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Оценка студентами взаимодействия с компонентами образовательной среды вуза в допандемийном и пандемийном периодах

Вынужденный переход на дистанционное обучение вследствие пандемии привел к качественному изменению компонентов образовательной среды вуза. Целью статьи является сравнительный анализ оценок студентами образовательной среды в обычном допандемийном обучении и при переходе на дистанционные формы обучения в период пандемии. Была высказана гипотеза о взаимосвязи стадии субъектности, на которой находится студент, и экопсихологическими типом его взаимодействий с каждым из компонентов образовательной среды в обычном и в дистанционном режимах обучения.

В качестве испытуемых выступили студенты второго и пятого курсов инженерных направлений обучения ($N=159$; $M=20,3$; $SD=1,5$; 68% девушки). Для диагностики оценки взаимодействия компонентов образовательной среды использовался опросник, позволяющий оценить в интервальной шкале взаимодействие каждого компонента среды с экопсихологическими типами субъект-средовых взаимодействий (от объект-объектного до субъект-субъектного). Для оценки стадий становления субъектности в учебной деятельности была разработана авторская модифицированная решетка Дж.Келли, с помощью которой реализовывался идеографический метод исследования. Влияние компонентов образовательной среды на студентов определялось пошаговым регрессионным анализом.

В ходе исследования выявлены стадии становления субъектности «подмастерье» (субъект-объектный и объект-субъектный типы), «ученик» (субъект-совместный тип), «критик» и «творец» (субъект-порождающий тип) в обычной и «цифровой» образовательных средах. В частности, повышенная частотность стадии субъектности «подмастерье» свидетельствует о доминировании репродуктивных технологий при обучении как в обычной, так и в «цифровой» среде. В технологическом компоненте обычной образовательной среды в допандемийном периоде выявлена взаимосвязь с рядом стадий становления субъектности «наблюдатель» (0,20), «подмастерье» (0,21), «ученик» (0,20), «мастер» (0,17) и «творец» (0,22. Тогда как в отношении «цифровой» среды выявлена лишь одна обратно пропорциональная взаимосвязь с выраженностью стадии «творец» (-0,19) при объект-объектном типе взаимодействия.

Ключевые слова: образовательная среда, компоненты, обычная, «цифровая», пандемия, экопсихологические типы субъект-средовых взаимодействий, стадии субъектности

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Students evaluation of interaction with the components of the educational environment of the university in the pre-pandemic and pandemic periods

The forced transition to distance learning due to the pandemic led to a qualitative change in the components of the educational environment of the university. The purpose of the article is a comparative analysis of students' evaluation of the educational environment (spatial-subject, communicative and technological components) in regular education before the pandemic and during the transition to distance forms of education during the pandemic. Based on this, a hypothesis was put forward about the correlation between the stage of a student's subjecthood and the eco-psychological type of his interactions with each of the components of the educational environment in the regular (traditional) and distance (virtual) learning modes.

The test subjects were students of the second and fifth years of engineering specialties ($N = 159$; $M = 20.3$; $SD = 1.5$; 68 per cent of girls). To diagnose the evaluation of the interaction of the components of the educational environment, we used the questionnaire, which allows us to evaluate the correlation of each component of the environment with the Eco-psychological types of subject-environmental interactions on an interval scale (from object-object to subject-subject). To assess the stages of the formation of a student's subjecthood in educational activity, the author modified G. Kelly's grid, with the help of which the ideographic research method was implemented. The influence of the components of the educational environment on students was determined by stepwise regression analysis.

The study identified the stages of the formation of a student's subjecthood "journeyman" (subject-object and object-subject type), "student" (subject-joint type), "critic" and "creator" (generative subject type) of traditional and digital educational environments. In particular, the increased frequency of the "apprentice" stage of a student's subjecthood testifies to the dominance of reproductive technologies in teaching both in the traditional (33%) and in the "digital" (22%) environment. In the technological component of the traditional educational environment in the pre-pandemic period, a correlation was revealed with a number of stages of the formation of a student's subjecthood "observer" (0,20), "journeyman" (0,21), "student" (0,20), "master" (0,17) and "creator" (0,22). Whereas in regard to the "digital" environment, only one inversely proportional relationship with the severity of the "creator" stage (-0,19) in the object-object type of interaction was revealed.

