Aspects of Ensuring Information Security in the Educational and Pedagogical Sphere

Magomed Abdurazakov [a], Elena Burdukovskaya [b], Ziyaudin Batygov [c] and Lyubov Shilova [d]

[a] *Russian Academy of Education, Salaryevskaya, 14-3-8, Moscow, 108811, Russia*
[b] *Amur State University, 21, Ignatyevskoye shosse, Blagoveshchensk, 675029 Russia*
[c] *Ingush State University, Magas, I.B. Zyazikova, 7, Magas, 386001, Russia*
[d] *V. I .Vernadsky Crimean Federal University, Academician Vernadsky Avenue, 4, Simferopol, 295007, Russia*

Abstract

The article examines the concept of information security of society and man, the requirements and problems of its provision in the context of global telecommunications and the Internet; manifestation of information security in education, in the educational and cognitive process and in the content of training. It is noted that the information security of educational subjects is a specific part of the general security of education, as its qualitative development in the developing information society in accordance with its properties and requirements. The concept of information security in the field of education is formulated in the context of a general concept and in the aspect of its specificity in education, its educational and educational processes, as well as in the aspect of personal, psychological, age and other properties of subjects of education.

The manifestation of information security in education is expressed both as the implementation of general information security in it in terms of learning goals and public order, personal, socio-cultural and information-psychological development of educational subjects, and as a subject of education through the implementation of subject-based educational training in the context of the formation of relevant knowledge, competencies and personal qualities. This presupposes the presence of a corresponding purposefulness of general education, which also acquires the quality of informational education, and its expression in the content of education and subject-based educational training. In particular, this applies to the subject ”Informatics and ICT” as the main resource of information education, in the process of forming relevant knowledge, competencies and personal qualities.

The formation of personal competencies presupposes the reflection in the content of teaching informatics of the content line or topic ”Information security”, which is related to the information security of society, the environment, a person, and also reveals the conditions and requirements for its provision. In terms of content, for example, topics such as protection of information and information copyright, protection from disinformation and negative information impact, communication culture, network ethics, etc. Moreover, competencies related to information security should be classified as general cultural and should become mandatory for study.

The formation of the personal qualities of the subject of education, necessary for him to effectively and safely interact with the modern information environment, provides for the formation and development of personal information culture and culture of the information society. This is a culture of communication and information interaction in the Internet, cyberspace. Special attention is paid to the issues of the formation of critical thinking and critical attitude to information; development of the ability to differentiate information and resistance to negative information and psychological influences.

Keywords [1]

Information, security, Internet, society, person, subject of education, socioculture, information culture, critical thinking.

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EMAIL: abdurazakov@inbox.ru (Magomed Abdurazakov); bulena@mail.ru (Elena Burdukovskaya); bat-zo@yandex.ru (Ziyaudin Batygov); kabprakt@gmail.com (Lyubov Shilova)
ORCID: 0000-0002-7979-0847 (Magomed Abdurazakov); 0000-0002-3928-8588 (Elena Burdukovskaya); 0000-0001-7368-9417 (Ziyaudin Batygov); 0000-0003-4817-132X (Lyubov Shilova)

1. Introduction

With the development of global informatization and social and information aspects in the scientific and educational sphere, the driving force behind the change in the form and content of education is not the production of goods, but the information industry and the corresponding IT-technology for its processing, which is characterized by the task of providing educational subjects with the necessary knowledge in the required form in real time. Almost unlimited access to knowledge through global networks, the possibility of intensive communications between people at a distance, the growing intensity of the ”virtual” or ”augmented” life of users in cyberspace makes one think about the future of education, about the ways of its development. The development of methods and means of informatics and the process of informatization of education require a radical rethinking of the goals, content, forms and methods of teaching any academic discipline at a new modern level, including at the system level. The system-informational approach is increasingly beginning to be perceived as a general scientific method of cognizing nature and society.

It is quite obvious that the consequences of the information revolution affect the very foundation of civilization. Back in June 2000, the Okinawa Charter of the Global Information Society was adopted, as well as a special Manifesto on the Information Revolution in Economics and Finance. The Charter has repeatedly emphasized that the information revolution is carried out within the framework of the concept of a Knowledge based Society.

According to the Doctrine of Information Security of the Russian Federation, ”information security” is understood as ”the state of protection of the individual, society and the state from internal and external information threats, which ensures the implementation of constitutional rights and freedoms of man and citizen, a decent quality and standard of living of citizens, sovereignty, territorial integrity and sustainable socio-economic development of the Russian Federation, defense and security of the state” [30].

A further impetus in the state-building of the post-industrial (information) society in our country was given by the adoption of the Strategy for the Development of the Information Society in the Russian Federation for 2017-2030. This document defines ”... goals, objectives and measures for the implementation of the domestic and foreign policy of the Russian Federation in the field of application of information and communication technologies, aimed at the development of the information society, the formation of a national digital economy, ensuring national interests and implementing strategic national priorities” [29].

