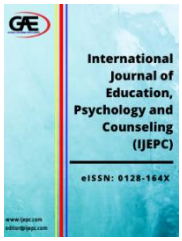
International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1076-1092
DOI 10.35631/IJEPC.1061073



INTERNATIONAL JOURNAL OF EDUCATION, PSYCHOLOGY AND COUNSELLING (IJEPC)
www.ijepc.com

PEDAGOGICAL AGENTS FOR STUDENTS WITH AUTISM: A CONTEMPORARY WORLDWIDE BIBLIOMETRIC INSIGHT

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Article Info:

Article history:
Received date: 30.09.2025
Revised date: 20.10.2025
Accepted date: 30.11.2025
Published date: 17.12.2025

To cite this document:

Nawi, N. S. M., Hamzah. M., & Rokeman, M. I. (2025). Pedagogical Agents For Students With Autism: A Contemporary Worldwide Bibliometric Insight. *International Journal of Education, Psychology and Counseling, 10* (61), 1076-1092.

DOI: 10.35631/IJEPC.1061073

Abstract:

This bibliometric study examines the development of research on pedagogical agents for students with autism, a field that has gained increasing attention as digital learning tools become more sophisticated and widely used in special education. This field of research has seen an ever-increasing interest with educators and researchers examining the ways in which virtual tutors, conversational agents, and avatars may be used as cognitive, social, and behavioural learning aids with autistic learners. The research is timely in response to the demand to know the world trends, contributions of various disciplines, powerful nations, and prevailing research areas and patterns of cooperation that inform this field. Data were collected using Scopus advanced search, producing a final dataset of 219 publications that met the established criteria. OpenRefine was used to clean up and normalise the dataset by eliminating duplicate data and merging conflicting records. The Scopus Analyzer was used to study statistical trends, an increase in publications and distribution of subjects, where co-occurrence networks, keyword clusters and co-authorship structures were drawn up with the help of VOSviewer. The numerical findings show consistent publication growth across the last decade, with computer science emerging as the primary disciplinary contributor, followed by medicine, engineering, social sciences, and psychology. The United States, China, Italy, the United Kingdom, France, and Japan appear as the most productive countries, forming strong collaboration networks. Keywords such as autism, virtual reality, avatar, augmented reality, conversational agent, eye-tracking, and human-computer interaction dominate the research landscape, revealing a strong emphasis on immersive technologies and behavioural analysis. The results highlight a field that has evolved into a multidisciplinary space where advanced digital technologies intersect with

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educational and clinical needs. On the whole, the study offers a very broad overview of the way pedagogical agents are currently being researched throughout the world and highlights the fact that AI-enhanced tools are becoming more and more relevant to the learning process of autistic students, as well as their communication and engagement in the digital world.

Keywords:

Pedagogical Agent, Autism

Introduction

Autism spectrum disorder (ASD) is currently being framed in the context of neurodiversity, which perceives autism as a variation in human neurology as opposed to a deficit and disorder. Identity-first language and social model of disability are the main ideas of this paradigm shift, which is reflected in recent educational research, which suggests inclusive environments that should embrace the strengths of autistic individuals and help them express their authentic self, instead of focusing on correcting their perceived weaknesses (Cherewick, 2024; Peters, 2023; Rodríguez, 2024). In this context, educational technology has become an effective instrument for creating inclusion and personalized learning.

The most common technological innovation leading to the use of pedagogical agents is the use of virtual or animated characters, which are featured within digital learning settings. Pedagogical agents are meant to be mentors, guides, or facilitators who utilize artificial intelligence (AI) to offer an individualized, adaptive support based on the needs of the individual learner in real-time. In the case of autistic students, these agents promise to support the process of academic and social-emotional growth by providing individualized instruction, modeling social behaviours, and providing feedback in multimodal and accessible forms (Papoutsi et al., 2024; Peng & Wang, 2022; S. Zhang et al., 2024).

The convergence of neurodiversity-supportive pedagogical approaches and highly developed pedagogic agent design is a great step in autism education development. According to the most current literature, Universal Design for Learning (UDL) and participatory co-design have a positive influence on the accessibility of digital tools, as well as the validation of autistic identities and the presence of various learning profiles (Boyd & Zolyomi, 2024; Hopkins, 2025; Papoutsi et al., 2024). The increasingly advanced features of pedagogical agents, with integrated AI-based personalization, emotion detection, adaptive feedback, and so on, place them in a better position to meet the individual cognitive, social, and emotional needs of autistic learners.

The design features of pedagogical agents are strictly connected with their effectiveness with autistic students. Recent research has indicated the significance of the agent's appearance, communication style, and multimodal signs in determining learner engagement and outcomes. As an example, a formal appearance and human-like voice of agents can increase the level of engagement and decrease cognitive load, whereas a positive tone and emojis in text-based agents can increase social and affective engagement (Ji & Zheng, 2025; Lyu et al., 2025). Such personalizations as the matching agent persona to student preference or the use of personal strategies to address attention have been found to enhance motivation, attention, and independent performance in autistic learners (Chinchay et al., 2024; Y. Zhang et al., 2025).

