Studies on the Trends of Artificial Intelligence Applications in Language Education

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Abstract

In the digital age we live in, artificial intelligence has begun to entirely take over human life in tandem with technical advancements. Language education is one area where artificial intelligence technology is being employed. This technology is starting to be used in practically every discipline, especially in the fields of economy, law, medicine, and industry. The process of learning and teaching one's native language as well as the language that has to be taught is called language education. Language education has seen significant advancements as a result of the development of artificial intelligence applications, and these breakthroughs have given rise to significant potential for language instruction. Artificial intelligence, which mimics the structure and functions of the human brain, greatly benefits people by solving problems and thinking like humans. Artificial intelligence applications have gained importance in language education, particularly in the areas of teaching mother tongue and second language acquisition, translating studies, and improving speaking, writing, and reading abilities. The purpose of this study is to ascertain the patterns of artificial intelligence applications in Turkish research, which are becoming more and more prevalent in the field of language instruction and are employed in practically every discipline. According to the study's objectives, papers from the TR Index database (n=8) and Google Scholar on artificial intelligence in language instruction were examined. Data were gathered for the study using a qualitative research paradigm using document analysis. The data were examined concerning the year of publication, the name of the researcher, the research methodology, the index where the study was published, and the institution where the researcher is employed. The study's findings included the following: the majority of the researchers were university members and faculty members (n = 4), the majority of publications were made in 2023 (n = 4), the majority of studies were conducted at Atatürk University (n = 2), the studies were scanned in the Tr Index index (n = 6), and the majority of studies employed qualitative methods (n = 7).

Introduction

The concept of artificial intelligence, which was first expressed by John McCarthy at the Dortmund Conference

in 1956, has now become one of the important research areas and topics in the fields of engineering, economy, agriculture, art, education, as well as language education (Alpaydın, 2013). The concept of artificial intelligence has arguably been considered the most important power of technology since the first half of the century we live in. In this regard, artificial intelligence technologies and applications have dominated almost all of our daily lives and have become an indispensable part of our lives. These developments in technology in recent years have deeply affected societies. Artificial intelligence, one of these developments, has created a revolution in human life. So much so that artificial intelligence is now included in human life in many countries, from internet search engines to smartphone applications, public transportation and home appliances. These complex algorithms and software are typical examples of artificial intelligence solutions that have become part of daily experiences (Bostrom and Yudkowsky 2011; Luckin, 2017).

These technologies serve on every platform through different devices and applications. Smart home appliances, autonomous cars or smartphone applications can be given as examples of artificial intelligence technologies. The widespread use of these technologies, which we use in almost every moment of our lives, in the field of education has brought significant advantages to education and training activities. Artificial intelligence technologies attract more attention every day, especially with the contribution of successful projects carried out in recent years, and research on this subject is becoming increasingly important. Artificial intelligence technologies, which have been used successfully in many sectors, have gained importance in language education in recent years (İşler, Kılıç: 2021). The events that have occurred in technology in the past twenty years and caused radical changes have deeply affected all societies. Artificial intelligence is one of the most important of these changes and has directly changed life in its ordinary course. In this process, artificial intelligence has entered every aspect of life and has made radical changes in every field it enters (Bostrom and Yudkowaky, 2011).

When the literature is examined, the differences in the definitions made with artificial intelligence attract attention. McCharty, the inventor of artificial intelligence, defined artificial intelligence as the calculator of the ability to achieve goals. Based on this definition, it is possible to accept artificial intelligence as the science and engineering of creating human-like intelligent machines, especially intelligent computer programs. In addition, a computer's display of human-like behavior such as reasoning, problem solving, inferring meaning and generalization, that is, using high-level cognitive skills, can be defined as artificial intelligence. The fact that this concept is relatively new has led to it being defined differently by different disciplines and fields (Arslan, 2017). Alan Turing, another pioneer of the applicability of artificial intelligence in machines, while defining artificial intelligence, discussed this concept in terms of its contributions to the field of computer science and also explained it in terms of the philosophical aspects of artificial intelligence developments (Muggleton, 2014). Definitions of artificial intelligence encountered in the literature include the emergence of big data, cloud computing, artificial neural networks and machine learning processes as a machines that can simulate the human intelligence of engineers (Zhai, 2021); a discipline that aims to ensure that computer systems have human-like intelligence (Yıkar, 2023); Deep learning is an artificial intelligence approach based on learning features and structures in large and complex data using multilayer artificial neural networks (LeCun, et al., 2015).

