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PEDAGOGICAL ASSESSMENT OF AUGMENTATION

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The education challenges in the information technology progress are considered. In particular, the problem of artificial intelligence is equal to humans and thus poses a challenge to the teaching system. The augmentation concept as the human and machine's interaction that enhances the capabilities of each party is analyzed. We assessed these opportunities as the ability to create more value and get more personal benefit on the economic plane. But a worthy place for a human – to be above technology. Purpose of the study is to provide a pedagogical assessment of augmentation. The analysis of futurological research on human-machine synergy gave the opportunity to determine the social consequences and educational prospects of such development. It is questioned the prospect of singularity, the point at which artificial intelligence will match or exceed human intelligence. We will become dependent on «the society of the program», but it will not depend on us. It causes the spontaneous progress of techno-science. On the study basis (questionnaire), there were identified the predominant models of pedagogical interaction in traditional and online learning; described changes in teachers' behavior under the influence of computer technology. We emphasized the threats of computer-mediated learning: «cool» [cold] environment according to Jean Baudrillard, «robot» as a pedagogical communication model, hyper-formalization of the educational process. But the concept of increase can be useful in the short term. The results of the study confirm the conclusions about the need to humanize education, balance technology and live communication. This is possible through the appeal to live communication as a «hot» system, inclusion of the classical literature, folklore in the digital learning tools narratives, the soft use of design thinking and principles of game design in teaching, leaving free space for human creativity, choice, decisions that contradict the logic of machines

Keywords: *information technologies, artificial intelligence, augmentation, humanitarian vector of education, employment*

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1. Introduction

In recent decades, progress in education has often been associated with the use of computer technology and information technology. As society becomes more informative, information technology is becoming both a means and a result of education. The circulation of knowledge in the educational process, based on technology, acquires a technological color. The focus is on the algorithm. The humanitarian aspects of education and upbringing take a back seat. Sometimes, their presence in the learning process is tolerated. And from the point of view of the information-cybernetic approach, everything is logical: more information is directed toward the educational process, more information is considered in its management and its control. But, educators feel uncomfortable. They still believe that the purpose of education includes not only informing, instilling knowledge but also upbringing. That the purpose of education is a person, not a full flash drive, decorated with a program to use its content somewhere where «human capital» is needed. It can be assumed, therefore, that there is a contradiction between the technological and humanitarian vision of the purpose of education, which is becoming tangible. Education always reflects the general trends, observed in society. And here we should consider the V. Kutyrev's idea that the main global contradiction that breaks our destiny is the contradiction between the natural and the artificial, between the universe of nature and the universe of activity. This contradiction has existed since the emergence of humanity, but now it has escalated to a critical state [1]. The solution to this contradiction is an important scientific problem. The latter is reflected in higher education.

Let's remember that 20 years ago, education was involved with only one thing: how to increase the contact time of students with a computer. Now teachers are often already concerned with how to distinguish students' knowledge from those that they received either from a computer or from the Web. The corresponding term has already appeared – «retransmission training». That can be called the «student-computer» system. The latter learns more effectively because it can forget nothing. Education follows the same path as production and science. The insane pressure of new information generated contradicts the biological ability of a person to perceive

and assimilate it. We believe that the object of the education system's activity is still a person. The humanitarian vector preservation in education becomes a condition to preserve the human in a person - both in its biological basis and in the way of thinking.

Education must answer the crucial general question: what principles should determine human interaction with information technology? What position should the higher school take in view of this contradiction? Focus on the technological finish of the graduate or on his/her human qualities? The best solution combines technological and humanitarian aspects of training, but should this be achieved? At the moment, at least, education does not reveal any definite strategy on these issues. Thus, for the education system, especially for higher education, there is a problem of forming conceptual foundations for building the relationship of the future professional person with information technology.

2. Literature review

Philosophical and pedagogical understanding of the human-machine interaction rapid development consequences, the education and human transformation is not new. This topic is raised by many scholars who warn against technological learning [2] or see great opportunities for human community development [3, 4].

