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AI in inclusive education which differences in research trend

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Abstract

In modern education systems, inclusive education is an approach that aims to meet the different needs of all students, especially those from underrepresented groups, by ensuring everyone has fair access to good education. It sees the value in every child and creates a setting where differences are accepted and appreciated. Artificial intelligence (AI) can change how we learn, especially in the area of inclusive education. Using AI technologies is important to meet students' different needs, particularly those with disabilities. Studies show that AI can create personalized learning by adjusting content to fit individual needs and giving quick feedback with smart tutoring systems. Additionally, using AI in teaching methods can improve engagement for students from underrepresented groups, which helps combat existing gaps in educational success. However, even with the increasing recognition of AI's advantages, challenges like poor infrastructure and lack of teacher training remain, making it hard to implement effectively. The manuscript's aim is to analyse the trend of publication research. Mainly, the manuscript focuses on analyzing the paradigm that is used in research when academicians treat arguments about AI inclusion and Education. The results will create an opportunity for future discussion on the effects of AI on inclusive education, looking at both the possibilities it offers and the obstacles that need to be addressed to build fair learning environments for every student.

Key words Artificial Intelligence, Education, AIED, Inclusion, disability, migrants

1. Introduction

From the 40 years of the invention of the first computer to the present day, we have moved from 'giant electronic brains' to artificial intelligence. After the first computers were used, it was soon realised that computers could be used beyond simple numerical calculation to perform many intellectual tasks that are usually considered challenging for human intelligence. Once the practical use of giant electronic brains was recognised, visionary researchers such as McCulloch and Pitts (1943), Wiener (1948), Shannon and Weaver (1949), Turing (1950), and von Neumann (1958) proposed theories that emphasised the common characteristics of machines and minds. (Wang, 2019). Artificial intelligence has come to influence many aspects of human life. AI applications can be found in many parts of our daily lives (e.g. smart appliances, smartphones, Google, Siri). AI has spread to all sectors (industry, medicine, science, art, education) to improve user efficiency. The use of technological tools in education goes back many years before the development of artificial intelligence: the term artificial intelligence was coined in 1956, while the use of technologies in education was attempted by Pressey in 1926. The attempt was later performed in 1954 by Barrus Frederick Skinner, the father of behavioural psychology, with a "teaching machine". In his experiment, he designed a box-like mechanical device that would "feed" questions to students. Correct answers were

rewarded with new academic material, while incorrect answers led to a repetition of the old question, motivating the student to adapt quickly and learn to answer correctly. (Spulber, 2021). With the emergence of technologies such as artificial intelligence, neural networks, machine learning, and big data analysis, several opportunities for digital transformation are opening up in the education sector.
Modern challenges facing education today require the integration of the latest IT developments into the educational process. The coronavirus infection pandemic, the related problem of self-isolation, and distance learning have sped up the invasion of technology use in education. Starting in 2020, due to the spread of a new viral infection and the announcement of a worldwide pandemic, the introduction of digitalisation of education (including school education) began to grow rapidly. Over the past two years, the educational process has entered a new direction. (Adedoyin, Soykan, 2020; Khlaif, Salha, Kouraichi, 2021). With difficulty and problems (technical and emotional), the participants of the educational process switched to a distance learning format. It can be said that such a global "medical challenge" has become a powerful leap for the urgent digitalisation of education at all levels of training, and the pandemic has served as a kind of "catalyst" for the technologization of the education system. Technology keeps changing, and using it in education is getting more important, especially for helping marginalized groups. AI can be a helpful tool for solving the special problems that migrant children face, allowing for learning experiences that fit their different needs. For example, (Mathai, 2024) shows how AI apps made for learning a native language create a flexible learning experience that boosts involvement and performance in main subjects like English and Math. Also, using AI can help in making educational materials that respect cultural differences and language issues, helping to create a more inclusive setting. Moreover, AI's ability to give instant feedback and customized support can lower the stress that comes with changes in education for migrant kids, as seen in (Ojwang, 2022) with personalized integration programs like Apptigration. In the end, using AI smartly in schools can help lessen gaps in access to resources, academic success, and social connections for migrant groups.

2. Artificial Intelligence in Education

Many schools around the world are implementing artificial intelligence into their educational systems. The beginning was associated with such simple, in modern opinion, tools as word processors, calculators, slide projectors. Today, the capabilities of artificial intelligence are already being used in all educational institutions to improve the learning process. The development of learning materials that can adapt to students' individual characteristics and provide them with the necessary knowledge and skills according to their training and needs is an important direction in modern education. The use of AI to create such materials can significantly increase the effectiveness of learning and facilitate the work of teachers.

The application of artificial intelligence algorithms fundamentally changes the paradigm and conceptual basis of the educational system, raising the quality of education to a new level.