The main principles of the Strategy are:

a) ensuring the rights of citizens to access information;
b) ensuring freedom of choice of means of obtaining knowledge when working with information;
c) preservation of traditional and customary for citizens (other than digital) forms of receiving goods and services;
d) the priority of traditional Russian spiritual and moral values and adherence to the norms of behavior based on these values when using information and communication technologies;
e) ensuring the legality and reasonable sufficiency in the collection, accumulation and dissemination of information about citizens and organizations;
f) ensuring state protection of the interests of Russian citizens in the information sphere.

In the modern division of labor, the subjects of training are not the IT-technologies and information systems themselves, but the ways of interacting with them and the technology of their consumption. The UNESCO report emphasizes that ”it is not the technology itself that is important, but its interaction with learning and its role in the context of the education system as a whole” [32]. The thesis received practical confirmation in the context of COVID-19 with the transition to distance learning and the use of mobile devices.

In the course of the digitalization of society and education, a very specific social context of informatics and ICT began to crystallize. The following aspects of this context are definitely of fundamental importance for our study:

The first aspect is related to the influence of the information factor on social processes. In the scientific literature, this direction is called ”Social Informatics”, the priority task of which is a comprehensive study of the information society. The leading experts in this field, both in our country

and abroad are: D. Bell, A. P. Ershov, K. K. Colin, N. N. Moiseev, A. I. Rakitov, A. Toffler, A. Touraine and others.

The second aspect covers the problems of modernization of general information education and is due to the incomplete correspondence of its level and the requirements of the information society; the absence of a systemically conditioned formation of information culture of educational subjects in the information education system, as indicated in the documents ”Strategy for the Development of the Information Society”, ”Doctrine of Information Security”, etc. This discrepancy can be traced, in particular, in relation to the above-mentioned characteristic properties of the information society (socio-culture, information culture, information security, etc.).

The third aspect of the social context of information education is associated with the development of informatics and ICT, including the need to comprehend the social aspects of informatization of education, legal regulation of the processes and relations that are implemented in them. The fact is that information processes are studied like all natural and social phenomena based, first of all, on the modeling methodology. On the other hand, an information product is created by a person for a very specific purpose and, as a rule, according to a specific technology, which assumes the presence of mass consumption and a certain order of this consumption. This clearly shows its social aspect.

Fourth aspect. The quality of education and the effectiveness of educational and cognitive activities of educational subjects largely depend on the efficiency and quality of consumption, generation and reproduction of information and knowledge.

The work [6] substantiates the need to integrate the information security system into the activities of educational institutions, since "one of the most active consumers and generators of information is the education sector, where the intellectual and moral potential of future generations is formed."

Thus, the integration of a security and information security system in the information and educational sphere becomes a necessity. This problem is the focus of our research.

Safety means the security of the human society, expresses a guarantee of the safety of the state, their resources, wealth, knowledge; conditions, environments in which they live, operate and develop, which correspond to their level and development goals. Since all phenomena and processes of the world are informational in nature, any activity and any interaction in society is implemented as informational, then any security is realized through information security ”... information security is becoming one of the most important conditions for ensuring national and international security, as well as personal security of every person” [18].

Therefore, information security is as follows:

- security of the human information sphere, information, information processes and relations, the infrastructure of this sphere;
- informational expression of general safety and security of any particular type.

Information security in the educational and pedagogical sphere must be considered in the following aspects:

- as a socio-cultural phenomenon of the world, society, environment, human sphere and the corresponding social, general cognitive, scientific concept, expressed in research and knowledge;
- as their manifestation in the educational environment, in educational interaction and pedagogical research, in the personal systems of subjects of education, in their development and self-development;
- as the content of education and subject teaching, including information education and computer science teaching.

Thus, the aspect of the social context of informatics and ICT is associated with the development of informatization, including informatization of education, with the need to comprehend the social and socio-legal aspects of informatization, legal regulation of the processes and relations that are implemented in them. In the work [21], the authors emphasize that the national policy of informatization of society and education ”develops as a part of global (world) informatization”, ”harmonization of national information law with laws, laws, standards of the general information environment" is carried out. As rightly noted, ”the modern educational space is a participant in the emergence of a new global community” [13].

The informatization of society is developing in the system of subject and object relations, in the aspect of information interaction, which requires a legal subsystem of informatization. The legal system of informatization, in turn, presupposes the presence of an appropriate theory - legal informatics, a component of the scientific system of informatics, which constitutes a complex unity with social informatics.

The purpose of the study is to substantiate the importance and prospects of the system of pedagogical support and support for information security of educational subjects in a secondary school as the foundation of their information culture in accordance with the requirements of Federal State Educational Standards; directions in pedagogical science, which is in a state of formation.

2. Literature review

The modernization of the existing information education is due to the need to form a culture of knowledge and, accordingly, a culture of educational knowledge, which will become the basis for the development of skills, competencies of subjects of education and a forming part of the content of education and self-study. This thesis is supported by a number of trends taking place in society and education in the context of digitalization.