Keywords: educational environment, components of educational environment, regular (traditional) education, "digital", pandemic, Eco-psychological types of subject-environmental interactions, stages of a student's subjecthood

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Introduction

In the last decade, modern Russian higher education has undergone changes associated with the transition of schools and universities to the competence paradigm of education and from the reorientation of education to the development of the subjective qualities of the personality of students. Such a change of target in the education system requires a more active use of the psych didactic approach, a distinctive feature of which is a change in the ratio of the goal and the means of teaching. Namely, subject skills and competencies are considered not as an end of learning, but as "a psychological and pedagogical means of developing cognitive, communicative, personal and other abilities and structures of students' consciousness" [5, p. 122]. At the same time, the role of the educational environment and the types of interaction of students (hereinafter referred to as university students) with its spatial, communicative and technological components increases significantly. The object-subject type of interaction with the educational environment and its subjects, which dominates in traditional learning, should be replaced by the subject-generating and subject-joint types of communicative interaction [17]. Only under this condition, the interaction of students with the educational environment will contribute to the formation with it of "an aggregate subject of a joint (jointly distributed) process of cognitive and other development" [5, c. 123]. At the same time, the development of the subjectivity of students receives particular importance, as the ability to be a subject of the learning action (from "observer" to "master" and "creator") and as the ability to arbitrarily take a subject and/or object position, depending on the educational situation and educational material [5; 8; 16].

In recent years, the education system has experienced the powerful impact of two seemingly unrelated global factors: digitalization and the coronavirus pandemic. It was the pandemic that forced schools and universities to switch from full-time to distance learning, the so-called "remote education". This immediately changed the educational environment for both students and teachers. The spatial component has changed – instead of a school class or classroom; teaching began to take place mainly at home. In turn, this changed the character and forms of communicative interaction between students and the teacher; it began to occur in a remote form. "Live" communication with a real teacher and real group (not virtual) mates was replaced by virtual communication with a virtually represented teacher and group mates. As a result, it became easier for the teacher to return to the traditional subject-object interaction with students than to organize the subject-generative and subject-joint interaction with them. The technological component also changed radically – digital (information and communication) means and methods of teaching came to the fore, which required the active use of digital teaching aids and, consequently, the transformation of educational material and educational process into digital form. Therefore, we will call the educational environment in the indicated distance format the "digital" educational environment (we have taken the term "digital" in quotation marks, because in this case, we can only speak to a minimum extent about the digitalization of the educational environment). Taken together, these changes in the educational environment have led to a change in the formation of a student's subjecthood in learning conditions before a pandemic and during a pandemic.

Due to this, the necessity of a comparative study of the stages of the formation of a student's subjecthood as predictors of eco-psychological types of their interaction with the

spatial, communicative and technological components of the educational environment in the pre-pandemic and pandemic periods of education has been appeared.

The second direction is determined by digitalization processes that qualitatively change human life. Digitalization is not just a more intensive use of information technology; research confirms "the transformation of mentality, consumer's behavior, labor functions, mental functions under the influence of digitalization of the information environment"[16, p. 26].

We are talking about completely different models of communication as a result of layering, combining digital and traditional environments [16, p. 27-29], about the integrated digital environment of the organization through the coordination of natural (human) and artificial intelligence [7, p. 68]. The necessity to take the challenge and respond to the complexities of learning and teaching in the digital age with the intensive use of information and communication technologies is appeared [3].

Speaking about the educational organization, we must take into account the fact that digitalization violates the traditional division of the spheres of educational activity; a person loses the features of the "main player" in the process of collaboration with software products and devices [7, p. 69].

