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Philosophy of the Future in the Context of Scientific and Pedagogical Workers Training and Artificial Intelligence Application

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Abstract: Aims: The article is aimed to introduce a conceptual and categorical framework of the future, to analyse the philosophical fundamentals of scientific and pedagogical workers training and artificial intelligence application, and to reveal applicable scenarios of establishment of efficient training in future in the context of application of artificial intelligence. **Methodology:** To conduct the research thoroughly we used mixed methodology. A scientific literature review was used in order to establish the theoretical basics of the investigation, to clarify the relevant ideas, and to develop the research

methodology. During the investigation the most recent 41 papers devoted to the philosophy of future-focused education and application of artificial intelligence were selected to describe the problem accurately. To collect data the questionnaires, surveys and online data acquisition were applied. The research included three stages and lasted during September, 2021 – May, 2023. The research involved 119 scientific and pedagogical workers from institutions of higher education including instructors, post-graduate students and undergraduates. **Results:** The research interpreted the category artificial intelligence from the philosophical perspective, described the applications of artificial intelligence in the process of training of scientific and pedagogical workers at the institutions of higher education, and elaborated the model of artificial intelligence application while training scientific and pedagogical workers. Also, four future-focused scenarios to implement the model were outlined. **Scientific Novelty:** The study initially represents a unique perspective of philosophical interpretation of the future. Also, it brings original ideas to design the model of artificial intelligence application while training scientific and pedagogical workers that has not been done before. **Conclusion:** The model can be used for the improvement of scientific and pedagogical workers training at the institutions of higher education and prepare them to future transformation within the educational environment.

Keywords: artificial intelligence, scientific and pedagogical workers, model, scenario, future, education.

Introduction

Each generation has its part to play in solving new economic, political, social and cultural problems. At the beginning of the XXI century education faced the crisis of competence caused by a failure to match rapid transformations of technological development and it became a serious problem. This has created a need to reform the educational institutions through a correct interpretation of pedagogical science as strategically important part of human life and, moreover, consideration of the process of training as essential for the development of nation.

The reformation of traditional activities actualises the study of historical experience but unawareness or ignorance of future directions threatens to bring serious complications in the sphere of education. The analysis of today's global challenges also includes the examining the field of education as it has to outline its priorities and directions considering current and long-term needs of the humanity. The description of the future scenarios requires theoretical and methodological discussions in the studies concerning the prospects of the processes that aim to identify future changes and formulate relevant steps for sustained improvements (Virmajoki, 2022) as it will contribute to building efficient educational process in long-term perspective and improve training of future specialists.

Education is directed at achieving the vision of pedagogical process and its contribution to actualization of coherent philosophical understanding of future, formation of new type of personality, and modernisation of methodology taking into account the requirements to intellectual and creative potential of young people, their professional independence, and international competitiveness. The philosophy of the future has certain features affecting professional training in the context of using new technologies. They include: an orientation towards creative self-actualization; an understanding of own behind planet-wide and cosmic origin; a formation of new social and cultural reality where system of values is changed significantly. At the same time new phenomena in education give great opportunities to optimise the hidden potentials of personality and differentiate his/her needs or abilities.

Scientific and pedagogical workers are central figures in the system of modern historic epoch when professional training is one of the main mechanisms of reproduction of culture, spirituality, and science in the society. Also, it is considered to be a unique form of person's existence and further socialisation. In such circumstances scientific and pedagogical workers must realise the responsibility

for finding solutions for global issues and determine its strategic objectives, main functions, and possible future improvements. According to Nasrollahi et al. (2020), education is the most effective and promising factor in the humanity success and the main condition for progress of civilization, formation of high spirituality, intelligence as well as sense of responsibility for promotion of scientific and technical ideas. This is a clear indication that all efforts to address these problems connected with prospects for human growth must be oriented towards, in particular, their philosophical reflection.

This requires a new level of reflection of the notions of future establishing, an education, professional training, and technological development. In this regard, the study of philosophical understanding of the future as universal knowledge in the information age is the very important thing. Today artificial intelligence is a part of comprehensive and reflexive revolution of human civilization. It is a component of implementation and imperative of improvement of quality of education. The process of training of scientific and pedagogical workers and application of artificial intelligence is considered as humanitarian category facing significant transformations and a shift of emphasis from industrial to non-production or creative activity. Also, we observe changes of characteristics of information, group and individual identities that will determine the nature of education and its philosophical principles.

Consequently, the study of this problem refers to the deep understanding of philosophical paradigm of future-focused education since artificial intelligence is gaining a universal use within the educational process. At the same time, this requires a thorough description the philosophy of education as an area of activity in which educational issues are evaluated and applied from a philosophical perspective to diagnose the problem and to obtain benefits from technological innovations and particularly advances in artificial intelligence (Alemdar & Aytaç, 2022; Gao, 2023) that is high on the agenda of current experts' discussions about development of conceptual framework of modernization of higher education and possible ways to improve it.

Research Problem

The recent decade faces the artificial intelligence becoming a subject of educational discourse, replicating the traditional approaches to understanding technologies (Selwyn, 2022). Currently, the speed of technological change is very fast, and it may create high pressure to transform educational practices, institutions, and policies in future (Tuomi, 2018). From the perspective of philosophical science, artificial intelligence and education are closely interconnected as they both concern cognitive procedures, the ability of understanding, and communication that are important manifestations of human intelligence (Wang, 2021). Unfortunately, the role of artificial intelligence in education revolution is still uncertain, unpredictable and essentially unknowable over the long term (Selwyn, 2022). Therefore, it is necessary to explain the potential impact of artificial intelligence on learning, teaching, and education, as well as on upcoming changes within the process of training of scientific and pedagogical workers.

Research Focus

According to the philosophical analysis the category of education has always been important research topic as, being the kind of learning, it creates fundamentals for formation of knowledge, skills, attitudes, and values among young people. In recent years education has been greatly influenced by innovative transformations like information and communication technologies. Therefore, a systematic study is needed in order to provide the description of future profile of education constantly changing because of new technologies, artificial intelligence particularly. In this regard, examination of the future in the context of training of scientific and pedagogical workers and application of artificial intelligence is aimed to outline the main notions used to describe the problem, to reveal the philosophical principles

of future-focused education, to present the theory and practice of usage of artificial intelligence while training scientific and pedagogical workers at the educational institutions.

