Role of Artificial Intelligence in the Indian Education Sector: A Systematic Literature Review

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Abstract: *This research investigates the role of artificial intelligence AI in the Indian education sector through a systematic literature review using the PRISMA method. The study analyzes 111 papers and presents findings in three clusters: AI definitions and evolution, technological advancements in AI, and AI's role in Indian education. The findings reveal that AI tools enhance grading efficiency and foster critical thinking and analytical skills among students.*

Keywords: Artificial Intelligence, Systematic Literature Review, Technological Advancement, Critical Thinking, Indian Education Sector

1. Introduction

In the realm of education, artificial intelligence (AI) is crucial. It benefits both students and teachers by offering an automated mechanism for reviewing answer sheets and robotic teaching (Malik et al., 2019). Teachers are able to assist students considerably more effectively because artificial intelligence improves the effectiveness of education on both a curricular and administrative level. Learning analytics (LA), virtual reality (VR), grading/assessments (G/A), and admissions are just a few of the amenities that artificial intelligence offers to teachers (Ahmad et al., 2022). Artificial intelligence can be divided into three paradigms: AI - directed, AI - supported, and AI - empowered. Each paradigm presents new opportunities, potentials, and difficulties for educational practices (Ouyang & Jiao., 2021). Artificial intelligence tools will enable educators in underdeveloped nations to use data to improve the equity and standing of education. They will also offer new teaching and learning strategies (Joshi et al., 2021). Educators are still unsure of how to employ AI effectively for pedagogy on a larger scale and how it can affect teaching and learning in higher education (Kengam, 2020). Artificial intelligence technological improvements aid in the resolution of educational challenges in a variety of ways, including advances in algorithms, vast data, and increased computer power and storage at a low cost. Consequently, the research article attempts to respond to the following research question.

RQ1 What are the main definitions of artificial intelligence and its evolution over time?

RQ2 The purpose of this research is to investigate the role and impact of artificial intelligence in the Indian education sector, addressing key research questions about AIs definitions and evolution, its role in Indian education, and future research gaps.

Existing literature focuses mostly on various artificial intelligence techniques; however, it fails to discuss the evolution of artificial intelligence and its critical role in developing countries such as India. This artificial intelligence work is unique in the following ways 1) The authors of the study did a thorough evaluation of previous studies. 2) Various clusters are created to answer the research questions. The remainder of the work is structured as follows: section 2 represents the review methodology, which includes a mechanism for extracting data and discussing inclusion and exclusion criteria. Section 3 reflected the results obtained after examining the papers extracted using the SLR approach. Section 4 summarises the findings, identifies the study deficit, and suggests future research directions.

2. Review Methodology

This study employs the PRISMA method for a systematic literature review, which involves identifying relevant studies, selecting studies based on predefined criteria, assessing the quality of the studies, and synthesizing the findings. This method ensures a comprehensive and unbiased review of the literature (Verma and Agrawal, 2021). The structured literature review addresses the flaws of traditional reviews. The traditional literature review provides a summary or overview of the topic while the systematic review answers a focused clinical question and eliminates bias, connecting practicing research to high – quality evidence and supporting evidence - based practice. During the systematic review process, the quality of studies is evaluated, and a statistical meta - analysis of the study results is conducted on the basis of their quality. Thus, conclusively systematic literature reviews (SRs) are a method of synthesizing scientific evidence to answer a specific research question in a transparent and reproducible manner while attempting to include all published information on the issue and assessing its quality (Lame., 2019). There are certain steps to conduct a systematic literature review explain the research problem, mention research questions, Search protocol - Keywords and filters - Database selection, PRISMA Approach - Inclusion and Exclusion Criteria, Planning for the Analysis, Answer the SLR questions with proper reference, relate it the Beneficiaries, Outcome, Research Gap, Future Scope. There are basically five stages of systematic literature review which are to be described as follows:
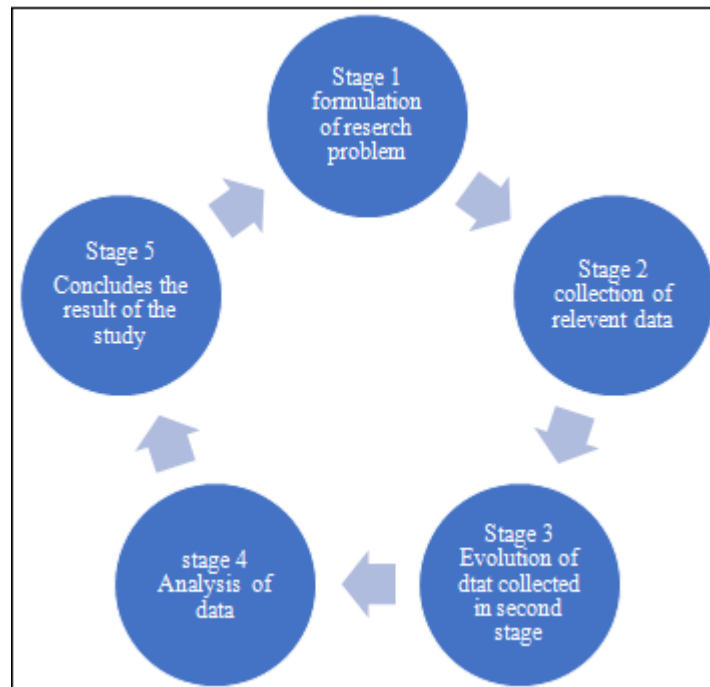
Source: The authors
Note: The figure can be read clockwise.

