Review Article

Exploring the scope of artificial intelligence literacy in education: A bibliometric approach

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ARTICLE INFO	ABSTRACT
	The aim of the study is to research based on artificial intelligence (AI) literacy in the context of education with the bibliometric analysis method. Study identifies trends in studies on AI literacy and reveals the main disciplines, methodologies, and thematic focal points of this field. During the data collection process, a comprehensive search of the Web of Science and Scopus databases was carried out. A total of 154 articles published as of February 2025 were included in the analysis. The year of publication, database, research area, country of publication, journal in which it was published, university in which it was conducted, author distribution, method, abstract and keyword trends, and citation network information were analyzed. VOSviewer software was used for data visualization and network mapping. According to the results; It was seen that the first article on the subject was published in 2019 and the highest number of articles were published in 2024. In the researches, it was seen that AI literacy focused on teacher education, student skills, reflection on programs, ethical concerns and technological infrastructure. It was observed that the most phase research was conducted in China and the USA and the quantitative method was predominantly used. The journals in which the researches are published the most are Education and Information Technologies and Computers and education: Artificial Intelligence. As an institution, Education University of Hong Kong is the university with the most research on the subject. It was observed that the words AI, literacy, Higher education and teacher competency were used extensively as keywords and abstracts. In terms of the results, it was suggested to the researchers that comparative studies examining how AI literacy is perceived and applied in different cultural and educational contexts and research that includes multifaceted evaluations in which mixed methodology is put to work can be conducted.

INTRODUCTION

Today, artificial intelligence (AI) technologies show innovations in various fields such as data analysis, automation, and decision support systems. This technology has brought about a major transformation in some disciplines such as education, healthcare, finance, and industry. The 2024 Nobel Prizes in physics and Chemistry revealed the impact of AI in terms of various disciplines (Coulter, 2024). The fact that individuals can use these technologies consciously makes AI literacy mandatory. AI literacy is a multidimensional concept that includes individuals' competencies to understand, use, and critically evaluate AI. It requires not only technical knowledge, but also an understanding of the social, ethical, and pedagogical dimensions of AI (Li & Sun, 2024). In this context, understanding the importance and impact of AI literacy in educational processes has become an increasingly important research topic in the literature.

Bibliometric analysis is a systematic method that allows the quantitative examination of academic publications on a particular topic. Through bibliometrics, current trends in the field are identified and findings are presented as a guide for future research (Merigó & Yang, 2017). This study aims to present a bibliometric analysis of research focusing on AI literacy in the context of education. It was aimed to systematically reveal the knowledge in this field.

AI Literacy Definition and Context

The concept of AI literacy was first used in *iRobot: Teaching the basics of artificial intelligence in high schools*, published by Burgsteiner et al. (2016). This concept was initially focused on learning the basic principles in computer science. However, with AI technologies becoming increasingly integrated into everyday life, the definition of AI literacy has also changed over time. Today, AI is involved in many areas of life, and it is becoming increasingly important for individuals to be able to use this technology consciously. AI literacy is considered as a set of competencies that appeal to a wide range of individuals, rather than just a field that requires technical expertise (Mikalef & Gupta, 2021). AI literacy refers to the ability of individuals to critically use, evaluate, and interact effectively with AI technologies (Long & Magerko, 2020). According to another definition, AI literacy requires individuals to understand how AI systems work, collaborate with these systems, and evaluate them in an ethical framework (Wang et al., 2022). AI literacy is a concept that involves the combination of technical knowledge and ethical awareness. Understanding the impact of AI on decision-making processes and becoming informed users in these processes are among the key elements of AI literacy (Pinski & Benlian, 2023). In this context, individuals are expected to have the ability to analyze the information generated by AI, to distinguish between right and wrong, and to use these systems within the framework of ethical rules. It is important to be able to comprehend the capabilities and limitations of AI technology and understand how it can be used to solve real-world problems (Kong et al., 2021). Key components of AI literacy include awareness, use, evaluation, and ethical responsibilities (Wang et al., 2023). Individuals' basic knowledge of AI, their conscious and effective use of this technology, and their consideration of its social effects are among the factors that determine the scope of AI literacy.

AI literacy, as defined by Laupichler et al. (2022), consists of three basic dimensions: technical understanding, critical appraisal, and practical application. Technical understanding refers to the level of individuals' comprehension of AI technologies. In this context, the basic mathematical and statistical principles of AI algorithms, model building processes and techniques used in different types of AI are discussed. Mastery of concepts such as linear algebra, probability theory, and statistical analysis are among the important components of this dimension. Critical appraisal aims to enable individuals to develop an inquisitive and informed perspective towards AI technologies. In particular, issues such as ethical and social impacts, data privacy, privacy and justice are evaluated in this dimension. Being aware of the possible risks associated with the use of AI and being able to approach these technologies in a critical framework enables individuals to make informed decisions. Practical application focuses on how AI technologies are used in everyday life. Individuals' ability to develop AI-supported solutions, understand applications in different sectors, and integrate these technologies into their own business or projects are among the basic elements of this

dimension. Being able to evaluate the opportunities offered by AI in areas such as business, health, education and security strengthens this competence. According to Wang et al. (2023), this literacy includes four key elements: awareness, use, evaluation, and ethics. Awareness refers to the ability to recognize these systems and comprehend their functioning in the usage processes of AI technologies. The usage component includes the ability to perform various tasks by effectively using AI tools and applications. In this context, ease of access to AI systems and competence for their functioning are among the important factors. Evaluation, on the other hand, is defined as the ability to analyze the output produced by AI-based applications, to select the appropriate ones and to evaluate them critically. Finally, the ethical dimension includes the responsibilities associated with the use of AI technologies and the ability to perceive potential risks.

AI Literacy in the Educational Context

AI literacy is critical for students to prepare for the digital world of the future (Ng et al., 2021). AI literacy enables students to understand key concepts such as data analysis and machine learning. This is especially important in STEM fields (Chen et al., 2020). As students understand how AI systems work, they can evaluate these technologies more critically. This encourages students to become producers rather than consumers of technology.

The integration of AI literacy into educational curricula allows students to improve their algorithmic thinking and problem-solving skills. Research shows that AI-based learning tools improve students' academic performance (Holmes et al., 2019). Automated feedback systems personalize students' learning processes and make them more effective. The ethical dimension of AI literacy is important, especially in data privacy and algorithmic bias. Students should understand the potential risks and limitations of AI systems (Zawacki-Richter et al., 2019). AI literacy in education is also changing the role of teachers. By using AI technologies, teachers can design learning experiences that fit the individual needs of students (Luckin et al., 2016).

In order to comprehensively evaluate the effects of AI technologies in the field of education, it is not enough to examine the usage habits of individuals. At the same time, it is necessary to analyze the approaches of educational institutions towards these technologies. As a matter of fact, many educational institutions integrate AI-powered tools into their curricula, thus aiming to accelerate students' learning processes, improve individualized learning experiences, and provide instructors with a more efficient evaluation process (Akinwaler & Inanov, 2022). With AI literacy, it will be possible for students to comprehend the functioning of AI technologies and to use these tools consciously and effectively. In addition, an education model structured in line with the principles of ethics and social responsibility will contribute to protecting students from possible negative effects while making the most of the advantages offered by these technologies (Ran, 2024).