Speaking about users, AI in education research has mainly focused on such clusters as teacher support (as personalised teaching, didactical materials, …) and student support (personalised programs, Interactive tutoring, assessment feedback) or student-focused AI and Teacher focused AI (Holes, Tuomi, 2022). In both cases, AI speeds up the teaching process and makes it more efficient. Through the use of AI, it is possible to analyse data about students, such as their previous successes, preferences, learning styles, etc., to determine the most effective learning strategies for each student (Cox, Ram, 1999, Cunska 2020, Lokare, Jadhav, 2024). With the appropriate use of AI, teaching can become customised. Using AI to automatically generate texts, assignments, questions, and other learning content customised to students' knowledge and skill levels can help teachers create diverse and personalised materials for their students (Bhutoria, 2021, Chen, 2021)

The other cluster is the use purpose of the AI in education: assessment, customisation of homework, tasks, accessibility, and inclusion. AI can be used to assess student performance more efficiently and accurately. For example, AI systems can be used to assess student performance in tests and assessments and provide personalised feedback and advice to improve performance (Minn, 2022; Renzella et al., 2022) and analyse their responses to assignments to determine their progress, success, and areas for development. Schools, for example, are already making extensive use of artificial intelligence and the latest digital technologies in - the creation of digital educational materials (electronic textbooks) (Shamir et al. 2021, Qian, 2021); attendance control (electronic diaries and class journals)(Othman, Aydin, 2019, Nguen et al. 2021); calculation of learning outcomes (assessment)(Cope, Kalantzis, 2016, Wu, Yu, 2024); analysis of the results of surveys, tests, smart boards(Gun, Yilmaz, 2020, Al-Tarawneh,2021)

During the pandemic period, since it was impossible to be in class and work out with classmates, many found help in using AI to perform tasks, such as Alexa for pronunciation (Dizon et al. 2022) or Intelligent Tutoring System for math homework (Xu et al., 2023).

AI can also be used for translations, both in learning translation techniques (Yang, 2022) and in perfecting the study of a foreign language. (Liu, Chen, 2023) The use of translation AI in classrooms is an innovation that can potentially significantly impact learning. This is particularly relevant for schools with heterogeneous student populations, using multilingual education or hosting international or exchange students regularly. Making the educational process more inclusive is perhaps one of the most important uses of AI in educational institutions. It opens up many tools to make education more inclusive and accessible to students with different needs (Kazimzade et al., 2019; Salas-Pilco et al., 2022, Toyokawa et al., 2023)

The analysis of trends in the use of artificial intelligence technologies in the educational sphere gives grounds to consider the following instrument analysis and

their effect on education like the use of avatars (Fernández-Martínez et al, 2021, Wu, You, 2024) and chatbots (Han, 2020, Birenbaum, 2023, Jauhiainen et al., 2023) in the educational space for consulting, testing and designing individual educational routes; use of additive manufacturing 3D printers, 3D modelling (Kwak,et al 2015, Chun 2021); big data (Cope, Kalantzis, 2016); blockchain(Sousa et al., 2022 Kaul, et al 2023)- virtual and augmented reality (or its elements) as part of the educational process and educational space (Xu, et al., 2019, Kapoor, Naik, 2020, Tsai, Lay,2022)

3. AI and Inclusive Education

In modern education systems, inclusive education is an approach that aims to meet the different needs of all students, especially those from underrepresented groups, by ensuring everyone has fair access to good education. It sees the value in every child and creates a setting where differences are accepted and appreciated. Inclusive education is key for making sure that all students can access learning, no matter their different needs and backgrounds. There is more focus on personalizing education now, thanks to advancements in artificial intelligence, which fits well with inclusive education principles. The ideas of inclusive education come from the belief that all learners, no matter their background or abilities, should have the right to get quality education and take part in it. A key part of these ideas is equity, which seeks to fix gaps and offer customized support to meet different needs, creating a good learning environment for every student. This is in line with what is shown in Schleicher et al. (2024), which highlights the important role of artificial intelligence (AI) in supporting equity and inclusion. Studies show that AI can improve learning for students with disabilities by offering customized tools that meet their specific needs, as stated in (Garg et al., 2020). These tools not only help create unique learning experiences but also strengthen the emotional bonds between teachers and students, which boosts motivation and engagement necessary for inclusion (Xia et al., 2022). The use of Artificial Intelligence (AI) tools in schools is an important advance for helping students with disabilities. With smart tutoring systems and AI-based tools, teachers can customize learning for each student, improving involvement and supporting inclusivity. As noted in Garg et al. (2020), AI serves as helpful technology that enables personalized education paths, helping students with visual impairments or learning issues like dyslexia and Autism Spectrum Disorder (ASD) to learn better. These developments not only support academic success but also help students connect with others, reducing feelings of loneliness that many students with special needs face. For example, Garg et al. (2020) show how AI acts as assistive technology, providing custom resources that tackle specific issues faced by students with disabilities like dyslexia and Autism Spectrum Disorder (ASD).