Research Aim and Research Questions

The purpose of the article is to introduce a conceptual and categorical framework of the problem of philosophy of the future and to analyse the philosophical fundamentals of scientific and pedagogical workers training and artificial intelligence application in the view of future scenarios.

The article objectives include:

- to interpret the future in the context of transformations within the education system from the philosophical perspective;
- to conduct a systematic review of the future profile of the process of training of scientific and pedagogical workers that is constantly changing under the impact of new technologies, artificial intelligence particularly;
- to carry out a survey among scientific and pedagogical workers at the Ukrainian educational institutions and to describe their understanding of philosophy of the future in the context of professional training and artificial intelligence application as an effective tool for modernisation;
- to reveal applicable scenarios of establishment of efficient process of training of scientific and pedagogical workers using artificial intelligence instruments in future.

Literature Review/Theoretical Overview

The review of scientific literature on the problem shows that a number of studies are related to the description of philosophy of the future focusing on the education system in order to give accurate consideration to objective transformations caused by new technologies.

Pedagogy in the philosophical sense is a sphere that deals with the analysis of ways of mastering, maintaining, developing, strengthening and flourishing the knowledge among each particular person individually as well as the whole society or state collectively (Kurylo et al., 2023). Accordingly, philosophy of pedagogical training is an interdisciplinary sphere that provides stable basis of human development and preserves the conditions for efficient evolution of education environment where future specialists are trained (Rostoka et al., 2021). Hence, we are confident that philosophy and education are closely interrelated and their links definitely create fundamentals for practical application of the concepts of professional training.

Taking into consideration of the findings of V. Kurylo et al. (2023), it can be affirmed that philosophy of education is related to a system of philosophical views that studies; it describes the general laws of the existence of the educational environment as part of the world and gives recommendations how to manage this environment accurately and ethically.

When examining the concept of future, it was found that it was subjective and objective time category of reality perception that was characterised by a complex of phenomena and events which had not happened yet (White, 2020). Multiple efforts have been done to explain the peculiarities of future-focused education. According to Menéndez-Alvarez-Hevia et al. (2022), the studies differentiate four characteristics of education of the future. They are the following: prediction, interpretation, criticality, and anticipatory action.

- 1) Prediction means the future transformations within the education system can be predicted or known.
- 2) The interpretation is related to understanding how different elements, phenomena, structures constitute the efficient education system and provide it with relevant methodological tools.

- 3) Criticality assumes that any stable representation or concept is problematic and the education system requires the development of more specific methods for solving the possible errors in future.
- 4) The anticipatory action concerns the main idea of the future – the necessary qualities of education system emerge from the visions of a certain group and are oriented towards the formation of essential knowledge, skills, and abilities on the basis of individual needs and professional functions.

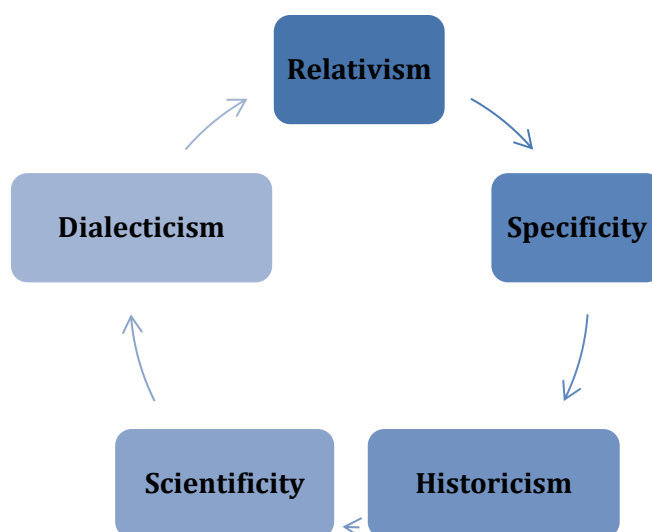
Other findings show that from the philosophical perspective future education features universality, integrity, fundamentality, competency, and humanisation (Tauginienė et al., 2019; Tomé, 2022). They are explained as follows:

- 1) Universality means that education forms a personality that is able to perform under a wide range of spheres and the knowledge must be universal.
- 2) The integrity includes a number of conditions such as actual content of training and the efficient methods to realise it through subjects; person's cognitive and emotional abilities; and coherence with external factors.
- 3) Fundamentality means a conceptual understanding of education and development of basic rules for its organisation. Also, the characteristic deals with establishment of strong connections between all the components and creation of positive scientific and educational environment.
- 4) The competency is related to the formation of readiness to practical activities among students which is actually means training of scientific and educational workers to carry out professional tasks in future changing environment.
- 5) Humanisation concerns the process of adjustment of education, its content and instruments, to human nature.

The detailed philosophical analysis of a phenomena requires the determination of its main principles as the fundamental ideas formed in the process of cognition. The philosophical principles of future-focused education depend on the dialectic and ontological laws (Dafermos, 2018). These principles create conditions to facilitate scientific and educational environment and adapt it to the dynamic development of technologies. Figure 1 shows the philosophical principles of future-focused education which comprise specificity (Bagheri Noaparast, 2022; Lerner & Bornstein, 2021) historicism (Moser et al., 2021), scientificity (Al Husaeni & Munir, 2023; Bagheri Noaparast, 2022; Busmann & Kötter, 2018; Ozen, 2023), dialecticism (Bagheri Noaparast, 2022; Su & He, 2021) and relativism (Bonino et al., 2022; Busmann & Kötter, 2018; Poshka, 2019).

Figure 1

The philosophical principles of future-focused education



Source: author's own development

In practice, the philosophical principles of future-focused education can be easily applied to the analysis of future perspective of scientific and pedagogical workers training and contribute to the enhancement of efficiency of education system in future since they are considered to be necessary conditions for didactic relevance or clarify the methodological framework and educational process.