Understanding AI literacy in the context of education has become an important area of research. Studies in this area explore how AI literacy can be integrated across different levels of education and disciplines. AI literacy in higher education is a major focus, especially for prospective teachers and college students. In this context, Al-Abdullatif (2024) evaluated teachers' AI literacy levels and their trust in AI technologies, and Kong et al. (2024) evaluated the effects of AI literacy programs for university students on conceptual learning, ethical awareness, and empowerment. Furthermore, Zhang and Zhang (2024) investigated the effects of AI literacy in teacher education on instructional support and inclusive learning. AI literacy at the preschool and primary school level aims to introduce children to the concepts of AI at an early age. Su (2024) developed AI literacy assessment tools for kindergarten students and examined the effects of these tools on children's perceptions of robots and engineering attitudes. Eguchi et al. (2021) aimed to increase K-12 students' AI literacy levels through culturally responsive approaches.

In fields such as vocational education and nursing, AI literacy is focused on improving students' professional skills and research into how AI literacy can be integrated into nursing curricula (Abou Hashish & Alnajjar, 2024; Porter & Foronda, 2024; Tomlinson et al., 2025). Teachers' AI literacy levels play a critical role in enabling students to use AI technologies effectively. While Sperling et al. (2024) and Younis (2025) focus on how AI literacy can be integrated in teacher education; Jang (2024) has developed AI literacy training programs for pre-service teachers. Lee (2021) and Saklaki and Gardikiotis (2024) investigated the change in students' levels of ethical awareness after AI literacy training. AI literacy is also addressed through an interdisciplinary approach. Relmasira et al. (2023) discussed how AI literacy can be integrated in STEAM education, and Kim and Han (2023) developed a program that combines AI literacy and art education. However, in the digital

transformation process, AI literacy helps students improve their digital skills. Ndungu (2024) examined how AI literacy could be integrated into media and information literacy programs, Hong and Kim (2025) examined how AI education programs affected primary school students' digital and AI literacy levels, and Wu and Sun (2024) examined AI literacy education based on UNESCO's AI qualification framework. However, various scales and assessment tools have been developed to measure AI literacy levels. Ma and Chen (2024) developed an AI literacy scale for Chinese university students. Zhang et al. (2025) created an AI literacy concept inventory for middle school students. Yuan et al. (2024) developed a comprehensive scale to measure AI literacy competencies.

Scientific research results have an important place in influencing various fields of science, policies and practices. These results both provide an empirical basis for practices and guide practitioners in professional activities. In addition, many studies in the field of education serve an important function, forming the basis of educational reforms. The approach of integrating scientific research results, examining research on a particular topic from a broad perspective, and creating a new product is one of the widely used research methods today (Ellegaard & Wallin, 2015). Research such as determining the quality of educational research, mapping the general profile, the dimensions of these researches, and obtaining new upper results from the data (bibliometric analysis, systematic review, meta-analysis, etc.), which were especially popular in the USA in the 1980s, are among the types of research that are widely covered with increasing accumulation (Merigó & Yang, 2017). In particular, AI studies have gained momentum in the last few years and is a field of study. The first source to be determined by a researcher who plans to start new research is the studies that reveal the existing research, identify the missing areas in the literature, and present the results in a broad framework. Identifying trends by bringing together different studies in a particular area can help educators and decision-makers make informed decisions. At the same time, the resulting meta-result effect will find a wide range of research and application. This research provides a bibliometric analysis to understand the current state of AI literacy in education and to guide future research. It is expected that the findings will contribute to identifying the gaps in this field by revealing the general trends of academic studies on AI literacy.

The aim of this research is to examine the scope of AI literacy in education by using the bibliometric analysis method. In this context, answers to the following questions were sought.

- What is the publication year distribution of AI literacy articles in education?
- What is the distribution of AI literacy articles in education according to databases?
- What is the distribution of AI literacy articles in education according to research areas?
- What is the breakdown of AI literacy articles in education by country?
- Which journals are the most published with AI literacy articles in education?
- Which universities publish the most AI literacy articles in education?
- What is the author distribution of AI literacy articles in education?
- What are the keyword, summary word, and citation network distributions of AI literacy articles in education?

METHOD

Model of the Research

Case study model, one of the qualitative research methods, was used in the study. Case study refers to an in-depth process of analysis and identification on a finite system; this definition emphasizes the features that distinguish the case study from other qualitative research designs (Merriam, 2015, p. 40). Yin (2009), on the other hand, defines case study as 'a method that investigates a current event or phenomenon in its own real-life environment' in the context of the research process.

Universe and Sample of the Research

The universe of the study; Web of Science (Wos) and Scopus databases are articles in the field of AI literacy in education, the full text of which can be accessed. In this context, a total of 154 articles were included in the study.

Data Collection Techniques

Research strategy and inclusion/exclusion criteria

(1) The research process in the databases was done on 20.02.2025.

(2) The terms "*artificial intelligence*" and *"literacy"* and "*AI*" and *"literacy"* were searched in the databases as keywords.

(3) Have an original research or review article.

(4) As a result of the relevant literature review in the research; Author, year of publication, publication title, database, subject, university information, country information, journal information, citation information, keywords and abstract information were determined in accordance with the purpose and these data were withdrawn.

(5) In the research, each research was numbered by using the *Academic Publication Evaluation Form* prepared in this context, and apart from those specified, *it was withdrawn from the research for the reporting process* as a bibliography in APA 7 style.

Reasons for not including the research study in the context of the case study:

(1) Not available in relevant databases

(2) The full text is not accessible

(3) Lack of focus on AI literacy in the educational context

(4) It can be specified as a book chapter, thesis, report or paper.

As seen in the PRISMA diagram in **Figure 1**, in order to determine the studies that were suitable for analysis, all studies were scanned from the relevant databases within the scope of keywords. Of the studies whose full texts could be accessed, 1114 studies were included in the study pool. Of the studies examined, 562 studies that were duplicates/overlapping with the same studies in both the keywords and databases were excluded from the scope. In the second stage, the remaining 582 studies were examined in depth and 261 of these studies were removed from the pool due to irrelevant topics, 133 because they were not suitable for the main purpose, and 34 because they did not meet the inclusion criteria. The remaining 154 studies were transferred to the Mendeley Program for evaluation because they were suitable for the purpose.

Analysis of Data

In the study, document analysis was used in the analysis of the data. Docs can be journals, biographies and autobiographies, technical documents, field notes, diaries, official records, papers, reports or statistics, primary or secondary sources, historical events or chronologies, projects, plans, letters, photographs, books, articles (Cohen et al., 2017). It is known that documents are important sources of information about the relevant field and researchers generally work on these written documents in qualitative research (Wallen & Fraenkel, 2000).

In the study, document analysis was carried out in two stages. These are as follows:

(1) In the study group, it was obtained from *WoS* and *Scopus* bases and transferred to the computer environment in pdf format. In the study, *Mendeley Reference Manager, Excell*, and *VOSviewer* programs were used in the collection, classification and presentation of the data.