(1) The task of the subject of education is to develop, increase the level of their competencies (information and communication, sociocultural, socio-legal, etc.) with active interaction with the information and educational environment (IEE), including self-immersion in this Wednesday. ”Learn to learn” and ”teach to learn” are the fundamental principles of modern education (lifelong learning), which are mutually determining components of a single educational setting. At the same time, this is only a pragmatic, cognitive expression of the culture of knowledge and the culture of knowledge, the upbringing of the personality of the subject of education, the formation of his motivation to develop personal knowledge, to self-development [1]. However, information should be differentiated in accordance with the measure of their significance, value, necessity, and the criteria for the advisability of including knowledge and other information in the content of training or self-study is their compliance with the goals of education and personal development, efficiency, productivity and continuity.

(2) The social culture of society exists and develops today in the context of digital technologies, the so-called ”social media” [15], which manifests itself in the active presence of people in social networks, in other virtual forums or forms of communities.

(3) Technological culture develops under the powerful influence of the new scientific paradigm ”Data Intensive Science”, the main ideology of which is the priority of communication and communication in the process of scientific research over the generally accepted methodologies - theoretical and empirical.

All three trends are shaping a new ”networked information reality” [15], which largely determine the current trends in the development of education and they are related to fundamental issues of pedagogy and digital didactics: how to ensure a balance between individual and collective in the learning process, new content and methods education; the role and place of subjects of education in the ITS, methods and procedure for the systematic organization of training, ensuring the effectiveness, legitimacy, information security and safety of educational and cognitive activities of students. Fundamental is ”a balanced correspondence of the information competence of the subject and his information culture, the intellectual and spiritual levels of development of subjects of computer science training, between their formation and development in this training with a corresponding reflection of this in its content and forms” [2].

We agree with the opinion of V. P. Polyakov that with the development of IT technology, new forms of illegal activity appear, in particular, with the use of information and communication technologies [12]. Therefore, the education system is given a special role - the formation of knowledge and competencies in the field of information security, necessary for a successful life, adaptation in society and professional activity in the digital era. One of the strategic goals of ensuring information security in the field of science and the educational and pedagogical sphere is the formation of a culture of personal information security among citizens.

The issues of studying the problems of information security and information protection in the Russian Federation are reflected in seven areas of the profile in the curricula and basic educational programs for training specialists in applied informatics (by area) and other categories of IT specialists. For example, the Federal State Educational Standard of Higher Education was approved in the area of training 10.03.01 ”Information security” (Link to file: http://fgosvo.ru/100301); approved by the Federal State Educational Standard of Higher Education in the area of training 10.02.01 ”Organization and technology of ensuring information security” (as amended by the Order of the Ministry of Education and Science of Russia dated 09.04.2015 N 391. The file with the text of the standard is posted in the Federal State Educational Standard of Higher Education section of the website www.fgosvo.ru)

The OECD Guidelines for the Security of Information Systems and Networks: Towards a Culture of Security were the starting point for the formation of a culture of information security in developed countries. The recommendations of the Organization for Economic Cooperation and Development (OECD Guidelines for the Security of Information Systems and Networks: Towards a Culture of Security) [31], adopted in 2002. These recommendations formed the basis of the UN General Assembly Resolution “Building a Global Culture of Cybersecurity”, adopted in December 2002.

In May 2011, the French Government decided to increase the number of areas for training specialists in the field of information systems security in higher educational institutions [36]. It was announced that the goals of training specialists are the formation of the necessary competencies that meet the requirements and needs of employers; developing a strategic vision of information security problems in a dynamic market environment.

An analysis of the Master's degree programs of higher educational institutions in Germany shows that the preparation of masters (Master of Science [M.Sc.] and Master of Laws [LL.M.]) [34], [35], [40], [41], for example, at the Leibniz University of Hannover, the following programs are being implemented: ”Computing and Law”, ”Cyber Law Research Group”, ”Corporate and IT Security”, ”Security Management”, ”Information Law and Intellectual Property Rights”, etc.

The information security strategy in the UK is based on increasing information literacy and media competence of citizens as the ability of children and youth ”to make informed choices, understand the nature of content and services and take advantage of the full range of opportunities offered by new communications technologies. They are better able to protect themselves and their families from harmful or offensive material”. This strategy is based on the understanding that media literacy is just as important in modern society as traditional literacy [33].

The process of formation of socialization of schoolchildren, their motives of behavior, value orientations, behavioral skills are largely formed today at the junction of the virtual world with reality, a ”digital generation of children” has appeared, which are characterized by such qualities as creativity, innovation, awareness, thanks to the constant involvement in search and research activities etc. However, according to the researchers, the problem area of the ”digital generation” is the departure of children to virtual reality, their information overload, as a result of which motivation, the ability to learn, form knowledge and operate with them decreases [10], [24], [34], [39].

Thus, the report of the results of the global research ”EU kids online” notes that the use of the Internet by children and adolescents from 9 to 16 years old from 25 European countries spend 88 minutes daily online; at the age of 15-16, the duration of Internet use reaches 118 minutes: 87% of respondents have online access at home, 63% at school; 49% of the study participants admitted that they use the Internet with friends and their parents (about 25142 respondents). This indicates the need to strengthen control over the use of the Internet by children as part of the consumption of resources in order to reduce the impact on the psyche and physical development of the younger generation of dangerous, traumatic, immoral, or inappropriate content for their age [7], [9], [25], [35], [36], [37], [38].