The first principle – *specificity* – reflects connections between the theory of training and requirements for formation of professional identity of scientific and pedagogical workers. The use of this principle is oriented towards formation of educational process as dialectically structured phenomenon based on the relationship of general and specific components, determination and further implementation of special psychological and pedagogical conditions (Lerner & Bornstein, 2021) to optimise the process of training of scientific and pedagogical workers, description of methodology of application of innovative technologies.

The second principle relates to *historicism* that means the necessity to investigate certain historical aspects of pedagogical phenomena (Moser et al., 2021). Historicism transfers from empirical findings to theoretical generalization and this makes possible to determine the evolution of scientific ideas and philosophical views on character scientific and pedagogical workers training as well as to contribute to classification and typology of components within the education system. The principle of historicism is used to systematisation of existing philosophical knowledge and to predict possible developments in future.

Scientificity, the third principle, is used to form notional thinking regarding the problem of professional identity and peculiarities of future educational environment where philosophical ideas and categories are logically interconnected (Al Husaeni & Munir, 2023; Ozen, 2023). The scientificity helps scientific and pedagogical workers demonstrating the process of professional development from the philosophical perspective, determining their unique professional features, and outlining the methodological approaches of new technologies application, particularly the artificial intelligence, while training.

The fourth philosophical principle concerns *dialectic* and is interpreted as determination of main controversies within education system (Su & He, 2021). Unless they are solved, the educational process is ineffective and unsustainable. Dialectic contributes to the organisation of scientific and pedagogical workers training and its modernisation, facilitates the designating of new models of professional training and encourages the application of innovative technologies on the basis of causal relationship.

And the fifth philosophical principle – *relativism* – is introduced when personal values dominate general ones (Bonino et al., 2022; Busmann & Köttler, 2018). It means that educational process depends on individual characteristics, needs and attitudes of student as a main subject of educational process. The principle formulates the requirements to enhancement of creativity among those who learn, development of their unique features, and, consequently, selection of effective methods and instruments considering students' interests (Poshka, 2019). In the context of training of scientific and pedagogical workers relativism contributes to person-centered learning.

While digital technologies are widely implemented within the education system, the future of education is closely connected with artificial intelligence. According to Gray and Kucirkova (2021), it is a game changer and has all the possibilities to transform educational process in future. Artificial intelligence is determined as the simulation of human intelligence processes by digital instruments or computer systems (Huang et al., 2021). AI-driven tools and technologies have already used within the educational processes and they will be taken seriously over the next years (Selwyn, 2022). This must be

taken into account while elaboration possible scenarios of training of scientific and pedagogical workers at the institutions of higher education.

As the learning is a capacity that could be used to show intelligence, the learning process of artificial intelligence differs from how humans learn (Youheng, 2023). This fact outlines a number of ways how artificial intelligence can be used in education and particularly during the scientific and pedagogical workers training. The findings show that artificial intelligence can be applied within the educational process and in organisation of scientific research (Gao, 2023; Huang et al., 2021; Selwyn, 2022; Tuomi, 2018). Continuous applications of artificial intelligence as an instrument to organize educational process and/or scientific research stimulate training of scientific and pedagogical workers in the framework of implementation of technological advances and contribute to enhancement of their preparation to future activities within digital innovative environment.

Table 1 shows the detailed analysis of applications of artificial intelligence in the process of training of scientific and pedagogical workers on the basis of literature review.

Table 1

Applications of artificial intelligence in the process of training of scientific and pedagogical workers

Applications of artificial intelligence in the process of scientific and pedagogical workers training	Researchers who have studied the problem
Educational process	
providing customised prompt feedback from students	Dever et al., 2020
assessment of learning achievements	Baykasoğlu et al., 2018; Tuomi, 2018
implementation of online higher education	Lim et al., 2023; Ouyang et al., 2022
examining of class attendance	Crompton & Burke, 2023
facilitation of inclusive learning	Gupta & Chen, 2022
student management	Crompton & Burke, 2023; Lim et al., 2023; Selwyn, 2022
organisation of tutoring system	Crompton & Burke, 2023; Huang et al., 2021
establishment of a quality assurance system through the implementation of new mechanisms	Crompton & Burke, 2023
big data analysis	Crompton & Burke, 2023
curriculum generation and sequencing, personalised curriculum planning	Crompton & Burke, 2023; Wong, 2018
instructional design	Crompton & Burke, 2023
adaptive learning	Huang et al., 2021
teaching evaluation	Huang et al., 2021
promoting personalised teaching and learning	Huang et al., 2021; Tuomi, 2018
generation of new content	Lim et al., 2023; Tuomi, 2018
assignment of lessons and correction of homework	Tuomi, 2018
Organization of scientific research	
development of hypothesis, forecasting	Selwyn, 2022
carrying out of interdisciplinary research	Crompton & Burke, 2023
conduction of literature review	Crompton & Burke, 2023; Shukla et al., 2019
automatic assessment	Crompton & Burke, 2023
predictive modelling	Salas-Pilco & Yang, 2022
intelligent analytics	Salas-Pilco & Yang, 2022

image analytics	Salas-Pilco & Yang, 2022
seeking of solutions through deductions	Wang, 2021
correction of errors while conduction large-scale research	Wang, 2021

Source: based on the literature review

To analyse the philosophy of the future accurately and to reveal objective transformation in education under the effect of new technologies, it is necessary interpreting the peculiarities of training of scientific and pedagogical workers using the instruments of artificial intelligence.

Research Methodology

General Background

The subjectivity is one of the key conditions to philosophical research and it requires the use of the qualitative and quantitative methodologies because of the bias existing. As a result, while studying the problem, a number of qualitative and quantitative methods in order to collect, evaluate, and apply data was used.

To carry out the research existing scientific literature on the problem was analysed in order to establish the theoretical basics of our investigation, to clarify the relevant ideas, and to develop the research methodology. In addition, the literature review established the links between what was studied earlier and what problematic aspects we examined to reveal the problem in philosophical science. To collect data we applied questionnaires, surveys among scientific and pedagogical workers at the institutions of higher education. Also, we used online data acquisition via social media like Facebook pages, Twitter discussions, Viber groups, blogs and thematic forums.

