full article

The Features of the Students' Interaction with Artificial Intelligence in Foreign Language Classes in the Era of Digitalization of Higher Education

R. S. Islamov

Kemerovo State University, Kemerovo, Russia

r.islamov87@gmail.com

Abstract: The paper aims to demonstrate the students' interaction with artificial intelligence (AI) of educational information and communication technologies (ICTs). The study focuses on the students' groups studying the Foreign Language discipline and belonging to the non-linguistic departments of the university. The paper explains and defines "AI" and "ICT" concepts as well as the "interaction in the educational process." The necessity of studying the students' interaction with AI is becoming a great sign of the era of digitalization of higher education. The primary scientific method of the study is modeling. As a result, the students' interaction with AI is shown via the model demonstrating some systematic factors of interaction and dynamic processes influencing its course. The study's principal conclusion became the correlating interrelation between the levels of AI influence on the students and their reflexive and evaluation abilities within linguistic competence.

Keywords: digitalization, information and communication technologies, artificial intelligence, foreign language mastering, modeling, higher education

Roman S. Islamov – Candidate of Sciences (in Philology), Associate Professor at the Department of Foreign Languages of Kemerovo State University (Kemerovo, Russia); r.islamov87@gmail.com

оригинальная статья

Особенности взаимодействия студентов и искусственного интеллекта на занятиях по иностранному языку в эпоху цифровизации высшего образования

Р. С. Исламов

Кемеровский государственный университет, Кемерово, Россия

r.islamov87@gmail.com

Аннотация: Цель исследования – рассмотреть особенности взаимодействия студентов с искусственным интеллектом (ИИ) образовательных информационно-коммуникационных технологий (ИКТ). В фокус исследования попали студенческие группы, изучающие дисциплину «Иностранный язык» на неязыковых направлениях университета. В статье объясняются и определяются понятия «ИИ» и «ИКТ», а также «взаимодействие в образовательном процессе». Потребность изучения взаимодействия студентов с ИИ актуализируется как знаковое явление эпохи цифровизации высшего образования. Главным методом исследования является моделирование. В результате взаимодействие студентов с ИИ смоделировано через демонстрацию некоторых системных факторов и динамических процессов, влияющих на его ход. Главный вывод исследования – установление коррелирующей взаимосвязи между уровнями влияния ИИ на студентов и их рефлексивно-оценочными способностями в рамках языковой компетенции.

Роман Сергеевич Исламов – кандидат филологических наук, доцент кафедры иностранных языков Кемеровского государственного университета (Кемерово, Россия); r.islamov87@gmail.com

Introduction

Nowadays, modern Russian higher education experiences some changes dictated by new realities. One of the significant sources of these changes becomes the process of informatization (or digitalization).

Today the development strategy of the national universities is closely connected with the formation of an internal digital environment via the use of educational information and communication technology (ICT) [Savel'eva et al. 2020].

In general, ICT is considered a tool directed to improving the quality of the educational process. Indeed, there is an active implementation and ICT use at university.

Besides, the ICT acts as the subject of this process because "ICT plays an active (specific-purpose) role of training the students". For more details, see our work [Islamov et al. 2020].

Figure 1 shows that modern teaching of many disciplines, including foreign language, means interacting with three subjects: teachers, students, and ICT.

According to our classification, the following ICTs are familiar in foreign language classes: machine translation
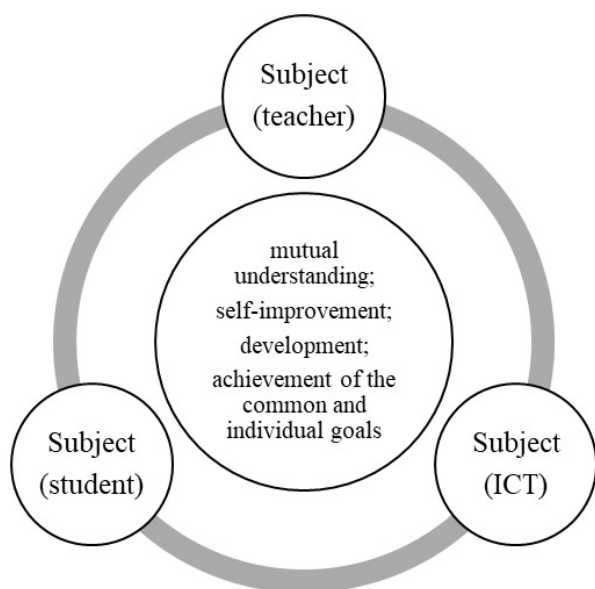
systems, electronic dictionaries, speech synthesizers, writing assistants, search engines, online foreign language proficiency tests, and educational platforms [Islamov 2021].