EU Kids Online, one of the collaboration partners of the Global Kids Online initiative, is an international research network that currently spans 33 countries. Data for the report was collected from research in Albania, Argentina, Brazil, Bulgaria, Ghana, Italy, Uruguay, Montenegro, Chile, Philippines, South Africa and members of the Global Kids Online network. The report notes that Internet use carries risks for children:

- More than half of children and young people surveyed in South Africa said they had encountered sexual content on the Internet.

- 22 percent of respondents in Italy and Uruguay said they had been shown self-harm material.
- 35 percent of children surveyed in Italy and Uruguay said they had experienced incitement to hatred.
- Only 2 out of 5 Facebook users aged 10 to 14 in Bulgaria open their accounts.
- In 11 countries surveyed, 30 to 75 percent of children said they may not be able to verify the accuracy of online information [37].

Commenting on the Global Kids Online report, LSE social psychology professor and report co-author Sonia Livingston notes, that ”Rather than worrying about how much time kids spend online, the Global Kids Online study encourages parents to positively interact with and discuss with their children's digital world the specific content and contact risks they may face so that children can become resilient and thrive” [37].

However, there is a view and opposite view that the Internet as entertainment is critical to the development of digital skills in schoolchildren: ”We often hear so much about the risks of using children online, but less about how we can improve their resilience. on the Internet and digital skills ”, underlines Priscilla Idele (Deputy Director of the UNICEF's Office of Research-Innocenti in Florence, Italy). ”We need to help children navigate the Internet in the same way that we teach children to cross the road. We cannot - and do not want - to prevent children from crossing the road just because it is dangerous; our task is to teach them how to cross the road safely and responsibly in all situations and apply security measures that allow them to do so” [37].

There is a deep understanding of the issues of information security, information security, ensuring the security of the younger generation and the need to form the information culture of a person's personality in the digital era. But in school education there is no clear position on how to ensure the information security of students, what mechanisms (other than blocking sites or content) can be effectively used in this process. We see that the problem is further aggravated by the lack of teaching staff - specialists who are purposefully trained to implement and support just such a project.

3. Problem statement

Graduates of universities with special training in support of information security of students in the conditions of the information and educational environment of a general education school can now fully prepare only outside the sphere of humanitarian and pedagogical education. For pedagogical support, in addition to studying subjects of the natural science and professional cycle (mathematics, computer science, information technology, computer communication networks), a methodological training system is needed that ensures the formation of the level of information culture of a teacher or specialist with an obligatory component - competence in the field of information security and information security in education. This problem is of an interdisciplinary nature and requires pedagogical understanding in the development of the student's personality in the aspect of ensuring information security in a modern digital society. Unfortunately, pedagogical science does not fully pay attention to various issues related to training university graduates to ensure information security of schoolchildren.

The formation of information culture is a multifaceted step-by-step process of continuous information training of students. It is the level of information culture that is an indicator of the subject's readiness for learning and self-learning, development and self-development and characterizes the efficiency of using information and information resources in educational and professional activities in the information space, with the mandatory provision of information security requirements.

4. Research problem

At the same time, the development of the information society has given rise to significant and only inherent problems in this society. There is a virtualization of public life as a process of creating a ”virtual world” or ”augmented reality”, that is, the replacement of real things and values with their information models, virtual values becomes a universal phenomenon in the information society.

It is with these features of modern society that a graduate of a secondary school and a university has to face, therefore, the process of their information education should be an adequate ”response” to the ”challenges” (in A. Toynbee's terminology) of modern society.

The **information security problems** considered in the study are:

- protection of information in the context of information law, protection of information, including copyright;
- protection of the information environment and the person, including the subject of education, from negative information and disinformation, negative information impact on them;
- the formation of personal qualities of a person, including the subject of education as resources of his personal information security.

Information security problems of education, considered in the study, are:

- pedagogical development of the topic of information security and its implementation in the field of education;
- adequate reflection of topics and problems of information security in the content of education and subject teaching, including in the content of teaching computer science;
- formation of personal information culture and critical thinking of educational subjects.

5. Research objectives

The objectives of the study are:

– Pedagogical identification of the concepts of information security of society and man, information security of education and the subject of education.
– Pedagogical description of the content of topics of information security of society and education, their subjects, reflection of topics in the content of subject training, in the subject of informatics and ICT.
– Pedagogical description of the means and methods for the formation of knowledge and personal competencies of educational subjects on the topics of teaching information security and its provision.
– Pedagogical description of the means and methods of developing information culture, including the culture of information security of educational entities.