Educational methods are greatly affected by cultural variety, which requires changes in teaching styles to address the different needs of students. For example, using Information and Communication Technologies (ICT) in schools gives chances to include diverse cultural views and learning preferences, as pointed out in Asqui et al. (2024). By using digital resources, teachers can adapt their methods to better

support students from different backgrounds, which helps create a more welcoming learning space. Additionally, understanding students' language and cultural identities is crucial for their school success; ignoring these aspects can lead to labelling and exclusion, as mentioned in Migliarini et al. (2020). Using teaching strategies that are culturally aware not only boosts involvement but also helps migrant children feel included, strengthening their engagement in education. Therefore, valuing cultural diversity is not just an educational need but also a duty to provide fairness and justice in schools. This is very important for migrant children, who often deal with challenges like language issues and cultural changes. As noted in Fierli et al. (2024), including unaccompanied migrant children (UMC) in schools requires special strategies, like informal education, to help meet their specific needs. By adopting inclusive education methods, schools can improve the social inclusion and academic success of migrant children, helping them feel like they belong while offering resources tailored to their individual challenges. This strategy not only helps improve learning outcomes for each student but also builds a more unified and compassionate society. The education of migrant kids has many problems that make it hard for them to succeed in school and fit in socially in their new countries. One big issue is language skills. Many migrant kids come with little or no understanding of the language used in school, which makes it tough for them to join in classroom activities. This problem is made worse by unfair practices in school systems, where migrant students are often wrongly put into special education programs due to misunderstandings about their backgrounds—something researchers call SENitization (Migliarini et al., 2020). Also, the social environment in schools can be challenging; many migrant children feel alone and struggle to make friends, which can lead to feelings of isolation and low self-esteem (Fierli et al., 2024). To tackle these issues, we need to rethink our education systems to create more inclusive spaces that appreciate and honour cultural variety while also offering the right resources and support that fit the specific needs of migrant students. Studying AI solutions for supporting migrant children's education is very important to tackle the various issues these kids face. According to Fierli et al. (2024), unaccompanied migrant kids in Italy deal with major integration problems, showing the need for effective educational strategies suited to their specific needs. This research will show how artificial intelligence can customize educational support, which will improve their academic results and social inclusion. The importance of this study is in its ability to enhance teaching methods and its connection to global goals like the United Nations' Sustainable Development Goals, which promote fair education for everyone. By using AI to close gaps in education access and quality, this research helps create a more inclusive education system that meets the needs of disadvantaged groups, as discussed in Akinlar et al. (2023) about the vital role of digital tools. In the end, the results will guide policymakers and educators in creating thorough strategies that are both inclusive and adaptable to the changing demographic realities of today's educational environments.

Using AI could change how learning experiences are customized for each student's needs. By using algorithms to look at student information, AI can change teaching materials to fit different learning speeds and styles. This can make learning more engaging and easier to understand. For example, Schleicher et al. (2024) show how AI tools can create personalized learning paths, which are especially helpful for students who have special educational needs. This flexibility helps meet the specific challenges that diverse learners face, making classrooms more inclusive. Additionally, AI systems can spot students who might be at risk early, allowing for quick help and support, which can lower dropout rates and improve grades. The rise of AI-based personalized learning is a big change in teaching methods, especially in promoting inclusivity. These tools use advanced algorithms to customize learning experiences for each student, allowing instruction to fit different skills and styles. For example, research shows how intelligent tutoring systems (ITS) and AI robotics provide quick feedback and adjust content on the fly, which helps keep students with special needs engaged and improves their learning results (Hopcan et al., 2023). Also, studies suggest that bringing in self-determination theory (SDT) in these settings can greatly boost motivation and participation, especially for underrepresented students (Xia et al., 2022). Personalized learning offers a big chance to meet the different needs of various learners in schools. By changing teaching styles and materials to fit students' unique strengths, interests, and speeds of learning, it not only boosts their engagement but also improves educational results. As mentioned in Schleicher et al. (2024), using AI tools in personalized learning plans provides the needed support to tackle the challenges that students from different socio-economic backgrounds, including those with special educational needs, face. This specific approach helps close gaps that traditional education methods often miss, promoting fairness. In addition, personalized learning creates a more inclusive setting that fosters student choice and independence, giving learners more control over their education. In the end, using personalized learning techniques can create a fairer educational system, making sure all learners, no matter where they start, can reach their full potential.

4. AI inclusion and teachers

AI tools can help create personalized learning that tackles individual student issues, especially for those with disabilities or other learning challenges. But to make inclusive education work well, it requires not just new technology but also a focus on thorough teacher training and getting the community involved, so that education structures mirror the diversity of students. Therefore, an inclusive strategy must combine new methods with ethical practices, making sure that all students have fair chances to succeed in their education. Putting AI into personalized learning systems well needs complete training and support for teachers. Research shows that even though many educators know about AIs benefits, they still struggle with big obstacles to using it, like not enough training and resources, which negatively affects student results (Nguyen et al., 2022). For example, customized training programs can help teachers gain the skills needed to use AI tools well, improving teaching methods and promoting inclusive learning settings (Garg et al., 2020). Also, continuous support from schools is important; this means not just technical help but also chances for teachers to work together and share good practices. Findings regarding different learning needs show that using AI in schools can change the way teachers teach, especially for students with disabilities, highlighting the importance of a strong support system (Hopcan et al., 2023). Even though AI tools have great potential to change how students engage and succeed, issues like low digital skills among teachers and poor infrastructure need to be fixed to make sure everyone can access and effectively use these personalized learning methods (Aravantinos et al., 2024). This all-around strategy will help make sure that teachers feel sure and skilled in using AI technologies to create personalized learning experiences. As pointed out in (Hopcan et al., 2023), there are major challenges like insufficient training for teachers and the absence of thorough implementation plans that need to be solved to make the most of AI in inclusive education. Therefore, focused studies and funding in teacher training are crucial for building supportive classrooms where every student can succeed. Still, even with these advantages, obstacles like limited resources and the need for extensive teacher training continue to be major issues. Thus, a complete approach that combines AI tools with strong support systems is necessary to fully realize AI's potential in promoting inclusivity in education.