We consider the interaction in the educational process as "the purposeful activity based on the interpersonal interaction between educators and students. The high-quality changes influence each participant to improve and accumulate new knowledge, abilities, skills, and competencies. This influence happens toward the productive communication with other subjects of interaction for the achievement of the common/individual educational goals as well as for the achievement of a certain level of mutual understanding." [Islamov et al. 2020].

In our opinion, the interaction with ICT directly impacts the activation of a student's cognitive activity since the modern didactic process is experiencing a stage of mixed cognition. Some authors present this phenomenon in the form of mental and machine transformation of the human cognition and connect it with the computerization of such processes as perception, acquisition, and the accumulation of knowledge [Dem'yankov 2005; Kibrik 1994; Kotel'nikova 2012; Krasnykh 1997].

Besides, modern ICT show the transition to "livelier" interaction, viz. the students interact with them as something defined with the "artificial intelligence" (AI) concept.

Henceforth, the need for answers to the following questions appears: How will the interaction in educational process change with the presence of such subject as AI?; What should the teacher of the Foreign Language discipline pay attention to in case of using ICT? All above causes the **significance** of the studied problem.

Thus, the research **aims** to study students' interaction with AI. Since, as we write in [Islamov 2021], the influence of ICT can have a negative impact – "ICT with AI strongly influence their user from the point of the information processing by our consciousness. Some students shift their cognitive abilities to the functionality of AI" [Islamov 2021].

For the realization of the research purpose, we formulated a number of the following **tasks**: 1) to define and correlate the concepts "AI" and "educational ICT"; 2) to prove the use of a modeling method for the realization of the purpose;

Fig. 1. Interaction in the educational process
Рис. 1. Взаимодействие в образовательном процессе

3) to reveal some system factors influencing the course of the students' interaction with AI; 4) to characterize the dynamic processes proceeding in training the Foreign Language discipline due to the use of ICT with AI.

The **theoretical base** of the research *contains the works in the fields of cognitive studies of discourse and artificial intelligence, theory of pedagogy, modeling in pedagogical science, pedagogical interaction, information and communication technologies*, and *psychology*.

We chose the **analysis**, **modeling**, and **questioning methods** to solve the formulated tasks.

The *scientific novelty* means designing the model that demonstrates the features of the students' interaction with AI in ICT.

The **practical importance** of the research means that its results and conclusions may be suitable to organize the students' interaction with AI while teaching the Foreign Language discipline and other linguistic disciplines. It will help create a more detailed description of the development of mixed cognition among students of higher educational institutions nowadays.

Materials & Methods

Firstly, let us consider the ICT concept. Today there are several definitions for such technologies. Firstly, the definition of ICT legislatively exists at the federal level in some countries. For example, Russian Federal law of 27.07.2006 No. 149-FZ (Edition of 18.03.2019) *About information, information technologies, and information security* defines ICT as "processes, methods of search, collecting, storage, processing, granting, and the distribution of data and the ways of implementation of such procedures and practices"[1].

Secondly, the analysis of some researchers' works allows defining educational ICTs as integrating digital didactic means into training specialists. They provide a chance to reach the informatization level and open boundless opportunities for the reformation and innovation of training activity. They also allow searching the sources of knowledge unavailable earlier and create a uniform digital medium of interaction between the educator and the student, or the student and artificial intelligence [Asanova 2018; Drobysheva 2007; Islamov et al. 2020; Savel'eva et al. 2020].

The AI concept stands for "the cross-disciplinary school creating things that solve various problems human-likely. AI uses mathematics, logic, psychology, biology, philosophy, linguistic sciences, electronic engineer, etc." [Tolstel' 2005].

AI is "software and hardware carrying out the intellectual activity comparable with the human" [Islamov 2021]. Artificial intelligence intends to digitize human thought in its machinery coding.

English speakers use the expression *Artificial Intelligence*, i. e., "the ability to think, reason, and understand instead of doing things automatically or by instinct" [Collins English Dictionary 2008]. Other widespread languages have the similar term *Künstliche Intelligenz* (German), *Inteligencia artificial* (Spanish), *Intelligence artificielle* (French), *Intelligenza artificiale* (Italian), *Искусственный интеллект* (Russian, Iskusstveniy intellekt), etc.

