

## INFORMATION COMPETENCY OF STUDENTS AS A UNIVERSAL META-SUBJECT ECOLOGICAL COMPETENCY FOR INTERACTING IN THE VIRTUAL EDUCATIONAL ENVIRONMENT OF UNIVERSITIES

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**Abstract:** The paper emphasizes the relevance of the process of development of the student information competency within the advancing virtual educational environment of higher educational institutions. Approaches to defining the phenomena of "information competency", "ecological competency", "digital image", and "virtual educational environment" in the era of the digital paradigm of education being established are described. Attention is paid to setting up the virtual educational environment of higher educational institutions based on modern resources, online projects, and platforms. The leading research methods are analysis and summing up of methodological approaches to studying the said phenomena. The materials of practical value for Master and PhD students, university teachers, education researchers.

**Keywords:** information competency of students, meta-subject nature, ecological competency, digital hygiene, digital image, virtual educational environment.

### 1 Introduction

In the era of the digital paradigm of education getting established, a new option of educational information interaction on the subject-to-subject basis via digital technologies emerges – the virtual educational environment as an ecosystem.

Within the contemporary context, the virtual educational environment as a phenomenon is filled with new meanings which guide the students to entering the world of culture through "absorbing" universal and professional competencies contributing to their social mobility and stability in the labor market. It is the information competency that is one of such universal, meta-subject, key ecological competencies.

Based on analyzing the studies of both Russian and foreign scientists in the focus areas of digital transformation, digital paradigm of education, the virtual educational environment, and the information competency (Kondakov, 2019; Karakozov & Uvarov, 2016; Polichka et al., 2019; Noskova, 2011, 2014; Weindorf-Sysoeva, 2012), the authors are convinced of the fact that the information competency of students has to excel the current nomenclature of competencies – in order to be proactive towards the situation. The development of the student information competency as a university process allows "teaching them to study" in the virtual educational environment. This includes being ready for change, for working with large integrated data streams, following the principles of digital hygiene as information security rules. It is also about maintaining the profound and unmistakable "digital image", trends of self-education, and self-improvement of their own information competency levels.

Within this context, for this research, it is important to understand that there arise new values and attitudes to the process of development of the student information competency at higher educational institutions. They emerge under the effect of the digital paradigm of education being established and the university virtual educational environment being set up.

Studies by a number of Russian and foreign scientists (Khutorskoy, 2003; Tabachuk, 2016, 2019; Ermakov, 2008; Zakhlebnyy & Dzyatkovskaya, 2020; Kondakov, 2019; Noskova, 2011, 2014; Weindorf-Sysoeva, 2012; Mosquera, 2017; Kerimbayev et al., 2019) are of interest in this context. In them, the in-depth meanings of such phenomena as "information competency", "ecological competency", "digital hygiene", "digital image", and "virtual educational environment" are considered. This gives evidence about the process of

development of the student information competency being relevant within the advancing virtual educational environment of higher educational institutions.

### 2 Literature Review

Many contemporary studies deal with rethinking the phenomenon of "information competency of students" within the context of the digital paradigm of education being established.

The digital paradigm of education implies the anthropocentric approach being fulfilled in a high-tech infrastructure (the virtual educational environment as an ecosystem of interaction orienting to a person's individual educational paths). It also involves a new level of fulfilling the possibilities granted by digital educational technologies for automating the processes of working with information performed by subjects (digitization of education).

Within implementation of the digital paradigm of education, the virtual educational environment is developed.

As of today, the university student information competency turns into one of the universal and meta-subject ecological competencies of interaction in the virtual educational environment of higher educational institutions.

The universal and meta-subject nature as a characteristic of the information competency is emphasized in the works of A. V. Khutorskoy (2003), A. E. Polichka, O. A. Malykhina, I. V. Karpova, and N. P. Tabachuk (2020). By meta-subjectness, these authors mean thinking through the crucial notions of educational subjects; the educational activity of re-discovering knowledge with various study materials; the learners' reflexive activity; training in the summarized methods of working with any subject material – notions, diagrams, models; association with life situations. Such aspects of understanding the student information competency as a meta-subject one move it up to a new level in interacting within the university virtual educational environment as an ecosystem.

The information competency as the ecological competency is associated with students' aspiration to interact in the virtual educational environment in the ecologically favorable and safe conditions.

Studies related to the ecological competency as a phenomenon of the modern reality are detailed by D. S. Ermakov (2008), A. N. Zakhlebnyy, and E. N. Dzyatkovskaya (2020). They note that the ecological competency is a need of security, mastering the ecologically safe techniques and methods of life activity.