A mixed methodology was applied to answer four questions guiding this research. They are the following:

- 1) How do scientific and pedagogical workers interpret artificial intelligence and do they consider this technology essential for educational process and scientific research?
- 2) What categories of scientific and pedagogical workers apply artificial intelligence most often? Are there tendencies to extend its application while training scientific and pedagogical workers?
- 3) What are the applications of artificial intelligence in the process of training scientific and pedagogical workers? And what are the future opportunities of artificial intelligence in education? Can it significantly change the game?
- 4) What is the model of application of artificial intelligence while training scientific and pedagogical workers in future?

The research included three stages. The first or preliminary stage lasted during September, 2021 – May, 2022. It dealt with concerned literature review and development of research methodology. The main stage lasted during June, 2022-January 2023 when we collected quantitative data through questionnaires, surveys and online data acquisition. We carried the final stage in February-May, 2023. The research involved 119 scientific and pedagogical workers from institutions of higher education including instructors, post-graduate students and undergraduates. Also, the responses from 96 individuals via Facebook, Twitter, Viber, blogs and thematic forums were obtained. All the respondents were informed about the research and they participated voluntarily.

The questionnaire form contained three parts and the questions we used concerned the interpretation of the category of artificial intelligence, its role in the education process, and the frequency of application of artificial intelligence while teaching/researching/learning. Also, we asked about the ways artificial intelligence is applied and its future opportunities. The findings were used to design the model of application of artificial intelligence while training scientific and pedagogical workers in future. Appendix A shows the questionnaire form used during the research.

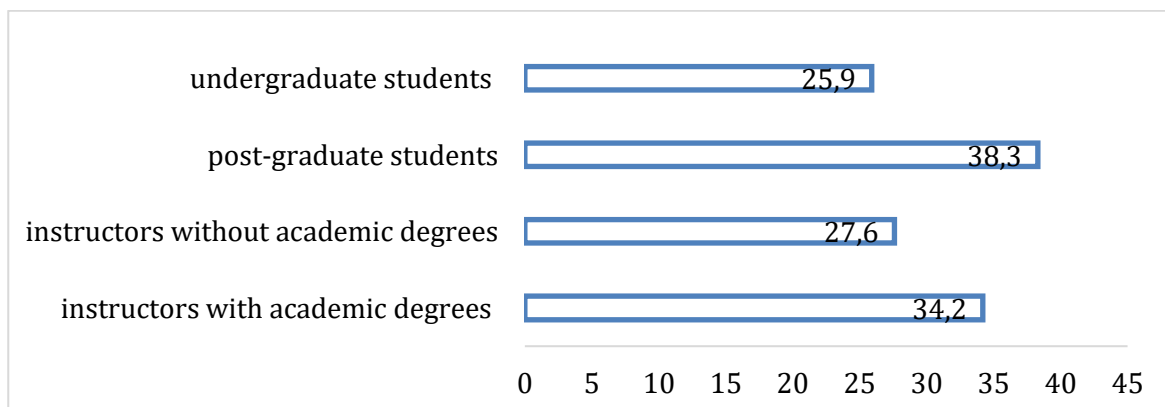
Research Results

The findings showed that all categories of respondents use artificial intelligence technologies almost equally. At the same time instructors with academic degrees and post-graduate students apply artificial intelligence slightly more frequently as they devote more time for scientific research. The indicators demonstrate that 34,2 % of instructors with academic degree use artificial intelligence and consider it effective instrument for modernisation of training of scientific and pedagogical worker. 27,6 % of instructors without academic degree use this new technology and witness the benefits within the educational process. At the same time 38,3 % of post-graduate students use artificial intelligence for researching and learning. Some of them use the technology to prepare to conducting lessons during apprenticeship. 25,9 % of undergraduate students use artificial intelligence while learning and they are convinced its possibilities will be extended in future significantly. Figure 2 shows the frequency of using artificial intelligence by different categories in the process of training of scientific and pedagogical workers.

Chronological interpretation of the results show that the usage of artificial intelligence has been increasing gradually. The answers of instructors with academic degree showed that the number of users has grown by almost 10 % during the period of research. Instructors without academic degrees and post graduate students showed almost similar growth (13,9 % and 13,7 % respectively). At the same time, the number of undergraduate students using artificial intelligence is increasing the most rapidly. Thus, in September 2021 13,4 % of this category used artificial intelligence for learning and preparing projects, and in May 2023 this number was 25,9 %. These findings show that the process of training of scientific and pedagogical workers is currently conducted with the use of artificial intelligence tool for teaching/researching/learning. Figure 3 demonstrates the chronological analysis of using artificial intelligence tools by categories (during September, 2021-May, 2023).