Selection criteria

To discover relevant publications for this study, keywords such as "artificial intelligence, " "education, " "India, " "technological advances, " "virtual learning, " and "quality education" are used inside the search framework. Only display information that I have complete access to in assessments. In the article type, only whole articles are selected. Book reviews, editorials, and review articles were not included in our analysis. The subject Behavioural sciences and education, the journal English Studies, and the quarterly Journal of Speech are chosen for the study.

Inclusion / Exclusion Criteria

Selection criteria, especially inclusion/exclusion criteria, are used to filter out research publications that fall within the topic of the study (Verma and Agrawal., 2021).

Inclusions

To identify the literature on the topic of artificial intelligence and education, this review pulls articles purely from the English language, excluding Spanish and French papers, spanning the years 2010 - 2022.

Exclusions

This study excludes papers from book reviews, review articles, and conference proceedings. Art, social science, and humanities subjects are also not included. Any studies unrelated to the research questions (s) are excluded from the study (Xiao & Watson., 2019).

After analyzing over 300 research articles, publications with obscurity and ambiguity are rejected, and the author finally analyses 108 research articles. The majority of research studies are published in reputable journals with appropriate citations. Figure 2 explains the complete data retrieval process through a systematic literature review. Once the data extraction process is complete, the reviewer will organize the data according to the review they have chosen (Xiao & Watson., 2019). The motivation behind using Scientific literature review articles is that studies are methodological that use database searches to gather research results, and their major goal is the theoretical discussion of a given topic or issue (Rother 2007).
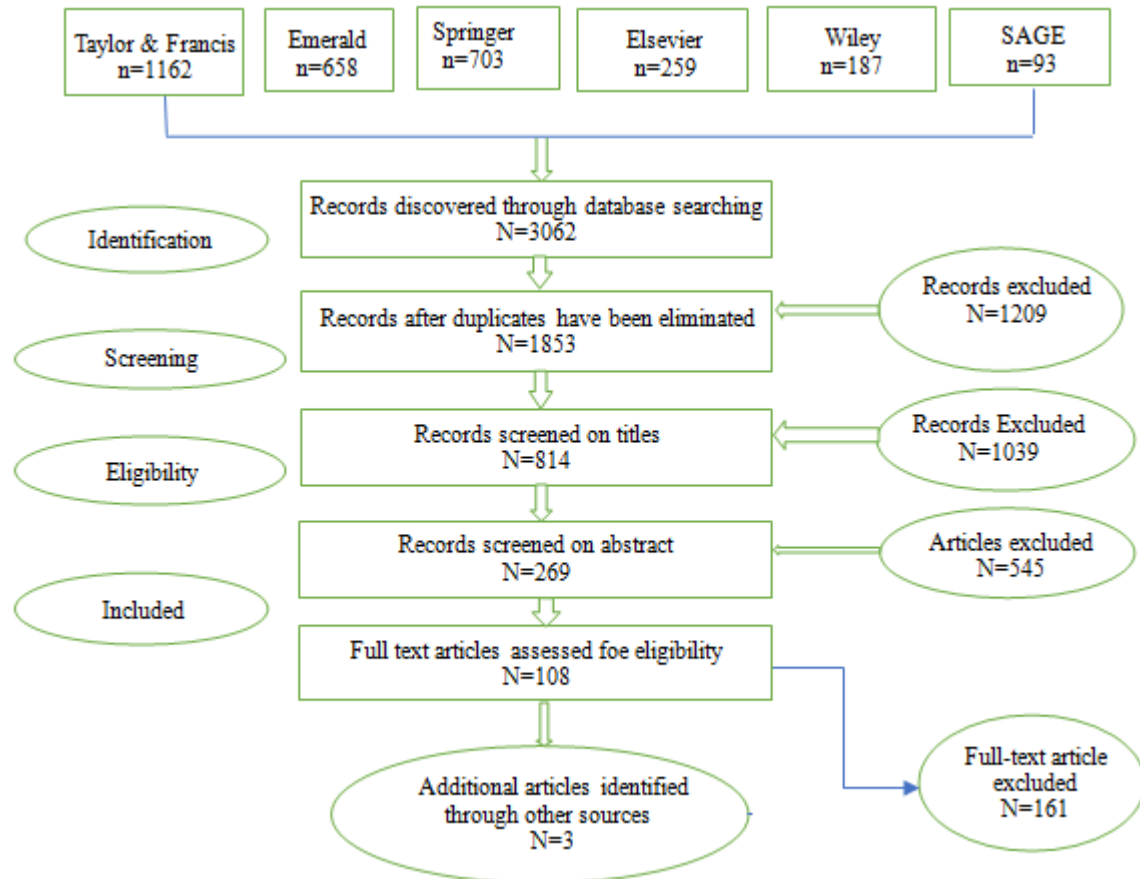
Figure 2: The data retrieval procedure is depicted in the PRISMA flow diagram.