The information competency as the ecological competency manifests itself within interaction in the university virtual educational environment based on the principles of digital hygiene.

Digital hygiene as rules of information security is considered in works of A. M. Kondakov (2019) and T. V. Sukhorukova (2020). When detailing the phenomenon of "digital hygiene", these authors emphasize the following principles: communication security, the security of devices, and the security of information.

Digital hygiene influences the formation and maintenance of one's profound and unmistakable "digital image".

A. M. Kondakov (2019) notes that "digital image" or "digital identity" is an entire set of data left by a person in the Internet, the person's digital projection (footprint) in the Web. He emphasizes that it is forming an individual's digital identity that has to be taught today.

It is based on the principles of digital hygiene with a focus on developing the student information competency and forming the profound and unmistakable "digital image" that the system of interaction in the virtual educational environment of higher educational institutions has to be built.

Modern approaches to studying the virtual educational environment are described in works of many scientists (Losev et al., 2019; Lubkov, 2006; Kataev M. Yu. & Kataev S. G., 2014; Noskova, 2011, 2014; Weindorf-Sysoeva, 2012; Mosquera, 2017; Kerimbayev et al., 2019; Soltovets et al., 2019). They are associated with identifying its didactic potential, strategic and tactical role in the process of learning, with modeling the virtual educational environment, and with finding out its parameters that ensure the efficiency of communication between participants of the educational process.

In studies of the listed authors, one can note the unity of views on the priority of developing the students' information competency within the university virtual educational environment.

### 3 Research Methodological Framework

The object of the research is the process of development of the information competency in the new conditions.

The subject of the research is the student information competency as the universal meta-subject ecological competency of interaction in the virtual educational environment of higher educational institutions.

The objective of the research consists in giving a more precise understanding of the phenomena of "information competency", "ecological competency", "digital hygiene", "digital image", and "virtual educational environment" in the era of the digital paradigm of education being established and in identifying their interdependence.

According to the research subject and objective, the following tasks were accomplished.

1. Describing and analyzing the methodological approaches to studying the said phenomena.
2. Substantiating the universality and meta-subjectness of the student information competency as the ecological competency of interaction in the virtual educational environment of higher educational institutions.
3. Identifying the strategic and tactical role of the virtual educational environment in developing the information competency of students.
4. Singling out the principles of digital hygiene to be followed for ensuring the information security in the university virtual educational environment while maintaining the students' profound and unmistakable "digital image".
5. Highlighting modern resources, online projects, and platforms for setting up interaction in the virtual educational environment of higher educational institutions while orienting to development of the information competency of students.

## 4 Results and Discussion

### 4.1 Approaches to Studying the Phenomena of "Information Competency", "Ecological Competency", "Digital Hygiene", "Digital Image", and "Virtual Educational Environment"

This research relies on considering the essence of the phenomena of "ecological competency", "digital hygiene", "digital image", and "virtual educational environment" that are associated with developing the student information competency.

In the authors' understanding, the information competency of students is the universal meta-subject ecological competency of interaction in the virtual educational environment of higher educational institutions.

Within this context, D. S. Ermakov's approach (2008) to comprehending the ecological competency phenomenon is of interest. According to him, this is the need of self-actualization and fulfillment of one's internal potential of the ecological consciousness.

When describing the ecological competency, D. S. Ermakov (2008) emphasizes the point that it can be developed provided that associations and dependencies within ecosystems are explained, and students master ecologically safe techniques and methods of life activity, ensuring communication security, the security of devices, and the security of information. According to the authors, it is the university virtual educational environment that is such an ecosystem maintaining the security functions. Within this environment, the process of developing the information competency as the ecological competency unfolds.

E. F. Losev, R. A. Ganieva, and N. R. Poluyan (2019) note that the basis of the virtual environment built upon the systemic approach grounds is made up by educational resources. It is the modern resources, online projects, and platforms that include students into the activity of forming the profound and unmistakable "digital image". In their earlier studies, the authors have analyzed the approaches to understanding the phenomenon of students' "digital image" as an author's approach to self-fulfillment in the real and virtual world (Tabachuk et al., 2020).

Leonardo Herrera Mosquera (2017) observes that students sense the inclusion into the digital era, as higher educational institutions implement the virtual educational environment.