With its features such as solving problems, adapting to changing conditions, and adapting to different human languages and experiences, artificial intelligence is also at the stage of directly contributing to the education and training process, especially the management of knowledge in education. Today artificial intelligence has already entered the classroom and has taken education to a different dimension for students, teachers, or in high schools and universities around the world under the name of smart, adaptive, or personalized learning systems. This dimension continues with the process of collecting and analyzing big data generated by each student, which is now impossible to manage and reach (Arslan, 2017). With technological developments, artificial intelligence applications are decreasing day by day in terms of cost, while they are increasing day by day in terms of performance and awareness. Although it sometimes remains in the background in our daily lives, it has become widespread and inevitable in terms of impact. (Luckin, Holmes, Griffiths, & Forcier, 2017). This technology is used effectively in many different fields, from Siri to digital journalism, from predicting stock movements to predicting crime, from facial recognition to medical diagnoses and education (Holmes et al., 2019).

Artificial intelligence, with its features such as learning, making intelligent predictions, solving complex problems, adapting to changing conditions, and adapting to different human languages and experiences, which can be considered among the definitions of artificial intelligence, is also at the stage of directly contributing to the education and training process, especially the management of knowledge in education. In fact, today artificial intelligence has already entered the classroom and has taken education to a different dimension for students, teachers or in high schools and universities around the world under the name of smart, adaptive or personalized learning systems. This dimension continues with the process of collecting and analyzing big data generated by each student, which is now impossible to manage and reach (Arslan, 2017). With technological developments, artificial intelligence applications are decreasing day by day in terms of cost, while they are increasing day by day in terms of performance and awareness. Although it sometimes remains in the background in our daily lives, it has become widespread and inevitable in terms of impact. (Luckin, Holmes, Griffiths, & Forcier, 2017). And this technology is used effectively in many different fields, from Siri to digital journalism, from predicting stock movements to predicting crime, from facial recognition to medical diagnoses and education (Holmes et al., 2019).

While the subject of artificial intelligence in education is perceived by most researchers as the involvement of robot teachers in education, the reality is slightly different from what is expected. Artificial intelligence can be grouped under three headings in terms of the areas it deals with. These are data-based, logic-based and knowledge-based artificial intelligence approaches. From the 1980s to the 2000s, educational applications of artificial intelligence were mostly based on a knowledge-based approach (Sleeman and Brown, 1982). In the specified period, research areas focus on structures consisting of three modules: domain, student and pedagogical, mostly under the name of intelligent teaching systems (Woolf, 2009).

Noe (2009) listed the elements that put artificial intelligence in a special place among other educational technologies as follows;

- Matching the education with the individual needs of the student,
- Ability to communicate directly and respond,

- Modeling the learning process,
- Ability to decide what information is required and what information to provide to the student based on performance,
- Being able to decide on the levels of understanding that will be appropriate for the student,
- The ability to make decisions regarding the implementation process of education (Akkaya, Çıvğın, 2021).

With the developments in technology and software, the developed materials can not only support the student's self-learning, but also take on the role of the teacher in guiding and facilitating learning. Educational materials and software are equipped with artificial intelligence, giving them abilities such as thinking, abstracting, learning, adapting to new situations, and interacting like intelligent creatures (Uğur and Kınacı, 2014). With these features, artificial intelligence finds its place in the field of education by using it together with other learning methods, especially active learning, and the number of researches on this subject is increasing (Akdeniz, Özdinç: 2021). Uses artificial intelligence techniques to model a human teacher to enhance learning by providing better support for learners of the native language or another target language Recommendation systems are software tools based on machine learning and information retrieval techniques that provide recommendations for potentially useful items that might be of interest to someone (Hasanov, Laine & Chung, 2019).