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Nevertheless, the most suitable structure of these properties is also an open question, and research underway must balance the cognitive, affective, and social aspects of agent design.

The past five years of empirical research have given increasing evidence of the positive learning outcome impact of pedagogical agents on autistic learners. They can be used in educational robotics (for example, Bee-Bot robots of executive function), virtual reality environments, and in conversational agents powered with AI and supporting both academic and social-emotional development (Atturu et al., 2025; Davis et al., 2023; Fang et al., 2025; Lorenzo et al., 2025; Perez-Vazquez et al., 2022). According to meta-analyses and systematic reviews, embodied, animated, and role-specific agents can be used to boost self-regulated learning and motivation and social skills. Nevertheless, it is also observed in the literature that the performance of such interventions is also limited by the design of the agent, the situation, and the level of personalization. Though obtaining encouraging outcomes, the potential of more rigorous and longitudinal research and standardized outcome measures is necessary to comprehend the long-term effects of pedagogical agents in the field of autism education.

Although the role of pedagogical agents is highly acknowledged, a lot of difficulties still remain. The major problems are the difficulty of developing agents that can convey emotional and metacognitive indicators effectively, the possibility of heightened intellectual load due to inefficiently designed features, and the ethical challenges of AI-based personalization, in particular, the data privacy and algorithmic bias (Adako et al., 2025a, 2025b; Septiana et al., 2024; Sikström et al., 2022; Wiedbusch et al., 2023). It is also characterized by a significant research gap in terms of research on younger learners and agents that may be adapted to balance cognitive, affective, and social support. It is hoped that future studies will focus on interdisciplinary cooperation, participatory co-designing with autistic stakeholders, and designing ethical frameworks to help legitimize the use of AI in autism education.

Research Question

There are several questions that we want to answer in this paper :
RQ1 – What are the global publication trends on pedagogical agents for students with autism?
RQ2 - What are the popular subject areas related to the study, and what percentages for each subject?
RQ3 - Which countries are the most productive in publishing research on pedagogical agents for students with autism?
RQ4 - What are the most frequent author keywords related to pedagogical agents for students with autism?
RQ5 – What is the co-authorship by countries' collaboration?

Methodology

Bibliometrics is defined as a methodical approach to the collection, arrangement, and analysis of bibliographic information that has been obtained through scientific journals (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). Whereas certain basic bibliometric indicators tend to concentrate on some descriptive statistics like the identification of publishing journals, the year of publication, and the most active authors (Wu & Wu, 2017), there are more advanced methods that involve more advanced analytical tools like document co-citation analysis. A rigorous bibliometric study demands a careful, iterative process that begins with the selection of suitable keywords, followed by comprehensive literature searches and in-depth data analysis. Such a methodological approach ensures the development of a complete and

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reliable bibliography while also allowing for meaningful insights into the intellectual structure of the field (Fahimnia et al., 2015).

In this study, attention was given to high-impact publications, as they provide stronger theoretical grounding and deeper perspectives on the frameworks that influence the research domain. The Scopus database of Elsevier was selected as the primary source of bibliographic data to avoid any mistakes in the data since it is exhaustive and very credible (Al-Khoury et al., 2022; di Stefano et al., 2010; Khiste & Paithankar, 2017). Peer-reviewed journal articles were also used as inclusion criteria to guarantee the integrity of data, and all non-scholarly sources, including books, conference abstracts, and lecture notes, were excluded (Gu et al., 2019).

Moreover, the raw bibliographic data retrieved from Scopus were thoroughly cleaned with OpenRefine. It was needed in the correction of the common data discrepancies, including duplication of records, variations in the authors, changes in the institutional affiliation, and variations in the use of keywords. OpenRefine enhanced the validity and consistency of the next bibliometric analysis by standardizing and refining the data. The data set comprising publications published within the period of 2020 to 2025 was then consolidated and is now prepared to undergo more analytic procedures.

Data Search

The bibliometric search strategy was well designed to ensure systematic and reproducible literature retrieval. Search string was carried out in the Scopus database, with attention paid to such areas as title, abstract, and keywords (TITLE -ABS-KEY). The last search string was the combination of the keywords such as pedagogical agents and autism, with the prefix Autism. In this way, only the articles that explicitly mentioned the collaboration between pedagogical agents and studies in the field of autism were retrieved. To sustain the quality and relevance of the dataset, filters reduced the results to English-language publications at the most recent publication stage, therefore, excluding works-in-progress, early-access articles, and non-peer-reviewed sources. This type of systematic process enabled establishing the relevant studies correctly and gave a clear view of the research directions within a period of several years and science disciplines.