Nurassyl Kerimbayev, Nurdaulet Nurym, Aliya Akramova, and Saule Abdykarimova (2019) discuss the influence of such an environment on the interactive communication of students and teachers.

R. A. Lubkov (2006) views the virtual educational environment as a united information and educational space where the principles of pedagogical system of the new educational environment act. The author emphasizes the open nature of this environment.

M. Yu. Kataev and S. G. Kataev (2014) highlight personalization (remoteness and the possibility of individual training) as the main parameter of the virtual educational environment.

In her research, T. N. Noskova (2014) brings a focus on the fact that the virtual educational environment is a new "tier" of the educational environment, a kind of "superstructure". In it, the course of the process changes, and its new qualitative aspects are manifested: the need of shifting the center of educational interaction from the teacher to the learner; the need of "seeing" the learners via this environment by the "traces" of their information and communication actions registered in it; the readiness for forming the advanced ICT-competencies.

M. E. Weindorf-Sysoeva (2012) stresses that one's lacking the virtual educational environment competency limits one's professional capacities.

When characterizing the virtual educational environment, both T. N. Noskova (2011) and M. E. Weindorf-Sysoeva (2012) focus the attention on the need of developing the information competency of students and forming their profound and unmistakable "digital image" or "footprint".

In the authors' understanding, the virtual educational environment of higher educational institutions is the ecosystem featuring the following:

- educational information interaction on the subject-to-subject basis while orienting to students' individual educational paths;
- relying on the "digital hygiene" principles;
- students' entering the world of culture through "absorbing" universal and meta-subject competencies contributing to their social mobility and stability in the labor market. It is

the information competency that is one of such universal, meta-subject, and key competencies.

#### 4.2 Universal and Meta-Subject Nature of Student Information Competency as the Ecological Competency for Interacting in the Virtual Educational Environment of Universities

The universal nature of the information competency of students is determined by the range of its components: the team work culture, the culture of presenting the results of project activity using digital technologies, the culture of managing one's activity, the culture of working with information, and the culture of presenting the information in a digital format, which characterizes the information competency as a meta-subject one, too.

Meta-subjectness as a feature of the information competency of students details its aspects as follows. First, this is the students' ability to self-assess their own information competency development level, to make decisions, and perform conscious choice in their cognitive and learning activity. It also involves finding a common solution which will meet everyone's interests within interaction in the university virtual educational environment and knowing universal methods of working with information and the Internet-based sources. Some other aspects are the communication activity management in the virtual educational environment based on the "digital hygiene" principles, knowledge of universal methods of self-presenting in the virtual educational environment in a positive manner, and the conscious readiness for cultural rise in the world of "the digital".

It is the development level of basic abilities – thinking, understanding, communicating, reflecting, and acting – that has to be considered as the meta-subject result in the process of development of the student information competency.

The information competency of students as the meta-subject result is formed in the virtual educational environment with particular regularities, principles, objectives, and means.

#### 4.3 Building the Interaction System in the Virtual Educational Environment of Universities Relying on Digital Hygiene Principles for Maintaining the Profound and Unmistakable "Digital Image" of Students

V. I. Blinov, M. V. Dulinov, E. Yu. Esenina, and I. S. Sergheev (2019) in their scientific work "Draft didactic concept of digital professional education and training" highlighted the factors, regularities, objectives, principles, and means of the digital paradigm of education.

Let these provisions be extended to the system of interaction in the virtual educational environment of higher educational institutions aimed at developing the information competency of students. Then, the factors generating a need of building the system of interaction in this virtual educational environment are the following: digital generation, new digital technologies, and digital economy.

As for regularities of building the system of interaction in the virtual educational environment, these are: a higher role of independent work in learning, a greater part of active and interactive forms and methods of training, a higher extent of structuring of the learning activity, and eye-mindedness prevailing as a type of thinking.

The principles of personalization, flexibility and adaptivity, successfulness in training, the principles of training in cooperation and interaction (the interactivity one), orientation to practice, and polymodality (multimediality) are the major principles of interaction in the university virtual educational environment that ensures developing the information competency of students.

The digital hygiene principles to be followed for ensuring information security in the virtual educational environment of

higher educational institutions while also maintaining the students' profound and unmistakable "digital image" are: understanding the value of the safe lifestyle, interiorizing the rules of individual and collective safe behavior in the virtual educational environment, using information proceeding from norms of ethics and law. They also include building a positive attitude to discovering the world of "the digital" during the learning and cognitive activity and preventing the Internet-addictive behavior in students. The authors of the paper detailed these contexts in their earlier studies (Tabachuk et al., 2018, 2020).