Artificial intelligence applications are pedagogical computer programs that predict who, what and how to teach in language education and teaching. It can organize the educational program according to the data obtained by evaluating the student's performance in the learning process by using artificial intelligence techniques, determining the student's level, and interacting with the student. It is a system that can imitate what a human instructor can do by using pedagogical teaching techniques appropriate to the student's level and abilities (Piramuthu, 2005). Artificial intelligence applications increase the functionality of computers and ensure effective teaching. With this feature, it can be said that it is a revolution in education. Educational technologies, computer technology and artificial intelligence are used together in the design stages of artificial intelligence applications. The use of artificial intelligence in education has been gaining importance in recent years. In the artificial intelligence literature, the section on education occupies a small place (Arık and Seferoğlu, 2020; Tahiru, 2021). Artificial intelligence plays a supporting role in education, and especially in language education, by assisting teachers and providing learners with meaningful experiences (How and Hung, 2019). In recent years, with the development of robotic technology, the use of artificial intelligence in education has gained momentum. Humanoid robots Yuki and Sophia are also used in educational contexts (Retto, 2017).

Artificial intelligence technology, which is used in many aspects in education, can of course offer significant advantages and very innovative solutions in terms of teaching the mother tongue and the target language. Artificial intelligence promotes the use of adaptive learning environments and flexible, inclusive, personalized, and engaging educational technology tools in education (Luckin et al., 2016). These facilities provided in education will also facilitate language education in many aspects. The advantages of artificial intelligence applications in terms of language education can be explained as follows (Akkaya, Çıvğın, 2021):

* Artificial intelligence can make basic activities such as grading easier in the education process. In

addition, many problems that may occur in the grading process are resolved in this way. Again, grading processes can be made more objective and more egalitarian.

* Software prepared for educational purposes can be adjusted according to student needs. The student can complete his/her deficiencies and fill in the missing parts of the education process through the software provided for his/her needs.
* It can serve as a guide for teachers by showing areas of lessons that need editing. The guidance provided to the teacher can pave the way for lessons to be presented in a more interesting and effective manner. Making lessons more interesting will directly affect student and teacher success.
* Students can get additional support from instructors created with artificial intelligence. The basis for increasing students' academic success can be laid through the additional support they receive.
* Programs prepared with a focus on artificial intelligence can provide useful feedback to educators and students. Students and teachers who benefit from this useful feedback can directly see the pros and cons of their workplace and profession.
* It can change the role of teachers in the education process. The teacher's role can be transformed into a guiding position rather than a teaching one.
* With the help of artificial intelligence-based data, it can change the way schools find, teach and support students. The way can be paved for supporting students in areas where they can be more successful, not by subjecting them to direct exams, but through general analysis of their personal data.
* Artificial intelligence can change the way students learn in their learning environments, how they access information, and how they acquire basic skills.

Aim of the Study

Artificial intelligence is one of the most used and researched technologies in recent years. This research is to identify trends in research articles prepared in the field of artificial intelligence in language education prepared in Turkey and scanned in Google Scholar, Tr Dizin and other international indexes. . This study aims to present new perspectives to the academic literature based on studies on artificial intelligence, especially in the field of language education, to present new suggestions and ideas to researchers working in the field of artificial intelligence, to reveal the current situation through the preferred methods and the extent to which artificial intelligence is used in all sub-branches of language education. constitutes another purpose. In line with this purpose of the research, answers were sought to the following sub-problems.

* What is the distribution of articles on artificial intelligence in the field of language education by years?
* What is the distribution of articles on artificial intelligence in the field of language education according to the institution where the researcher works?
* What is the distribution of articles on artificial intelligence in the field of language education according to the title of the researcher?
* What is the distribution of articles on artificial intelligence in the field of language education according to the index in which they are scanned?
* What is the distribution of articles on artificial intelligence in the field of language education according to the method in which they are written?

Method

In this section, the research method, data collection tool, data analysis and validity and reliability titles are included.

