A CRITICAL ANALYSIS OF PHILOSOPHY AND CONNOTATIONS OF ARTIFICIAL INTELLIGENCE IN EDUCATION

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

SANDHYA SHARMA

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BY

SANDHYA SHARMA

DEPARTMENT OF EDUCATION

SUPERVISOR

Dr. PRATEEK CHAURASIA

Submitted

In partial fulfillment of the requirement of the Degree of Doctor of Philosophy in Education of Mizoram University, Aizawl.

Mizoram University

TANHRIL: MIZORAM – 796004
Dr. Prateek Chaurasia.
M.Sc (Math) M.Ed, Ph.D.
Email-Prateek.chaurasia100@gmail.com
Department of Education.
Mobile-+8765506489

CERTIFICATE

This is to certify that the thesis entitled, ***A Critical Analysis of Philosophy and Connotations of Artificial Intelligence in Education*** submitted by **Sandhya Sharma,** having Regn. No. MZU/Ph.D/1851 of 27.08.2021 to the Mizoram University for the degree of Doctor of Philosophy in Education has been completed by her under my guidance and supervision. The work done by the candidate is original and it has not been submitted to any other university or Institution for the award of any degree or diploma and it is within the area of registration.

Date: **(Dr. PRATEEK CHAURASIA)**

Place: Aizawl Supervisor

DECLARATION

MIZORAM UNIVERSITY

SEPTEMBER, 2024

I **SANDHYA SHARMA**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and thatthe thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the Degree of **Doctor of Philosophy in Education.**

(SANDHYA SHARMA)
Research Scholar

(Prof. LOKANATH MISHRA)
Head

(Dr. PRATEEK CHAURASIA)
Supervisor

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Dated: Aizawl
The .....

(SANDHYA SHARMA)
Department of Education
Mizoram University

LIST OF TABLES

ABBREVATIONS

AI : Artificial Intelligent.

AGI : Artificial General Intelligence.

ANI : Artificial Narrow Intelligence.

ANN : Artificial Neural Networks.

AES : Adaptive Educational System.

CAI : Computer Assisted Instruction

CAL : Computer Assisted Learning

CBSE : Central Board of Secondary Education.

CISCE. : Council for the Indian School Certificate Examinations.

ICSE : Indian Certificate of Secondary Education.

EDM : Education Data Mining

ITS : Intelligent Tutoring system.

NCERT : National Council of Educational Research and Training NCTEN

NCTE : National Council for Teacher Education.

NEP : National Education Policy.

NLP : Natural Language Processing

ML : Machine learning.

STEM :Science,Technology,Engineering and Mathematics

UNESCO : United Nations Educational, scientific and cultural organization.

VR : Virtual Reality.

Chapter- I

Introduction

Introduction:

1.1 Artificial intelligence: An Overview

Artificial intelligence (AI) though in its infancy stage has penetrated almost every aspect of human lives and it would not be long before we witness AI thinking, acting and behaving like humans. Artificial Intelligence is concerned with understanding the nature of human intelligence and designing intelligent artifacts which can perform the tasks that, when performed by humans, are said to require intelligence. Although, still a dream till the recent past, has now become one of the greatest realities in today's time, where researchers and scientists are engaged to understand the morals, values, and ethics attached to Artificial intelligence. The word Artificial intelligent was first used at a work shop in 1956 held at Darmouth College, A US Ivy league University (McCarthy et al.. 2006). Zhong (2006) defined AI as "a branch of modern science and technology aiming at the exploration of the secrets of human intelligence on one hand and the transplantation of human intelligence into machines as much as possible on the other hand, so that machines would be able to perform the function as intelligently as they can"

The question that needs to be understood regarding AI is, how is a program capable of performing such remarkable functions that make up human intelligence? Human intelligence has been defined differently by different scientists and philosophers over the years. According to Jean Piaget intelligence is the ability to adapt to one's surroundings. Lewis Terman defines intelligence as the capacity to learn and adjust to a relatively new situation. Now, what is artificial intelligence? So long, Artificial intelligence has been seen only as a by- product of science fiction rather than as a discipline of knowledge. But now AI has gained global momentum and is one of the most sought-after subjects. At its core, AI is a branch of computer science that

deals with building and managing technology. The general conception of AI is a supercomputer that has the ability to perform human-like tasks and has “Human-like cognition”. (Timms 2016). It is however not a single term but an umbrella term for any kind of software or hardware that supports machine learning, computer vision, natural language understanding, and Natural language processing.