The search in November 2025 resulted in 219 documents, which indicates the great amount of scholarly interest that has been paid to the issue of pedagogical agents and autism. This dataset forms the empirical foundation of bibliometric inquiry, so that it is possible to analyse the dynamics of temporal publications, the most common authors, the most significant institutions, and the most important thematic trends. Placing the dataset in a systematic search procedure guarantees reliability and transparency- conditions of strong bibliometric studies. In turn, the collected literature provides a rich platform to explain intellectual frameworks, identify new trends, and delineate gaps in knowledge in the area of pedagogical agents and autism.

Table 1: The Search String

Scopus	**TITLE-ABS-KEY ((“pedagogical agent*” OR “cartoon” OR “virtual agent*” OR” animated agent* “OR” avatar*” OR “conversational agent* “OR” virtual tutor* “OR” embodied agent* “OR “virtual character*”) AND (“autism*” OR “autism spectrum disorder” OR “ASD”))**

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AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English"))

Table 2: The Selection Criteria Is Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Publication Stage	Final	In Press
Years	2020-2025	<2020

Data Analysis

VOSviewer is a bibliometric software that is easy to use and was created by Nees Jan van Eck and Ludo Waltman at Leiden University, the Netherlands (van Eck & Waltman, 2010; 2017). The tool is frequently used to visualise and analyse scientific literature, and it is specifically useful to create intuitive network visualisations, cluster related items, and create density maps. It is broad and enables the investigation of the networks of co-authorship, co-citation, and keyword co-occurrence, which will give a researcher a comprehensive overview of research landscapes. The dynamic updates and the interactive interface enable effective and dynamic exploration of large datasets. The opportunity to compute metrics, the possibility to customize visualisation, and the fact that VOSviewer can be combined with a vast amount of bibliometric data allow considering it as one of the significant sources that should be utilised by researchers who intend to obtain an idea of a complex research field.

One of the most striking features of VOSviewer is the possibility to convert rather complex bibliometric information into visually simple to comprehend maps and charts. The software is very effective in visualizing networks that group similar items, studying the pattern of co-occurrence of keywords and generating density maps. The fact that it has a convenient interface is helpful to the researcher because both the inexperienced and the experienced users are able to navigate research landscapes effectively. The creation of VOSviewer ensures that it remains at the forefront of bibliometric analysis by providing valuable information, such as computations of metrics and visualisations that are customisable. The ability to support different kinds of bibliometric data, such as co-authorship and citation networks, renders VOSviewer a versatile and indispensable resource in the possession of researchers who must be able to understand their research field better and gain deeper insights into it.

The Plain Text files of the datasets on the publication year, title, author name, journal, citation, and keywords of the databases were obtained in the Scopus database from 1976 to September 2025. They were subsequently analyzed using VOSviewer software 1.6.19. The software allowed the analysis and the construction of the visual representations by using VOS clustering and mapping. Presenting a variation of the multi-dimensional scaling (MDS) method, VOSviewer is focused on the placement of items into the low-dimensional space, therefore, ensuring that the proximity between any two items reflects the corresponding relatedness and similarity appropriately (van Eck & Waltman, 2010). VOSViewer in this aspect resembles a

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parallel with the Multi-Dimensional Scaling (MDS) method (Appio et al., 2014). As opposed to MDS, which mainly aims at computing similarity measures to, among others, the cosine and Jaccard indices, VOS uses a more suitable way of normalizing co-occurrence frequencies, which is association strength (ASij) as follows (Van Eck & Waltman, 2007):

$$AS_{ij} = \frac{C_{ij}}{w_i w_j}$$

which denotes "proportional to the ratio between on the one hand the observed number of co-occurrences of i and j and on the other hand the expected number of co-occurrences of i and j under the assumption that co-occurrences of i and j are statistically independent" (Van Eck & Waltman, 2007).

Result And Discussion

RQ1 - What Are The Global Publication Trends On Pedagogical Agents For Students With Autism?