6. Methodology

The methodological basis that implements the fundamental system-activity approach in the field of education, primarily in information education and teaching computer science and ICT, are:

– systemic and informational, as a basic approach to the implementation of an informational approach to understanding the world and a person through the prism of social relations and sociocultural orientation of informational-cognitive and educational-cognitive processes.
– a meaningful approach aimed at an adequate expression of the content of education in the context of digitalization of education;
– a formal approach aimed at determining the optimal formal and logical means of resources and technologies for ensuring information security in the educational and pedagogical sphere;
– a socio-cultural approach aimed at the development of socio-culture, personal information culture by means and resources of electronic-digital learning, and a culture of interaction in IEE in the context of protecting information and educational resources of IEE and educational subjects.

7. Research methods

The research used theoretical research methods:

– analysis of philosophical, psychological, pedagogical, scientific, technical and methodological literature, analysis of educational literature, analysis of school and university basic educational programs and fulfillment of the requirements of the Federal State Educational Standard;

– general scientific methods of cognition: analysis, synthesis, comparison and collation, generalization, systematization, etc.;
– system-structural and system-functional analysis of the methodological training system, in particular, computer science and ICT.

8. Results

The expediency of training a teacher in the field of information and ensuring information security of students in the context of higher pedagogical education is confirmed.

The methodological prerequisites for studying the foundations of information protection and ensuring information security as the foundation of information culture of educational subjects have been determined.

The goals and directions of pedagogical support and information security support of schoolchildren in the information and educational environment in order to protect them from negative manifestations, threats and risks in open cyberspace are formulated.

It is noted that the results of educational and cognitive activities of students without taking into account the problems of ensuring information security in the context of digitalization can become the most unpredictable in terms of reducing motivation, interest in learning, research activities, etc.

9. Discussion

An important sign of the information and digital age is the growing role and value of knowledge. At the same time, the understanding and value of education as a channel for the transmission and environment of ”personal appropriation” of the experience, knowledge, skills, culture of previous generations to a new one for subsequent use and expansion in accordance with the goals of society and the requirements of its development is growing. In this regard, the goal of education is to ensure the historical security of society as a condition for the continuity of existence and development - the resources and knowledge of society lose value without acquiring them by the new generation. The question is how and how to make this transmission channel secure!

Creation and cognition provide for the preservation of results and ensuring continuity - the transfer of the heritage of society to future generations. In addition, creation involves ensuring its implementation, continuity, completion. Therefore, an equally important task is to ensure security, information security - the security of processes, relations, objects and subjects, security of the state; development security and historical perspective.

In these conditions, the education system is assigned a special role - the formation of knowledge and competencies in the field of information security, necessary for a successful life and professional activity in the information society, and ”these competencies should be classified as general cultural” [4]. The process of forming personal competencies in the field of information security should cover all levels of the education system: secondary (complete, incomplete) education, primary, secondary and higher professional education, which imposes new requirements on the system of higher pedagogical and vocational education.

The progress of mankind is unthinkable without effective processes of creation, cognition, production and reproduction. But even without information security, without its effective organization and provision, progress is also impossible, and even more so there is no historical perspective for it. That is, information security is a logical extension of the system of building society, and all the problems of mankind, all its processes of cognition and construction should be linked to security problems and solved with them in a complex, in accordance with information balance.

Consequently, ensuring information security, solving its problems should be carried out in a complex, parallel and interconnected with the solution of problems of the development of society.

Ensuring security is the creation of necessary and sufficient conditions for the state of security, assurance, safety. Since any security is implemented through information security, then ensuring any type of security (social, technological, energy, food) requires appropriate information security. And vice versa, information security presupposes consideration of any security problem in a complex of

interrelated and interdependent problems, in the interconnection of all its information characteristics and forms of implementation.

At the same time, information security, as well as its provision, are not self-sufficient and cannot either exist separately from other problems of development and ensure the security of society, or be implemented exclusively by information means, without the use of material and energy resources.

Thus, information security (IS) is an objective factor in the life and development of modern society, its state and quality characteristics. Functionally, information security is provided by many social, technological and production systems, but this is another research topic.

Information security and its provision are of particular importance in the information society, in which all cognitive and socio-cultural phenomena have informational expression and presentation and are implemented at the informational level.

As social and socio-cultural concepts ”security” and ”information security” and its provision are general scientific and are studied in a variety of fundamental sciences and applied science systems: philosophy, sociology, cultural studies, natural science, pedagogy, etc. Since this security is informational, then its theoretical research and systematized description presupposes the use of information methods, and its provision - of information means, that is, methods, knowledge and means of informatics and social informatics are required.

Consequently, informatics and social informatics occupy a central place in the theoretical substantiation of information security theory and in its practical implementation on the basis of their universal means.

Protection of information and information sphere is as follows:

1. In the physical protection of materialized information, information resources and information infrastructure by methods and forms of their preservation, the use of various software and technological tools, means of cryptography, etc. This is the most widespread and time-consuming form of information protection. It is necessary, but clearly insufficient, due only to the relative reliability and efficiency.
2. Legal protection of information and the information sphere generated by it was formed along with the corresponding legislative base of information law, as a result of informatization, its processes and relations, requiring effective regulation and regulation. The presence of a legal system generated by information law and its implementation is one of the main qualitative characteristics of the modern information society. The legal system of informatization and, accordingly, the information society is aimed at protecting copyright and intellectual property and expresses other qualitative characteristics of the information society and develops along with it. This means that all information resources must be documented and, as such, are subject to legal protection.

