

The Risky Influence of Artificial Intelligence Technologies on the Foreign Language Proficiency of Eurasian Students in Mining

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Abstract. The article touches upon a topic of current importance, viz. the influence of the artificial intelligence (AI) found in some educational information and communication technologies (ICT) on the upcoming generations of graduates of higher education institutions. This is an issue of their prospective work in the industry (especially the mining one). This matter is considered for the students of mining fields of specialization in foreign language classes of the Kemerovo Region (a.k.a. Kuzbass) universities. The special group under consideration is the international students from Middle Asia, India, and China. The article aims to define the peculiarities of AI's influence on an undergraduate via ICT in foreign language classes at the tertiary level. The article explains why some types of ICT may be considered as AI systems; how their inclusion into the educational process influences the cognitive changes of an undergraduate, and what role the level of trust plays in this. The scientific novelty is the consideration of the influence of ICT on the cognitive abilities of a student learning a foreign language through a prism of AI. In conclusion, the closer AI of ICT to the human activity working with a foreign language, the lower activation of the cognitive activity of a student is.

1 Introduction

The coal industry is one of the significant fields of fuel industry in the Russian Federation. It plays an important economic role in some federal subjects of the country. The Kuznetsk Basin is one of the largest coal mining areas in southwestern Siberia. Administratively, the Kuznetsk Basin lies in the Kemerovo Region. That makes the region economically important for the whole country. Nowadays, regional coal exports are competitive globally. Russia is also planning to become the largest exporter in the coal market by 2035.

The above-said factors need the constant development of the industry in the Kemerovo Region. First and foremost, it touches upon the field of higher education. The local school leavers often choose to major in coal mining departments as their further occupation in the region. Besides, some applicants come to the region from other places of the country.

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Moreover, there might be some international students from Middle Asia, India China, and others.

The graduates of Kuzbass universities should be able to respond to new standards and requirements, e.g. how to make the industry more friendly to the environment, how to increase mining and export of coal, how to apply complex and up-to-date equipment, how to make relations with international partners, etc.

The latter two needs are directly connected with foreign language proficiency, especially English. The universities following the reality of time are implementing educational information and communication technologies (ICT) to satisfy it.

Besides, one should note that the poor language proficiency will reasonably lead to misuse of supplied machinery (with documentation in English), some personal misunderstandings with international colleagues and partners, and other failures.

Despite the obvious profits and advantages of this way, there is a reverse of it. In this paper, we want to pay attention to the presence of artificial intelligence (AI) in some ICT to reveal and explain why this issue should be particularly treated with care currently.

Since the beginning of the XXI century, the life of society promptly changes under the influence of a new round of development of technological progress. In particular, it is about the large-scale application of systems capable to imitate human behavior. These systems are closely integrated into daily reality every year. The history of such application in a quite modern sense originates from the middle of the last century. However, the digitalization of the world has extremely accelerated for the last ten years due to the worldwide and high-speed Internet access and the use of neural networks. Nowadays many devices, ranging from smart refrigerators to the products of robotics, are jointly connected. Besides, the neural networks create generative arts in the style of famous music bands, performers, and artists [1].

The above-mentioned systems are widely considered as ones belonging to the AI. They can analyze and extract information from a big data set, train themselves, automatize some daily processes and also solve problems where massive calculations are required. The examples of such systems are the followings: (a) registering patients and assisting with the interpretation of diagnostic results (in medicine); (b) doing analytics, studying the behavioral metrics of a user, his consumer preferences (in retail trade); (c) analyzing data from different production sites and regulating load of the equipment (in the industry); (d) entertaining ones (computer games), (e) processing human language (machine translation, spell checkers and grammars) and so forth.

Such close interaction with AI systems cannot but affect the transformation of the life of society, the change of structure of ordinary reality, the alteration of the external environment and internal state of a person [2].

The term “mixed cognition” steps forward. It stands for “the set of machine and human processes and procedures for the information processing achieving via the immersion of consciousness into the AI technological environment and the active interaction with it. Being a synthesis of a new phenomenon throughout the mental and machine transformation of a person’s reasoning, the mixed cognition is directly connected with computerization of processes of experiencing, acquisition and accumulation of knowledge” [3].