As P. Luksha writes, a huge flow of information requires the integration of the human knowledge, the involvement of students in the real world and its problems. He notes that the learning environment will be effective through constant interaction and expansion of professional, social and cultural fund through cooperation with family and the community, with higher education, business and the use of alternative sources of knowledge. Such an educational system would not be like an industrial conveyor plant, but a living ecosystem of knowledge.

The educational ecosystem is built on the principles of activity and cooperation [12], and these areas are indicated in the research of the analytical company McKinsey as wanting a large-scale transformation [4]. Besides the flexibility of educational trajectories, attention of researchers should be focused on the development of students' personal, social skills and skills of solving intersubject tasks [4, p. 60].

We can see that both directions of changes in education are primarily related to the requirements for the conditions of the learning environment, which makes the research of the influence of the educational environment on students relevant.

Literature review

Researches of the influence of the educational environment on students, as noted in [5, p. 10], is based on the concepts of the psychology of ecological consciousness, psychological ecology, environmental psychology, behavioral ecology, behavioral geography, etc.

The influence of the educational environment can be traced at all levels of education. Using the example of school education, V.A. Yasvin speaks about the pedagogical organization of personally developing school environments as a means of achieving personal educational results of students [24, p. 6].

Noting the importance of the environment of an educational organization in the social and cultural development of a person, V.A. Tomyuk remarks that "the digitalization of the educational environment expands the boundaries of opportunities, communications of students, and this changes the social situation, transforms the motivational and value sphere, affects the personal and professional self-determination of modern students as a

digital generation immersed in a digital environment and digital communications, an owner of values, formed under the influence of computers, mobile devices, the Internet, social networks" [22, p. 426].

The digital educational environment as an infrastructure of the educational process, which serves and supports the formation of a student's subjecthood in educational activities, includes information, technical and educational subsystems which orient its subjects to receive high-quality educational results [10, p. 552].

The transformation of higher education is accompanied by the formation of global competence [21, p. 7] and a personality-oriented pedagogical approach. This pedagogical approach takes into account prior knowledge of the learning styles and abilities of several students, while students take an active part in what and how they learn [19]. They understand how their learning relates to continuous development, goals and future aspirations [21, p. 28].

At the same time, the aspiration to globalization is accompanied by the fact that educational activities and work practice are increasingly taking place in different conditions and contexts. According to [11], society is increasingly divided into sectors and subsectors with a growing division of labor, the development of knowledge in which leads to the emergence of more and more specialized methods of work, which are a special configuration of professional languages, technologies and organizational mechanisms. This specialization implies that knowledge cannot easily shift between different situations, such as school, places of work and leisure.

The issue of taking into account individual features and needs, along with the subject area of competencies when developing an ontological model for increasing the competitiveness of university graduates to create an individual plan for professional training and self-study, is characteristic of both foreign and domestic models [9].

The impact of the digital learning environment is also considered in connection with student achievement. For example, [6] shows that the average exam scores of students and the average value of the general satisfaction of students in the e-learning group (experimental) are statistically significantly higher than in traditional learning [6, p. 80]. This result is comparable to the statistics of B. Chernev that 52 per cent of American graduates and 39 per cent of undergraduates consider online learning better than classroom learning, which underlines the growing importance of e-learning in the United States [2]. Speeding up of learning is associated with the use of artificial intelligence systems that simulate the most comfortable conditions for understanding and learning [14].

It is noted that most of the works are focused mainly on the conditions for organizing the educational environment and their impact on learning results.

Specially created pedagogical conditions, saturated with digital teaching technology, ensured the development of students' competitiveness in the solidarity of value-motivational, content-technological and reflective-evaluative components [1, p. 552]. Not only the volume and quality of knowledge, skills and abilities have grown, but also the level of motivation of professional activity, the ability to project their professional development; the ability to self-regulate behavior and activities; awareness of oneself as a subject of educational and professional activity.