In the information society, information is not only an intermediary in commodity-market relations, but also is an independent commodity represented by information products.

3. The actual problem of modern society is the protection of information from its opposite - from disinformation, which has a political science, commercial or anti-sociocultural orientation. Such ”information” can be a means of information warfare or a targeted negative informational and psychological impact on its addressees. It is also protection from ”informational garbage” - information of dubious quality, unreliable, expressing personal conceit, often openly harmful and destructive. The clogging of the information environment is, on the one hand, a consequence of the low level of culture, information culture of the authors of such ”information”, on the other hand, it entails a decrease in the level of culture of the information environment and the personal information culture of its direct consumers. Protection of information from misinformation, and from ”information garbage” is also the protection of society, the environment, a person from their negative impact. In general, this is exactly what it is focused on.

Protection from negative information and ”information waste” is difficult: it is not easy to ”separate the wheat from the chaff”. But it is necessary, since the information of the environment must be analyzed, systematized, take the form of knowledge: ”any knowledge is information, but not all information is knowledge" (emphasis added by the authors).

4. The most reliable form of information and information sphere protection is socioculture, information culture corresponding to the information society, its development and reflection in the personal information culture (information subculture) of the subjects of the considered sphere

”... information as an element of culture prevents dehumanization and replacement of spiritual values” [19].

According to the authors, ”information culture characterizes the level of development of modern society in its transformation into information. It should be manifested in every informational cognitive process, in every informational interaction and relations expressing them. That is, it should be reflected in every manifestation in education of the sociocultural and, therefore, sociocultural systemic and informational approach” [23].

The culture of information and communication relations, first of all, respect for copyright and other information rights, intellectual property rights, that is, compliance with the fundamental norms of copyright protection, etc. It is also a rejection of hacking, spamming, viruses, software piracy. At the same time, reciprocal steps of copyright holders and owners of information products are necessary, expressed in the following:

- taking into account the psychology and material capabilities of potential consumers of their products;
- a system of discounts and incentives for conscientious owners and consumers of information products;
- providing an opportunity for all real and potential violators of information security (hackers, virus creators) to realize their creative abilities in the creative sphere, in informatization.

In the information and computer sphere, normal, mutually beneficial commodity-market relations are needed. Mutual respect of owners and consumers of information products, as elements of information culture, must be instilled in students starting from school.

An indispensable attribute of the modern information environment is the Internet. Based on the technocratic approach of the definition of the ”World Wide Web”, this is no longer a computer and communication network, and not a sphere of information and communication interaction, but a virtual image of the entire life of society socio-economic, sociocultural, scientific and educational and other spheres. The Internet sphere contains not only a variety of information resources. In a computer-communication environment, implemented through the WWW, you can find out all the news of interest and get any information about all aspects of public life - from political to everyday life. By its scale and multifaceted structure, the Internet sphere, expressed by electronic and communication technologies, is an electronic virtual space, or cyberspace.

Cyberspace is an abstract representation of an electronic virtual world, with a variable but always ordered set of dimensions, which allows modeling and algorithmic paths in any possible direction.

Educational cyberspace is a specific part of the general cyberspace that has an educational purpose and is characterized by purposeful educational relations with it. Consequently, internal relations, the structure of educational cyberspace are derived: they are determined by the relations with it of subjects of education in terms of their effectiveness, rationality, security [22].

In formal abstract terms, cyberspace is a relational model of the media environment, the features of which are considered here as dimensions with open and expanding sets of values. Since each feature of this model can be represented as an ordered sequence of other features, cyberspace is hierarchical, and each of its dimensions can be deployed into cyberspace.

The conventionality of the relational representation of cyberspace lies in the fact that any of its ordering is not a single, ”continuous” one that applies to all its objects. Therefore, in fact, cyberspace in each of its states can be represented in many different relational models with finite sets of conceptual features and their values, taken as spatial ”dimensions” and ”metrics” defined on them, that is, the ordering of cyberspace is always local and therefore relative.

Chinese scientist Liu Gang [11] points out that the choice of any path and structure of any subspace in cyberspace is based on a variety of logical assessments, taking into account such modalities as ”necessary”, ”accidentally”, ”possible”, ”impossible”, their combination. That is, interaction with cyberspace presupposes a qualitatively different logic that goes beyond the binary - modal logic [2].

Due to its comprehensiveness, the Internet sphere contains information of varying quality: reliable information presented in knowledge and information resources, and not very reliable, low-quality in form and content. That is, the Internet sphere contains a lot of ”information waste”, from which it must be freed. All positive, cognitive and sociocultural information and knowledge can drown in this

”garbage”, get lost. Users (consumers of goods, services, etc.) consent to the processing of personal data. A certain regulation is required, the rules of relations in the sphere of the Internet, based on ethical and moral norms of society, the implementation of which must be undertaken by each subject entering this sphere. Therefore, the order of inclusion in it of the information of any of its active systems must be determined.