In the end, inclusive education is not just a way of teaching but a promise to social justice, recognizing and appreciating the diverse roles all learners play, which makes education better for everyone. This promise is backed by the need for major changes in teaching methods to meet the diverse abilities of students, as seen in (Nguyen et al., 2022).

5. Methods and Results

This research aims: 1) to gather and analyse the scientific works on AI and Inclusive Education; 2) to determine the discrepancies used in keywords and abstracts by academicians.

A systematic literature review of empirical peer-reviewed publications in Scopus platform followed the four steps of systematic reviews in science education (Bennet et al., 2005).

Key words Identification: Used Platform - Scopus; Keywords artificial AND intelligence or AI AND education AND inclusion and school

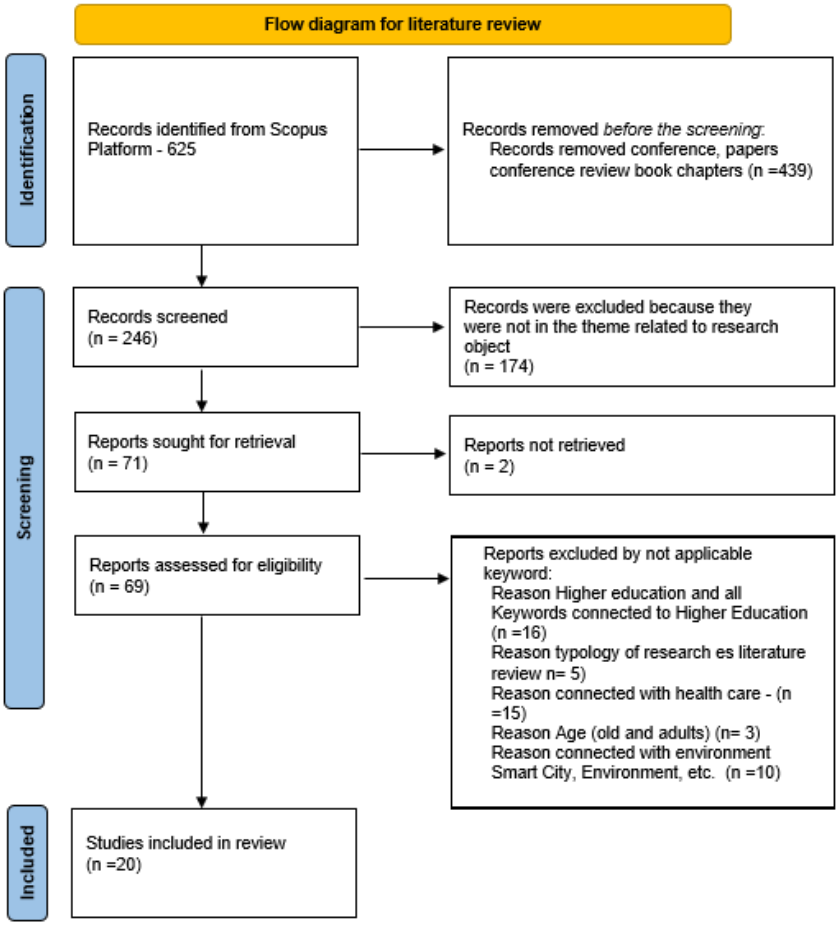

Figure 1 Flow diagram

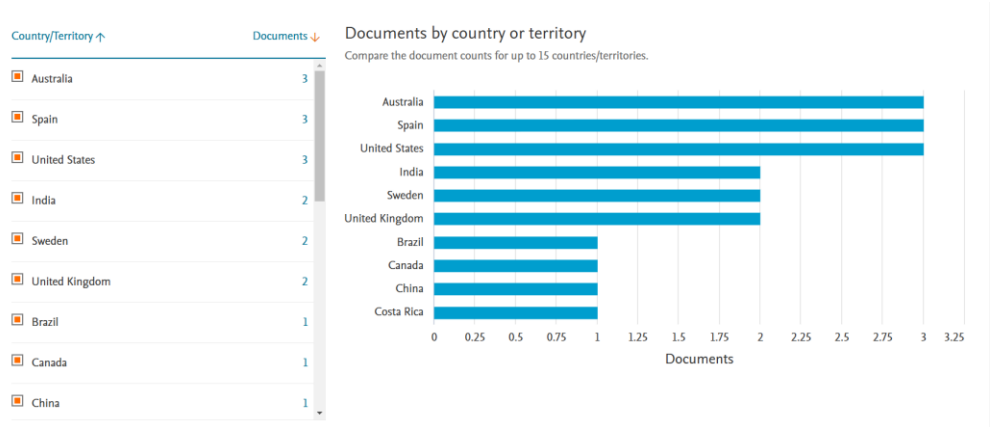

Figure 2 Distribution of academicians by country or territory

Checking the year of publication then is possible to observe an increase of research publication in the last years Only in 2024 there are 11 articles published see the figure 3