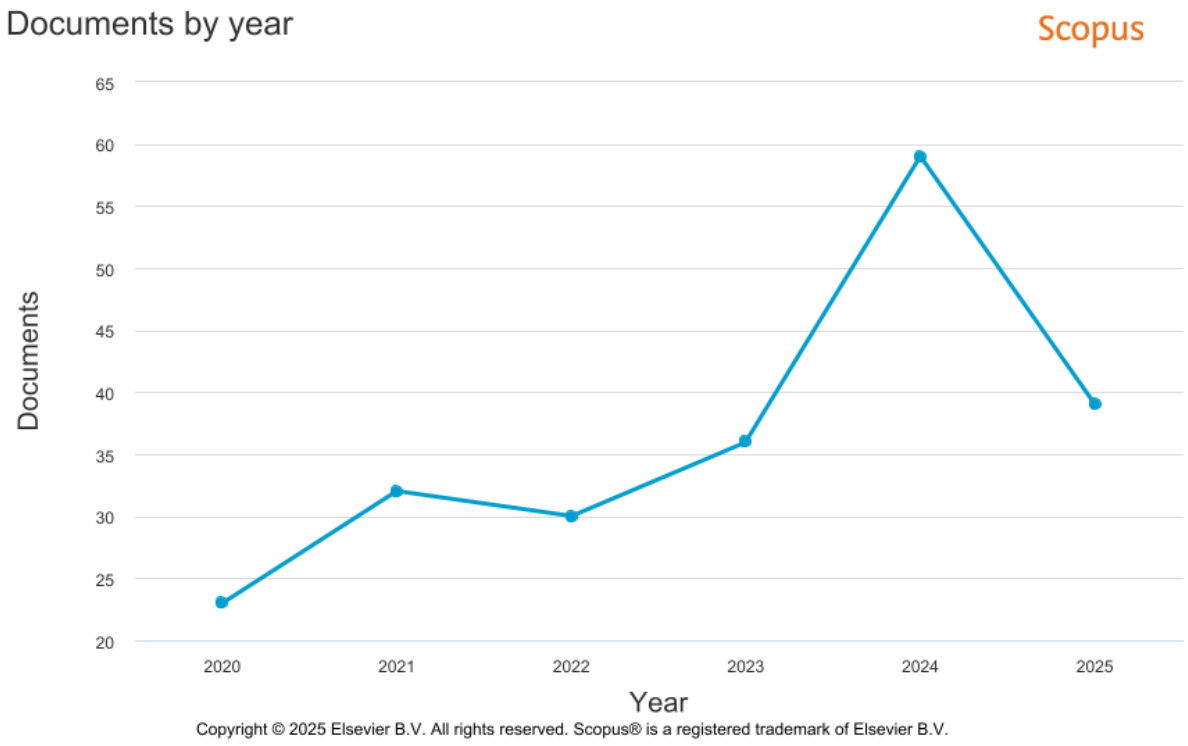

Figure 1. Global Publication Trends on Pedagogical Agents for Students with Autism (2020–2025)

Figure 1 observes the trend of publication production over 2020-2025, demonstrating a field that is gradually becoming a subject of academic interest, with fluctuations that are also reflected in the overall trends in technologies and education. The research activity began with a small figure of 23 papers in 2020, but increased slightly in 2021 and 2022 with more studies discussing how virtual agents, animated tutors, and AI-supported tools can be modified to suit students with autism. This growth in 2023 points to the fact that the subject matter was already

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starting to gain attention, potentially due to the accelerated progress of available multimedia platforms and demand in special education to implement a personalised digital intervention. This trend is an indication of a slow transition between theoretical debate and more applied classroom studies.

The most striking change appears in 2024, with the number of publications reaching 59, the highest in the decade. The leap signifies a drastic increase in both empirical and design studies, with the indication that the role of the pedagogical agent was a research trend in autism and instructional technology circles. The number decreases to 39 in the year 2025; however, this is still very high compared to the early years, which indicates that the field has levelled off instead of showing a decrease. The overall trajectory implies increasing confidence in the role of agents as supportive tools for autistic learners, supported by a richer body of evidence and growing interdisciplinary collaboration. This trend also indicates that the researchers are shifting more towards finer models of interaction, motivation, support and adaptive learning- spheres that are still defining the future research directions.

RQ2 - What Are The Popular Subject Areas Related To The Study, And What Percentages For Each Subject?

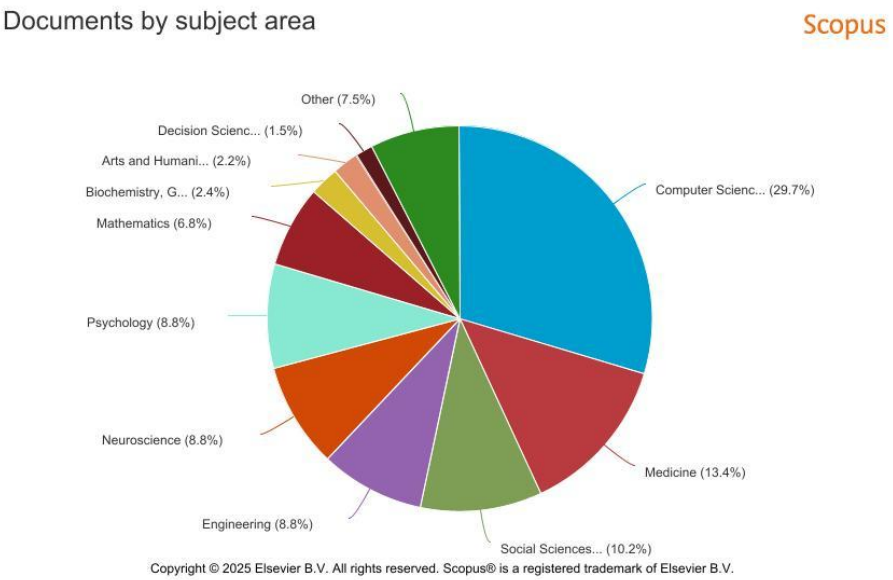

Figure 2: Percentage Distribution of Subject Areas in Research on Pedagogical Agents for Students with Autism (2020–2025)