Due to the rapid development of the Internet, there is a virtualization of the economy [16], which consists ”in the revolutionary transition of society from traditional forms of business to electronic business, ie. to conduct all economic transactions only through information telecommunication networks” [20].

Among other things, the Internet sphere is a market, a network of Internet stores of various types of commercial products. This type of trade is more convenient and cheaper for the buyer: he does not need to go shopping, and the seller does not need to spend money on retail space and warehouses.

However, this type of trade is also less reliable: the relationship between the seller and the buyer is only indirect, virtual. Therefore, various overlays are possible: there is no guarantee that the goods ordered by the buyer meet his requirements, that the goods ordered by him will be delivered, there is no guarantee for the guarantee (warranty period). This is an example of not entirely secure information relations, virtually expressed in the Internet, not always successful implementations in the real environment of virtual relations in the Internet sphere.

Banking and other financial transactions are not entirely safe in the Internet. It is necessary to use secure payment systems, software implemented on the Internet. These examples are a consequence of insufficiently high professional competence, as well as a manifestation of low socioculture and/or information culture of a certain set of subjects of virtual relations, the moral foundations of which allow outright deception and money-grubbing. In the virtual economy, ”we need completely different forms of economic operations, a different style of thinking ..., a different form of interaction ..., a radical retraining of personnel” [20].

However, as many sources and researchers point out, the main threat to information security in the Internet is different. This is a ”leak” of personal data. By entering into any social, commercial and other relations via the Internet, subjects register, indicating their personal data, which automatically become part of the content of its sphere. In the event of bad faith of any link in the network or malicious interference in its functioning (hacking), they become publicly available or are ”appropriated” by certain groups of people, which contradicts their confidentiality. It is necessary to fight this by all means and forms of information protection to ensure the information security of the individual. We share the opinion of I. V. Robert that the implementation of measures to ensure the information security of an individual should ensure:

– human protection from unethical, illegal, aggressive information (propaganda of violence, terrorism, suicide, violation of the norms and rules of human behavior in society; ”denigrating” a person; involvement in prohibited Internet communities; extortion; intimidation);
- protection of a person from providing him with unreliable, illegitimate information, as well as information that is ethically incorrect;
– the security of personal information, personal data, which determines the status of non-interference in a person's private life;
– the protection of the individual from ”information violence” from the source of information addressed to the ”dark side” of his personality [26]].

In pedagogy and, in particular, in teaching computer science and ICT, information security is represented as follows:

– safety of information and educational space, educational process, interaction, relations;
– protection of subjects of education from negative information and psychological impact;
– safety of subjects of education in relation to technologization and virtualization of their thinking.
– formation of information culture of educational subjects, including their personal culture of information security.

It is necessary to develop in each subject of education a critical attitude to information, which means the following:

– the subject's invariant ability to assess and analyze information new to him for its objectivity and reliability, ethical correctness, compliance with reality, socio-cultural and moral values;

– the ability to differentiate information from the environment for its value for their socially determined personal development.

A personal information culture is needed that provides the subject with resistance to possible negative information and psychological influences, counteraction to their implementation and implementation in a personal and public environment.

The subject's critical attitude to information is an important component of personal information culture, including his media culture and media security culture [28]. It is necessary to develop the ability of the learning subject to assess information for its quality and reliability, which will allow him to distinguish between positive and negative, meaningful and meaningless information.

The subject's critical attitude to information entails his ability for critical thinking, which is understood as his intellectual and imaginative thinking in the process of acquiring his own knowledge, including the search for ways to effectively and efficiently solve problems, analysis and synthesis, assessment of network, media and own information, and its identification positive and negative aspects, factors.

The formation and development of critical thinking of the subject of education provides for ”the creation of a basic attitude towards oneself and the world, implying a variable, independent, meaningful position. This position significantly increases the reliability of education - because it becomes conscious and reflective and increases the communicative potential of the individual” [27].

That is, critical thinking is a synthesis of conscious and reflexive thinking of the subject of education, which creates his ability to efficiently, efficiently and safely use the information coming to him in the information environment, media environment, cyberspace in terms of his personal development and self-development. At the same time, the ability to be critical of information and the presence of critical thinking are derivatives. A level of information culture of the subject is needed, which does not allow him to go beyond the ethical norms of relations in the environment. The internal potential of the subject is required to ensure the elimination of the possible negative influence of information from the external environment. It is necessary to develop the spiritual and intellectual culture of the student, the formation of the corresponding qualitative characteristics of the personality.

An important aspect of computer culture is also the development of a culture of information and computer security not on the basis of information and legal culture, subculture, ethics of relations in the computer sphere. Much attention is paid to this issue in the section ”Computer Ethics” [17]. Among the topical problems of information and computer security, the following stand out in particular:

– aspect of technization (technologization) of a person. Robot Syndrome;
– aspect of formalization of thinking;
– the consequences of the development of intelligent systems;
– aspect of virtualization of personal information environment;
– aspect of virtual values (in the perception of information);
– aspect of physical security of subjects.