This allows us to conclude that the mentality, attitude, and experience of a modern individual are different, unique, and unlike the previous generation of people. Moreover, they are not thoroughly studied because this subject matter for modern science takes a “here-and-now” position, viz. a constant development. It draws the attention of various disciplines, e.g. psychological, social, linguistic, pedagogical sciences, and so forth.

Such attention is also caused by the fact that “AI possesses the growing potential resources and the increasing risk of their inefficient application”.

2 Materials and methods

The all aforesaid brings to the following questions predetermining the relevance of this study in the field of modern pedagogics – what ICT are applied in foreign language lessons? Why can they be recognized as AI systems? What is the effectiveness of their application? How are AI systems capable to change the educational process from a point of the cognitive aspect of natural intelligence?

To achieve the objective of the research, we formulated a number of the following tasks to complete, i.a.: (1) to define AI as a research object; (2) to categorize ICT used for a foreign language study; (3) to show that these ICT are actual AI systems; (4) to classify AI of these ICT from “the simple to the complex one”. This builds the research’s methodological base including methods of analysis, comparison, questioning, and classification.

The work also contains the following hypothesis: it is supposed that the existence of a more complex (further generating) AI in ICT increasingly influences the cognitive abilities of a student while learning a foreign language. It also has an effect on the degree of human trust in the work done by AI.

The theoretical base of the research is formed by the works in cognitive science and research of AI of such Russian and international authors as O.V. Tolstel, N.V. Hamitov, V.M. Sergeev, I.Yu. Alekseeva, I.I. Glushkov, Beáta Jelínková, Abdusalamu Nijati [4, 5, 6, 7, 8, 9, 10].

The results and conclusions of the research can be used in pedagogical activity for the improvement of the educational process. It can also contribute to the development of effective cooperation between philologists, cognitive scientists, AI developers, and teachers. This makes the practical importance of this research.

First of all, let’s address the interpretation of the term artificial intelligence. In the above-stated works, AI is given the following definition: “this is a cross-disciplinary direction creating things which solve various problems humanly. AI uses mathematics, logic, psychology, biology, philosophy, language sciences, electronic engineer, etc.” [4]. The dictionary on cybernetics by I.I. Glushkov treats this term as follows: “it is an artificial system imitating the human’s solution of difficult tasks in the course of activity” [8].

Besides, N.V. Hamitov notes the accruing crisis in attempts of AI creation emphasizing the evolutionary approach to its creation: “the traditional principle (peculiar cliché) often guiding the most of scientists in their initial attempts to create AI is that it has to be the copy of human intelligence. This task is unsolvable not only today but also in the foreseeable future” as “any algorithm – no matter how complex it is – can’t be identified with the intelligence in the broadest sense. The intelligence is a process and the result of continuous generation and transformation of algorithms of thinking and behavior” [5].

Whatever way for achieving the result in the creation of AI is chosen, there will be program and hardware means carrying out the intellectual activity comparable with the human: “the artificial intelligence is the “world of thoughts” embodied in the technical device. It is not an exaggeration to tell: there was an event in the middle of the XX century.

It was extraordinarily important for civilization history – the “world of thoughts” and the world of technical devices merged. For the first time, a thought began to act independently out of a human body” [6].

Further, we will address the definition of the term natural intelligence “it is a human ability to logical thinking, an aspiration to the acquisition of new knowledge, and ability to draw conclusions and make creative solutions” [7].

Thus, an ideal AI solves problems as it is done by a human. We believe that cogitative activity is a creative way of a solution. Thoughts carry the creative beginning leading to the

generation. The generating nature of natural intelligence is what artificial intelligence aspires to. As it was noted above, the digitalization of thought is already observed nowadays. Following it, we formulate our criterion for the classification of AI systems as the generation.

The adequacy degree of generation compliance executed by the artificial being concerning the natural one forms the basis of our classification of ICT in the lessons for studying a foreign language.