Research Method

In this study, a systematic review method was used to examine and evaluate studies on artificial intelligence in language education in terms of various variables. A systematic review is a research method based on identifying, summarizing, and synthesizing publications related to these questions in line with certain criteria to find answers to determined research questions (Yılmaz, 2021). A systematic review is the process of determining which studies will be included in the review by comprehensively scanning all studies published in that field, using various inclusion and exclusion criteria, evaluating the quality of the studies, and synthesizing the findings in the studies included in the review to answer a clinical question or create a solution to a problem. (Centre for Reviews and Dissemination, 2008; Higgins and Green, 2011). A systematic review can examine quantitative and qualitative evidence or examine two or more types of evidence in a form called "mixed-method systematic review" (Hemingway and Brereton, 2009). A systematic review enables reaching some inferences in the light of studies conducted on a subject and provides information on this subject. It allows for obtaining conceptual knowledge (Hanley and Cutts, 2013). In the systematic review, a broad literature review is conducted on the concept under study, and the scope of the studies to be included in the compilation study is narrowed down and determined in line with various inclusion and exclusion criteria (Karaçam, 2013). The systematic compilation method, which allows a gradual look at the framework of the determined concept from general to specific, is a guide for studies to be carried out on this concept (Çelebi, Demir, & Karakuş, 2023).

Data Collection Tools

In this study, national and international indexes prepared in Turkey in the field of artificial intelligence in language education, such as SOBİAD, Tr Dizin, EBSCO, İndex Copernicus, Modern Language Academy, H. W. Wilson, Scilit, ERIH PLUS, were scanned. Since the issue has emerged in recent years, a start date has not been determined. The year 2023 was determined as the completion date for the articles reviewed. While scanning, studies written in Turkish and English were selected as the keyword in the title of artificial intelligence in language education. As a result of the preliminary screening, eight studies were found. Eligibility criteria were determined for the data, such as being an article published in a scientific peer-reviewed journal, being in English or Turkish, and having full text access. In a systematic review study, only a small number of studies can be found in studies conducted in a new and limited area (Slyer, 2016). A systematic review study should be conducted with at least two studies (Karaçam, 2013). However, in cases where there are no studies suitable for inclusion, systematic review studies with zero studies are also quite common (Yaffe et al., 2012; Çelebi, Demir & Karakuş, 2023). Below, the articles from which the research data were obtained are coded as A1, A 2, A 3, A 4, A 5, A 6, A 7 and A8.

Article1 (A1)	Akkaya, N. & Çıvğın, H. (2021). Artificial intelligence in Turkish education. *The Journal of International Education Science, 8*(29), 308-322.
Article (A2)	Aslan, E. & Kuşçu, E. (2015). *Applications of artificial intelligence in translation, Journal of KazımKarabekir Education Faculty, 31, 63-78.*
Article3 (A3)	Çelebi, C., Demir, U. & Karakuş, F. (2023). Artificial İntelligence literacy: a systematic review. Journal of *Necmettin Erbakan University Ereğli Education Faculty 5(2),* 535-560. https://doi.org/ 10.51119/ereegf.2023.67
Article4 (A4)	Kul, S. (2020). Natural language processing on the way to Turkish lecturer artificial intelligence, *Journal of Management Information Systems*, *6*(2), 43-56. ISSN: 2630-550X
Article5 (A5)	Şenyaman, G.(2023) The future of artificial intelligence in Arabic as a foreign language teaching: the example of ChatGPT, *RumeliDE Journal of Language and Literature Studies, (33*), 1057-1070. DOI:10.29000/rumelide.1285940
Article 6 (A6)	Yaman, İ. (2023). A comparison of deepl translate and google translate considering their English-Turkish And Turkish-English translation performances, *Söylem Journal of Philology Translation Studies Special Issue,* 29-41.
Article7 (A7)	Yıkar, G. (2023). An evaluation on artificial intelligence supported translation and text generation in persian language education. *RumeliDE Journal of Language and Literature Studies, (36),* 1204-1221. DOI: 10.29000/rumelide.1369151.
Article8 (A8)	Zileli, E., N. (2023). ChatGPT Example in Learning Turkish as a Foreign Language, *International Journal of Karamanoglu Mehmetbey Educational Research, 5(*1), 42-51.

Validity and Reliability

While analyzing data in this study, expert opinions were consulted to ensure validity and reliability. While coding the data in the study and determining the categories, the opinions of experts with at least the academic title of associate professor were consulted. An expert opinion form (Sözbilir & Kutu, 2008) was sent to the experts whose opinions were consulted and they were asked to independently code the studies selected for the research and examine the categories. In this context, responses were received from four associate professors and 3 professor experts whose opinions were consulted. 85% of the experts concluded that the data we discussed in our study was usable and that the coding was in line with the findings of the researchers. Compliance between coders of 80% and above ensures reliability in the analysis of the data (Miles et al., 2018; Çelebi, Demir & Karakuş, 2023). In this regard, it was concluded that the data analysis was suitable and reliable for the study. In ensuring the validity of the study, the researchers explained the stages of the study in detail, clearly and understandably with the help of tables, figures and graphs.