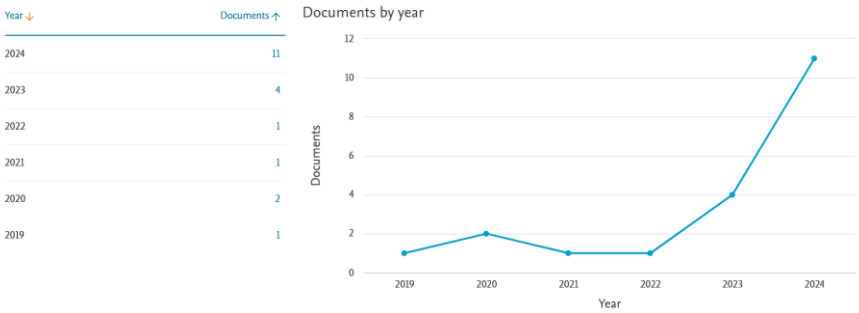

Figure 3 Distribution of published articles by years

The same sampling design was used with the keywords AIED (Artificial Intelligence in Education) and Inclusion and school. A flow diagram was not needed as there were only 21 articles in the results after excluding keywords connected with higher education and health care only 6 articles were selected Seeing the small size of the sample no filter was used for to see which kind of publication matches with the search requirements. So, there were four conference paper, only 1 article 1 Book Chapter.

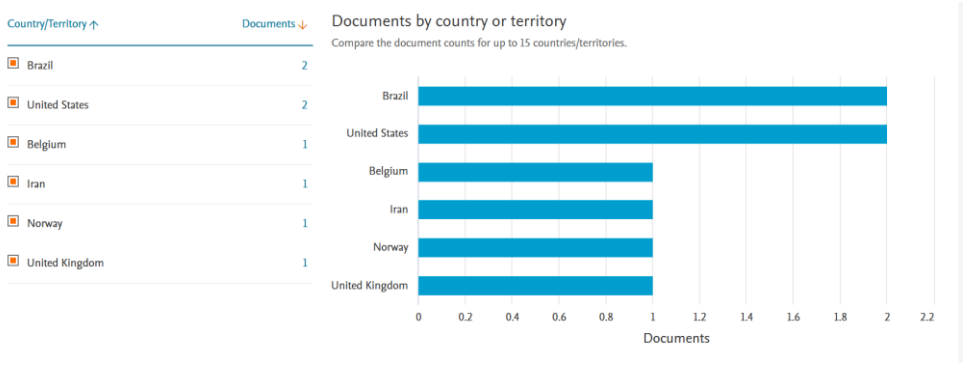

Figure 4 Distribution of academicians by country or territory

Observing the distribution of researchers by country is possible to note that Brazil United States are more likely to use AIED followed by Iran, Belgium Norway and United Kingdom.
Examining the distribution by year, it is possible to see that only in 2024 there are two papers published (Figure 5).

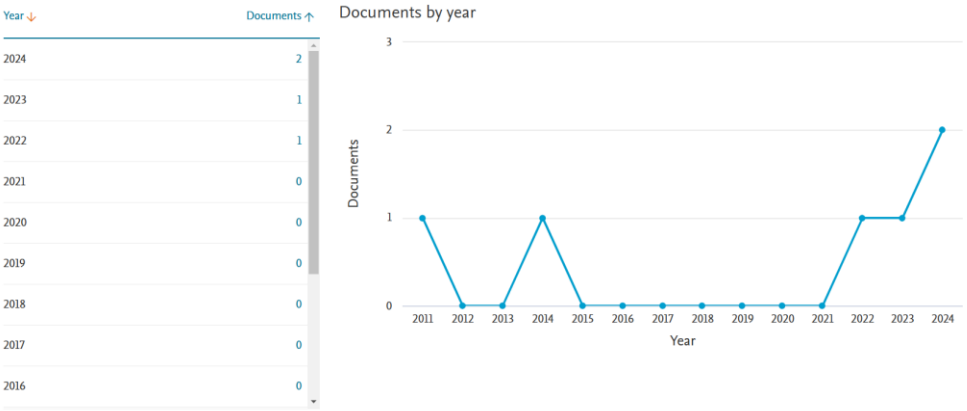

Figure 5 Distribution of published articles by years (AIED inclusion school)

Other Key word analysed was Special Education Needs. Analysing the tendency on use of SEN (Special Education Need) in keyword connected with AI and Inclusion only 4 cases were found as indicated in figure 4 and academicians from Brazil China India South Korea United Kingdom and United States are using this combination I the article's Keywords (see figure 6)

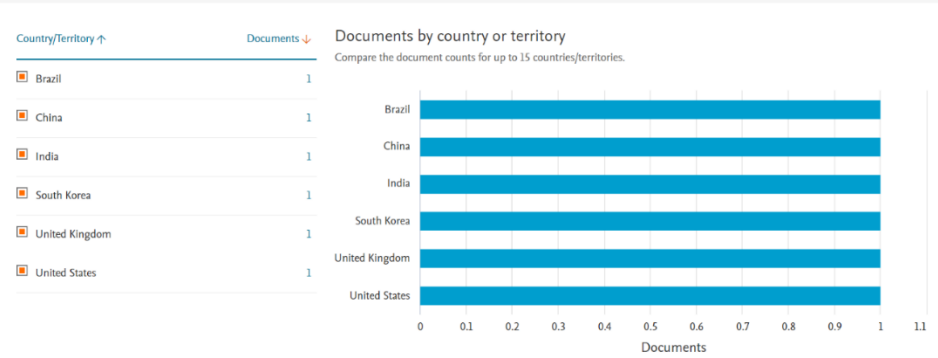

Figure 6 Distribution of academicians by country or territory (use of SEN)

Checking the documents by subject area is possible to find 2 articles in Social Sciences 1 article in Psychology Medicine and Computer Science.