We distinguish the following systems of ICT: (a) machine translation system; (b) electronic dictionaries; (c) speech synthesizers; (d) services for the help in writing texts; (e) search engines; (e) the online tests and any language applications estimating the level of proficiency in a foreign language.

These systems satisfy the definition of ICT as they meet the following criteria: “The ICT in the scope of modern higher education is the digital didactic integration into the process of a computerization of training when its communicative, interactive and perceptual components reach the level of informatization opening almost boundless opportunities for the reformation and an innovation of training activity, the search of the sources of knowledge unavailable earlier, the development of the uniform digital medium of interaction between the teacher and the student, and the student and the artificial intelligence, i.e. the educational software that is not requiring the presence of “live” participation of the teacher” [9, 11].

Returning to the objective of this work, we note that the criterion generation or the generating AI classifies the above-mentioned systems as follows where the first is the highest degree of generation:

1. Search engines. The high degree generation of the user’s inquiry result: the elimination of unnecessary information, the solution of any possible polysemy and homonymy. Besides, S. I. Ryazanov notes “in fact, the search engines that can range the preferences and consider the deviations, excesses, and bursts in the inquiries are those options of Artificial Intelligence that somehow become the coauthors of inventions and discoveries” [12].
2. Machine translation systems (MT) have the generating character in the outcomes of their work. They independently analyze the source text. The unpredictability of results (like a “black box”) makes them independent for the user that brings MT closer to the characteristics of AI systems [10].
3. Services for help in writing the texts. The function of checking the texts in Microsoft Word, online services based on artificial intelligence like Grammarly help the user write texts and give recommendations concerning correctness, clearness, fascination, and tone of the message. Hence, the generated text based on the machine’s advice, if followed, is not for one hundred percent creation of the natural intelligence on the one hand. On the other hand, it is not absolute AI either that reduces the degree of generation for such systems.
4. Language applications and online tests for the level of proficiency in a foreign language. Speech synthesizers. Electronic dictionaries. We consider these three types of systems in one category because it is rather difficult to carry out an accurate classification based on their work. It is possible to say confidently that these types of ICT are united through the very low degree or the total absence of generation. The results of the work of the electronic dictionaries and the speech synthesizers are very predictable and have simple algorithms. There is no generation in them. The programs estimating the level of language proficiency are typically digitized tests where the person (viz. the author of the test) registers in advance what grade will be given to a tested one (e.g. a student) for the certainly achieved scores, points, marks, etc. The machine is engaged in a simple activity here, viz. the calculation of the result. Therefore, the generation is very low in this case.

To check the hypothesis of this research, we decided to carry out the questioning among the students of 1 and 2 academic years studying the discipline “foreign language” not as their major. Some international students from Middle Asia, India, and China also took part. Initially, we thought that their answers might be rather unusual, irregular, or different due to cultural and social differences. However, we are now ready to state in this part of the article that it does not affect any results further.

The questionnaire offered to students is of the following kind:

The Information and Communication Technologies (ICT) for learning a foreign language:

- Search engines (applied to a foreign language only)
- Machine translation systems
- Text editors (the function of spellchecking in MS Word)
- Speech synthesizers (programs for pronunciation of separate words/sentences)
- The language applications estimating the level of proficiency in a foreign language. Online tests for the level of proficiency in a foreign language.
- Electronic dictionaries

Answer the following questions:

1. Do you use (ever used) ICT (see 1 - 6)? How often?
2. What purposes do you use (ever used) ICT for (see 1 - 6)?
3. What is your trust in ICT (see 1 - 6)? Use a scale of 0-1-2 where:
 - 0 – no trust
 - 1 – middle trust
 - 2 – high trust
4. Do you consider the above-listed ICT (see 1 - 6) as examples of systems with artificial intelligence (they can do such tasks according to the human’s abilities only)?
5. How is it important for you to use ICT in your training? (provide a detailed response)
6. What advantages and disadvantages do you see in it?

The questionnaire comprises two blocks. The first one is the list of the types of ICT programmed for both studying language and solving different tasks. The second one is the list of questions. The fourth question has a deliberately semantic ambiguous definition of AI that allows to answer it more honestly from a position of a personal idea of this concept based on one’s own experience.