The conditions of the educational environment should include the development and exchange of effective educational experience by the teachers themselves, the potential of training design to achieve certain educational goals in this context [13].

Educational goals are shifting from preparing for blue-collar trades in terms of rigid knowledge to providing students with access to the tools and skills that enable them to become experts and learners on the job. This gives technological skills such as digital literacy and understanding of artificial intelligence paramount importance [17].

If we consider mental phenomena from the point of view of an Eco-psychological approach to the development of the psyche, then we can trace the mutual influence of a person and the environment, which occurs both in a situation where a person is exposed by the environment, and in situations of a person's impact on the environment. This leads to the necessity to apply an Eco-psychological typology of subject-environmental interactions: object-object, subject-object, subject-subject [5, 15].

At the same time, in the context of the digital transformation of the educational environment, this typology acquires new content [17, p. 108-117]. As we have seen on the peculiarities of the interaction of students and undergraduates with the educational environment of the university and their supervisors, the influence on students occurs not only with subject-subject types, but also with object-object type of interaction.

The digital transformation of the educational environment has sharply increased during the pandemic, when a large number of students were forced to study online. According to the World Economic Forum, more than 1.2 billion students switched to digital learning during the pandemic, and it is concluded that the pandemic has fundamentally changed education in general. A new, hybrid (mixed) model of education has appeared [23]. However, there have been no researches on the influence of the spatial, communicative and technological components of the educational environment of a university with various Eco-psychological types of interaction at the stage of formation of a student's subjecthood during the period of the pandemic.

The aim of the empirical research was the comparative analyze of the stages of the formation of subjecthood as predictors of each component of the traditional and "digital" educational environments for various Eco-psychological types of student's interaction with the educational environment.

Materials and methods

For empirical evidence of the hypothesis about the influence of the components of the educational environment on the university students' subjecthood, a research was carried out in the pre-pandemic and at the beginning of the pandemic periods of study (September 2019 - May 2020). The test subjects were students of the second and fifth years of engineering specialties ($N = 159$; $M = 20.3$; $SD = 1.5$; 68 per cent girls).

To diagnose the influence of the components of the educational environment, the author's questionnaire was used, which implements the Eco-psychological approach and makes it possible to evaluate, on an interval scale, the student's interaction with each component of the environment (spatial, communicative and technological) in the presence of seven Eco-psychological types of interaction [5].

The test subjects are invited to evaluate their perception of the process of interacting with components in both traditional and "digital" educational environments. The test subject chooses one of 7 answers corresponding to the Eco-psychological type of interaction for each item of the questionnaire, coded by numbers: 1 – no interaction; 2 – object-object type; 3 – object-subject type; 4 – subject-object; 5 – subject-conflict; 6 – subject-joint; 7

– generative subject. The questionnaire contains a scale that diagnoses the intensity of subjects' interaction with the components of the educational environment (from very weak to very strong impact). The severity of the impact for various types of interaction was determined for each of the scales by summing the points given to the subjects in accordance with the key. The questionnaire has passed the required psychometric tests.

To evaluate the severity of the stages of the formation of a student's subjecthood when interacting with the educational environment of the university, the questionnaire of the stages of the formation of a student's subjecthood (QSF-S) [8], developed according to the ontological model of the stages of subjecthood, was used. The modified technique of repertoire grids of G. Kelly is used in this questionnaire [18]. In the case of evaluation of the stages of the formation of a student's subjecthood, we proposed using typical situations of educational activity as grid's lines, and the stages of educational activity as columns (elements). On the ideographic approach for the processing of the grid a nonparametric factor analysis was used, a feature of which was the usage of gamma statistics as an intermediate correlation matrix [20].

The predictors of the components of the educational environment were determined by stepwise regression analysis separately for traditional and "digital" educational environments.

Results of research

The results of the regression analysis for each of the components of the educational environment are shown in the summary table 1.