Results

This section includes the interpretation of the data obtained from the data collection tools and the results. In the table where the distribution of articles on artificial intelligence in the field of language education is examined by years, it is seen that the subject of artificial intelligence was first published in 2015. Among the 8 studies

reviewed, the year 2023 has the highest frequency value with five studies (n = 8). While conducting a literature review for conceptual studies on artificial intelligence, it was determined that no studies on this subject had been conducted in the years before 2015.

Table 1. Distribution of Articles on Artificial Intelligence in the Field of Language Education by Years

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
(A1)							✓			
(A2)	✓									
(A3)									✓	
(A4)						✓			✓	
(A5)									✓	
(A6)									✓	
(A7)									✓	
(A8)									✓	
f	12,5					12,5	12,5		62,5	100

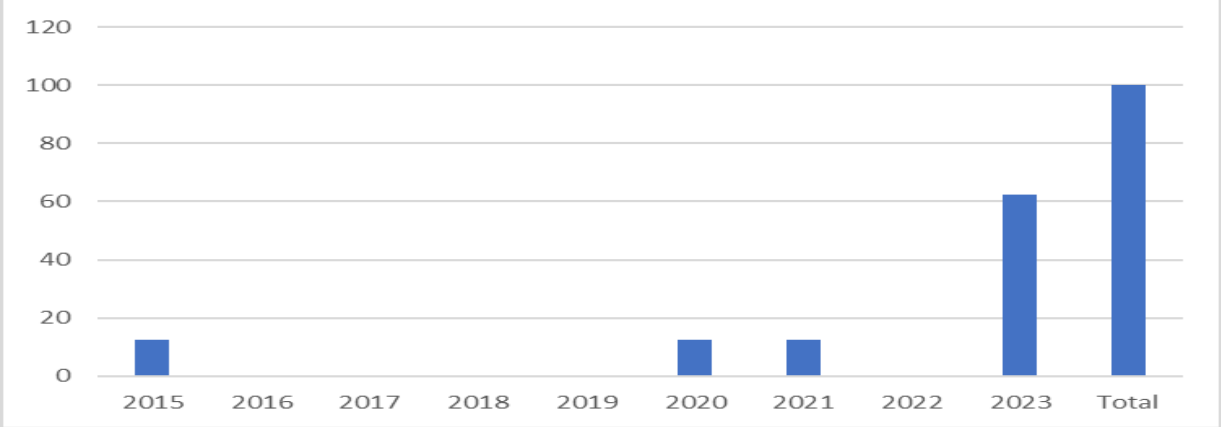
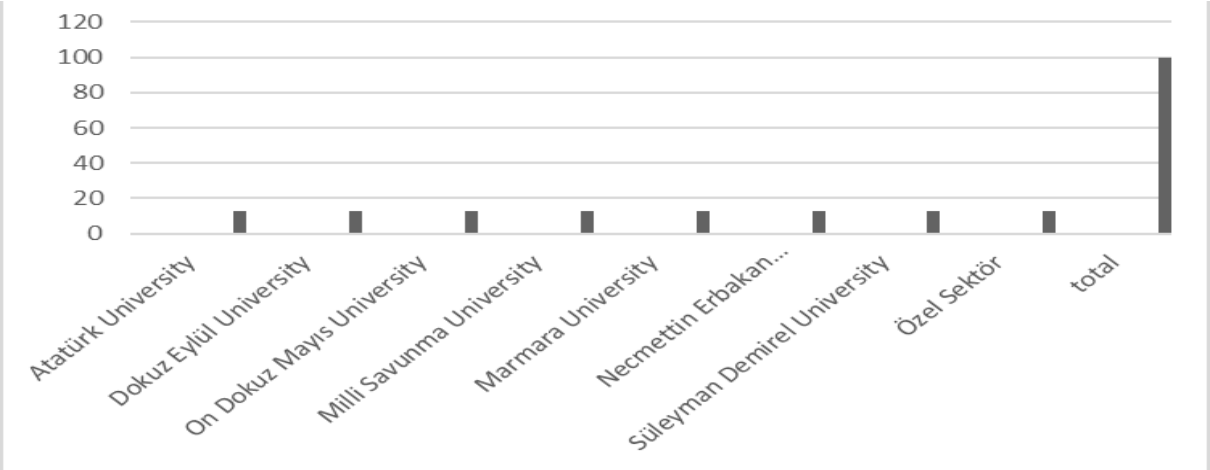