(2) In the second stage, the analysis of the studies transferred to the computer environment in the order of code numbers were made through the *academic publication evaluation form* developed within the scope of the research. In qualitative research, descriptive analysis techniques were used in the data analysis process. The first technique used is frequency analysis, which involves an approach that focuses on counting the frequencies of message elements. In this type of analysis, countable units are
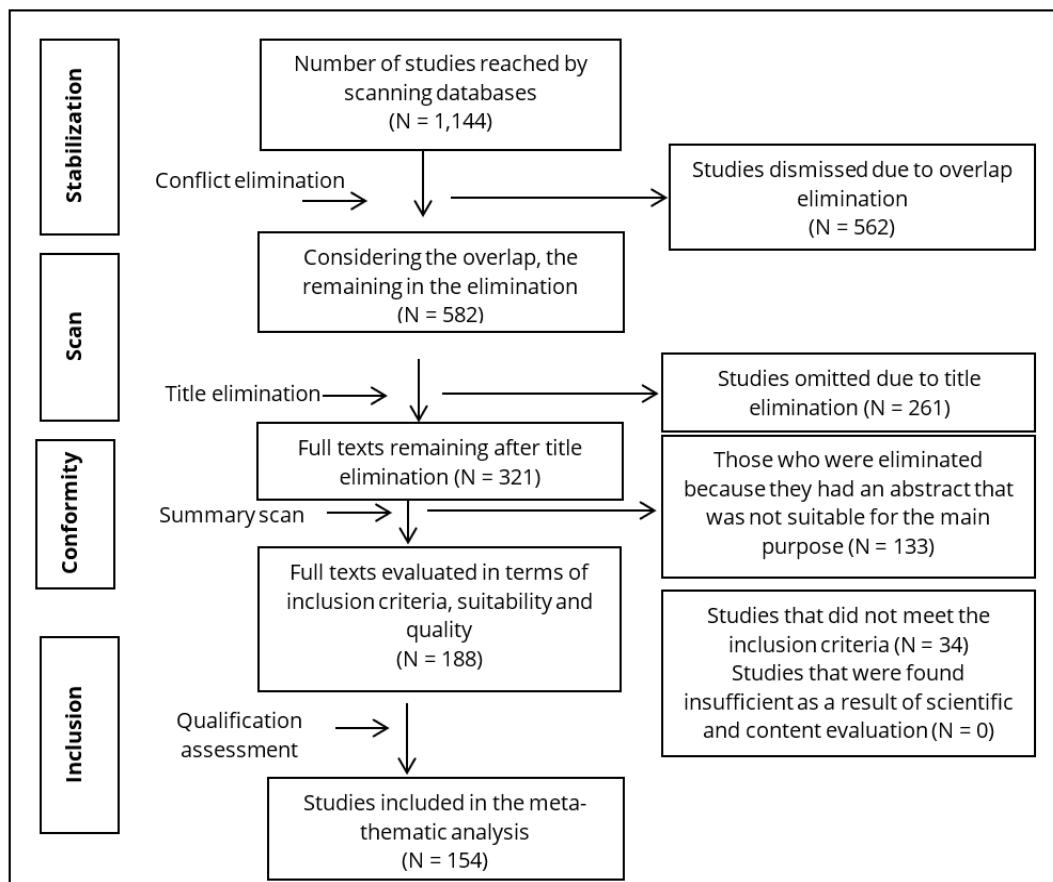
Figure 1. Flow diagram of the studies included in the analysis (Source: Authors)

determined and the analysis indicators are expressed in the type of frequency. Frequency analysis reveals in a simple way the frequency of quantitative appearance of recording units. During the analysis of the material, it was intended to count the message elements according to the frequency of a particular element, and these counts were expressed by the frequency type. This approach provides an understanding of how often a particular item occurs and the intensity and importance of that element in the context of analysis. As a result of frequency analysis, items can be ranked in order of importance and classified based on their frequency (Köhler & Stemmler, 1997).

## Validity and Reliability of the Research

Validity in qualitative research means that the researcher observes the phenomenon in its true form and as impartially as possible. In addition, the researcher's process of obtaining the data, explaining how he reached the results, and reporting the collected data in detail are also important criteria of validity (Merriam, 2015). In qualitative research, validity is handled in two ways: internal and external validity. Internal validity can be stated as the adequacy of the research process in revealing the truth under consideration. For this reason, the researcher is expected to be consistent both in the data collection process and in the analysis and interpretation of the data (Creswell., 2013). In this study, detailed definitions were made in the findings section in order to ensure internal validity, the information about the situation subject to the research was revealed with objective data, and then interpretation was made. The consistency between the data has been tried to be achieved by considering the internal homogeneity and external heterogeneity criteria. In other words, the similarities and differences are clearly revealed.

External validity can be expressed as the generalizability of research results. If the results of the research can be repeated to similar environments and situations, it can be said that the external validity of the research has been ensured. In this study, the withdrawal of publications from databases is explained in detail and the raw data obtained are presented in addition. It is defined in detail at a level that can be compared with different databases. Reliability; a clear and detailed description of the research process and data, i.e., in a way

Table 1. Distribution of the studies included in the research by years

Variable	Year	WoS	Scopus	Total number (n)	Percentage (%)
	2025	8	17	21	13.64
	2024	46	47	80	51.95
	2023	12	18	25	16.23
Year	2022	7	3	11	7.14
	2021	6	4	13	8.44
	2020	2	0	3	1.95
	2019	1	0	1	0.65
Sum		82	89	154*	100

* Articles with overlaps have been removed.
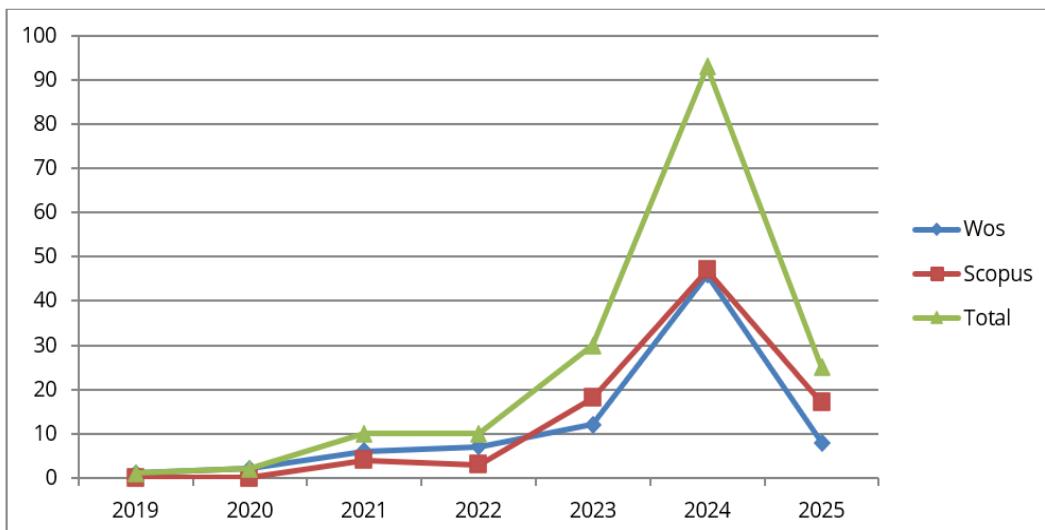
Figure 2. Distribution of researches by years on the basis of databases (Source: Authors)

that allows another researcher to evaluate them; in short, it is about the reproducibility of research results (Creswell., 2013). In this context, the analysis of the data was carried out by two experts and the formula developed by Miles and Huberman (1994) was used for the reliability calculation of the study.