3 Results and discussion

110 students were interviewed in total. 60 persons of them answered the fourth question positively (we conventionally carry them to the first group). Other opinions (the negative and the doubted of the choice) were equally divided into two groups of 25 persons (we carry them to the second and third group respectively). As one can see, 55 percent of respondents believe that AI is inherent in ICT. Thus, they understand that frequent and regular interaction with ICT – what they report in questionnaires about – leads to the interaction with AI too. This fact proceeds from the average indicator of trust of all respondents.

AI is in ICT (degree of trust in ICT is 1.16). The first student's group has a lower degree of trust (see indicators of other groups). It is because these students might allow the presence of AI in ICT. That is why they do not tend to rely on it. There is possibly a mistrusting factor to something alien, inhuman, and rather independent. For example, machine translation as a “black box” can mean uncontrollability of result that raises doubts, skepticism, and disapproval.

On the other hand, it is possible to claim that answers turned out to vary because some students paradoxically rely on ICT on the contrary, i.e. they still mark their positive sides without trusting the results of their work.

We think that some respondents in their consciousness have a sort of “drift” of concepts. The rate of training is not equal to the efficiency. It is an illusion because the result was received from the machine but it was not one’s brainwork (see answers of students): “ICT help to be developed in any sphere”; “I often need a check written and told”; “it is possible to master the essentials without a tutor”; “for preparation my homework, the learning efficiency increases”; “without ICT I would understand nothing in class”; “it is not necessary to use the huge volume of printed handbooks, textbooks, etc. Minus is the physical and logical actions of the person are minimized”; “it is possible to do a lot of things staying in”; “plus is when I need to translate a text, the ICT does it for me”; “it is not necessary to take a lot of books and notebooks”; “it increases the informative activity, an individualization”; “they (ICTs) are very important because my level of English does not allow me to do my translations independently”; “about ten years ago I spent the whole day for the translation, it is much quicker now. Plus is it gives more free time”; “it reduces expenses of time for work”; “I do my homework with the help of ICT”; “it does not take a lot of time (a respondent probably means machine translation)”; “an opportunity to learn language closer”; “it renders the huge assistance and I cope with my objectives”; “I understand English better with ICT”; “it is not necessary to go to the library to do exercises”; “help in my training”; “availability is an opportunity to translate the text via phone right in the bus”; “risk is to begin to trust ICT completely”; “it is not learning English but neglecting”; “growth of dependence on ICT”; “dependence and laziness”; “there is no learning from ones’ mistakes (perhaps, the student means that the ICT do not explain the result of their work or the student’s mistakes)”; “there is not always an opportunity to contact the teacher or to sign up for courses”; “everyone got used to receiving info without any efforts for search. It is bad!”; “the machines will enslave the world!”.

No AI in ICT (degree of trust in ICT is 1.18). In this case, the result is almost equal to the previous. The answers are also rather varied from the blaming assessment to the positive one. It includes a personal benefit too, viz. the minimum of own intellectual efforts increases free time.

These 23 percent of respondents do not believe that there is any AI in ICT. These technologies are just the tool for them. This is what they saw in the general definition of AI given by us (see answers of students): “There is a lot of monotonous information. There is no reliability”; “They don’t always function well. It is harmful to eyes”; “I don’t see any shortcomings – advantages only”; “The minus is the necessity of the Internet (access)”; “Thanks to ICT I understand the meaning of the text better”; “They partially facilitate a person’s work (search for information, explanations)”; “Because of the fast access to information, it can be forgotten also quickly”; “I don’t see any shortcomings, ICT are created for the help to those who don’t know”; “They are important for the translation from Russian into English. They make my homework simpler”; “Minus is the person gets lazy to think for himself”; “Plus of ICT is they can be used by any person”; “Reliability is put in doubt sometimes”; “There is too much unnecessary information, some mistakes made by a person, ICT consider as correct ones (here the student refers to the software failures)”; “Time is money, so, ICT are considerably doing things as quickly as possible, but the brain stops to get strained and loses its “flexibility”; “ICT are important for me as the assistant”; “Sometimes, I can do nothing without them”.