The objectives (expected results) are as follows. First, the students' readiness for continuous change is developed, and so are their internal borderline between the virtual and the real world as well as their ability to differentiate these worlds and the responsibility types appropriate for them. Next, the culture of network-based communication, the digital segment of the ecological culture is formed which can be conventionally termed "digital hygiene skills", and the ability to analyze information critically is developed. In these aspects, the strategic and tactical role of the virtual educational environment of higher educational institutions is detailed.

The main means for building the system of interaction in the virtual educational environment that ensure achieving the set objectives are the personalized educational process, digital pedagogical technologies, modern resources, online projects, and platforms.

#### 4.4 Modern Resources, Online Projects, and Platforms for Setting up Interaction in the Virtual Educational Environment of Universities

In the authors' earlier studies, they noted some online projects and platforms for developing the information competency in students and forming one's positive "digital image" in conditions of digital transformation within which subject-to-subject interaction is possible in an interactive form based on mental activity (Tabachuk et al., 2020).

As of today, this range of resources can be supplemented with the following systems for organizing interaction in the university virtual educational environment:

- Moodle as an open system for developing the culture of managing one's activity, the culture of working with information;
- Bandicam and LearningApps.org as resources for developing the culture of presenting the project activity results using digital technologies;
- Whiteboardfox is an interactive board for developing the team work culture;
- Quizizz as a platform for holding educational flash-based games for developing the team work culture;
- StoryJumper as a system for creating interactive books for developing the culture of presenting information in a digital format;
- Zoom and TrueConf as resources for organizing video conferencing and forming the students' profound and unmistakable "digital image".

On balance, the use of the said systems and resources in the virtual educational environment of higher educational institutions contributes to developing the information competency in students as the universal meta-subject ecological competency.

#### 5 Conclusion

In conclusion, let it be noted that the relevance of research in this focus area is substantiated by establishment of the digital paradigm of education, by the virtual educational environment of higher educational institutions advancing, and by a new compulsory educational meta-subject result and attribute of a human of the 21st century – the information competency – being outlined in the sphere of education.

Based on analyzing the methodological approaches to studying the phenomena of "information competency", "ecological competency", "digital hygiene", "digital image", and "virtual educational environment", it has been found that the problem space associated with the understanding of these phenomena is a new and little explored one.

According to the research results having been studied by the authors, a group of Russian and foreign scientists focus their attention on the fact that student information competency has to excel the current nomenclature of competencies and to be proactive towards the situation.

As understood by the authors, the information competency of students is the universal meta-subject ecological competency of interaction in the virtual educational environment.

The universal and meta-subject nature of the student information competency has been substantiated through the range of its components.

The strategic and tactical role of the virtual educational environment in developing the student information competency has been identified through the lens of factors, regularities, objectives, principles, and means of digital hygiene.

The paper outlines modern resources, online projects, and platforms for setting up interaction in the virtual educational environment of higher educational institutions with a focus on the development of students' information competency.

The materials presented in the paper can be of practical value for master degree students, PhD students, university teachers, and teachers of other educational institutions organizing the implementation of the digital paradigm of education.