We consider the European lexeme "intelligence" (mental capacities) closer to understanding the essence of this phenomenon, unlike the Russian one where this term is occasionally associated with science fiction by some non-specialists.

In our work [Islamov 2021], we note that not all ICT possess AI. Among all educational ICT valid for the Foreign Language discipline, we consider ICT with AI if it can *generate*.

For example, there can be machine translation, search engines, and writing assistants. Generation satisfies the above-stated definition of AI because generating ICT imitates human mental activity naturally. We state the following: "if the imitated action is more complex, then the software is closer to the concept of artificial intelligence. Hence, the work of such ICT is more independent and less predictable, and the algorithms of programs remind algorithms of human mentality" [Islamov 2021].

We chose the modeling method to realize the purpose of the study. Since the studied issue is related to the learning process, we relied on the modeling approaches approved in pedagogical science.

According to A. M. Novikov and D. A. Novikov: "the modeling method allows to study an object, process, or phenomenon in a convenient way (the original of the model). It might be an image, analog (thought or conventional: image, description, diagram, drawing, graph, plan, map, etc.). A model can be called an artificially created image of a particular object, device, process, phenomenon (and any system as a result)" [Novikov et al. 2010].

Yu. O. Delimova writes the following "the modeling method makes it possible to combine empirical and theoretical. It allows combining an experiment, the construction of logical structures, and scientific abstractions during the study of a pedagogical object" [Delimova 2013].

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[1] Federal Law № 149-FZ of 18.03.2019 "About information, information technologies and information protection". URL: http://www.consultant.ru/document/cons_doc_LAW_61798/ [ФР № 149-ФЗ от 18.03.2019 «Об информации, информационных технологиях и о защите информации»].

Fig. 2 represents some characteristic features of pedagogical modeling: "1) this is a pedagogical activity implemented in the conditions of the pedagogical process; 2) its purpose is not simply to obtain new information but to improve the educational process; 3) the modeled objects are not material; 4) the result is a pedagogical model as a developing entity" [Yakovlev et al. 2010].

M. V. Yadrovskaya notes another feature of models in pedagogy "since this model does not exist in reality, there is a lack of a clear classification, and we can present it from different points of view" [Yadrovskaya 2013].

Nevertheless, the educators developing models traditionally rely on essential components including goal, content, teaching strategies, task formation, educational results, feedback, and rating [Bespal'ko 1989; Dakhin 2010; Savel'eva et al. 2020; Joyce et al. 2017].

To demonstrate the specifics of the interaction of the students' groups with AI of educational ICT for studying the Foreign Language discipline, we built a model that uses some components typical in pedagogical science. The model presents the interaction of students with AI using three of them, and these are *1) planning-and-regulatory, 2) motivating-and-activity, and 3) cognitive components*. Modeling interaction aims to discover systemic factors that affect its progression.

The *planning-and-regulatory component* determines what ICT with AI the students will interact within foreign language classes. Some can motivate to interact, be more independent and less predictable, imitate human activity, and require reflection and evaluation. Thus, this component adjusts the upcoming interaction with AI.

The *motivating-and-activity component* demonstrates the interaction with AI by the students' interest in ICT. Using the questionnaire method, we discovered that the desire to interact with AI increased if the ICT used gamification. Thus, gaming language mobile applications increase the interest in the studied material, e.g., Duolingo (duolingo.com), Lingua Leo (lingualeo.com), etc. Also, a competitive element motivates students allowing them to compare their results.

We believe that the activity of all subjects of interaction also ensures motivation. We consider students and teachers as always active subjects. As for ICT, we point out two categories: passive subjects (ICT as a tool only) and active subjects (ICT with AI).

The former are educational ICTs with a one-sided *query-response*. These ICTs enter into interaction with students only on their demand. An example is using an electronic dictionary to search for a lexeme. The latter can interact with a student independently. For instance, ABBY Lingvo dictionary has ABBY Tutor (abbyy.com) service. On the one hand, it allows to make a list of words for learning or choose a ready-made one on the proposed topics. On the other hand, this application trains grammar and contains the necessary theory.

This application is an active subject because it can send a query to students and prompt them to respond, e.g., learning new words, considering grammatical topics, etc. Being an active subject, the student may respond or ignore this request. Thus, we get interaction with a two-way query-response (see Fig. 3).

Live and free interaction with AI motivates the students since they recognize ICT as a participant of the current educational process but not a tool.

The *cognitive component* of the model demonstrates the interaction of students with AI through their ability to analyze their knowledge and evaluate AI work. Thus, we observe the AI interaction via the student's reflexive and evaluation prism.