Reliability = consensus/(consensus + disagreement).

In the calculation made according to the reliability formula, the reliability of the research was found to be 95%. Reliability calculations above 70% show that the research is reliable. According to the result obtained, it can be said that the research is reliable.

RESULTS

Findings for the First Sub-Research Question

The findings regarding the distribution of the researches in the first sub-research question of the research by years are presented in **Table 1**.

According to the findings in **Table 1**, the first studies started in 2019, and the highest number of studies belongs to 2024. The year 2024 represents a rate of 51.95% with a total of 80 studies. There are 25 (16.23%) studies in 2023 and 21 (13.64%) studies in 2025.

When we look at the distribution of the articles in the databases by year, in total, There are 82 studies in WoS and 89 studies in Scopus. The year 2024 is the year in which the most studies are published in both databases, with 46 studies in WoS and 47 in Scopus.

Figure 2 depicts the distribution of researches by years on the basis of databases.

The distribution of the articles included in the study according to the field class is presented in **Table 2**.

Table 2. Distribution of the articles included in the research by fields

Variable	Area	n	Percentage (%)
	Educational research	48	31.17
	Computer science	39	25.32
	Psychology	13	8.44
	Engineering	10	6.49
	Nursing	9	5.84
	Mathematics	6	3.90
	Environmental sciences ecology	5	3.25
	Arts and humanities	5	3.25
Field	Science technology other topics	4	2.60
	Health professions	3	1.95
	Business economics	2	1.30
	Health care sciences services	2	1.30
	Communication	2	1.30
	Information science library science	2	1.30
	Chemistry	2	1.30
	Telecommunications	1	0.65
	Agricultural and biological science	1	0.65
Total		154	100
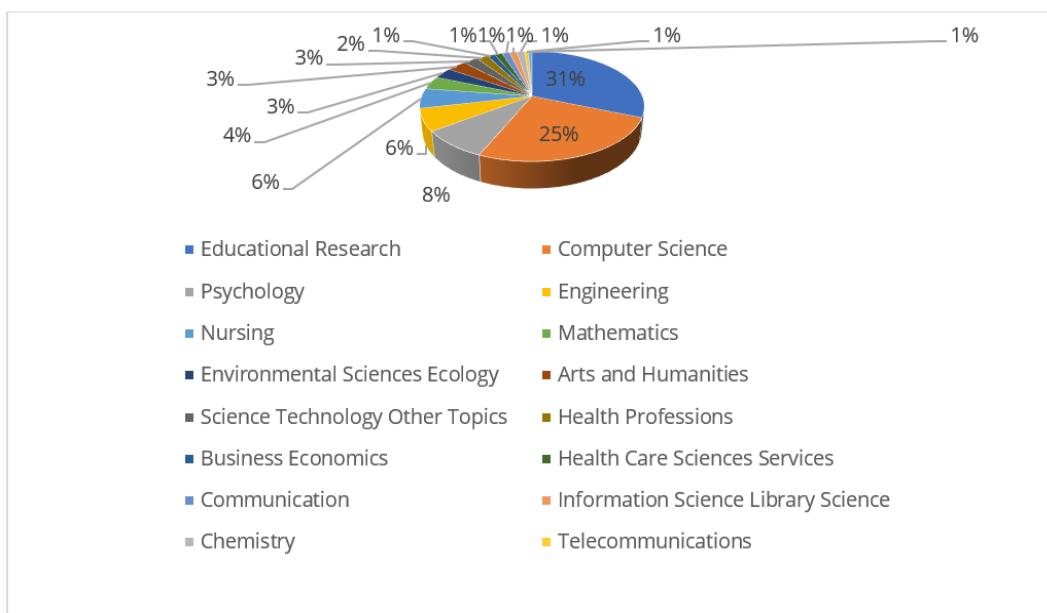
Figure 3. Distribution of articles by fields (Source: Authors)

According to **Table 2**, the highest rate belongs to the field of educational research, which has a rate of 31.17% with 48 articles. This is followed by computer science with 39 articles and a rate of 25.32%. He has 13 (8.44%) articles in the field of psychology and 10 (6.49%) articles in the field of engineering. Telecommunications and agricultural and biological science fields each contain 1 (0.65%) article.

Figure 3 shows the distribution of articles by fields.

In **Table 3**, the distribution of articles on AI literacy in education according to their subjects is presented as themes and categories.

When we look at the subject distributions of the articles; It was seen that they were gathered in the themes of teacher education, student skills, training programs, ethical concerns, and technological infrastructure. Within the scope of teacher education, the most examined issue is the AI literacy levels of teachers and it was discussed in 12 studies. On the subject of student skills, the impact of AI literacy on student assessments stands out with 15 studies. Under the theme of educational programs, the integration of AI literacy into the curriculum is the most researched topic with 14 studies. While data privacy and security were discussed in 10 studies under the title of ethical concerns, technological infrastructure requirements were the most examined

Table 3. Distribution of articles on AI literacy in the context of education by subject

Theme	Category	Frequency
AI literacy and teacher training	Teachers' AI literacy levels	12
	Design and implementation of AI literacy training programs	10
	The relationship between AI literacy and teacher competencies	6
	The contribution of AI literacy to teacher professional development	5
AI literacy and student skills	Assessing students' AI literacy levels	15
	The effect of AI literacy on students' critical thinking skills	12
	The relationship between AI literacy and STEM skills	10
	The impact of AI literacy on student achievement	6
	Impact of AI literacy on student outcomes (excluding achievement)	6
AI literacy and training programs	Integration of AI literacy into training programs	14
	Ethics and social responsibility in AI literacy education	7
	Technological infrastructure and access in AI literacy education	6
AI literacy and ethical concerns	Data privacy and security with AI literacy	10
	Algorithmic bias and fairness in AI literacy education	8
	Global standards in AI literacy education	5
	AI literacy and equal opportunity	
AI literacy and technological infrastructure	Technological infrastructure requirements in AI literacy education	10
	Open-source platforms in AI literacy education	7
	Learning management systems in AI literacy education	6
	Online and hybrid learning models in AI literacy education	5
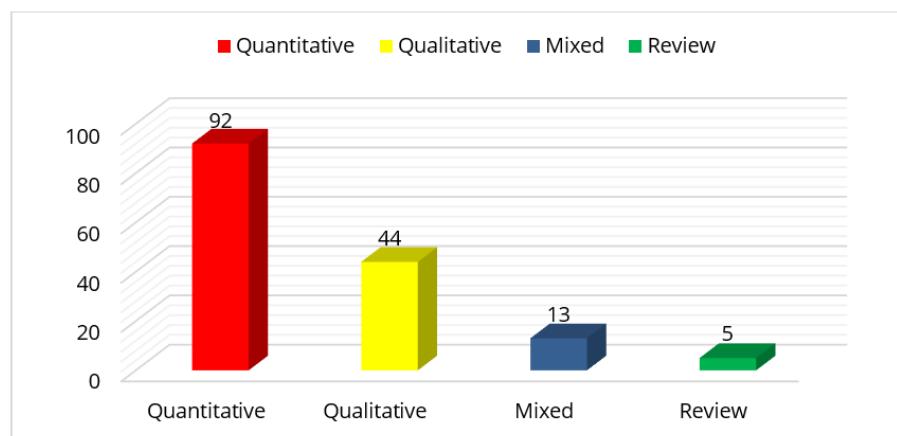
Figure 4. Distribution in terms of research method (Source: Authors)

issue in AI literacy education within the scope of technological infrastructure. The findings show that AI literacy is considered as a multidimensional research area in education. The distribution of the studies according to the method is presented in **Figure 4**.