Figure 2 shows the subject-area distribution from 2020 to 2025, which shows that research on pedagogical agents for students with autism is strongly anchored in technology-driven fields, with Computer Science taking the lead at 29.7%. The overpowering nature is indicative of the intensive dependence on artificial intelligence, virtual agents, robotics, and multimedia systems, which form the basis of the majority of intervention tools. Medicine, Social Sciences, and Engineering together form another significant block, signalling that the topic is not only technical but also clinical and educational in nature. Their combined contributions suggest that researchers are increasingly integrating medical perspectives on autism, social-behavioural insights, and engineering innovations to design more effective agent-based systems.

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Neuroscience, Psychology, and Mathematics have a contribution of 6-9% each, meaning that there has been consistent participation of the fields that study cognition, behaviour, and learning processes. These regions tend to aid the development of software that can accommodate the perception and reaction of autistic students to the digital world. Smaller contributions from Biochemistry, Genetics, Arts and Humanities, and Decision Sciences show that the field attracts a broad mix of perspectives, even if in limited numbers. The variety indicates that the field of research on pedagogical agents is becoming increasingly interdisciplinary, incorporating technological development with clinical knowledge, behavioural theory, and educational practice. This balance of technical and human-centred domains reflects the shift toward designing learning agents that are not only functional but also developmentally appropriate and sensitive to the needs of autistic students.

RQ3- Which Countries Are The Most Productive In Publishing Research On Pedagogical Agents For Students With Autism?

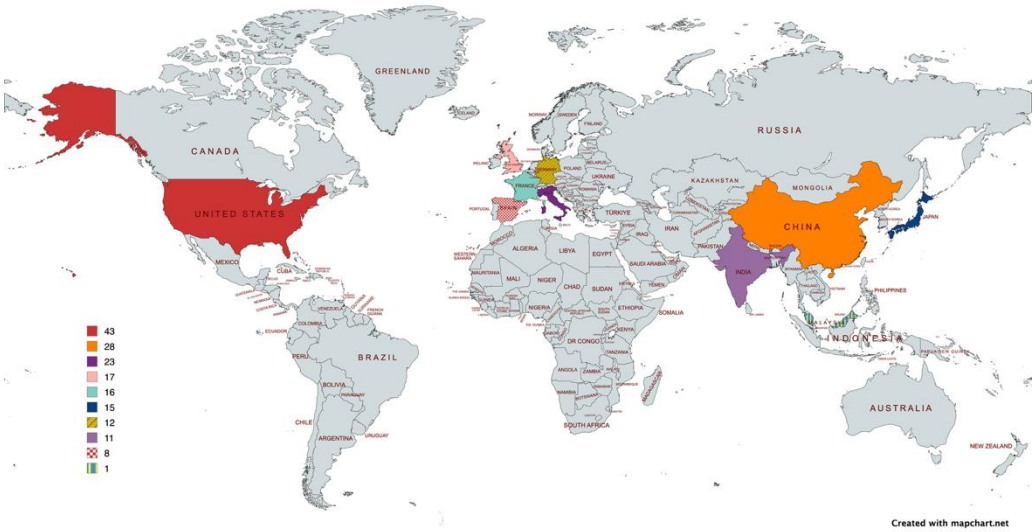

Figure 3: Most Productive Countries in Publishing Research on Pedagogical Agents for Students with Autism

Table 3 : Most Productive Countries in Publishing Research on Pedagogical Agents for Students with Autism

Country	Number Of Publication
United State	43
China	28
Italy	23
United Kingdom	17
France	16
Japan	15
Germany	12
India	11
Spain	8
Malaysia	1

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Figure 3 and table 3 shows the publication pattern led by the United States, China, Italy, and the United Kingdom, which reflects the strong research ecosystems that these countries have built around artificial intelligence, educational technology, and autism-related studies. The United States, with 43 publications, dominates the field due to its long-established infrastructure in AI laboratories, special education research centres, and consistent federal funding for autism interventions. It is followed by China with 28 publications, where intelligent systems, robotics, and digital learning are fast becoming a significant part of national investment, which correlates well with the increasing popularity of agent-based solutions in the neurodiverse learners market. Italy, the United Kingdom, France and Japan are also well-contributing, with each having 15-23 papers, and both have well-organized networks of researchers in the field of human-robot interaction, cognitive science and technology-enhanced learning.