The human-machine dialectic was also considered in higher education. The issues open up new horizons for the lifelong learning paradigm, where artificial intelligence (AI) is a supporting power [5]. Analyzed the problems of introducing AI when hiring a person [6], game training and professional development [7], predictability and eliminating biases [8], the mismatch between skills and technologies in employment and wages [4]. The economics of artificial intelligence [9]; risks, challenges, competencies, and strategies in regulating AI systems [10] were explored.

In the variety of scientific concepts, it is advisable to emphasize several directions:

– «technological singularity» [11], the mechanism of replacing people with artificial intelligence [12–14];

– «employment dilemmas» [12, 15];

– «adaptive theory», when a person is like a computer and takes over its functions. This approach is offered by almost most modern pedagogical concepts: computational thinking, design thinking, project-problem learning and design problem solving, IBL learning.

– «combination» (mutual use in conditions of human-computer interaction) [4, 16]. According to J. E. Aoun, the pedagogical result of this «human and AI combination» is «workers-learners», which «will have no barriers to effortlessly design their own learning experiences», «they will be able to smoothly and intuitively follow their own respective paths in an authentic and meaningful learning experience, which only a teaching and learning institute, firmly embedded in a particular local context, can provide» [5]. Scientists emphasize: «The debate is characterized by a false dichotomy between the view that automation will spell the end of work for humans and the argument that technologies will always tend to increase the demand for labor as they have done in the past» [4].

We propose the «augmentation theory» or «mutual reinforcement» of human-computer interaction in an educational context. Pedagogical augmentation is implemented in the direction STEAM, lifelong education [17], game-based learning [18–20].

The first and most common, that is inherent in modern production, is its insane dynamism. Modern production in close connection with science is saturating the world with innovations. They form such a wide front that determining the importance of certain areas for production, and thus for the education system, is a rather difficult task. Here are just a few that have already become global: saturation of production with robotics, artificial intelligence, «Big data», Internet of Things, «Network Society», the representation of anyone and anything on the World Wide Web, virtual and augmented reality, «Programs' Society», «Deeper learning». Each of these innovations is one that revolutionizes the modern world. The «oldest» of them is robotics. It particularly interests higher education, as it creates a competitor «labor» and even «skilled», at least able to perform almost any task. Such relations, according to [21], necessarily evolve from «Okay, he/she can do a lot, but he/she can't do everything I do» to «I'm so glad that a robot/computer probably can't do what I'm doing now».

Such a sequence is not a simple extrapolation. It is based on a certain empirically established pattern, e.g. Moore's Law [22]. Therefore, the future of education, to paraphrase [23], will depend on the social culture of working with robots.

We emphasize social terminology along with estimates of the potential of robots. They contain certain challenges to the education system as well. In a situation where artificial intelligence (AI) is the highest achievement of technological progress [3], three types of operations limit teachers [24]: automated ones are binary tasks, in which human participation is counterproductive; complementary – tasks that are not binary and require people to check machines or machines to check people; and co-working – people have a unique opportunity to start, promote and perform. «Co-working» reveals the potential for pedagogical augmentation.

This shows that the higher education system should define its relationship to intellectual systems. How do they change the purpose and content of educational activities, and what aspects of interaction with intelligent systems should be reflected in training programs? After all, it should be borne in mind, that «the fascination with the fantastic new opportunities of AI was replaced by anxiety» [25]. But abandoning the opportunities of artificial intelligence is no longer possible, because informatization processes are irreversible [3].

Of course, the above innovations do not faint in the information society in isolation. They develop in interaction and combine into extremely complex system formations. Thus, robotics is constantly absorbing the achievements of information technology, especially artificial intelligence. Together robotics and artificial intelligence are mastering the World Wide Web, forming in its environment the «Internet of Things», a completely artificial formation, which, however, is gaining momentum. This list is complemented by Big data technology, which has recently become dominant in many socio-decision-

making and relies on the capabilities of the global network [26], and intensifies by «cloud robotics» [23].