Most of the studies were carried out by quantitative method (n = 92, 59.74%). This is followed by qualitative studies (n = 44, 28.57%) and mixed studies (n = 13, 8.44%). In addition, the number of review type studies was stated as 5 (3.25 percent). The distribution of the articles according to the countries where they were made is presented in **Table 4**.

According to **Table 4**, it is seen that the most research in this field was carried out in China (n = 28, 18.18%). This is followed by the USA (n = 17, 11.04%), Hong Kong (n = 12, 7.79%), the UK (n = 10, 6.49%), Australia (n = 8, 5.19%), and Saudi Arabia (n = 7, 4.55%).

Table 4. Distribution of research by countries

Variable	Country	n	Percentage (%)
Country	China	28	18.18
	USA	17	11.04
	Hong Kong	12	7.79
	England	10	6.49
	Australia	8	5.19
	Saudi Arabia	7	4.55

Table 4 (Continued).

| Variable	Country	n	Percentage (%)
	Finland	7	4.55
	Egypt	6	3.90
	Malaysia	5	3.25
	South Korea	5	3.25
	India	4	2.60
	Sweden	3	1.95
	Germany	3	1.95
	Taiwan	3	1.95
	Turkey	3	1.95
	Philippines	2	1.30
	Iran	2	1.30
	Palestine	2	1.30
	Belgium	2	1.30
	Brazil	2	1.30
	Latvia	2	1.30
	Lebanon	2	1.30
	Greece	2	1.30
	Indonesia	2	1.30
	Japan	2	1.30
	Jordan	2	1.30
	Kuwait	2	1.30
	Cuba	1	0.65
	Germany	1	0.65
	Hungary	1	0.65
	Italy	1	0.65
	Portugal	1	0.65
	South Africa	1	0.65
	Switzerland	1	0.65
	Tunisia	1	0.65
	United Arab Emirates	1	0.65
Total		154	100
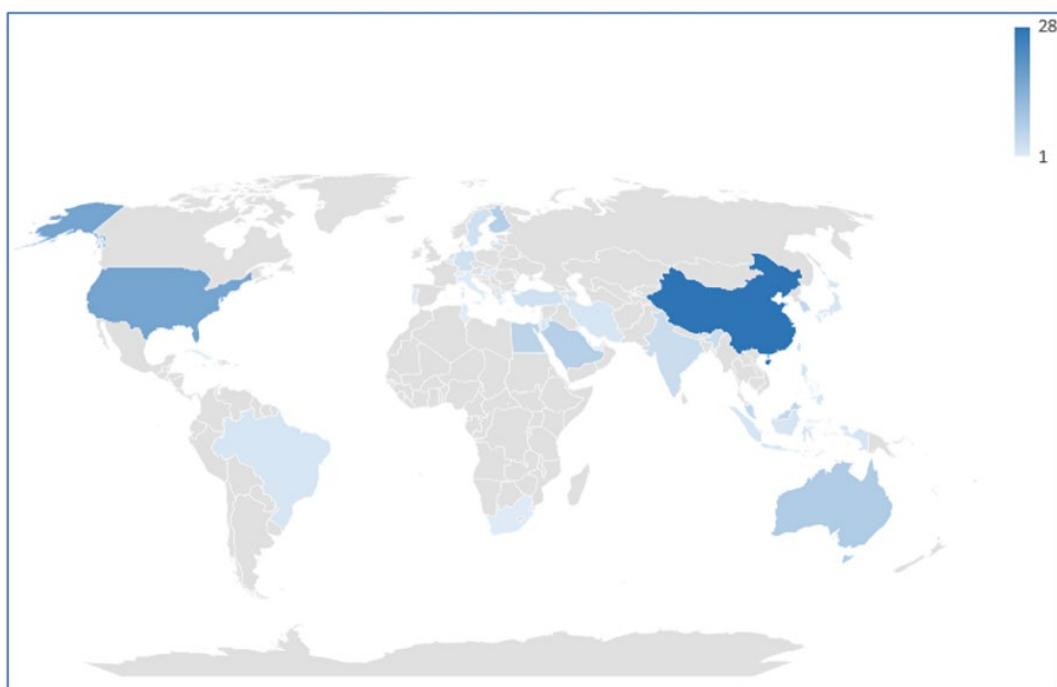
**Figure 5.** Distribution by countries (Source: Authors)

Figure 5 shows the distribution by countries.

The distribution of articles according to the journals in which they were published is presented in **Table 5**.

Table 5. Journals where research is published most frequently

Variable	Journal*	n	Percentage (%)
	Education and Information Technologies	15	9.74
	Computers and Education: Artificial Intelligence	13	8.44
	Computers and Education Open	12	7.79
	Journal of the Korean Association of Information Education	8	5.19
	Nurse Education in Practice	5	3.25
	International Journal of Artificial Intelligence in Education	4	2.60
	Journal of Library and Information Science in Agriculture	4	2.60
	Interactive Learning Environments	4	2.60
	Nurse Education Today	3	1.95
	BMC Medical Education	3	1.95
	Teaching and Learning in Nursing	3	1.95
	Education Sciences	3	1.95
Journal	Frontiers in Education	3	1.95
	Policy Insights from the Behavioral and Brain Sciences	2	1.30
	Research in Learning Technology	2	1.30
	Sustainability	2	1.30
	Journal of Computer Assisted Learning	2	1.30
	Journal of Educational Computing Research	2	1.30
	Journal of Research on Technology in Education	2	1.30
	Journal of Digital Contents Society	2	1.30
	Journal of Energy and Climate Change Education	2	1.30
	Journal of Korean Institute of Intelligent Systems	2	1.30
	Journal of the Korea Society of Computer and Information	2	1.30
	Korean journal of elementary education	2	1.30
	The Journal of Korean Association of Computer Education	2	1.30