6. Discussion and Conclusion

The complexity of data collection and interpretation in bibliometric studies poses significant challenges that can undermine the reliability of research findings. The growing use of artificial intelligence (AI) in education has led to much discussion about its effects on fairness and inclusion. As noted in the OECD working paper, AI has the potential to change education through various applications, like personalized learning and teacher-led programs that aim to improve results for different types of students (Schleicher et al., 2024). However, there are serious challenges that still exist, mainly the chance of worsening current inequalities in underprivileged communities. These inequalities are made worse by problems like bias in decision-making algorithms and uneven access to digital tools, which are further impacted by economic conditions (Schleicher et al., 2024). Thus, a thorough look at how AI can promote inclusive education needs careful examination of its strengths and weaknesses, leading to better insight into how AI can aid in providing fair educational chances while recognizing the ethical issues involved.

As it shown from the analysed publication is possible to find children as key word and less teacher. Here, it is possible to speak about learner-centred AI tools as a key change toward more personalized and inclusive teaching methods. These tools aim to meet different learning styles, which boosts student interest and creates a more customized learning experience. As pointed out in (Schleicher et al., 2024), learner-centred AI tools can improve educational results by meeting the various needs of students, especially those who are at risk or have special educational requirements. By using data-driven insights, these tools create flexible learning paths that help not just in academic progress but also in social and emotional growth. Still, putting these technologies into use comes with challenges, including problems with bias and accessibility that need to be carefully addressed to avoid making current inequalities worse. Therefore, understanding learner-centred AI tools is very important, as it is

vital to ensure these advancements are used ethically and effectively to achieve true equity and inclusion in education.

As AI in education keeps changing, future studies should focus on blending different fields to tackle the tough issues in inclusive education. Combining views from psychology, educational technology, and AI ethics can create better frameworks for fair learning experiences. The careful study of technology's role, shown in Aravantinos et al. (2024), stresses the need for a combined curriculum that meets various learning needs and boosts digital skills among young learners. Furthermore, research like that in Hopcan et al. (2023) can provide important information on how well AI tools work for students with special needs, helping to shape policies for their use. It's also important to pay attention to the social and emotional aspects of learning, following (Xia et al., 2022) findings about self-determination theory and its effects on teacher support, creating spaces that foster teamwork and belonging for all students. Using Artificial Intelligence (AI) in education can change things a lot, especially if it is adjusted for different learner needs. As noted in (Hopcan et al., 2023), AI can help create personalized learning, allowing teachers to change their teaching methods based on what each student can do and likes, which helps students with special needs stay engaged. This tailored method gets support from the idea that AI tools, like smart tutoring systems and responsive robots, can give quick feedback while being suitable for different disabilities, making learning places more inclusive (Garg et al., 2020). Additionally, the review in Aravantinos et al. (2024) highlights how effective AI is in early education, showing growth in thinking skills and creativity through hands-on and interactive learning. As AI keeps changing, it looks like it will improve learning results and also change education itself, creating a fair and accessible space for all learners.

As highlighted in various studies, the selection of counting methods profoundly affects the interpretation of bibliometric indicators, emphasizing the need for seasoned evaluators to apply criteria thoughtfully and contextually (Gauffriau et al., 2017). Successful case studies of AI use in inclusive education show how technology can change things when used well. A significant example is the use of personalized learning platforms that change based on each student's needs, allowing teachers to support different learning styles. These platforms have been effective in getting students with different abilities involved, which connects to Schleicher's claim about (Schleicher et al., 2024). AI's ability to improve personalized learning. Also, AI tools that find students at risk allow for quick action, showing how data-driven decisions can help stop academic failure. Still, these efforts face issues; biases in AI algorithms can keep unfair practices going, highlighting the need for careful assessment and ethical thoughts in their use. As Schleicher et al. (2024) point out, it's important to tackle issues like privacy and bias to make sure AI technologies are available fairly. The effective use of AI in these case studies provides a strong basis for enhancing inclusive education.

References

Akinlar, A., Kamisli, M., U., Yildiz, H. S., Bozkurt, A. (2023). Bridging the digital divide in migrant education: Critical pedagogy and inclusive education approach. *Journal of Qualitative Research in Education*, (36), 30-53.

Aravantinos, S., Lavidas, K., Voulgari, I., Papadakis, S., Karalis, T., Komis, V. (2024). Educational Approaches with AI in Primary School Settings: A Systematic Review of the Literature Available in Scopus. *Education Sciences*, *14*(7), 744.