The revolutionary nature of the synergistic influence of these technologies on the vital activity of the human species has caused the generalizing definition of them. The authors of «Disruptive Technology» [27] refer to J. Schumpeter's concept of creative destruction. Schumpeter in 1942 shocked his readers by giving destruction a positive meaning: a «good» innovation transcends and «breaks» old structures and technologies. Therefore, it is important that innovations do not contradict the expectations and vision of humanity regarding their future, which should become a criterion for assessing modern developments and the basis for their planning [28]. We consider this criterion important for the pedagogical assessment of augmentation.

How should humanity think and act in this situation? How to find a place for a person in the world of technology? And how should educational activities be carried out without intelligible answers to these questions? So, it is necessary to translate this understanding into specific curricula and disciplines? It can be seen, that higher education depends on a philosophical, social, predictive, and analytical understanding of the current situation. And there are two reasons for the certain confusion feeling among specialists in higher education.

The first is the high speed of changes in the world of technology, which puts all participants in educational activities in a state of uncertainty («fragile individuals on thin ice», according to N. Luhmann). And although the object of education is still a person, there is less and less sense in teaching him/her something that does not relate to technology. It is clear why: in production, technology is already dominating. And the higher school fulfills the order of production (which now exhausts the «social order»), then it is assigned a strange role – to prepare an application to technologies (only a small fraction of humanity will be lucky to create them). Thus, most of Tokyo's universities have excluded the humanities from their programs.

The second reason for the uncertainty arises from the opposite claims of education – on the formation, creation of the future, even responsible for it. After all, the future belongs to young people. Then the higher school remains the creator of the future – if in the future there will be room for humans. This contradiction of the situation forms the problem of searching, substantiating the strategy of educational activity. It, of course, depends on the prospect vision for the human and machines relationship. The search for a strategy for humans begins with the statement: «This is not a race against the machine. If we compete with them, we will lose» [21].

The human-centered approach to adaptive automation is the most interesting result for modern education. The computer «pays close attention to the person working with it», and «holds great promise for bringing a touch of humanity to the relationship between ordinary users and computers» [29]. The adaptability direction has been implemented in the human-centered design concept [30] and in the emerging field of adaptive pedagogy [31]. A smart learning system not only focuses on the person, reacts depending on the person, but also changes the student him/herself. This forms the basis for an interactive approach and implementation of active learning principles in digital learning environments. It should be noted, that the idea of adaptive automation has been embodied in the concept of augmentation. Thus, D. Engelbart invented a select-and-click interface and a mouse for working with it. He was the first scientist to use the term «augmentation», understood it as machine involvement to perform mechanical tasks, associated with thinking and the ideas' dissemination. In particular, in 1962, he published a work that became popular [32]. We admit outstanding scientists have long thought of augmentation. But, it should be noted, that, over time, the content of this term crystallized. Now we mean augmentation, such as an interaction between humans and machines that enhances the capabilities of each of the parties. When we talk about augmentation, we mean that a person, relying on the help of a machine, can create more value and receive more personal benefits.

The concept of augmentation appeals to us also because it is broader than the term «complementarity», which has been chosen by many economists. People continue to do what they do best, and computers bring on their part what they do best, and together they create a significant economic effect. Mutual complement is a wonderful thing; people stay with their jobs (at least they keep some types of work) and get more pleasure from this work than before because high technologies support and enhance their knowledge and skills. But, in our opinion, the interaction between people and machines should have a deeper meaning. Is it not possible to assume, that combining the efforts of human and artificial intelligence work to strengthen the capabilities of a person in what they know how to do well (and also to strengthen the capabilities of machines in their area)? And this will no longer be a simple division of labor, but an augmentation that increases the effectiveness of joint activities [25].

T. Devenport and D. Kirby define a series of steps, a kind of range of strategies available to people who want to keep their jobs or find a new one in the era of intelligent machines. This view of interaction with machines opens, in their opinion, no one, but many viable prospects [25]: making decisions that are too large-scale and unstructured for computers to work with; motivating people or explaining to them the decisions, made by machines; tracking the effectiveness of automatic solutions of computer systems, their improvement; selection of a narrow difficult to automate specialization; development of new systems and technologies that advance the artificial intelligence development. The listed strategies are rather like «tactics». Because the mentioned types of activities will also be mastered by technologies. Thus, people are encouraged to come to terms with this and change their position. «One way to adapt to the situation when the computer takes your work is to perceive artificial intelligence as a competent assistant, whose activity allows you to move up», these authors point out [25]. For a person, they emphasize, the most acceptable and worthy is the augmentation strategy, shown as «steps up»: a high level of understanding of problems and tasks. In particular, «you can decide at the highest level on the use of smart technologies; you know where to use one type of system or another, how they work in a particular work environment, and how a par-

ticular system fits into the context of a particular business or organizational process» [25]. Here is a worthy place for a person – to be above technology.