* Journals with more than one article
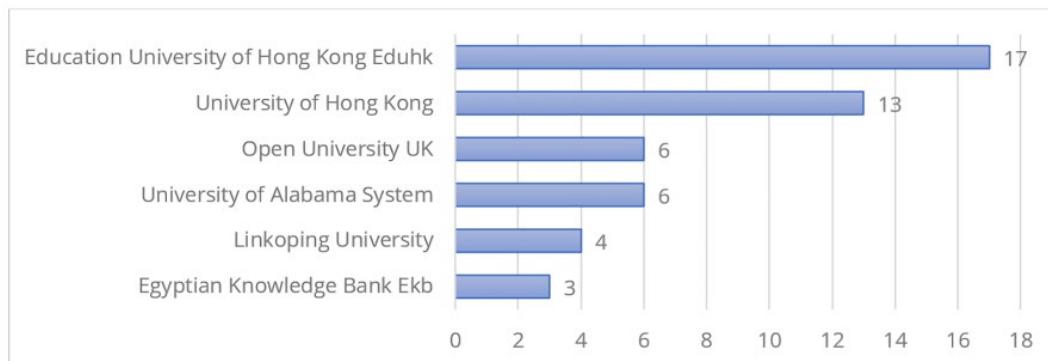
Figure 6. Distribution by research institution (universities) (Source: Authors)

According to **Table 5**, it is seen that the highest number of publications *were* made in the journal *Education and Information Technologies* (n = 15, 9.74%). This is followed by *Computers and Education: Artificial Intelligence* (n = 13, 8.44%), *Computers and Education Open* (n = 12, 7.79%) and *Journal of the Korean Association of Information Education* (n = 8, 5.19%). In addition, *Nurse Education in Practice* (n = 5, 3.25%), *International Journal of Artificial Intelligence in Education* (n = 4, 2.60%), *Journal of Library and Information Science in Agriculture* (n = 4, 2.60%) and *Interactive Learning Environments* (n = 4, 2.60%) are other prominent journals.

**Figure 6** depicts the distribution by research institution (universities).

When the distribution of the studies by universities is examined, it is seen that the most publications were made by *Education University of Hong Kong* (n = 17) and *University of Hong Kong* (n = 13). This is followed by *the Open University UK* and *the University of Alabama System* (n = 6). In addition, *Linköping University* (n = 4) and *Egyptian Knowledge Bank* (n = 3) are among the institutions where research has been published. The most frequently published authors are presented in **Table 6**.

When the researchers with the most frequent publications are examined, Kong, S. C. (n = 13, 8.44%) stands out as the researcher with the highest number of publications. This is followed by Su, J. H. (n = 10, 6.49%),

Table 6. Authors with most frequently published research

Variable	Author*	n	Percentage (%)
	Kong, S. C.	13	8.44
	Water, J. H.	10	6.49
	Cheung, W. M.-Y.	8	5.19
	Zhang, G.	6	3.90
	Korte, S. M.	3	1.95
	Adeeko, O.	2	1.30
	Adelana, O. P.	2	1.30
	Ahmad, Z.	2	1.30
	Al-abdullatif, A. M.	2	1.30
	Alamaeki, A.	2	1.30
	Alharbi, A.	2	1.30
	Alhuwailah, A.	2	1.30
Author	Alsabri, M. A.	2	1.30
	Alsenany, S. A.	2	1.30
	Amen, R.	2	1.30
	Arya,l S.	2	1.30
	Prime, M. G. R.	2	1.30
	Atenas, J.	2	1.30
	Ayanwale, M. A.	2	1.30
	Chu, S. K. W.	2	1.30
	Keskitalo, P.	2	1.30
	Lee, J. C. K.	2	1.30
	Ng, D. T. K.	2	1.30
	Tsang, O.	2	1.30
	Wang, L. X.	2	1.30
	Yang, W.	2	1.30

* Authors in more than one article
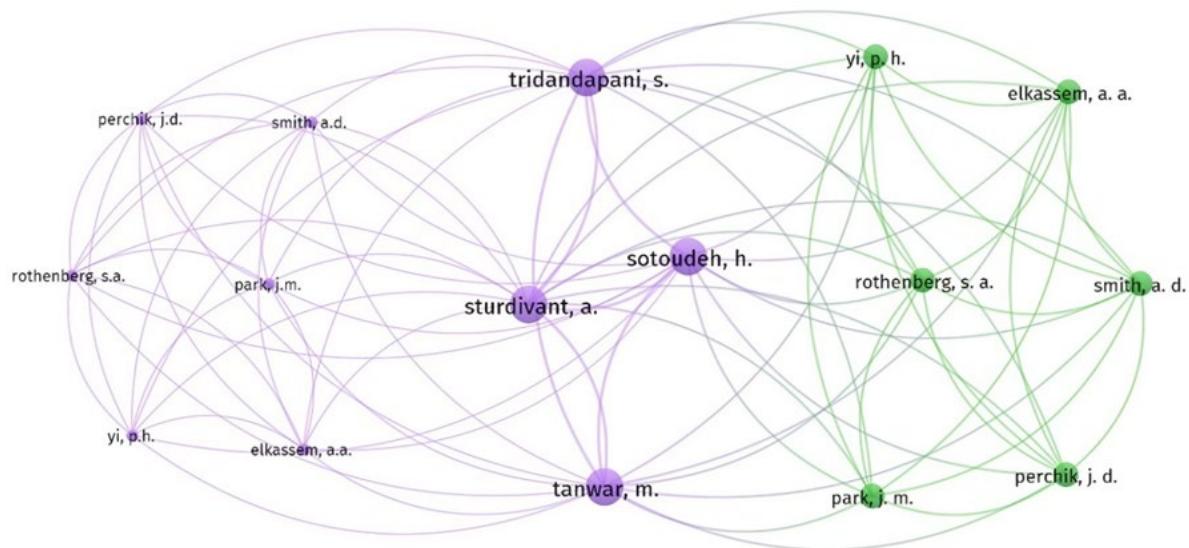
Figure 7. Author co-citation network (Source: Authors)

Cheung, W. M.-Y. (n = 8, 5.19%), Zhang, G. (n = 6, 3.90%) and Korte, S. M. (n = 3, 1.95%). The authors' common citation networks are presented in **Figure 7**.

As seen in **Figure 7**, it is seen that certain author groups create denser connections in terms of the co-citation network of authors. Especially authors such as Tridandapani, S., Sotoudeh, H., Sturdivant, A., and Tanwar, M. have a wide citation network by being in a central position.

In the research, the keywords of the articles were also examined in terms of word density analysis and the result is presented in **Figure 8**.