Countries such as Germany, India, and Spain contribute moderately, reflecting growing but more specialised research communities in these areas. Their publications often emerge from interdisciplinary collaborations that combine engineering, computer science, and behavioural studies. Malaysia is found to have just one publication, possibly due to inadequate funding, smaller research groups, and smaller large-scale projects specifically aimed at pedagogical agents in autism. Generally, the allocation resembles the international disparities in research potential, access to funding and technological use. Meanwhile, it also emphasizes that the countries that are similar in terms of AI development, have well-established communities of autism research, and engage in interdisciplinary cooperation, are also likely to be at the forefront of creating work on pedagogical agents for autistic students.

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RQ4 - What Are The Most Frequent Author Keywords Related To Pedagogical Agents For Students With Autism?

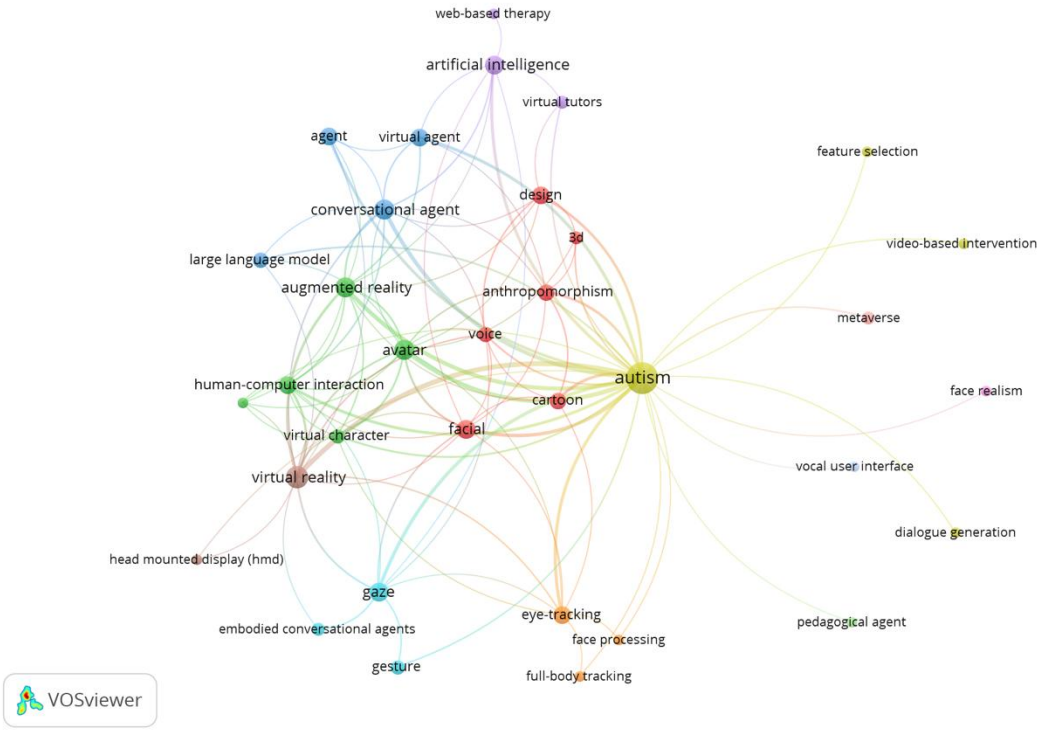

Figure 4: Network Visualization of Most Common Author Keywords in Research on Pedagogical Agents for Students with Autism

Table 4 : Network Visualization of Most Common Author Keywords in Research on Pedagogical Agents for Students with Autism

Keyword	Occurance	Total Link Strength
Autism	150	259
Virtual Reality	27	64
Avatar	19	49
Augmented Reality	16	50
Conversational Agent	15	36
Gaze	14	29
Artificial Intelligence	13	16
Facial	12	33
Human-Computer Interaction	9	22
Eye-Tracking	9	16
Virtual Agent	9	21
Agent	8	16
Design	8	19
Cartoon	7	15
Anthropomorphism	6	17
Voice	5	14
Large Language Model	4	6

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Gesture	3	4
Virtual Character	3	14
Embodied Conversational Agents	2	3
Virtual Tutors	2	4
3d	2	5
Metaverse	2	2
Animation	1	6
Head-Mounted Display (HMD)	1	2
Full-Body Tracking	1	2
Face Processing	1	2
Pedagogical Agent	1	1
Feature Selection	1	1
Face Realism	1	1
Dialogue Generation	1	1
Video-Based Intervention	1	1
Vocal User Interface	1	1
Web-Based Therapy	1	1

Figure 4 and Table 4 shows that the author-keyword co-occurrence analysis in VOSviewer is used to identify how key concepts appear together across the selected publications, helping to reveal the thematic structure of research on pedagogical agents for students with autism. Each keyword functions as a node, and links represent how often two concepts co-occur within the same papers. Larger nodes and stronger links indicate terms that are frequently discussed together. This type of analysis is valuable because it visualises the intellectual landscape of the field, showing how technological terms, behavioural concepts, and autism-related topics interconnect. By examining these co-occurrence patterns, the analysis highlights both dominant research themes and emerging areas of interest, offering a clearer picture of how the field is evolving.