Latter strategy development requires a higher level of understanding of problems and tasks, although it needs from «a few such workers». T. Devenport and D. Kirby suggest a high level is needed to see new horizons for technology. We are not talking about human needs and prospects – necessary at least to find a place among the machines. And the question arises about the fate of humanitarian knowledge in the future society. This question is very important for the higher education system. How it should act in the face of a significant decrease in the need for specialists? Higher education could rely on the above augmentation strategies in the short term because of their constructiveness and tangible intention to keep a person «in the space of human activity».

But there is another view of the trajectory of the relationship between humans and technology, which complicates the objectives of higher education definition. It is the concept of «the human brain connecting to Internet», and gets «the entire Wikipedia as its resource» by S. Hawking [3], «inter-brain-net» by Yu. N. Harari [33], singularity [22, 23]. And this is not surprising, given the broad concept of understanding the document as a crystallized thought by Paul Otlet [34] and its modern interpretation in the standard «ISO 15489-1: 2016 Information and documentation – Records management» [35], where the document is understood not as a material carrier of information, but as a signal-impulse, which is information, recorded in any form. Such a convergence of a person and an information intellectual system, all actions and characteristics of a person transform into a digital image of metadata, is implemented in programs, such as ERP, MRP, HRM, and others [36]. Such a cyborg will no longer be a human or even a living organism. It will become something different. It will become such a different being, we cannot even imagine all the philosophical, psychological or political significance of this» [33]. Of course, researchers are concerned about how far the «cyborgization» trend can go and what its result might be [23].

As we can see, the prospects for human in his/her relationship with the technological world are not very encouraging. The augmentation concept leaves a certain space for human abilities development. Then the model of the singularity as a perspective of the human relationship with technology can be only theoretical. Indeed, this model also recognizes humans at least at the level of indistinguishability from technology. But technological progress is being driven by the economy in its market version. In addition, unlike humans, technologies «forget nothing», therefore their development is cumulative and accelerated. The part of the «human» in the future will decrease [28, 29].

N. Carr sees the solution of the singularity in «adaptability». He notes that «automation proliferation makes life programmable. There are fewer opportunities to show ingenuity and resourcefulness, to feel confident in their abilities. Now there is the time to think about how humanity will develop» [29].

Sharing this N. Wiener's statement «a computing machine is only as valuable as the person who uses it», and «we can no longer evaluate a person by the work that he/she does. We must evaluate him/her as a person» [37], we believe it creates a fundamental setting for the education system of the near future. First, to leave a person, and not «human capital», «qualified labor force» or «competitive specialist» as the goal of educational activities. Implementing this attitude is a hard task, but it is important that it is at least understood by teachers.

3. The aim and objectives of the study

Purpose of the study – provide a pedagogical assessment of augmentation.

To achieve the goal, the following tasks were set:

1. Based on the analysis of futurological research on human-machine interaction, to determine the social consequences and educational prospects of such development.

2. To identify the predominant models of pedagogical interaction in traditional and online learning. To describe changes in teachers' behavior under the influence of computer technology.

3. To define the threats of computer-mediated education and provide a pedagogical assessment of augmentation.

4. Materials and Methods

The primary method of the outlined problem studying is a scientific reflection on the human-technologies interaction state, and the social consequences and educational prospects of such development. As the education depends on the sphere of social manufacture, the study of the state of production affairs should be given priority. However, in determining the state of society, the modern sphere of production must share its leading role with science. After all, these areas are already almost indivisible whole. Information technologies influence the efficiency of research and production, their integration, but also facilitating the instantaneous transfer of research results to the manufacturing sector.