As can be seen in **Figure 8**, the words "artificial intelligence", "artificial intelligence literacy" and "AI literacy" stand out. However, it is seen that the words "higher education", "curriculum", "AI education" and "digital
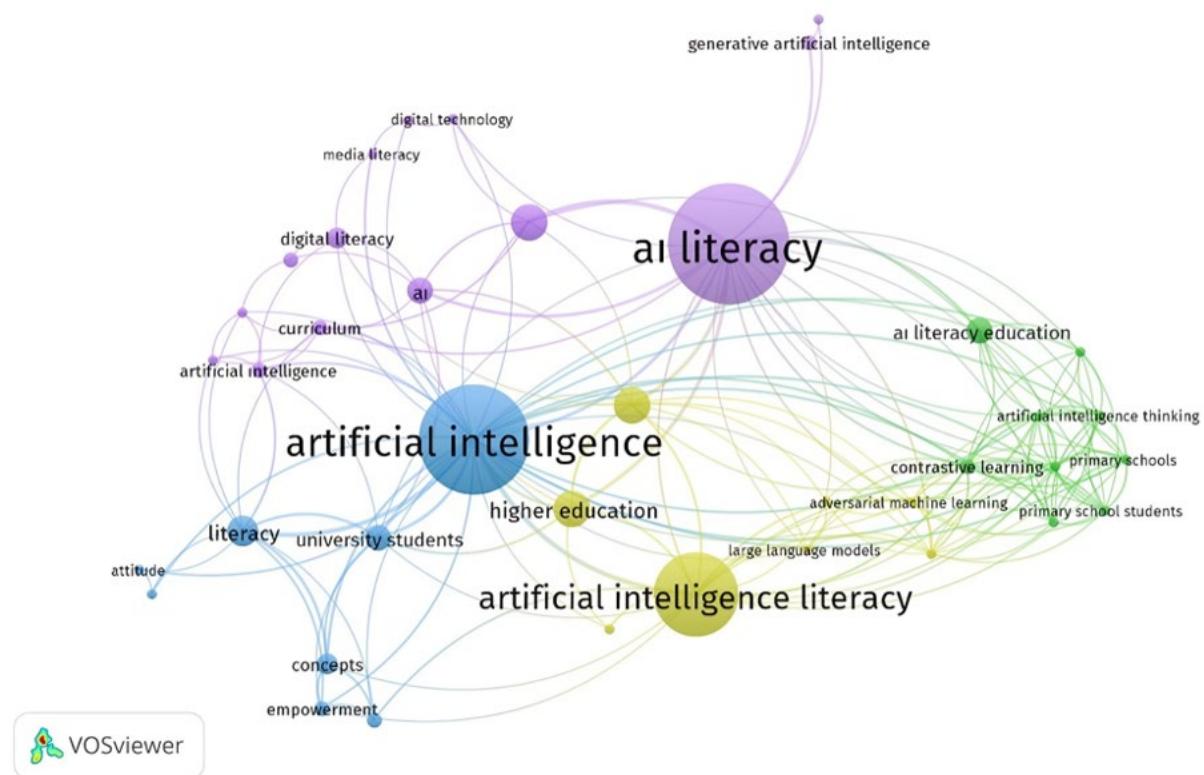
Figure 8. Keyword density analysis (Source: Authors)

literacy" stand out. The results of the density analysis of the words in the abstract section of the articles are presented in **Figure 9**.

Network structure shows that words such as education, AI literacy, teacher competency, ability, and content stand out. In addition, it is seen that the concepts related to survey, relationship, participant, and machine learning have intense connections.

DISCUSSION AND INTERPRETATION

In this study, bibliometric analysis of articles in the field of AI literacy was made according to years, databases, disciplines, subject distributions, research methods, countries, journals, institutions and authors. The findings reveal that AI literacy has an increasing importance in the field of education and that the studies in this field exhibit a multidimensional structure. The distribution of research on AI literacy by year reveals that this field is attracting more and more attention. It is seen that the studies that started in 2019 have rapidly reached the highest level by 2024. This trend shows that AI has an increasingly important place in education systems and academics are paying more attention to this issue. Chiu et al. (2024) reveal that there is a growing interest in the integration of AI in education systems. Databases are the providers that present research trends most effectively. The parallel increase in both WoS and Scopus databases shows that AI literacy attracts attention in the academic world and is studied as an international issue. AI literacy is also handled together in different disciplines such as psychology, computer science and engineering, which are associated with education. Allen and Kendeou (2024) state that AI is an interdisciplinary field of study and the use of AI in education occurs in conjunction with different fields. Educational research met most intensively in the common field of computer science and AI literacy. One of the main reasons for this is the technical need for the integration of this technology into teaching processes. Not only educational sciences, but also social sciences such as psychology conduct research on AI literacy.

It is seen that AI literacy is handled in a multidimensional way in education. In particular, topics such as teacher education, student assessments, and curriculum integration are prominent topics in research. Alamäki et al. (2024) reveal that training teachers in AI literacy will help them make their lessons more efficient,
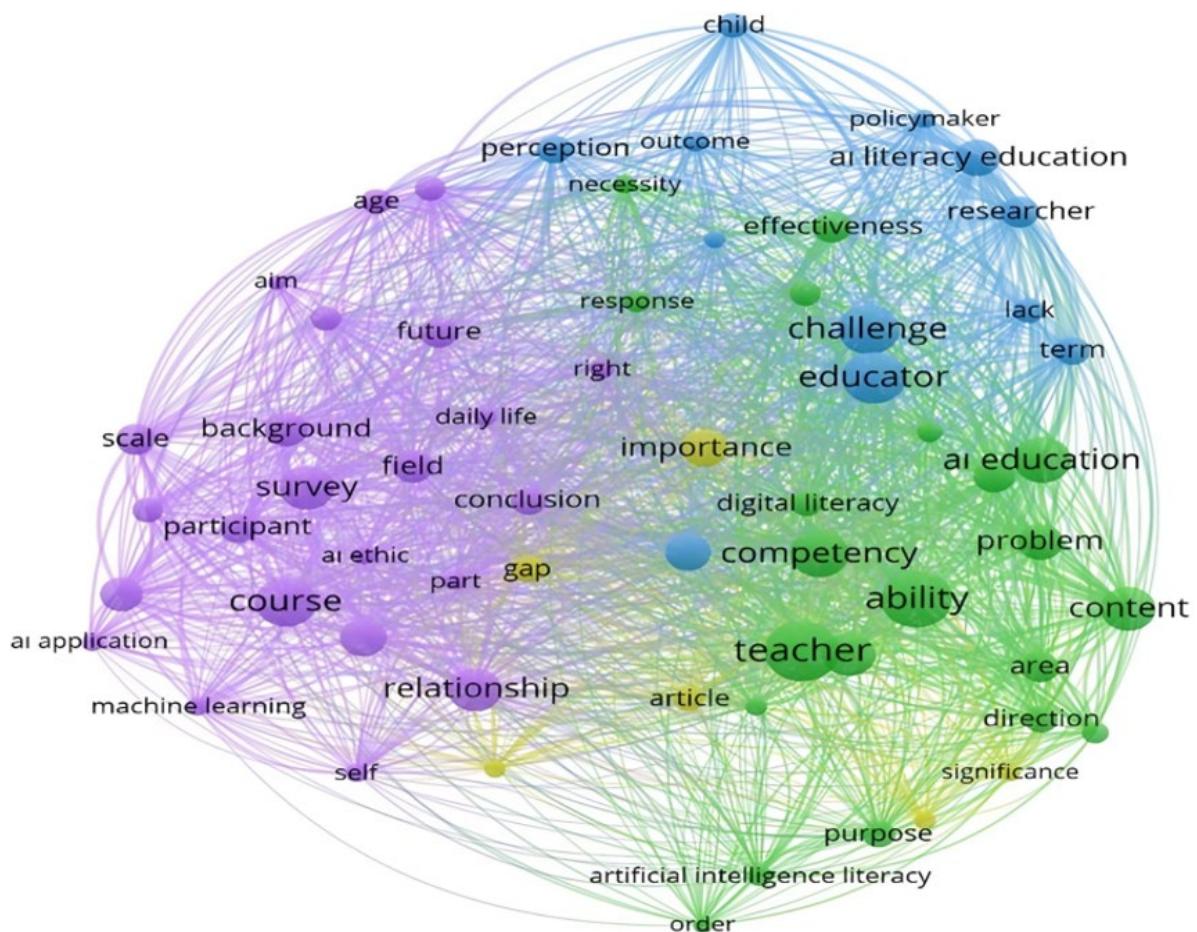
Figure 9. Summary content density analysis (Source: Authors)