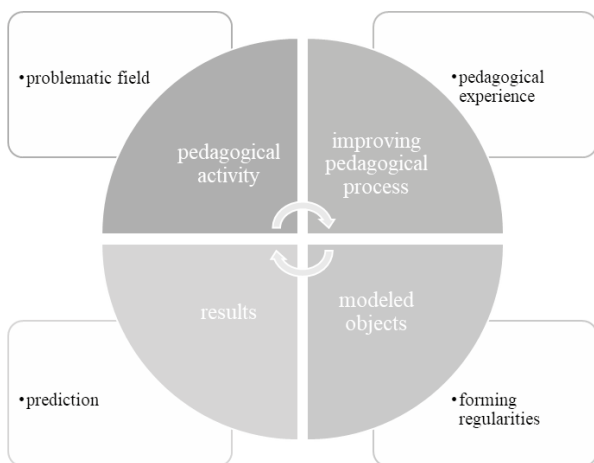**Fig. 2. Pedagogical modeling and its characteristics**
Рис. 2. Педагогическое моделирование и его особенности
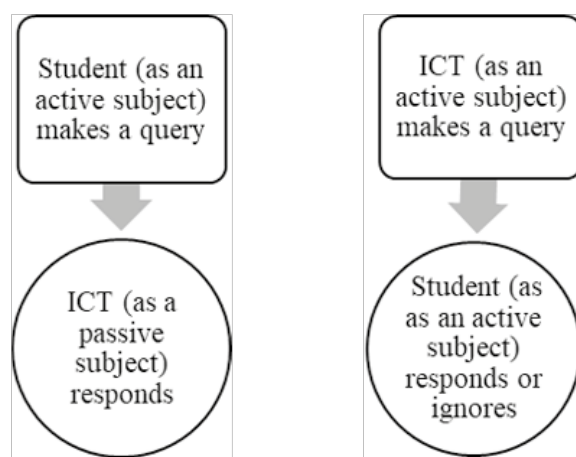

Fig. 3. ICT as a passive (left) and active (right) subject
Рис. 3. ИКТ как пассивный (слева) и активный (справа) субъект

To demonstrate the interaction with AI, we give an example of processing texts in natural language, viz. Machine Translation (MT) and Artificial Intelligence Writing Assistant (AIWA).

These technologies solve the problem of imitating human mental activity related to the analysis of the original text material and the generation of either utterly new one (MT) or partially-commented on lexical, grammatical, stylistic, or syntactic mistakes (AIWA).

The interaction of students with AI in ICT took place via a *query-response-reflection/evaluation* dialogue. We conducted the following experiment meant participation of such subjects as AI, an experimenter (educator), and students, viz. the bachelors of the first and second academic years of groups studying at non-linguistic departments of Kemerovo State University.

At **the first stage** of interaction (query), we asked the students to translate several texts in their field of study. The translation was from their native language via MT to English. They were also asked to render a scientific article offered by an experimenter with the following check by AIWA. The selected texts included complex syntactic constructions, lexical polysemy, and lexical and grammatical homonymy.

As a part of the **second stage** (response), the texts were computerized, and the results of AI work were obtained.

The third stage was the students' reflexive and evaluation activities. Their reaction to the machine results was gaged through a task: *Rate the result on a scale of 0–1–2 (where 0 – unacceptable, 1 – partially acceptable, 2 – acceptable).*

We observed the relationship between students' responses and their academic progress. Thus, students with higher academic scores picked out 0, rarely 1, but students with an average or lower academic progress picked out 2 or 1.

Therefore, we conclude that the level of proficiency in a foreign language plays a significant role in the student's interaction with AI. Students of non-linguistic departments with lower proficiency in a foreign language tend to show less reflection and evaluation and more trust in AI. Whether translation and check of the texts were correct or not, they fondly accepted the version offered by AI.

Fig. 4 shows the modeling of students' interaction with AI and some systemic factors affecting its progression:

In addition, modeling students' interaction with AI provided an opportunity to discover some dynamic processes in teaching the Foreign Language discipline through ICT.

We believe there is a current formation of students' category whose cognitive activity is limited by AI. We can consider this limitation through the prism of the *facilitation-inhibition* phenomenon. Many leading educators, theorists, and psychologists note that one of the tasks of any teacher is to allow the students to study and fill them with curiosity [Vygotskiy 2002; Sukhomlinskiy 2011]. Thus, the pedagogical interaction means the facilitating role for teachers. For example, C. Rogers connects facilitation and improving the quality of teaching [Rogers 1994].