Another method relevant to the problem under study is the analysis of futurology researches that intersects with its philosophical analysis.

The methodological basis of this work is the information approach in its cybernetic and social contexts.

During 2021, when the university had mixed (full-time and online) education, we tested lecturers to identify the prevailing communicative interaction styles and teachers' behavior patterns in communicating with students in traditional face-to-face teaching and online learning through pandemic. This should identify threats of computer-mediated learning, determine the ways of pedagogical augmentation.

Testing of the university's lecturers regarding the prevailing models of didactic interaction under the Yusupov's method questionnaire [38, 39] is an attempt to check the idea of a pedagogical augmentation in life. A comparative analysis of the survey results will help to find out the changes in the teachers' behavior in the class during traditional and online learning. This led to a conversation about the risks of computer mediated education and pedagogical effects of augmentation.

The survey was conducted twice with clarifications:

1) in a situation of traditional live learning,

2) online learning in the pandemic. By online learning, we mean conducting classes using video meetings (Zoom, Jitsi Meet, Google Meet, Skype, and others), recording tasks on platforms, such as Google Class and Moodle. Respondents were 30 lecturers of the Humanities Faculty: 6 male, 24 female, 40 to 75 ages. We obtained informational consent from all study participants.

5. Result and discussion

The test results were obtained:

1) The models of active interaction «Union» and differentiated attention «Locator» prevail in face-to-face learning (Fig. 1). The «Union» style prevails in the group of female lecturers. The style of friendly interaction prevails [38, 39].

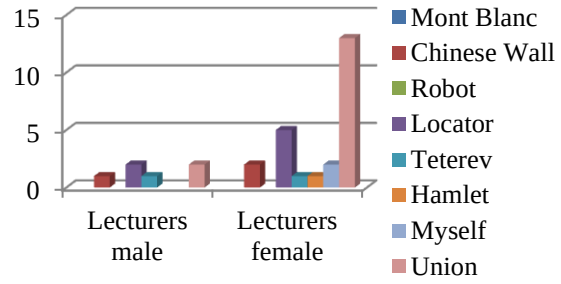

Fig. 1. Pedagogical communication styles in face-to-face teaching

2) 97 % of lecturers note the forced effect of distancing from the student audience with a high level of technical capabilities in online learning. Such styles prevail over the non-contact model «Chinese Wall», announcer model «Mont Blanc», the hypo reflexive model «Teterev» [38, 39]. The sides of the communication process are isolated from each other, the educational impact is presented formally (Fig. 2).

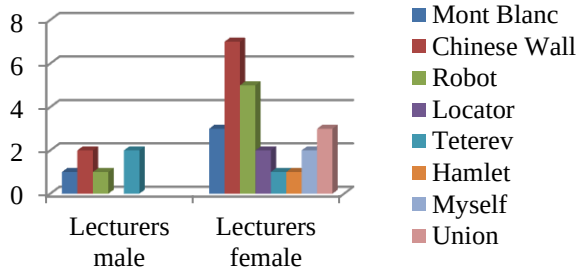

Fig. 2. Pedagogical communication styles in online learning during the pandemic

3. There has been a sharp decrease in the styles «Union» and «Locator» use, with a significant increase in the styles «Chinese Wall», «Mont Blanc», «Robot» in online learning. We showed the pedagogical communication styles changes in cases of traditional and online learning in Fig. 3.