In the 21st century, electronic intellectual means increasingly prevail over other means of perception and knowledge of the world. However, cognition of the diversity of the world, culture, knowledge presupposes the presence of the same variety of means of perception, sources of information, participants in the information dialogue ”... virtual space becomes not only a form of technology existence, but also a place of human social existence, which is represented by distributed, multiple **I**” [14]. At the same time, the limitation of the activity-cognitive environment entails the limitation of the cognizing personality itself. The withdrawal into the virtual world of reflected (abstract) information entails the closure of a person in a limited space of illusions and representations.

The study of the remote consequences of the introduction and development of intelligent systems borders on fantasy. However, the following becomes clear: a spiritless robot that does not have a direct connection with wildlife is potentially dangerous to humans. The man himself is no less dangerous to be separated from nature. Problems of development and security of mankind should be solved jointly and in parallel. Otherwise, instead of ”discerning the essence of technology”, present it only as a tool and tool [5], thus moving away from the ”realization of the truth”, we risk falling into the error that M. Heidegger warns about.

The technologization of the activity and cognition of the subject of education should in no case lead to the technologization of his consciousness and thinking. The well-known Russian thinker N. A. Berdyaev drew attention to the danger of the technization of society, speaking about the increasing separation of man from nature, about the technization of the human world, manifested in its dehumanization, in the loss of the moral and spiritual in the technical civilization created by mankind [3]. Fetishization of information and computer technologies, the Internet is also harmful, as is insufficient attention to the technologies of the IT industry. Formalization of thinking entails the manifestation of the ”robot syndrome", which is no less dangerous than the invasion of real robots. In the absence of ”live" communication with the world, a person's feelings are dulled; the spiritual world is impoverished. Virtual values may become more important for him.

The physical expression of the subject's information security is, first of all, compliance with the rules of work with information and computer technologies (ICT). Passion for working on a computer should not be expressed in maximalism and fanaticism.

10. Conclusion

The results considered in the study lead to the following conclusions:

1. It has been established that the introduction of information technologies in educational activities, the integration of pedagogical and computer technologies in education without linking with information security significantly increases the risk of information threats, data protection, information, etc.

2. The essence of the concepts ”information culture”, ”information security as a component of the information culture of subjects of education” has been clarified, their content has been disclosed. For example, the main goals of teaching information security to the general education system are highlighted, which include the issues of ensuring the basics of information security, which is a mandatory component of the information culture of the subject of learning.

3. Generalization of the research results allow us to draw the following conclusions:

– it is advisable to have a unified interpretation of key concepts and terms that are used in the field of ensuring information security of an individual in general, and of subjects of education, in particular;
– the formation of a person's personal qualities, ensuring his information security and comfortable interaction with the information, educational and social environment, should take place in the context of information law and the restriction of an individual's access to information that poses a threat to his life;
– in order to ensure the information security of the subject of education, it is necessary: an adequate reflection of the topics and problems of information security in the content of education and subject training, including in the content of informatics and ICT teaching; it is necessary to form a personal information culture and critical thinking of educational subjects as components of the general information culture of an individual.Use a first level heading for the references. References follow the acknowledgements.

Threats affecting the information security of educational subjects in the context of cyberspace and e-learning are analyzed. The use of modern information and pedagogical technologies as a means of ensuring information security of education in the network is substantiated.

It is shown that knowledge and culture are not only decisive for all other features of the information society, but also mutually determining:

– the development and use of knowledge presupposes a culture of knowledge and a culture of knowledge;
– information culture is systemic and has a representation as a high-level knowledge, develops and is realized through knowledge.

The necessity of mandatory inclusion of topics in the content of information education in the context of information security and information protection has been substantiated:

– he state and problems of information security, personal security;
– goals, objectives and means of ensuring information security;
– legal and other aspects of information protection, means of protecting electronic data;

– computer crimes and the fight against them.

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The authors consider it necessary to give some comments on the remark of the reviewer that ”specific information technologies or the main components of information security, which were practically applied by the authors in practice, are not presented”.

From the existing information security software and hardware, the authors use all technical means and methods of information protection and information security that are freely available to the user, or are presented for official use by educational institutions on the basis of a license agreement. The authors also use the data and information protection services built into the OS of computers, tablets and smartphones.

An example is open access software or software available under a license agreement:

– Norton Antivirus (protection, security, OS privacy program);
– ESETNOD32 (anti-virus program for protection against various cyber threats, blocks unauthorized access);
– Panda Security (a service for protecting against malicious software and Internet threats, runs on the Android OS);
– Kaspersky Anti-Virus (software against Internet threats);
– RoboForm (cross-platform password generator and manager for Windows, Mac, iOS);
– SefelnCloud (a password manager with cloud sync support and AES 256), etc.

Since the article also deals with personal information culture, the need to respect copyright and intellectual property protection, we have no right to mark licensed software without legal regulation of the mechanisms of their presentation, and even more so for practical use.

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