Those who have no unambiguous opinion on the presence of AI in ICT (degree of trust in ICT is 1.35). Here the degree of trust is higher. It might be possible because the doubts of

these students concerning the intellectual part of ICT allow them to consider this question in terms of binarism. This is one of the characteristics of the human mind [13].

The absence of a definite answer puts the AI concept outside the brackets and raises the trust degree on the one hand. On the other hand, a curiosity factor could be possible. The rising question is “what if the machine can do everything necessary for my training?”.

There is an important fact that machine translation systems have stepped far ahead concerning the translation in some certain functional styles of language [14].

Recently, it is difficult to distinguish the translation done by the machine and the student (especially one who is not majoring in language) in scientific or official styles in particular. The teacher cannot just control the student’s independent homework on translation. As a result, such a student comes to a logical conclusion that the machine can provide his progress and save time because he gets good and excellent grades. Thus, this fact increases his trust.

We believe that it is reflected via the answers of the group of respondents. Most of them are positive (see answers of students): “They (ICT) are important not for me but my progress in a subject”; “It is very important that the ICT help with understanding many things”; “ICT allow introducing interactivity, getting rid of a repetitive work, helping with the material familiarity”; “simplicity, availability, saving of time”; “I do not know many words in a foreign language, therefore I use ICT”; “for better homework”; “While typing some texts, a human factor may play a role and we make mistakes. The use of ICT decreases such mistakes”; “The use of ICT is rather important, I can learn the translation of some words, phrases and work in class properly”; “ICT help to deal with the difficult questions”; “ICT facilitate the training process, simplify life, save time that the person could spend (the student means a read-through of the text)”; “They help me as I suffer the lack of vocabulary. Minus is that they become addictive”; “The ICT strongly help out when there are questions and the teacher has no opportunity to help the students (the distance learning is meant)”; “mistakes that the machine won’t correct unlike the person”; “Minus is an exploitation of ICT”; “Help with understanding many things”.

The analysis of students’ questionnaires showed the following:

1. Students note the efficiency and positive aspects of ICT, the benefit for their education and self-development. Indeed, this group of students treats ICT seriously. They do not misuse their functionality but they are aware of how they can use ICT properly. The most important is that these students also see the reverse of the introduction of these technologies in the training.
2. The students consider ICT as a servant who is employed to be “dumped” with their homework. It is due to the obvious reasons, e.g. the lack of control from the teacher. It is especially actual for the student who is doing homework or answering from home while distance learning. All this leads to the translations done “from the bus on the way to the university”, the downloaded essays in a foreign language, etc. If the students get marks for this, it is easy to guess what consequences it will lead to.

Besides, this analysis proves our hypothesis. Indeed, the above-described ICT with AI of the “generating” category (viz. search engines, machine translation, and automatic text spellchecking) influence the user stronger in terms of the information processing by our consciousness. To some extent, the student shifts a part of the cognitive abilities (thinking, understanding, speaking, and reasoning) to the functionality of the machine to get an extra “day-off”.

4 Conclusion

We come to the following conclusions: artificial intelligence is a set of program and hardware means to achieve an ultimate goal, viz. corresponding its work with the intellectual human activity. Nowadays despite its imperfection, AI is closely integrated into social life at different levels, including higher education. It determines this sphere to changes, e.g. it rearranges teaching a foreign language.

Besides, our research highlights the examples of ICT used in teaching the discipline. The presence of the generating property in AI makes it possible to classify modern educational ICT on the criterion of their influence on the students. It was shown by the method of questioning. We note that cultural and social differences do not play any significant role.

In addition, the hypothesis about student's cognitive abilities, being exposed to the transformation, is proved. The poll shows that changes happen for the worse mostly.

Further researches should be aimed at the prospective development of a technique of training the students in the correct interaction with AI systems without any detriment to own intellectual work. That will let to decrease some potential risks and more serious problems in the mining industry and other spheres.

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