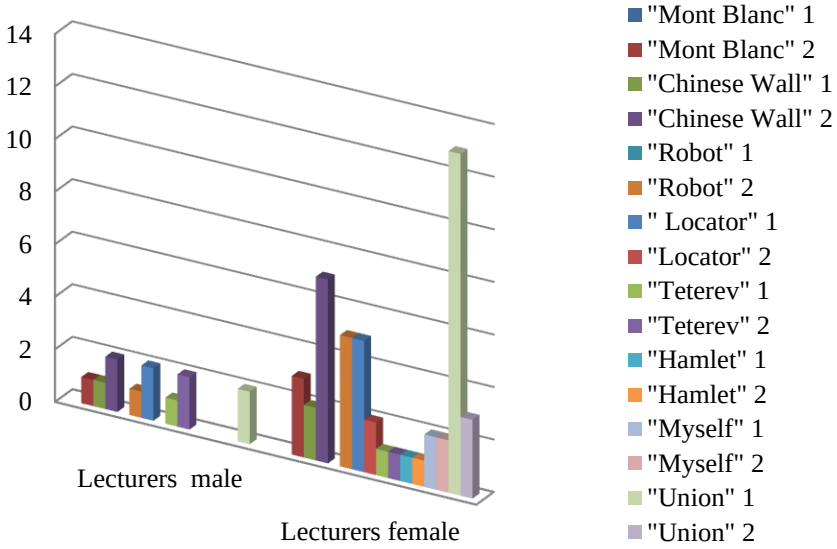

Fig. 3. Changes in pedagogical communication models during traditional (1) and online learning (2)

4) 96 % of respondents noted the predominance of the model of inflexible response «Robot» when training in Google Class and Moodle. This shows a low level of pedagogical interaction. The relationship between the teacher and the students is built according to a rigid program, where the goals and objectives of the lesson are maintained, methodological techniques are justified, there is an impeccable logic of presentation and argumentation of facts. But the teachers lack a sense of understanding the changing situations of communication, e.g. the pedagogical effectiveness, the composition and mental state of the trainees, their age, emotions, and ethnic characteristics [38, 39]

5) The vast majority of teachers (83 %) note that the use of computer means of communication, presentation of lectures, practical classes, increase their computer literacy, generally improve the quality of lectures in terms of demonstration and illustration, testing. But there are still problems with live communication, especially during practical classes.

The distancing we found in online communication indicates the state of «coolness». J. Baudrillard notes:

«Coolness is the pure play of the values of discourse and the commutations of writing. It is the ease and aloofness of what now only really plays with codes, signs and words, the omnipotence of operational simulation». And then «The cool universe of digitality absorbs the universe of metaphor and metonymy.

The simulation principle dominates the reality principle as well as the pleasure principle» [40]. Therefore, at the current stage of digitalization of higher education in Ukraine, the «automated» and «complementary» competencies prevail over «co-working». It is possible to develop:

– through the appeal to alive communication as a «hot» system (by J. Baudrillard);

– including classical literature and folklore as narratives of digital learning tools;

– softly using "design thinking" and game design principles in learning [19], leaving free space for human creativity, choice, and decisions that defy the logic of machines;

– forming the human future vision as a criterion for pedagogical assessing modern augmentation.

It does not limit the study to the presented article. In the future, to verify the results, it is advisable to apply the longitudinal method to a wider range of respondents and to consider communicative styles in pedagogical interaction and its IT augmentation from the students' point of view.

It is important to develop criteria for assessing pedagogical augmentation and conducting other practical experiments to illustrate the effects of human-machine interaction in education, forecasting and strategic planning of human-centered education as the highest value.

6. Conclusion

1. Based on the analysis of futurological research on human-machine interaction, determined the social consequences and educational prospects of such development, related to the education system. This is the adaptive learning technologies, human-oriented principles of the learning interface, training robotization, design of thinking, programmable life, singularity problems development. The purpose of the pedagogical assessment of the augmentation is to preserve the humanitarian vector of education under technical hegemony.

2. Identifed the predominant models of pedagogical interaction in traditional («Union», «Locator») and online learning («Chinese Wall», «Mont Blanc», «Robot»). Changes in the teachers' behavior under the computer technology influence are described: increasing the level of information and computer competencies, improving demonstration and illustrative opportunities for lectures, but forming a sense of alienation from the student audience, lack of live communication.

3. Defined the threats of computer-mediated education and provided a pedagogical assessment of augmentation*:*

– «cool» [cold] educational environment leads to the formation of a «professional robot» or «button manager» who cannot think from the standpoint of high human values (moral, ethical, spiritual).

– The prevalence of the «robot» model as a pedagogical communication model, hyper-formalization of the educational process will transform students and teachers into ideal subordinates, but not leaders (independent critical thinkers).

– The concept of increase can be useful in the short term. The results of the study confirm the conclusions about the need to humanize education.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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