Figure 2

Frequency of using artificial intelligence tools by different categories

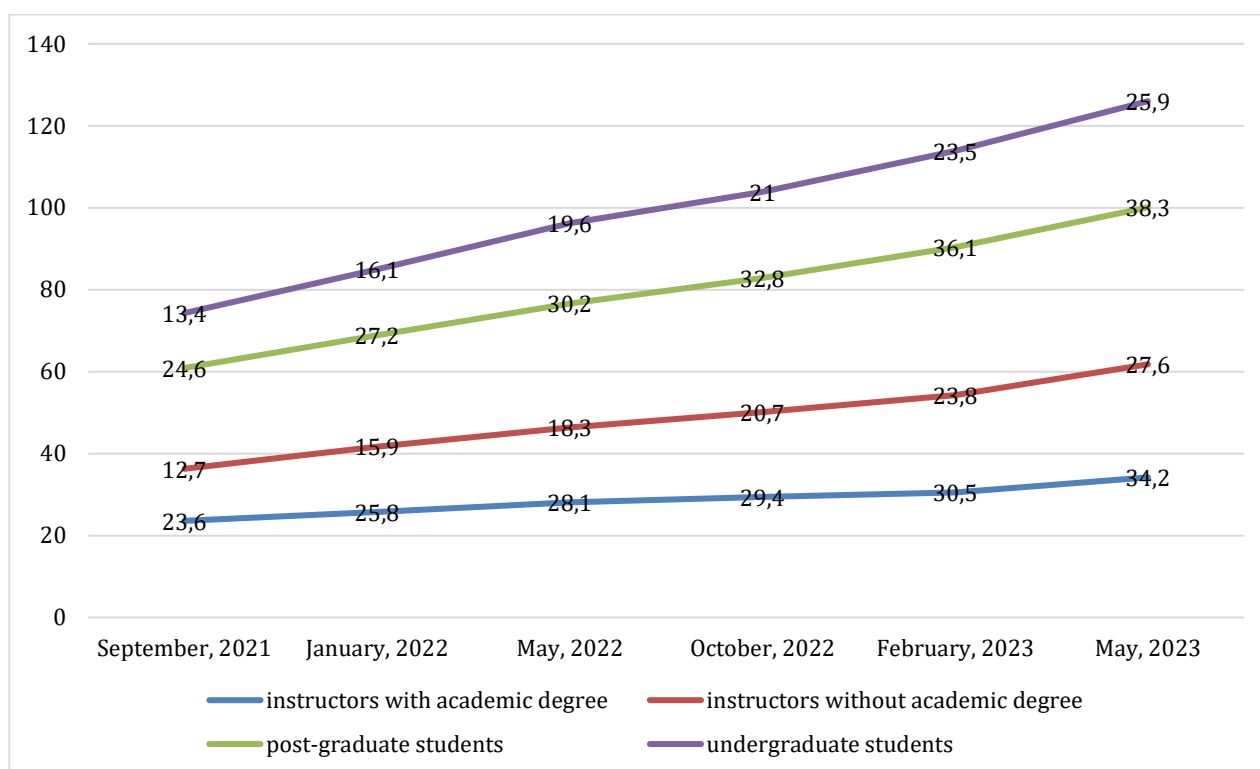


Source: author's own development

The research concerned the analysis of frequency of using artificial intelligence tools depending on the field of study. The findings showed that respondents dealing with computer science (37,2 %), engineering (36,1 %) and linguistics (32,7 %) use the technology the most frequently. But scientific and pedagogical workers whose professional sphere is history and arts demonstrated the lowest indicators, 4 % and 9,3 % respectively. Other professionals who teach or conduct their studies in the field of psychology, education, healthcare, business and economics, statistics showed fairly high results reflecting their interest to artificial intelligence technologies and lot of potential for the implementation of new instruments within educational process and organisation of scientific work. Figure 4 shows the frequency of using artificial intelligence tools depending on the field of study.

Figure 3

Chronological analysis of using artificial intelligence tools by categories



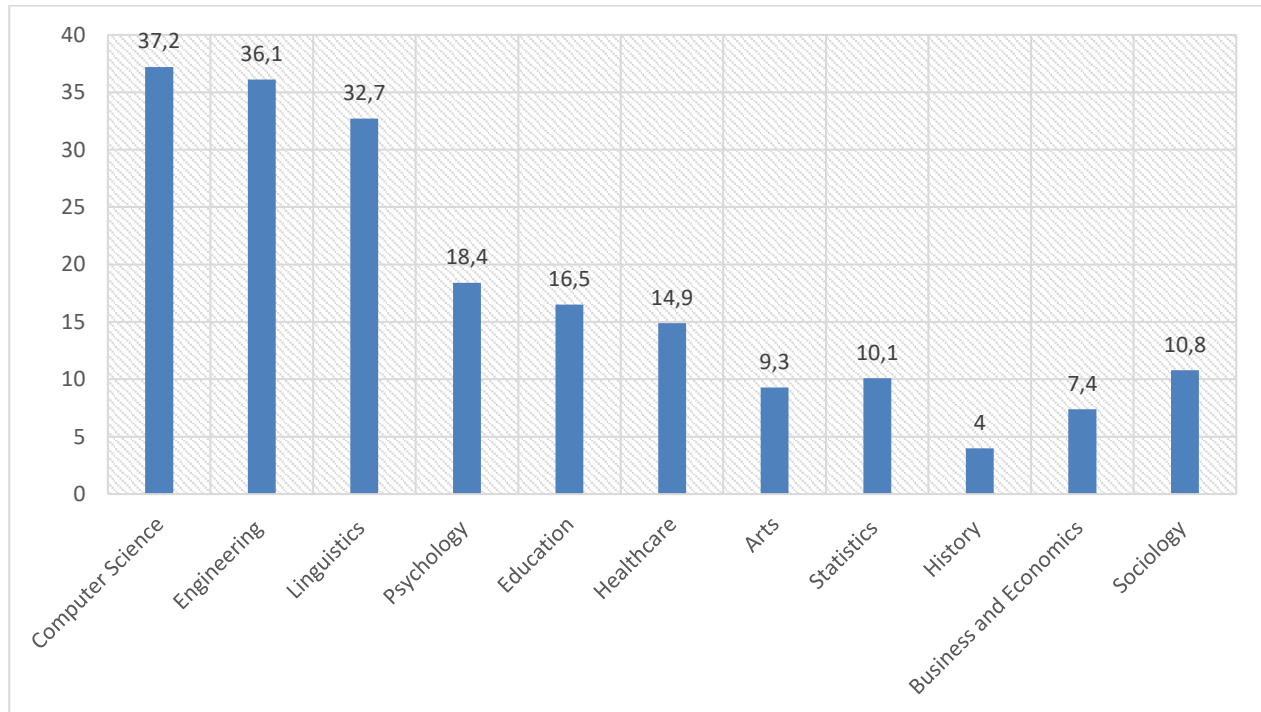
Source: author's own development

We found that artificial intelligence tools can be used for teaching/learning or conducting research. At the same time, each of these components comprises of a number of applications that are oriented towards improvement of educational process, modernization of education system and facilitation of scientific research. The results demonstrated that currently relatively small amount of scientific and pedagogical workers use artificial intelligence tools. Thus, only 5,6 % of participants use artificial intelligence for implementation of online higher education, 3,4 % - to facilitate inclusive learning, 2,2 % to introduce adaptive learning, 2,1 % - to assess students' learning achievements. It is obvious that most of workers prefer using artificial intelligence for generation of new content (11,2 %) and big data analysis (9,6 %). Analysing the sphere of organisation of scientific results, we found that 13,8 % of people use artificial intelligence for image analytics and 7,9 % - for intelligence analytics. Only 0,7 % implement the technology when they develop of hypothesis, forecasting (0,7 %) and correction of errors while conduction large-scale research (0,2 %). This indicates that artificial intelligence possess wide possibilities and it will be widely extended in future to organize efficient educational process or

accurate scientific research. Table 2 shows the analysis of applications of artificial intelligence in the process of training of scientific and pedagogical workers according to respondent survey.