Table 1

Stages of the formation of subjecthood (predictors) of the components of the educational environment for various Eco-psychological types of interaction "student – component of the educational environment"

Ecopsych. types of interaction	Traditional educational environment			«Digital» educational environment		
	SC	CC	TC	SCd	CCd	TCd
No interaction	–	-0,211M	–	-0,25M +0,15O*	0,27Cr-0,16M*	–
Object-object	–	–	-0,17M* +0,15S-0,19Cr	-0,23M	–	-0,19Cr
Object-subject	-0,25J	-0,217J	-0,18J+0,22Cr	–	-0,26J	–
Subject-object	0,155M	0,151J*	0,21J	0,283M +0,21J-0,18Cr	0,19J	–
Subject-conflict	–	0,153J*	–	–	-0,2C+0,2M	–
Subject-joint	-0,16S	-0,22S	-0,2S+0,2O	-0,17S	-0,17C* +0,2J	–
Emergent poly-subject	–	0,18M-0,19Cr	–	–	0,19C-0,17Cr	–

Note: the table contains the following conventions:

SC and SCd - respectively a spatial component in traditional and "digital" educational environments; CC and CCd - the communicative component in traditional and "digital" educational environments; TC and TCd - a technological component in traditional and "digital" educational environments; O - severity of the "observer" stage; J - the severity of the stage "journeyman"; S - the severity of the stage "student"; C - the severity of the stage "critic"; M - the severity of the "master" stage; Cr is the severity of the "creator" stage.

The * indicates the presence of a nonlinear correlation.

The statistically presented data in the table show the following.

The number of predictors in the component of educational environments that affect the student in the digital and traditional environments is the same (18 predictors each), which does not allow us to identify differences in this criterion of the educational environment in the pre-pandemic and pandemic periods of student learning.

However, the following qualitative differences are found between traditional and digital learning environments:

- within the traditional educational environment, reproductive teaching methods prevail (this can be seen from the frequency of occurrence of the "journeyman" stage);
- in cases of interaction with the "digital" environment, the influence of the productive stages of subjecthood was revealed (a higher frequency of occurrence of the stages "student", "master", "creator");
- within the technological component of the traditional educational environment in the pre-pandemic period, an interconnection with most of the stages of the formation of a student's subjecthood was revealed ("observer", "journeyman", "student", "master" and "creator"). Whereas in relation to the "digital" environment, only one has been identified, and the inversely proportional relationship with the severity of the "creator" stage in the object-object type of interaction, i.e. the more expressed the stage of subjecthood "creator", the less likely to observe in the object-object type of interaction among these students.

The data presented in the table also show the presence of a relationship between the Eco-psychological types of subject-environmental interactions and the stages of subjecthood at which the student is in his interactions with the components of the educational environment, both in its traditional and "digital" versions. Specifically:

- the object-subject type of interaction in four of six is determined by the frequency of using the "journeyman" stage, that is, the passive attitude of the student to the educational environment is observed less often when using educational actions of a reproductive nature;
- the subject-object type of interaction in five of the six types is also determined by the frequency of using the "journeyman" stage, but the active attitude of the student to the educational environment is observed more often when using educational actions of a reproductive nature;
- subject-joint type of interaction is determined by the frequency of using the stage "student", and a high frequency of referring to the subject-joint type of interaction is observed with a low level of need of interaction with teachers;
- emergent poly-subject type of interaction is determined by the frequency of using the stages "critic" and "creator", and only in the communicative component, both in conventional and digital educational environments.