Table 2. Distribution of Researchers Working on Artificial İntelligence in the field of Language Education according to the İnstitution they work for

	Atatürk University	Dokuz Eylül University	On Dokuz Mayıs University	Milli Savunma University	Marmara University	Necmettin Erbakan University	Süleyman Demirel University	Özel Sektör	Total
(A1)		✓							
(A2)					✓				
(A3)						✓			
							✓		

	Atatürk University	Dokuz Eylül University	On Dokuz Mayıs University	Milli Savunma University	Marmara University	Necmettin Erbakan University	Süleyman Demirel University	Özel Sektör	Total
(A4)									
(A5)				✓					
(A6)			✓						
(A7)	✓								
(A8)								✓	
f	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	100

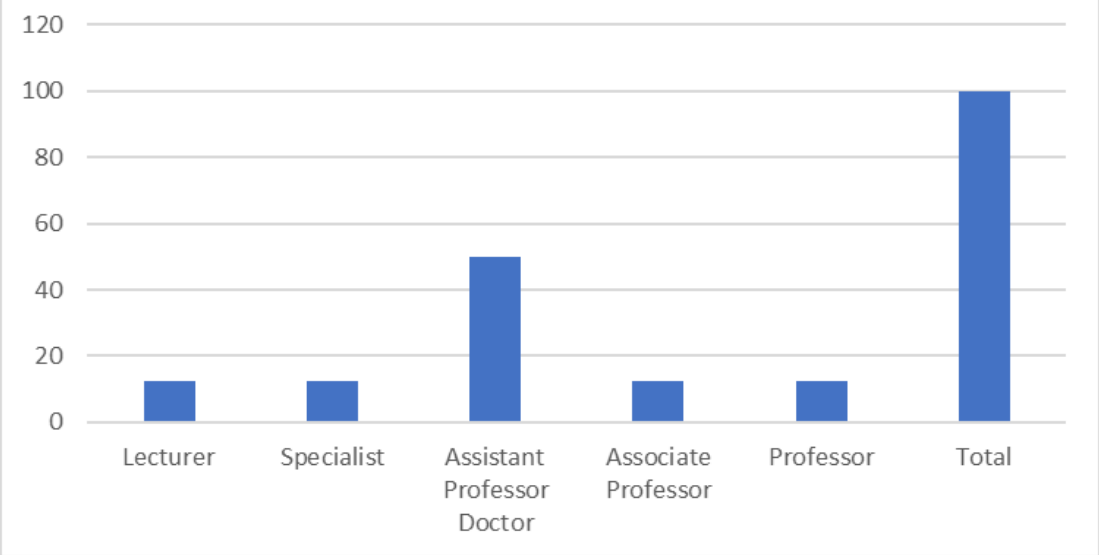


When the data of the institution where the researcher working on artificial intelligence in the field of language education is examined, it is seen that the researchers work at Atatürk, Dokuz Eylül, On Dokuz Mayıs, National Defense, Marmara, Necmettin Erbakan and Süleyman Demirel Universities and are members of these universities. Only one of the researchers is a member of the private sector/institution.

Table 3. Distribution of Articles on Artificial Intelligence in the Field of Language Education according to the Title of the Researcher

	Lecturer	Specialist	Assistant Professor Doctor	Associate Professor	Professor	Total
(A1)					✓	
(A2)				✓		
(A3)			✓			
(A4)			✓			
(A5)	✓					
(A6)			✓			

	Lecturer	Specialist	Assistant Professor Doctor	Associate Professor	Professor	Total
(A7)			✓			
(A8)		✓				
f	12,5	12,5	50	12,5	12,5	100



When the data obtained from the articles on artificial intelligence in the field of language education are examined according to the title of the researcher, researchers with the title of science expert, lecturer assistant professor and professor have published. It is seen that the researchers who published the most have the title of assistant professor (f = 50). The proportion of researchers working on artificial intelligence in language education consists of science experts, lecturers (f = 37.5), associate professors and professors (f = 25).

