Thus, it can be stated that the implemented system to some extent contributed to the development of the first-year students' faith in their ideas and capabilities, encouraged them to be a leader, and be able to manage their destiny without lowering their expectations after many failures. It also helps them to maintain a sense of control over the environment. Accordingly, there is a decrease by 3.34% (from 20.00% to 16.66%) in the number of respondents, who prefer subordination, and want to obey the decisions of leaders. They don't feel able to manage the events of their lives, even after success. In our opinion, such insignificant changes are connected not with the ineffectiveness of the implemented program, but rather with the internal attitude, type of temperament and worldview of students. Instead, the indicators of the control group according to the results of the experiment remained constant.

Qualitative changes in the indicators of students' *escapism* have taken place. According to the experiment results, it was found out that the most significant changes were recorded in the experimental group, where this indicator has increased by 9.97% (from 83.34% to 73.37%). The indicators of these students' escapism are within normal limits, these students are able to either escape problems or solve them by looking for constructive methods, choosing alternative ways and applying their personal and intellectual potential. But the chosen strategy depends on a situation. Due to it, a number of respondents, who are characterized by a high level of escapism, has decreased by 13.34% (from 20.00% to 6.66%). These students experience difficulties during the fulfillment of educational and mental activities in the university, as there appear some

problems during their adaptation to the educational institution. It has to be mentioned that a number of the first-year students with a low level of escapism has increased by 3.34% (from 6.66% to 10.00%). During formative experiment, students learned to solve difficult situations, keeping faith in themselves and their abilities, as well as to manage the appropriate level of their mental capacity. Some changes in this regard were recorded in the control group, where the indicators of a high level have decreased by 3.58% (from 14.29% to 10.71%) and a level of escapism within the norm has increased by 3.58%, respectively (from 82.14% to 85.72%). In addition, a lack of skills of constructive problem solving left unchanged, the indicators of a low level of escapism in the control group were 3.57%.

The implemented program also contributed to the correction of indicators of psychophysiological maladaptation of students (table 4).

**Table 4**

Quantitative indicators (%) of levels of psychophysiological maladaptation of students of experimental ( $n = 30$ ) and control ( $n = 28$ ) groups after a formative experiment. Indicators in % (absolute number)

Level of maladaptation	Experimental group before	Experimental group after	Control group before	Control group after
high	6.66 (2)	0	7.14 (2)	7.14 (2)
sufficient	10.00 (3)	3.33 (1)	10.71 (3)	7.14 (2)
medium	70.00 (21)	60.00 (18)	67.86 (19)	71.43 (20)
low	13.37 (4)	36.67 (11)	14.29 (4)	14.29 (4)

Table 4 shows that in the experimental group there were significant changes in the indicators of maladaptation. In particular, a number of students with a low level has increased by 23.3% (from 13.37% to 36.67%) and a sufficient level of maladaptation has decreased by 6.67% (10.00% to 3.33%). It shows that some students have overcome strong feelings, associated with insufficient socialization in the new conditions. They struggle with unacceptable attitudes, sharp change in living conditions, and a break in important social relations, etc. In addition, the work allowed to completely “get rid” of students with a high level of psychophysiological maladaptation (0% instead of 6.66%). They became more adaptable to the life and conditions of university, acquired skills of independence in the organization of their mental activity. The indicators of a medium level have also changed (from 70.00% to 60.00%) due to the change of the indicated results. Students have learned to overcome difficulties, associated with changing forms of learning, teaching and assessment methods, and the discomfort of a new learning environment. Instead, the results of the control group according to this indicator have remained almost constant. The number of students with a sufficient level has decreased by only 10.00% and increased accordingly in terms of the medium level of maladaptation. The experimental work contributed to the effective formation of experimental group students’ *value motivation to study* in the university (table 5).

As we can see from table 5, there was an increase of 16.66% in the number of experimental group students seeking for mastering the profession (from 10.00% to 26.66%). Thus, they rethought themselves as future professionals, they began to strive to develop professionally

**Table 5**

Motives of learning of students of experimental ( $n = 30$ ) and control ( $n = 28$ ) groups according to the formative experiment results. Indicators in % (absolute number)

Motives of learning	Experimental group before	Experimental group after	Control group before	Control group after
Knowledge acquisition	33.36 (10)	36.67(11)	28.57 (8)	28.57 (8)
Professional development	10.00 (3)	26.66 (8)	7.14 (2)	10.71 (3)
Getting a diploma	56.66 (17)	36.67 (11)	64.29 (18)	60.71 (17)

important qualities, to become an educated person and a highly professional specialist. In addition, a number of the first-year students, who are focused on acquiring certain professional knowledge, showing curiosity, determination and independence in the process of learning, has slightly increased (from 33.36% to 36.67%). Due to it, a number of respondents, who consider getting a diploma and higher education to be a priority when studying in the university, has decreased by 20.01%. So, it can be stated that learning motivation of the first-year students of the experimental group after the implementation of the program has become more evident. Analyzing the indicators of the control group, we can see only episodic changes. There was a shift of only 3.57% in terms of mastering the profession and getting a diploma.