On the contrary, AI plays an inhibiting role. This statement is demonstrated using Robert Baron's psychological *Distraction-Conflict* model [Baron et al. 1978]. Students with a low level of reflection and evaluation are distracted, and they tend to interact with AI to achieve desired results without their involvement and self-development.

It leads to a conflict in the students' interaction with a teacher because the environment of coherent and productive work created by the teacher is violated. Students' successes, achievements, and confidence in them are questioned. Students being subjected to AI inhibition do not develop, and their level of language proficiency stagnates. Moreover, the lower reflection leads to the attempts to fabricate AI work as their own.

When ICTs are passive subjects and experience a lack of the generating characteristic of AI, there is a decrease in the negative impact and the conflict with the teacher during the interaction.

planning-and-regulatory component
- *Systemic factor:* the course of futher interaction with ICT depends on the contents of component

motivating-and-activity component
- *Systemic factor:* the level of students' motivation to ineract with ICT increase with gamification and liveliness of AI

cognitive component
- *Systemic factor:* trust/distrust in AI correlates with the level of students' reflexive and evaluation abilities
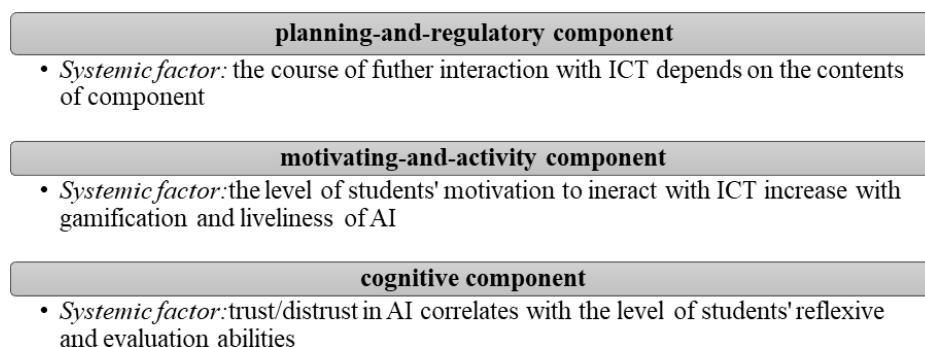
Fig. 4. Modeling the students' interaction with AI in ICT
Рис. 4. Моделирование взаимодействия учащихся с ИИ в ИКТ

Results & Discussion

The Department of Foreign Languages of Kemerovo State University verified the model in foreign language classes. Then the staff was asked to fill in a questionnaire on the applied use of the model. The educators of the department noted the importance of focusing on AI in ICT and its impact on student cognition.

Respondents believe that students should form a critical perception of the results of AI work. At the same time, the teacher is assigned the role of an observer of how students interact with AI. The gained experience should be directed to the adjustment of the program of further cooperative activity of all subjects of the educational process.

Conclusion

We come to the following **conclusions**: artificial intelligence is a system of software and hardware means that can simulate a human mental activity and influence cognition. AI is a part of modern information and communication technologies used in teaching various higher education disciplines today. As a result, students are increasingly interacting with AI of educational ICTs.

The modeling method was applied to realize the purpose of the study, and natural language processing programs were used as examples of ICT with AI. The conducted research was based on the Foreign Language discipline among the students studying at non-linguistic departments of the university.

We used the structure and components approved in pedagogical science to develop our model. As a result, the model includes three complementary components of interaction: planning-and-regulatory, motivating-and-activity, and cognitive components.

It was possible to describe the interaction of students with AI via the identification and analysis of systemic factors in each component. They are the controllability of future interaction, motivation for interaction, the activity of interacting subjects, and the students' level of reflection and evaluation.

In addition, the model demonstrates some of the dynamic processes taking place in teaching the Foreign Language discipline through ICT. It is the inhibitory property of AI in the development of student cognition and conflict in interaction due to the student's distraction from the teacher as a facilitator of the educational process. In conclusion, the problems in interacting with AI appear when students demonstrate lower reflection and evaluation.

Further research is seen in the additional development and improvement of the interaction model of all subjects of the educational process, taking into account the ongoing growth of more complex forms of AI, viz., neural networks. In future work, we plan to focus on the influence of ethnic identity on the interaction of representatives of different students' international groups with AI.

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Конфликт интересов: Автор заявил об отсутствии потенциальных конфликтов интересов в отношении исследования, авторства и / или публикации данной статьи.

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