Figure 4

The frequency of using artificial intelligence tools depending on the field of study



Source: author's own development

Table 2

Applications of artificial intelligence in the process of training of scientific and pedagogical workers according to respondents' answers

Applications of artificial intelligence instruments	% of answers			
	Often	Sometimes	Rarely	Never
Educational process				
Providing customised prompt feedback from students	0,0 %	0,4 %	0,7 %	98,9%
Assessment of learning achievements	2,1 %	3,4 %	6,3 %	88,2 %
Implementation of online higher education	5,6 %	6,9 %	8,1 %	79,4 %
Examining of class attendance	0,3 %	1,1 %	2,4 %	96,2 %
Facilitation of inclusive learning	3,4 %	5,8 %	7,2 %	83,6 %
Student management	0,2 %	0,8 %	2,1 %	96,9 %
Organisation of tutoring system	0,5 %	1,7 %	1,9 %	95,9 %
Establishment of a quality assurance system through implementation of new mechanisms	0,1 %	0,4 %	1,3 %	98,2 %
Big data analysis	9,6 %	11,2 %	17,9 %	61,3 %

Curriculum generation and sequencing, personalised curriculum planning	0,8 %	1,6 %	5,1 %	92,5 %
Instructional design	6,7 %	8,4 %	9,2 %	75,7 %
Adaptive learning	2,2 %	2,3 %	5,3 %	90,2 %
Teaching evaluation	0,1 %	0,4 %	0,9 %	98,6 %
Promoting personalised teaching and learning	2,7 %	3,4 %	5,8 %	88,1 %
Generation of new content	11,2 %	14,7 %	16,3 %	57,8 %
Assignment of lessons and correction of homework	0,4 %	0,7 %	2,0 %	96,9 %
Organization of scientific research				
Development of hypothesis, forecasting	0,7 %	2,3 %	5,6 %	91,4 %
Carrying out of interdisciplinary research	1,9 %	3,1 %	3,2 %	91,8 %
Conduction of literature review	3,6 %	4,4, %	8,7 %	83,3 %
Automatic assessment	6,9 %	7,5 %	9,0 %	76,6 %
Predictive modelling	3,4 %	8,6 %	11,2 %	76,8 %
Intelligent analytics	7,9 %	9,4 %	12,5 %	70,2 %
Image analytics	13,8 %	14,1 %	18,6 %	53,5 %
Seeking of solutions through deductions	0,9 %	3,2 %	8,4 %	87,5 %
Correction of errors while conduction large-scale research	0,2 %	1,3 %	5,6 %	92,9 %

Source: author's own development

In addition, it is necessary to admit that respondents provided their own variant of application of artificial intelligence instruments. Regarding educational process they included learning foreign language and using language learning platforms, performance of various administrative tasks, course development, self-study through global online learning platform, and test development. The analysis of organisation of scientific research showed that additional variants included generating new ideas and development of simulations.

Discussion

The findings showed that the future-focused education has its peculiarities and is implemented by means of philosophical principles. According to Tesar (2021) the education of the future has always been related to the ideas of modernisation, transformations, internationalisation, and effective policy. Moreover, the task of future-focused education was how to look towards the future with possibilities and potentialities, considering ourselves as active agents in the process. But today, when reimagining our future after COVID-19 pandemic and full-scale war in Ukraine, there is a need to find new narratives, new ideas and new approaches to modernisation of education system and adaptation it to serious challenges (Garg & Tamanna, 2022).

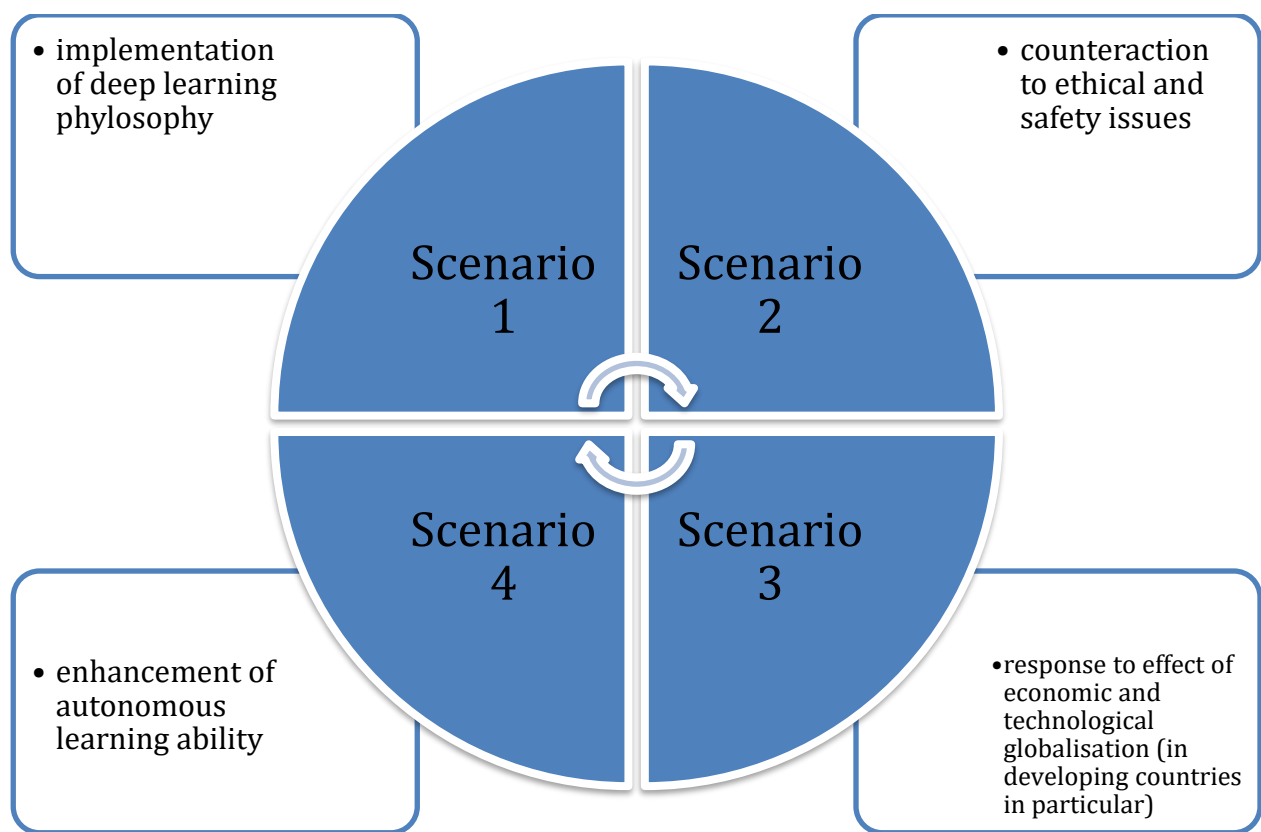
While philosophers of education continue to examine a wide range of issues concerning the development of educational theory, there have been two significant transformations that become a core technology in education. Recent breakthroughs of artificial intelligence are based on controlled machine learning. As artificial intelligence scales up, it can effectively replace old institutional structures and practices that may not be relevant for the future (Tuomi, 2018). This will predictably affect the training of scientific and pedagogical workers and will help to make a huge step forward in enhancing the education. As a result, the educational process at the institutions of higher education will transform into