To generate the map, the full counting method was applied, meaning every co-occurrence was counted equally, regardless of the publication. The total pool of keywords was 448, a minimum of one appearance was chosen, and there were 34 keywords included in the map. The threshold was set at a minimum cluster size of one, and all terms that exceeded the threshold were included in clusters; however, they may also occur infrequently. Based on these settings, VOSviewer produced 12 clusters. This relatively large number of clusters indicates that the field consists of multiple specialised micro-themes rather than a small number of broad categories. The flexible thresholds ensured that both high-frequency keywords, such as “autism,” “virtual reality,” “augmented reality,” and “conversational agent,” and low-frequency but emerging terms such as “dialogue generation,” “web-based therapy,” “head-mounted display,” and “large language model” were captured in the visualisation.

The findings contribute important insights to the body of knowledge by showing the central and peripheral themes shaping current research. The strongest core node is that of “autism,” which is a reflection of its anchoring in all the studies. The keywords that are strongly

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correlated with the technology include such terms as virtual reality, avatar, augmented reality, artificial intelligence, and conversational agent, which prove that digital and immersive tools are taking over the current intervention strategies towards the autistic learner. Behavioural and perceptual concepts like "gaze," "eye-tracking," "facial," "gesture," and "anthropomorphism" highlight the growing interest in understanding how autistic individuals interact with agents at a cognitive and emotional level. The presence of new technological terms—including "large language model," "metaverse," "HMD," and "full-body tracking"—signals an expansion into advanced AI-driven and immersive environments. Having 12 clusters, the map shows that the study of pedagogical agents in autism is very interdisciplinary, and it includes human-computer interaction, affective computing, behavioural analysis, and digital therapy. This breadth reinforces the idea that future work will likely integrate increasingly sophisticated AI and immersive systems to personalise learning and therapeutic experiences for autistic students.

RQ5 – What Is The Co-Authorship By Countries' Collaboration?

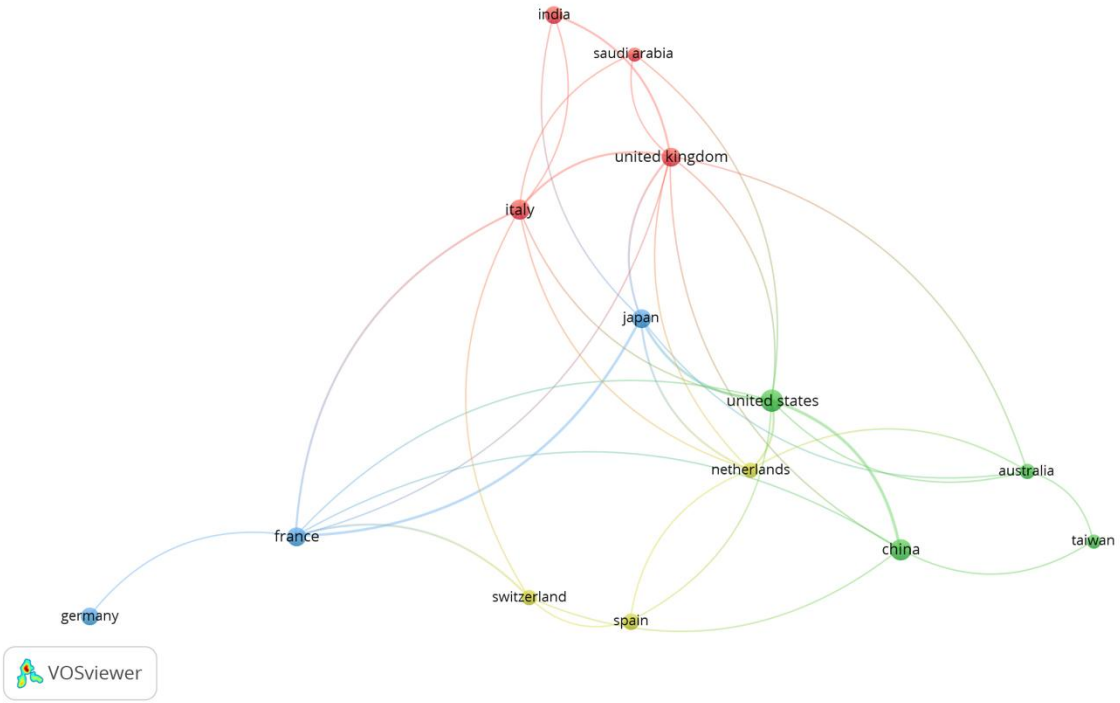

Figure 5: Co-Authorship Network of Countries Collaborating in Research on Pedagogical Agents for Students with Autism