Table 4. Distribution of Articles on Artificial Intelligence in the Field of Language Education according to the Index in which they are Scanned

	National İndex	International İndex	Total
(A1)		✓	
(A2)	✓		
(A3)		✓	
(A4)		✓	
(A5)	✓		
(A6)	✓		
(A7)	✓		
(A8)		✓	
f	50	50	100

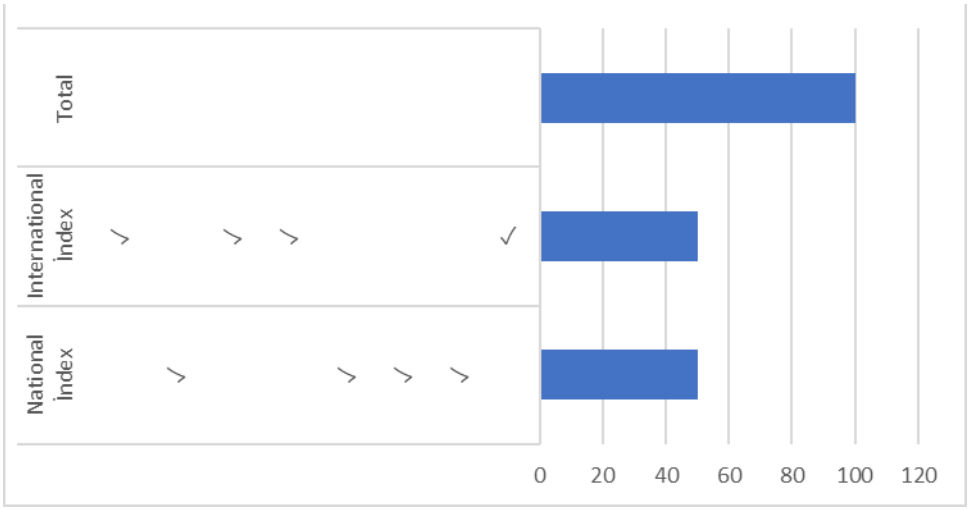
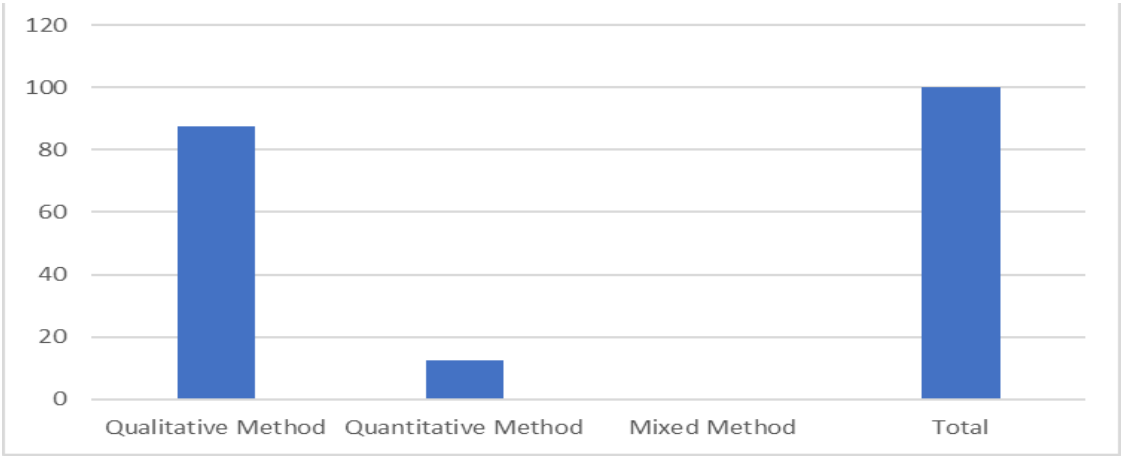


Table 5. Distribution of Articles on Artificial Intelligence in the Field of Language Education according to their Method

	Qualitative Method	Quantitative Method	Mixed Method	Total
(A1)	✓			
(A2)	✓			
(A3)	✓			
(A4)	✓			
(A5)	✓			
(A6)			✓	
(A7)	✓			
(A8)	✓			
f	87,5	12,5		100



When the data obtained according to the index in which articles on artificial intelligence in the field of language education are scanned are examined, it is seen that the studies have an equal distribution in terms of national and

international indexes. National databases and indexes Tr Dizin, Dergi Park, Türk Eğitim Index databases, and international databases EBSCO, ERIH PLUS, MLA, H. W. WİLSON Index Copernicus databases and indexes were taken into consideration.