innovative process oriented towards solving strategic tasks and match future demand in the sphere of education.

Obviously, artificial intelligence significantly changes and a specific model that will make the future-focused education effective and updated should be developed. The findings suggest that there are four possible scenarios that can be applied during the scientific and pedagogical workers training by using artificial intelligence tools. They are the following: the implementation of deep learning philosophy (Alzubaini et al., 2021; Sarker, 2021), solving the majority of serious ethical and safety issues related to application of artificial intelligence for education (Pisica et al., 2023), economic and technological globalization (Korinek et al., 2021), and formation of autonomous learning activity (Gao, 2023; Selwyn, 2022). Figure 5 shows the model of application of artificial intelligence during the scientific and pedagogical workers training in future.

Figure 5

The model of artificial intelligence application during the scientific and pedagogical workers training in the future



Source: author's own development

Scenario 1. It is related to the extensive implementation of advanced technologies and replacing traditional ones. The deep learning has become an important topic in the context of artificial intelligence. It is determined as the ability to automate the learning of feature sets for several tasks (Alzubaidi et al., 2021). Due to its dynamic nature and variations in real-world data, the deep learning helps solving difficult tasks in the education system like generative learning, hybrid learning, modelling, research, and intelligent decision making (Sarker, 2021). The scenario based on the deep learning may transform the scientific and pedagogical workers training as well as simplify the improvement of many learning fields.

Scenario 2. Despite of a number of artificial intelligence benefits for educational process and organisation of scientific research, it brings certain ethical and safety issues. The analysis of scientific and pedagogical workers training in the context of using artificial intelligence tools shows that the users may face unjustified actions, bias, discrimination, lack of privacy, disruption of moral responsibility, absence of safety, and unfair outcomes. In order to prevent these problems and to enhance the efficiency of education process it is necessary to form artificial intelligence literacy among the participants or focus group to know the basic techniques and concepts of the technology introduced in different products and platform.

Scenario 3 deals with economic and technological globalisation and increasing the gaps between developed and developing countries. This could bring a number of negative consequences, including less favourable educational environment for those who are able to use innovative technologies partially or rarely. In developing countries, the educational process is still provided mainly through traditional methods and demonstrates less advantages for those who learn. To prevent this, it is necessary spreading the products of artificial intelligence worldwide and creating the adaptive framework of artificial intelligence revolution considering the needs of all players.

Scenario 4. The autonomous learning is a process that requires students to identify the tasks, to develop appropriate strategies for their solving individually. The development of autonomous learning schemes may bring to decreasing of some soft skills like communication, leadership, creativity, time management, critical thinking, etc. To avoid these phenomena the scientific and pedagogical workers training must be aimed at enhancement of autonomous learning ability and implementation of developmental autonomous learning that suggests using a number of tools without negative effect. From the philosophical and educational perspectives, the autonomous learning scheme deals with increasing the interest, encouragement to learning by own needs, and development of self-instructional modes and moderate teacher's observation.

Thus, the philosophy of the future in the context of scientific and pedagogical workers training is closely connected with the use of artificial intelligence tools that may improve it significantly. Taking into consideration the advantages of artificial intelligence for the process of training and the philosophical principles of future-focused education, the specific model was developed. The four scenarios of the presented model are oriented towards solution of the problem of building relevant and efficient process of training of scientific and pedagogical workers in the context of application of artificial intelligence tools.

Conclusions and Implications

The study found that education is directed at achieving the vision of pedagogical process and it significantly contributes to the actualisation of a coherent philosophical understanding of the future, to the formation of a new type of personality of future professional, and to the modernisation of the research methodology. Currently, philosophy of the future has certain features affecting the professional training. The detailed analysis of philosophical and pedagogical literature outlined the following: an orientation towards creative self-actualisation; a deep understanding of own behind planet-wide and cosmic origin; a formation of new social and cultural reality where the system of values is significantly changed. At the same time rapid transformations within education give great opportunities to optimise the hidden potentials of personality and differentiate their needs or abilities.