Table 5: Co-Authorship Network of Countries Collaborating in Research on Pedagogical Agents for Students with Autism

Country	No. Of Document	No Of Citation	Total Link Strength
United States	42	476	15
China	27	177	8
Italy	23	244	9

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United Kingdom	17	154	12
France	16	58	11
Japan	15	96	12
Germany	12	109	1
India	11	92	4
Spain	8	25	3
Australia	6	26	5
Netherlands	6	25	8
Portugal	6	11	0
Saudi Arabia	5	63	5
Taiwan	5	65	2

Figure 5 and Table 5 displays the co-authorship by country collaboration in VOSviewer as an analysis of the number of times the researchers across various countries collaborate on publications to enable the map to represent the international research networks. Countries are represented as a node, and the intensity of the connections is the frequency of mutual publications between two countries. Larger nodes indicate countries with more documents, while thicker connecting lines show stronger collaborative relationships. This kind of analysis assists in finding out the countries that are the focal points in the area of the study and the way information flows beyond the geographical borders. The map provides the global patterns of cooperation that would be relevant in the context of pedagogical agents in students with autism and helps to develop technologies and interventions in an interdisciplinary and cross-cultural way.

In order to create the map, the entire counting technique was used, that is, every co-authored link was counted equally. An inclusion strength of 25 publications was put in place, leading to a final number of 15 countries being picked out of a total of 53. The smallest size of the cluster was established at one, and according to these parameters, VOSviewer created four clusters. These clusters are some of the groups of countries that are closer to each other in terms of collaborative efforts. The threshold applied makes sure that only the countries that publish significantly are included, which enables the map to look at the significant contributors and, at the same time, to capture the bigger picture of collaboration dynamics. The clusters that result are probably due to the community of research in an area, similarities in language or culture, and the formation of scientific collaborations.

The results have offered an invaluable understanding of how the work of international cooperation determines the identity of pedagogical agents in autistic learners. The United States is the most powerful node, containing the most documents and citations, and overall link strength, which demonstrates that it is the core of research on the planet. The patterns of strong collaboration are also high in China, Italy, France, and the United Kingdom, with the support of high numbers of citations and numerous international collaborations. Smaller output countries like Portugal, Saudi Arabia and Taiwan are found in the network with less strong links, which depicts more limited but significant involvement. This analysis shows that the field is motivated by a combination of technologically advanced countries and those countries that have powerful autism research populations. These networking relationships enhance

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1076-1092
DOI 10.35631/IJEPC.1061073
expert sharing across the world, increase innovation and lead to the creation of more efficient and culturally competent pedagogical agents.

Conclusion

The general bibliometric trends allow showing a continuously growing area of research within which the pedagogical agents are a topic that is increasingly discussed as a fruitful instrument for working with autistic learners. The increased number of publications, the prevailing character of technology-focused areas of subject matter and the high rates of outreach by countries with well-structured research facilities demonstrate that this subject matter has recently shifted out of the emerging interest level and into the organized and developed field of research. Keyword analysis confirms that the research landscape is shaped by advanced digital technologies, including virtual reality, augmented reality, conversational agents, and artificial intelligence, together with behavioural and perceptual concepts such as gaze, emotion recognition, and facial processing. These recurring themes indicate that current research not only focuses on designing digital agents but also on understanding how autistic individuals interact with these systems at cognitive, emotional, and sensory levels. Such a combination reflects an interdisciplinary shift in which technology, psychology, and human–computer interaction converge to create personalised and responsive learning environments.

The patterns of international collaboration and country productivity further demonstrate that the field is supported by a globally distributed yet uneven research network. The countries of origin of the nation, like the United States, China, Italy, the United Kingdom, Japan, and France, seem to be the primary contributors, with the amount of citations and co-authorship being high. Simultaneously, even those countries that have a smaller research base are being involved in the new partnerships, and it is possible to suggest the increasing global concern regarding the implementation of pedagogical agents into autism education. Collectively, the results indicate that the field of research on pedagogical agents of autistic students is developing into an eclectic, technology-intensive and globally interconnected field, with innovation being strongly associated with interdisciplinary collaboration. These advances offer a good platform to further research that can optimize the design of the agents, improve the interaction between the agents and the learners, and come up with interventions that are effective and competitive to the special needs of autistic learners.

Acknowledgement

The authors would like to extend their sincere appreciation to the Faculty of Human Development, FPM Tanjung Malim, Sultan Idris Education University, Malaysia, for the generous support provided through the completion and dissemination of this research project. The authors are also grateful to the reviewers for their insightful comments and suggestions that helped refine the quality of this article. Special thanks are conveyed to the authors' affiliated institutions and colleagues for their continuous encouragement and contributions throughout the research process. This research was carried out independently and did not receive financial assistance from governmental, commercial, or non-profit funding bodies.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
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DOI 10.35631/IJEPC.1061073

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