Asqui, J. D. C., Quichimbo, D. M. D., Vélez, L. E., Ajila, D. A. L. M., Campos, M. E. V. (2024). Inclusive Education from Cultural Diversity and ICT. *Migration Letters*, *21*(S2), 400-412.

Bennett, J., Lubben, F., Hogarth, S., Campbell, B. (2005). Systematic reviews of research in science education: rigour or rigidity? *International Journal of Science Education, 27*(4), 387-406.

Bhutoria, A., (2022). Personalized education and Artificial Intelligence in the United States, China, and India: A systematic review using a Human-In-The-Loop model, Computers and Education: Artificial Intelligence, т. 3, No 3, p. online, 2022.

Birenbaum, M. (2023). The Chatbots' Challenge to Education: Disruption or Destruction? *Education Sciences*, *13*(7), 711. Computers and Education: Artificial Intelligence, Vol.3,100050,

Computers and Education: Artificial Intelligence, Volume 3,100050, https://doi.org/10.1016/j.caeai.2022.100050.

Cope, B., Kalantzis, M. (2016). Big Data Comes to School: Implications for Learning, Assessment, and Research. *AERA Open*, *2*(2). https://doi.org/10.1177/2332858416641907

Dizon, G., Tang, D., Yamamoto,Y.,(2022), A case study of using Alexa for out-of-class, self-directed Japanese language learning, Computers and Education: Artificial Intelligence, Volume 3,100088, ISSN 2666-920X, https://doi.org/10.1016/j.caeai.2022.100088.

Fernández-Martínez, C., Hernán-Losada, I., Fernández, A. (2021). Early introduction of AI in Spanish middle schools. A motivational study. *KI-Künstliche Intelligenz, 35*(2), 163-170.

Fierli, C., Roverselli, C., Olmedo-Moreno, E. (2024). Non-Formal Education for the Inclusion of Unaccompanied Migrant Children in Italy. *Education Sciences*, *14*(7), 781.

Garg, S., Sharma, S. (2020). Impact of artificial intelligence in special need education to promote inclusive pedagogy. *International Journal of Information and Education Technology*, *10*(7), 523-527.

Gauffriau, M. (2017). A categorization of arguments for counting methods for publication and citation indicators. *Journal of Informetrics*, *11*(3), 672-684.

Gün, M., Yilmaz, A. (2020). Perceptions of secondary school 8th grade students regarding smart board concept. Journal of Language and Linguistic Studies, 16(1), 154-165. https://doi.org/10.17263/jlls.712676

Han, D. E. (2020). The effects of voice-based AI chatbots on Korean EFL middle school students' speaking competence and affective domains. *Asia-pacific Journal of Convergent Research Interchange*, *6*(7), 71–80.

Holmes, W., Tuomi, I. (2022). State of the art and practice in AI in education. European Journal of Education, 57, 542–570. https://doi.org/10.1111/ejed.12533

Hopcan, S., Polat, E., Ozturk, M. E., Ozturk, L. (2023). Artificial intelligence in special education: A systematic review. *Interactive Learning Environments*, *31*(10), 7335-7353.

Ibrahim, H., Asim, R., Zaffar, F., Rahwan, T., Zaki, Y., (2023). Rethinking Homework in the Age of Artificial Intelligence, *IEEE Intelligent Systems*, vol. 38, no. 2, pp. 24-27, March-April 2023, doi: 10.1109/MIS.2023.3255599.

ISSN 2666-920X, https://doi.org/10.1016/j.caeai.2022.100050

Jauhiainen, J.S., Guerra, A.G. (**2023),** Generative AI and ChatGPT in School Children's Education: Evidence from a School Lesson. *Sustainability*, n *15*, 14025. https://doi.org/10.3390/su151814025

Kapoor, V., Naik, P. (2020). Augmented Reality-Enabled Education for Middle Schools. *SN COMPUT. SCI.* **1**, 166 https://doi.org/10.1007/s42979-020-00155-6

Kaul, N., Deshpande, A., Mittal A., Raut, R., (2023). The Intersection of AI and Blockchain in Education: A Bibliometric and Thematic Analysis, *2023 7th International Conference On Computing,*

Communication, Control And Automation (ICCUBEA), Pune, India, 2023, pp. 1-6, doi: 10.1109/ICCUBEA58933.2023.10392092.

Liu, P. L., Chen, C. J. (2023). Using an AI-Based Object Detection Translation Application for English Vocabulary Learning. *Educational Technology & Society*, *26*(3), 5-20.

Mathai, A. (2024). Enhancing Education for Underprivileged Children Through AI-Powered Native Language Learning Inclusive Education Through AI-Powered Native Language Learning. *Available at SSRN 4899553*.

Migliarini, V., D'Alessio, S., Bocci, F. (2020). SEN Policies and migrant children in Italian schools: micro-exclusions through discourses of equality. *Discourse: studies in the cultural politics of education*, *41*(6), 887-900.