When the table is examined, it is seen that almost all (n = 7) of the articles published in the field of language education were made with qualitative methods. When the studies are examined, the articles are generally done in the form of document analysis and contribute theoretical knowledge to the field. Only one study in the field of language education was conducted with a mixed method, in which qualitative and quantitative methods were used together.

Discussion

As in every field, developing technologies and the use of these technologies cause significant changes in the field of education. These changes bring with them many consequences. These results appear in the field of language education, as in every field of education (Akkaya % et al, 2021). Nowadays, especially when productive artificial intelligence applications are used in various fields including health, finance, education, transportation and production, there is a more important development in the field of language education. has begun to play a role (Mertala et al., 2022). With the use of artificial intelligence in the field of language education, individuals can use artificial intelligence-supported systems to process language, understand language rules, comprehend the features of language at the word, sentence and text level, as well as in meaning-based studies such as reading and listening; Students can gain basic language skills in expression activities such as speaking and writing. In this context, artificial intelligence applications have come to an important place in native language education and teaching a second language (Hornberger et al., 2023).

In line with the findings obtained in the research, the following conclusions were reached. It is seen that the first studies in language education in Turkey were published in 2015 by Kazım Karabekir Faculty of Education, a publication affiliated with Atatürk University. When national and international databases in Turkey are examined, the lack of studies on artificial intelligence in language education before 2015 is a deficiency in this field. The issue of the importance of artificial intelligence in language education has gained importance in Turkey with the pandemic process. Since 2020, language educators have started to work in this field. In 2023, it was concluded that these studies reached the highest level. This result is an important sign that studies on artificial intelligence in language education will increase in Turkey in the coming years. According to some studies, it is predicted that artificial intelligence will be employed in 9% of jobs in the education sector by 2035 (Benitti, 2012).

Robots are currently used to assist teachers in order to increase students' proficiency, especially in areas such as language, science and mathematics (Mubin et al., 2013). When the literature is examined, it is seen that there are a few studies in which robots are used to assist teachers in classrooms in order to increase students' proficiency in fields such as language, science, and mathematics. To realize an artificial intelligence project that can replace the teacher, machines must understand the language spoken by humans. Thus, it can be a solution alternative to

the problem of quality instructors and contribute to the development of personalized education models (Kul, 2020). As a result of the research, it is seen that most of the researchers researching artificial intelligence are academicians and almost all of them belong to various universities in Turkey. It has been concluded that most of the researchers from Atatürk, Dokuz Eylül, Ondok Mayıs, National Defense, Marmara, Necmettin Erbakan and Süleyman Demirel Universities have the title of assistant professor, and only one of the researchers has the title of associate professor and professor. This situation seems quite insufficient for Turkey, which has more than 200 universities and is among the top 25 countries with universities in the world. When the databases and indexes where published articles are scanned are examined, they show an equal distribution in terms of national and international indexes. Although this rate is sufficient for national indexes, being scanned in international indexes is an insufficient rate for Turkey in terms of international recognition. Almost all of the studies were conducted with the qualitative research model and document review. Only one of the published studies was conducted with a mixed model.

Recommendations

When the literature is examined, it is seen that there is a very insufficient number of studies addressing artificial intelligence and education issues in language education. New and in-depth research in this field will make significant contributions to the field of language education.

* In Turkey, seven different university members and one private sector employee conducted research on artificial intelligence in the field of language education. This rate is quite insufficient for a country with a developed higher education system like Türkiye. Researchers from other universities in Turkey should be directed to work in this field.
* Studies in this field can be encouraged to be more application-oriented, that is, in an experimental model.
* Researchers can send the studies they plan to do in this field to publishing institutions scanned in international indexes to gain international recognition and contribute to the international literature.

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