Scientific and pedagogical workers are central figures in the system of modern historic epoch when the professional training is one of the main mechanisms of culture, spirituality, and science reproduction in the society. Simultaneously, education is considered the most effective and promising factor in the success of humanity and the main condition for progress of civilization as well as sense of

responsibility for promotion of scientific and technical ideas. This means that all the efforts must address the problems of education modernisation, establishment of future-focused education and its philosophical reflection.

According to the philosophical analysis the category of education has always been important research topic as it creates fundamentals for formation of knowledge, skills, attitudes, and values among young people. Recently, education has been greatly influenced by innovative transformations like information and communication technologies. The study shows that philosophy of education is related to a system of philosophical views that studies; it describes the general laws of the existence of the educational environment as part of the world and gives recommendations how to accurately and ethically manage this environment. Multiple efforts have been provided in order to explain the peculiarities of future-focused education. The following characteristics of education of the future were differentiated: prediction, interpretation, criticality, and anticipatory action; universality, integrity, fundamentality, competency, and humanisation.

In addition, it was suggested that the philosophical principles of future-focused education can be easily applied to the analysis of future perspective of scientific and pedagogical workers training and contribute to the enhancement of efficiency of education system in future since they are considered to be necessary conditions for didactic relevance or clarify the methodological framework and educational process. These principles are specificity, historicism, scientificity, dialecticism, relativism.

The findings show that artificial intelligence can be applied within the educational process and in organisation of scientific research as well. During the research a detailed analysis of applications of artificial intelligence in the process of training of scientific and pedagogical workers on the basis of literature review and survey was conducted.

Obviously, artificial intelligence is significantly changing nowadays and a specific model that will make the future-focused education effective and updated should be developed. The findings suggest that there are four possible scenarios that can be applied during the scientific and pedagogical workers training by using artificial intelligence tools. They are the following: the implementation of deep learning philosophy, solving the majority of serious ethical and safety issues related to application of artificial intelligence for education, economic and technological globalisation, and the formation of autonomous learning activity. The model implies the improvement of training of scientific and pedagogical workers at the institutions of higher education and prepare them to future transformation within the educational environment.

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Conflict of Interest

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Appendix A

Questionnaire form used during the research

You are kindly requested to answer the following questions. Please fill the following form objectively as the data obtained will be used to design the model of application of artificial intelligence while training scientific and pedagogical workers in future. Thank you for your participation!

1. What is your position?

a) instructor with academic degree	b) instructor without academic degree	c) post-graduate student	d) undergraduate student
2) Do you prefer to use traditional or innovative methods for teaching/researching/learning?			
a) preferably traditional	b) both traditional and innovative	c) innovative	d) does not matter
3) Does artificial intelligence belong to innovative instruments?			
a) yes, it is absolutely innovative instrument	b) it is innovative instrument with some traditional features	c) no, in is not innovative instrument	d) does not matter
4) How do you understand the category of artificial intelligence?			
a) computer systems used for language processing	b) field combining computer technologies and datasets to enable problem-solving	c) ability of a computer-controlled robot to perform tasks associated with intelligent beings	d) combination of many technologies to enable digital computer to sense, comprehend, act, learn, and solve problems
5) Do you use artificial intelligence technology for teaching/researching/learning?			
a) yes, often	b) sometimes	c) rarely	d) no, do not use
6) What subjects (field of science) do you teach/research/learn?			
7) Do you agree that possibilities of artificial intelligence can be extended in future?			
a) yes, completely agree	b) partially agree	c) almost disagree	d) completely disagree
8) Will artificial intelligence affect training of scientific and pedagogical workers in future?			
a) yes, will change significantly	b) yes, will change moderately	c) will change slightly	d) will not change
<i>Think of current or possible applications of artificial intelligence. How do you use it? Read the following variants and chose the most relevant answer</i>			
Educational process			
9) Providing customized prompt feedback from students			
a) use often	b) sometimes	c) rarely	d) do not use
10) Assessment of learning achievements			
a) use often	b) sometimes	c) rarely	d) do not use
11) Implementation of online higher education			
a) use often	b) sometimes	c) rarely	d) do not use
12) Examining of class attendance			
a) use often	b) sometimes	c) rarely	d) do not use
13) Facilitation of inclusive learning			
a) use often	b) sometimes	c) rarely	d) do not use
14) Student management			
a) use often	b) sometimes	c) rarely	d) do not use
15) Organization of tutoring system			
a) use often	b) sometimes	c) rarely	d) do not use
16) Establishment of a quality assurance system through implementation of new mechanisms			
a) use often	b) sometimes	c) rarely	d) do not use
17) Big data analysis			
a) use often	b) sometimes	c) rarely	d) do not use
18) Curriculum generation and sequencing, personalized curriculum planning			
a) use often	b) sometimes	c) rarely	d) do not use
19) Instructional design			
a) use often	b) sometimes	c) rarely	d) do not use
20) Adaptive learning			
a) use often	b) sometimes	c) rarely	d) do not use

21) Teaching evaluation			
a) use often	b) sometimes	c) rarely	d) do not use
22) Promoting personalized teaching and learning			
a) use often	b) sometimes	c) rarely	d) do not use
23) Generation of new content			
a) use often	b) sometimes	c) rarely	d) do not use
24) Assignment of lessons and correction of homework			
a) use often	b) sometimes	c) rarely	d) do not use
25) Your own variant(s)			
Organization of scientific research			
26) Development of hypothesis, forecasting			
a) use often	b) sometimes	c) rarely	d) do not use
27) Carrying out of interdisciplinary research			
a) use often	b) sometimes	c) rarely	d) do not use
28) Conduction of literature review			
a) use often	b) sometimes	c) rarely	d) do not use
29) Automatic assessment			
a) use often	b) sometimes	c) rarely	d) do not use
30) Predictive modeling			
a) use often	b) sometimes	c) rarely	d) do not use
31) Intelligent analytics			
a) use often	b) sometimes	c) rarely	d) do not use
32) Image analytics			
a) use often	b) sometimes	c) rarely	d) do not use
33) Seeking of solutions through deductions			
a) use often	b) sometimes	c) rarely	d) do not use
34) Correction of errors while conduction large-scale research			
a) use often	b) sometimes	c) rarely	d) do not use
35) Your own variant(s)			

Source: author's own development