which will contribute positively to students' academic success. These findings emphasize the importance of teachers adapting to new technologies in the digital transformation process. Students' interactions with AI-based tools, their cognitive development, and their motivation to learn are among the important research topics in this context (Won, 2023). The use of AI-based systems in education also raises ethical concerns and data privacy issues. Chiang et al. (2022) state that the growing awareness of the use of AI in education has increased interest in data security and ethics. Issues such as how students' personal data are processed and what kind of biases AI-based systems have in decision-making processes are of interest to researchers. In addition, the technological infrastructure required for AI education is also an important topic of discussion. The level of access of students and teachers to these technologies, especially in low-income regions, is considered as one of the important factors limiting the spread of AI literacy.

In terms of research methods, it is seen that the vast majority of studies on AI literacy are carried out with quantitative methods. Do and Kim (2023) state that this trend is due to the need to evaluate AI literacy with measurable outputs. However, the use of qualitative research and mixed methods allows for in-depth analysis of the subject. Choi (2024) states that AI literacy is a quality that cannot be expressed in numbers alone. The reason for this is that it emphasizes that ethical concerns are an important dimension. Another striking finding is that systematic reviews based on metadata are limited. One reason for this is that since 2024 is the year with the most publications, it can be said that intellectual accumulation is still newly formed.

Analyses on a country basis show that the studies on AI literacy are mostly carried out in China. This is directly related to China's strong investments in digital transformation and strategic plans for AI in education. Mansoor et al. (2024) state that China has taken significant steps towards integrating AI literacy into national education policies. Intensive research is being carried out in this field in countries such as the USA, Hong Kong and the UK, and the importance given by universities in these countries to AI education draws attention.

It is seen that the articles are concentrated in certain universities. Education University of Hong Kong and the University of Hong Kong have the highest number of publications, indicating that these institutions have developed a specific academic framework for AI education and literacy. These results show that AI education is becoming increasingly important, especially in Asian-based universities (Kong et al., 2024). In addition, the prominence of institutions such as the Open University UK and the University of Alabama System reveals that this subject is not limited to Asia but also receives significant academic attention in the West. Underlying reasons for this distribution may include efforts by certain universities to integrate AI education into the curriculum and the diversion of state-sponsored research funding (Chiu et al., 2024). The integration of AI literacy into education policies enables the production of more academic publications in certain countries. In addition, academic collaborations and citation networks established by researchers contribute to the more central position of certain institutions in this field (De Silva et al., 2024). In the study, it was determined that the researcher with the highest number of publications was Kong, S. C. It is known that Kong's work emphasizes the pedagogical aspects of AI literacy (Kong et al., 2023). Following this, researchers such as Su, J. H. and Cheung, W. M.-Y. stand out for their studies examining teachers' and students' attitudes and competencies towards AI literacy. This shows that certain academics have developed expertise in AI education and literacy and have shaped the literature in this field (Al-Abdullatif, 2024). Citation networks Tridandapani, S., Sotoudeh, H., Sturdivant, A., and Tanwar, M. It revealed that researchers such as have a wide network of citations. This shows that an interdisciplinary collaboration is developing among researchers working in the field of AI literacy (Allen & Kendeou, 2024). These strong connections between the authors suggest that AI literacy is increasingly associated with more disciplines and is addressed in a wide range of fields, from educational sciences to engineering (Eguchi et al., 2021).

In terms of academic publications, it is seen that most studies *are published in education and technology-oriented journals such as Education and Information Technologies and Computers and Education: Artificial Intelligence*. This trend shows that AI literacy studies are increasingly accepted in the academic environment and that knowledge in this field is produced in a systematic way. Keyword analysis shows that the terms "artificial intelligence", "artificial intelligence literacy", and "AI literacy" stand out. In this context, it reveals that research is largely focused on defining AI literacy and how it can be improved in an educational context (Chung et al., 2023). In addition, terms such as "higher education", "curriculum", and "AI education" are frequently used, indicating that AI literacy is being addressed especially in the context of higher education (Moon et al., 2024). Other prominent terms include "digital literacy". This finding shows that AI literacy has a strong relationship with digital literacy. Digital skills are considered as an essential prerequisite for the effective use of AI technologies (Kimiafar et al., 2023). In addition, the prominence of words such as "teacher competency", "survey", "participant", and "machine learning" in network analysis shows how teachers play a role in the context of AI literacy and that research on the evaluation of AI-based education programs is intensifying (Mertala et al., 2022).

These findings reveal that AI literacy is considered in terms of different disciplines and education levels. AI literacy has become an important topic not only in the fields of computer science and engineering, but also in areas such as health education, social sciences, and language education (El-Sayed et al., 2025). Studies in the field of health sciences, in particular, show that AI literacy has become a critical competency for future healthcare professionals (Abou Hashish & Alnajjar, 2024). Research in the context of teacher education emphasizes the importance of training programs to improve teachers' AI literacy. Teachers need to have specific skills in this area in order to effectively integrate AI technologies into their classrooms (Do & Kim, 2023).

AI literacy is becoming an increasingly important topic in education. Increasing the knowledge and skills of educators in AI directly affects students' competencies in this field. This research analyzes the distribution of academic studies on AI literacy by years, databases, fields and countries and reveals current trends. However, the study has certain limitations. Primarily, the research focused only on studies that took place in certain academic databases (WoS and Scopus). This may result in studies from other important academic sources (such as ERIC and Google Scholar) not being analyzed, and therefore not fully reflecting general trends. In addition, research in different languages may have been overlooked, as the publications used in the study were largely in the English language. This may lead to the exclusion of important studies published in their own languages, especially in countries such as China, Germany, and France. In addition, since the

research provides a cross-sectional analysis, it is difficult to make a precise prediction about the future direction of studies on AI literacy. More comprehensive and methodological research is needed to identify long-term trends.

Suggestions

In the light of these results, some suggestions can be made for researchers. AI literacy is increasingly becoming the focus of AI research. It is important that different disciplines such as educational sciences, computer science, psychology and engineering collaborate in this field. In addition to quantitative research, rich research can be done with qualitative studies that require in-depth analysis. Research such as systematic review, bibliometric analysis and meta-analysis can be emphasized. The most work in the field of AI literacy has been done in countries such as China, the USA, and Hong Kong. Comparative studies examining how AI literacy is perceived and practiced in different cultural and educational contexts will reflect the global perspective in the field. Issues such as ethical concerns and data security can contribute to bringing educational programs in line with universal standards.

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