Minn, S., (2022). AI-assisted knowledge assessment techniques for adaptive learning environments,

Murphy R.F. (2019). Artificial Intelligence Applications to Support K–12 Teachers and Teaching // A Review of Promising Applications, Opportunities, and Challenges. RAND Corporation, 2019. URL: https://www.rand.org/content/dam/rand/pubs/perspectives/PE300/PE315/RAND_PE315.pdf

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., Qiao, M. S. (2021). Conceptualizing AI literacy an exploratory review, Computers in Education: Artificial Intelligence, 2, https://doi.org/10.1016/j.caeai.2021.100041

Nguyen, G., Nguyen, N., Giang, N. (2022). Situation and Proposals for Implementing Artificial Intelligence-based Instructional Technology in Vietnamese Secondary Schools. *International Journal of Emerging Technologies in Learning (iJET)*, *17*(18), 53-75.

Nguyen, D., Nguyen, X., Than T., Nguyen, M., (2021). Automated Attendance System in the Classroom Using Artificial Intelligence and Internet of Things Technology, *2021 8th NAFOSTED Conference on Information and Computer Science (NICS)*, Hanoi, Vietnam, 2021, pp. 531-536, doi: 10.1109/NICS54270.2021.9700991.

Ojwang, F. (2022). Accelerating integration of immigrants using artificial intelligence-driven solutions: The panacea for integration gaps in Finland. *Technium Soc. Sci. J.*, *33*, 549.

Othman, N., Aydin, I., (2019). A Smart School by Using an Embedded Deep Learning Approach for Preventing Fake Attendance, *2019 International Artificial Intelligence and Data Processing Symposium (IDAP)*, Malatya, Turkey, 2019, pp. 1-6, doi: 10.1109/IDAP.2019.8875883.

Qian, J., (2022). Research on Artificial Intelligence Technology of Virtual Reality Teaching Method in Digital Media Art Creation, *Journal of Internet Technology*, vol. 23, no. 1, pp. 125–132,

Schleicher A., Borhan H., Cerna L., Chandra S., Fuster Rabella M., Santiago P., Vidal Q., Cabbar E., Torres Lima D., (2024). "The Potential Impact of Artificial Intelligence on Equity and Inclusion in Education". OECD, No. 23

Shamir, G., Levin, I. (2021). Neural Network Construction Practices in Elementary School. *Künstl Intell* **35**, 181–189. https://doi.org/10.1007/s13218-021-00729-3

Sousa, M.J.; Dal Mas, F., Gonçalves, S.P., Calandra, D., (2022). AI and Blockchain as New Triggers in the Education Arena. *Eur. J. Investig. Health Psychol. Educ.* **Vol.**, *12*, pp- 445–447. https://doi.org/10.3390/ejihpe12040032

Thomas, D. R., Gatz, E., Gupta, S., Aleven, V., Koedinger, K. R. (2024, July). The Neglected 15%: Positive Effects of Hybrid Human-AI Tutoring Among Students with Disabilities. In *International Conference on Artificial Intelligence in Education* (pp. 409-423). Cham: Springer Nature Switzerland.

Tsai, C.-Y.; Lai, Y.-C. (2022). Design and Validation of an Augmented Reality Teaching System for Primary Logic Programming Education. *Sensors,* Vol .*22*, 389. https://doi.org/10.3390/s22010389

Varsha T. Lokare, Prakash M. Jadhav, (2024). An AI-based learning style prediction model for personalized and effective learning, Thinking Skills and Creativity, Vol. 51, 101421, https://doi.org/10.1016/j.tsc.2023.101421.

Wang, Pei. "On Defining Artificial Intelligence" Journal of Artificial General Intelligence, vol.10, no.2, 2019, pp.1–37. https://doi.org/10.2478/jagi-2019-0002

Wang, X., Gülenman, T., Pinkwart, N., Witt, C., Gloerfeld, C., Wrede, S., (2020). Automatic Assessment of Student Homework and Personalized Recommendation," 2020 IEEE 20th

International Conference on Advanced Learning Technologies (ICALT), Tartu, Estonia, pp. 150-154, doi: 10.1109/ICALT49669.2020.00051.
Wu, R., Yu, Z. (2024). Do AI chatbots improve students learning outcomes? Evidence from a meta-analysis. *British Journal of Educational Technology*, 55, 10–33. https://doi.org/10.1111/bjet.13334
Xia, Q., Chiu, T. K., Lee, M., Sanusi, I. T., Dai, Y., Chai, C. S. (2022). A self-determination theory (SDT) design approach for inclusive and diverse artificial intelligence (AI) education. *Computers Education*, *189*, 104582.
Xiaojuan Chen, H., (2021). Research on Personalized Recommendation Methods for Online Video Learning Resources, *Applied Science*, Vol. 1, No 11, p. 804.
Xu, J., He, S., Jiang, H., Yang, Y., Cai, S. (2019). Design and Implementation of an English Lesson Based on Handwriting Recognition and Augmented Reality in Primary School. *International Association for Development of the Information Society*.
Xu, X., C. Sun and X. Yu, (2023). A Personalized Intelligent Tutoring System for Mathematics Homework," *2023 International Conference on Intelligent Education and Intelligent Research (IEIR)*, Wuhan, China, 2023, pp. 1-7, doi: 10.1109/IEIR59294.2023.10391237.
Yang, C. (2022). The application of artificial intelligence in translation teaching. In *Proceedings of the 4th International Conference on Intelligent Science and Technology* (pp. 56–60).
https://www.prisma-statement.org/prisma-2020-flow-diagram