Discussion

The results of the research showed qualitative differences in the interaction of students with the "digital" educational environment in comparison with the traditional one. Firstly, in the "digital" educational environment, there are higher requirements for the students with active position in comparison with the traditional environment. So, object-subject and subject-object types of interaction in traditional and "digital" environments are

represented by the stage of formation of a student's subjecthood – "journeyman", and the higher student's activity, the more often he chooses the subject-object type of interaction. Secondly, the subject-conflict Eco-psychological type of interaction in the communicative component of the "digital" environment is interconnected with the "master" stage, in which the student defends his views and interests in comparison with the conciliatory position in the dispute in ordinary communication (the "journeyman" stage). Third, in traditional educational environment (in all three components), the frequency of manifestation of a subject-joint Eco-psychological type of interaction is interconnected with low independence in educational activities, i.e. shifting one's responsibility to others, although in the "digital" environment there is a similar tendency in the spatial component, but in the communicative component there is a desire to use the help of group mates. The obtained fact, we note, is not taken into account at present when designing an ontological model designed to ensure the convergence of the components of the university's information and communication environment, described in [9]. Meanwhile, orientation, not only on knowledge bases, but also on interactions during communication should be, as we see, an integral component of the educational environment of the university. Fourthly, the emergent (generated) poly-subject Eco-psychological type of interaction is manifested by students both in traditional and "digital" environments exclusively in the communicative component. Students do not see the jointly distributed nature of combining efforts to achieve their goals in other components of the educational environment, and the frequency of referring to this type of interaction is interconnected with the insufficient manifestation of the subject's creative abilities (the "creator" stage). For all the similarity of the predictors of this type of interaction, they still differ qualitatively: in the traditional educational environment, unification into a certain subjective community occurs on the basis of individual skill (the "master" stage), and in the "digital" one – on the basis of critical understanding and analysis of the interaction partner that from the point of view of the productivity of the creative process is more perspective.

The results show the prospects of using an ecopsychological approach in the organization of the educational process in addition to existing foreign and domestic pedagogical technologies. Compliance with the design principles of collaborative learning and the acquisition of skills in collaboration [22] receives a specific focus. For example, in a digital environment, you can offer joint tasks with a critical analysis of opinions, and in a non-digital environment - taking into account the individual experience of students and the formation of their stages of subjectivity formation. Note that with an insufficiently developed stage of "critic", it will be difficult for a student to express critical comments, and therefore to work productively in a digital environment, using it only as a tool, and not as a means for his development.

This research revealed some undesirable facts and tendencies in a particular university and in the formation of the stages of students' subjecthood participating in the survey. First, it's the scarcity of predictors in the interaction of students with the technological component of the "digital" educational environment, which rather indicates insufficient attention to this component. This does not correspond to the opinion of some authors who pay attention mainly to the advantages of digital education, for example, the positive transformation of education [17]. Secondly, the "digital" educational environment of the university has not become an equal partner and assistant for students in achieving their educational goals yet. Thirdly, despite the positive signs and trends of the "digital" educational environment, distance learning is still dominated by reproductive teaching methods that do not stimulate the independence and activity of students.

Conclusion

The received data allow us to make the following conclusions:

1. Different stages of the formation of a student's subjecthood, at which students are in their self-esteem, significantly correlate with the eco-psychological types of subject-environmental interactions of students with different components of the educational environment of the university in the pre-pandemic and pandemic periods of study.
2. The "journeyman" stage of subjecthood most often correlates with object-subjective and subject-object types of subject-environmental interactions, which indicates the dominance of reproductive activity in interactions with the educational environment of those students who are at this stage of subjecthood.
3. For the stage of subjecthood "student", the most frequent correlation is with the subject-joint type of interaction with the educational environment, which confirms the need of students at this stage of subjecthood in interactions with the teacher, from whom they expect help in evaluation of the correctness of their educational actions.
4. The stages of subjecthood "critic" and "creator" most often correlate with the emergent poly-subjecttype of interaction with the educational environment, both with the traditional and with the "digital". A possible explanation for this correlation can be that these stages of subjecthood are characterized by a change in their own subjecthood, relying on interaction with other subjects or using new conditions.
5. Regression analysis of the received correlations in this case confirms the legitimacy of using the stages of the formation of a student's subjecthood as predictors of the subject-environmental interactions of students with the educational environment.
6. Taking into account the size and specifics of the sample, in the future it is planned to expand the sample of respondents by including the students of humanitarian specialties.

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