Source: The authors

Note: PRISMA is an acronym that stands for Preferred Reporting Items for Systematic Reviews and Meta - Analyses. It is a minimum set of evidence - based elements for reporting in systematic reviews and meta - analyses.

3. Results and Analysis of SLR

Cluster 1: Definitions of artificial intelligence and its evolution over time

Artificial intelligence entails communicating, directing, organizing, and controlling an ever - evolving frontier of computational innovations that references human intelligence in tackling ever more complicated decision - making challenges (Berente, 2021). Artificial intelligence (AI) has grown rapidly in the twenty - first century (from 2000 to 2015). The emergence of AI has accelerated the development of human society in our time, with major revolutions driven by both theories and tactics. (Liu et al., 2018). Artificial intelligence applications are used to replicate human intelligence for problem - solving or decision - making. It offers the benefits of permanence, dependability, and cost - effectiveness while simultaneously dealing with uncertainty and rapidity in either solving a problem or making a decision (Chowdhury & Sadek.,.2012). The objective of developing non - biological intelligence has been with us for a long time, predating the notional 1956 creation of the field of artificial intelligence by centuries or, according to some definitions, millennia. At the dawn of the 19th century, William Paley made such assumptions explicit, arguing that intelligent designers are necessary for the production of complex adaptive systems (Spector 2006). The evolution of artificial intelligence could be understood with the help of the following diagram.
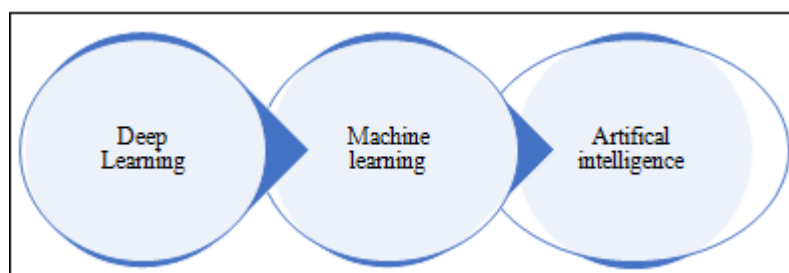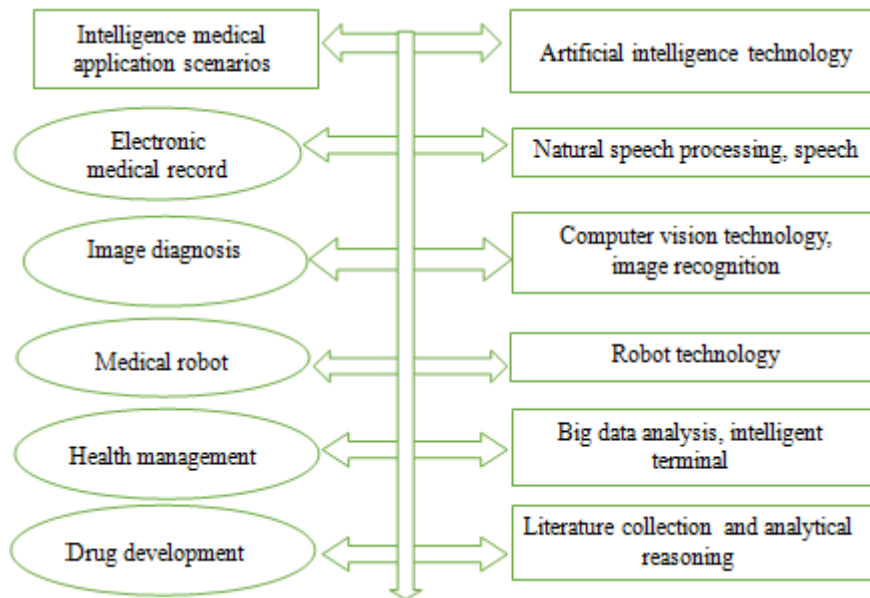