Along with it, the created conditions contributed to the development of different types of relationships, characteristic for a team, which improves the microclimate in the group (table 6).

**Table 6**

Quantitative indicators (%) of levels of social relations development among the students of experimental ( $n = 30$ ) and control ( $n = 28$ ) groups after the formative experiment Indicators in % (absolute number)

Types of relations	Experimental group before	Experimental group after	Control group before	Control group after
informativeness	33.34 (10)	10.00 (3)	39.29 (11)	32.13 (9)
contacts	23.34 (7)	3.33 (1)	21.44 (6)	21.44 (6)
openness	13.33 (4)	13.33 (4)	10.71 (3)	14.29 (4)
responsibility	13.33 (4)	16.67 (5)	10.71 (3)	7.14 (2)
collectivism	6.66 (2)	30.00 (9)	7.14 (2)	7.14 (2)
unity of opinion	10.00 (3)	23.34 (7)	7.14 (2)	14.29 (4)
good organization	-	3.33 (1)	3.57 (1)	3.57 (1)

As it is seen from table 5 after the experimental work collectivism has become a priority for the experimental group students (from 6.66% to 30.00%), as well as a unity of opinion (from 10.00 to 23.34%) and responsibility (from 13.33 up to 16.67%). They became more eager to work together to solve all issues, at the same time preserving and strengthening the group as a whole, preventing its destruction. Students note that the group has common ideas and goals understood

and perceived by everyone as their own. In addition, the first-year students have changed their attitude to joint mental and educational activities, to the tasks which the group has to do. It is the development of such relationships that most students in the experimental group have noticed. In addition, students became more organized (the indicator has increased by 3.33%), but they remain open to others (the result hasn't changed – 13.33%). It indicates the ability of the group to independently organize its work and leisure, quickly create an organizational structure of business relationships which are necessary for effective group work. In the control group, the results are stable according to almost all parameters.

Analyzing the obtained empirical data, we have come to the conclusion that there was an improvement of psychological and psychophysiological indicators of the first-year students' adaptive abilities as a result of their participation in the program "Adaptive", based on the use of cloud computing.

## **5. Conclusions and recommendations for future research**

The rapid spread of cloud computing makes modern educational environment integrate cloud services into the educational institution, review its IT-infrastructure and introduce innovative technologies into the educational process. The use of Google Workspace for Education in the educational process not only contributes to the fulfillment of main task of modern education – formation of a competitive and successful personality in the electronic information society, but also significantly improves and diversifies the activity of a teacher, activates creativity of students, creates appropriate conditions for the formation and development of their relevant skills and abilities, improves the assimilation and reproduction of information obtained by them, promotes the development of students' adaptive potential. The implemented program "Adaptive", based on the cloud computing use, proved to be effective, as the experimental group students demonstrated significant positive changes (qualitative and quantitative) in the indicators of mental performance and psychological and pedagogical conditions of their development. The obtained results show a tendency to increase the adaptive abilities of the experimental group respondents, their neuropsychological stability and level of their adaptability. Students developed the skills necessary for their adaptation to the new intellectual and educational environment, they became more optimistic about it, they are able to use basic adaptive mechanisms, at the same time maintaining their integrity. The experimental work helped to reduce a level of the first-year students' psychophysiological maladaptation and sociopsychological stress; they became more adaptable to the life and conditions of university, acquired skills of independence and personal stress resistance in the mental activity. The experimental program also influenced the development of students' learning motivation, their focus on the acquisition of knowledge, curiosity and independence in performing intellectual tasks. There was a certain increase of a percentage of experimental group students who choose a strategy of coping, focus on solving the problem with the orientation for its rational analysis and constructive solution. After the experimental work, collectivism, unity of opinion and responsibility became a priority for the experimental group students. We have also noted a desire to fulfill joint activity, preserve and strengthen group as a whole, admit the value of each group member. As a result of the analysis of program participants' feedback, we can say that there is an increase in students' interest in

some information services. It means that it is important to carry out a work on the introduction of cloud computing into the educational process. We consider information and communication technology to be a powerful means of increasing not only the effectiveness of learning, but also the development of professionally important personal traits as well as formation of future specialist's competitiveness.

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