#### Literature:

1. Blinov, V. I., Dulinov, M. V., Esenina, E. Yu., Sergeev, I. S.: *Draft Didactic Concept of Digital Professional Education and Training*. Moscow: Pero Publishers, 2019. Available from [https://firo.ranepa.ru/files/docs/proect\\_didacticheskoy\\_conceptii\\_cifrovogo\\_prof\\_obr.pdf](https://firo.ranepa.ru/files/docs/proect_didacticheskoy_conceptii_cifrovogo_prof_obr.pdf)
2. Ermakov, D. S.: *Ecological Competency of Learners: Content, Structure, Particularities of Formation*. Bulletin of PFUR, 1, 2008. 86-91 pp.
3. Karakozov, S. D., Uvarov, A. Yu.: *Successful Informational Support = Transformation of the Process of Learning within the Digital Educational Environment*. Problems of Modern Education, 2, 2016. 7-19 pp.
4. Kataev, M. Yu., Kataev, S. G.: *An Approach to Assessment of Knowledge in the Virtual Educational Environment*. TSPU Bulletin, 5(146), 2014. 41-44 pp.
5. Kerimbayev, N., Nurym, N., Akramova, A., Abdykarimova, S.: *Virtual Educational Environment: Interactive Communication Using LMS Moodle*. Education and Information Technologies, 2019. Available from <https://doi.org/10.1007/s10639-019-10067-5>
6. Khutorskoy, A. V.: *Key Competencies as a Component of the Learner-Centered Paradigm of Education*. National Education, 2, 2003. 58-64 pp.
7. Kondakov, A. M.: *Education in Conditions of Digital Transformation of the Russian Society*. 2019. Available from <http://vcht.center/wp-content/uploads/2019/06/Kondakov-Peterburg25maya2019-2.pdf>
8. Losev, E. F., Ganieva, R. A., Poluyan, N. R.: *On Fulfillment of the Systemic Approach to Designing the Virtual Educational Environment of the Department*. Science. Society. Defense, 3(20), 2019. 1-7 pp.
9. Lubkov, R. A.: *Modeling the Virtual Educational Environment*. Bulletin of Samara State Technical University. Series: Psychological and Pedagogical Sciences, 44, 2006. 64-67 pp.
10. Mosquera, L. H.: *Impact of Implementing a Virtual Learning Environment (VLE) in the EFL Classroom*. Alakala Revista de Lenguaje y Cultura, 22(3), 2017. 479-498 pp. Available from <https://doi.org/10.17533/udea.ikala.v22n03a07>
11. Noskova, T. N.: *Pedagogical Essence of the Virtual Educational Environment*. Bulletin of Herzen State Pedagogical University of Russia, 167, 2014. 183-194 pp.
12. Noskova, T. N.: *Virtual Educational Environment: Teachers and Students*. Bulletin of Herzen State Pedagogical University of Russia, 142, 2011. 119-126 pp.
13. Polichka, A. E., Malykhina, O. A., Karpova, I. V., Tabachuk, N. P.: *Current Problems of IT and Mathematical Education: Scientific and Methodological Bases of Improving the Professional Expertise of Mathematics Teachers*: a monograph. Khabarovsk: Publishing House of the Pacific State University, 2020. 211 p.
14. Polichka, A. E., Tabachuk, N. P., Dvoryankina, E. K., Kislyakova, M. A., Karpova, I. V., Nikitenko, A. V.: *Process Approaches to Personal and Professional Becoming of Students Based on Developing Their Information Competency*. International Journal of Applied Exercise Physiology, 8(2.1), 2019. 871-876 pp.
15. Soltovets, E., Chigisheva, O., Dubover, D.: *Foreign Language E-course as Informal Learning Tool for Digital Literacy Development*. Dilemas Contemporaneos-Educacion Politica y Valores, 6(3), Art. 50. 2019
16. Sukhorukova, T. V.: *Working Program on Extracurricular Activity "Digital Hygiene"*. 2020. Available from <http://podbelsksoh.minobr63.ru/wp-content/uploads/цифровая-гигиена-аннотация.pdf>
17. Tabachuk, N. P.: *Information Competency of a Student's Personality as a Sociocultural Phenomenon of Digital Society*: a monograph. Khabarovsk: Publishing House of the Pacific State University, 2019. 180 p.
18. Tabachuk, N.: *Online Resources as a Modern Means of Students' Information Competence Development*. International Journal of Economics and Education, 2(4), 2016. 90-94 pp.
19. Tabachuk, N. P., Ledovskikh, I. A., Shulika, N., Kazinets, V. A., Polichka, A. E.: *Internet Activity and Internet Addiction: Where is the Borderline in Developing One's Information Competency?* EURASIA Journal of Mathematics, Science and Technology Education, 14(12), 2018. Available from <http://www.ejmste.com/Internet-Activity-and-Internet-Addiction-Where-is-the-Borderline-in-Developing-One-97828,0,2.html>
20. Tabachuk, N. P., Polichka, A. E., Dvoryankina, E. K., Karpova, I. V.: *"Digital Image" in the Methodological System of Information Competency Development by University Students*. International Journal of Applied Exercise Physiology, 9(2), 2020. 81-87 pp.
21. Weindorf-Sysoeva, M. E.: *Virtual Educational Environment as a Necessary Component of the Modern Education System*. Bulletin of SUrSU, 14, 2012. 86-91 pp.
22. Zakhlebniy, A. N., Dzyatkovskaya, E. N.: *Ecological Competency as a New Plannable Result of Ecological Education*. 2020. Available from [https://iro86.ru/images/document/Obr\\_Deyat/umo/Ecolog\\_kompetencia.pdf](https://iro86.ru/images/document/Obr_Deyat/umo/Ecolog_kompetencia.pdf)

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