Figure 3: Evolution of artificial intelligence

Source: The authors

Note: Machine learning (ML) is a branch of artificial intelligence that allows computers to "learn" — frequently from data — without being explicitly programmed. Moreover, deep learning is an area of machine learning that employs self - learning algorithms called artificial neural networks (ANNs) that are inspired by the structure and function of the brain. Artificial intelligence is a field that combines computer science and large datasets to solve problems.

Cluster 2: Artificial Intelligence and its Technological Advancement

Significant competitive advantages will continue to accrue to those that use the Internet extensively and are ready to take entrepreneurial risks in order to transform breakthrough products/services into global commercial success stories (Makridakis 2017). The diagram on artificial intelligence technologies is described as follows:

Source: The authors

Note: Natural language processing (NLP) is the domain of artificial intelligence that focuses on the interaction between humans and machines through language through speech and text. While, in the context of machine vision, image recognition is the ability of software to recognize objects, places, people, writing, and actions in digital images. To recognize images, computers can utilize machine vision technology in conjunction with a camera and artificial intelligence (AI) software. Although, the use of methods and technology, such as AI and machine learning, to combine and analyze huge datasets with the purpose of detecting patterns and creating actionable insights is known as big data analytics. This allows you to make better, faster decisions based on data, which can enhance efficiency, sales, and profits.

Cluster 3: The Role artificial intelligence Plays in the education sector in the Indian Economy

The use of Artificial Intelligence (AI) in generating innovative teaching - learning solutions is gaining traction as a means of improving India's education system. Schools are beginning to transition from traditional teaching methods to smart education in order to improve students' learning experiences (Jaiswal & Arun 2021). AI is used in education in a variety of areas such as student affairs, learning and instruction, administrative efficiency, and student acquisition. When AI can provide struggling students with personalized degree planning as well as services such as extra coaching and advice, it falls under the purview of student affairs (Srivastava 2020). India has enthusiastically

embraced Artificial Intelligence (AI), which is causing our country to become wiser and more forward - thinking. India, being the world's fastest - growing economy with the second - largest population, has made significant contributions to the AI revolution. AI has penetrated every nook and cranny of India, whether in healthcare, agriculture, education, or transportation (Jingar et al., 2022).

4. Discussion and Conclusion

In recent years, Indian enterprises, governments, and individuals have witnessed numerous application cases of AI in various aspects of life. The purpose of this research is to investigate the role and impact of artificial intelligence in the Indian education sector, addressing key research questions about AIs definitions and evolution, its role in Indian education, and future research gaps. Various clusters are constructed in order to obtain authentic results. Clusters are often characterized as collections or groups of items that share or differ in some way. A cluster is a group or collection of things.

This research provides a comprehensive review of AIs role in the Indian education sector. The findings reveal that AI enhances grading efficiency and fosters critical thinking and analytical skills among students. Future research should explore how AI can be effectively integrated into educational practices and policies to further enhance learning.

Managerial Implication, Limitation, and future research scope

Our research benefits society, government, and higher education institutions. The government will learn more about the study's findings. One key incentive for employing AI in government procedures is that it can save millions of hours of manpower. This allows government employees to focus on more critical activities, allowing the government to provide services to the people more quickly. Investing in AI has enormous benefits for the public sector, including federal, state, and municipal governments. AI has the potential to help businesses work more efficiently, save money, and make substantial gains in research. AI in education is more important than we realise. With a growing emphasis on improving higher education quality, more than half of schools and universities rely on AI for administrative help.

Each study has some limitations. Our study's limitations are as follows: Due to time constraints, the systematic literature review is limited to 111 papers. To the best of the author's knowledge, all studies connected to this subject have been included. All keywords have been attempted to be included, although some may have been omitted. Our research is limited to the fields of artificial intelligence and education. However, artificial intelligence is being used in practically every area in India, including healthcare, automobiles, and infrastructure, among others. As a result, future research in these areas is possible.

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