Turing (1950) in his paper “computing machinery and Intelligence” raised some philosophical Questions like “Can machine think”, which subsequently established the fundamental goal and vision of artificial intelligence. The fear that artificial intelligence might supersede human intelligence has led researchers to explore and understand the concept of Artificial intelligence and the philosophy behind it.

The role of AI in education started with the introduction of microcomputers in the 1970s which got enhanced with the development of program instructions and other related computing technologies. The mid of 1900s saw the flourishing of CAI and CAL in educational institutions. Artificial intelligence in education plays an important role in shaping and re-shaping the future of education. AI enhances education in numerous ways. According to the UNESCO report (2019) Artificial intelligence in education should incorporate three areas **“learning with AI”. “Learning about AI”, and” Preparing for AI”.** Artificial intelligence can assist in **innovative teaching and personalized learning** and can address some of the biggest challenges faced by education today.AI can accelerate the progress towards Sustainable Development Goals by **achieving inclusive and equitable quality education and lifelong learning opportunities** for all (UNESCO, 2021).

Artificial intelligence has been incorporated into **instructions, Teaching and learning**, **and administration**. Chasignot et al.. (2018). It can be used for **adaptive and personalized learning experiences**, it can be used as an **intelligent tutoring system**, and it can also be used as **a future component of educational processes** Gotsel and Bozkurt (2019). AI in education is also used for **promoting instant feedback and virtual reality learning** (Alam,2020) which not only helps in reinforcing knowledge but also saves learners from embarrassment. and Apart

fromthese uses, AI in education is also used for bringing **inclusiveness in education**, **predicting students' Performa**, and helping in **retaining students**. It is also used as **assistance to teachers in assessment and evaluation,** Zawacki-Richter et al.. (2019.) The role of AI in education is multi-dimensional. Not only does it help in teaching and learning but also in **administration, evaluation, and even in curriculum**. AI helps in enhancing the concept of **Learning for all** by responding to the diverse need of the students, by developing different teaching methods to meet **individual differences**, and by helping students to gain **technology experience**. (Alam, 2020).

Artificial intelligence has already become an integral part of our life. It has changed the way we communicate with each other, the way we behave, and the way we look for information Cassignol et al. (2018). AI in education has gained tremendous attention over the years and it can be seen in the colossal rise of paper publication and research conducted in the field of artificial intelligence in the recent years, Chen et al. (2020). However, the biggest challenge of Artificial intelligence is how it can help us to work and live with AI and how it can be applied to enhance education (UNESCO, 2021). Understanding the momentous of artificial intelligence in education the National Education Policy of India, 2020 urges the education sector to augment the implementation of AI at all the different levels of education and to poise a quick response on its implementation. It has also urged for more research work on the different aspects of AI for a wider understanding of it.

The present research is an attempt to understand the philosophy of artificial intelligence in education, to identify the different analytics of artificial intelligence and their implementation in education, and to pinpoint the different components of AI in education with regard to teaching, learning and assessment. In doing so, the researcher would also try to understand and explore the relationship of AI with other disciplines (Honaver, 2016). Through this study, the researcher attempts to understand the current trend of AI, the future prospect, and the challenges that might prevail in the future with regard to AI in education.

A) Historical Back ground of AI:

The history of AI can be traced back in the evolution of Mankind itself, the knowledge of technology existed in human's thought, intelligence, consciousness, since time immemorable. To understand this one has to scroll down the memory lane of the history of the west as well of the east. one can trace the seeds of AI in Greek Mythology where Homer in the Iliad talks of Hephaestus, the great craftsman, who because he was crippled himself has to create assistant who could make him move. He is described as the creator of "robot-like machines". In one paragraph he talks of automated waiters," Three legged tables he was constructing, twenty in all, to stand out the wall. To these he had feted wheels wrought of gold, so that they could run by themselves to the banquet of the Gods, at his wish, and back home, leaving everyone staggered." In another paragraph he talks of girl assistants to assist him "Handmaidens, fashioned of gold, gave ready support to their master, looking like genuine girls. They proved their understanding by their intelligent speech, their proficient and their skillful performance. These are golden, and in appearance like living young women. There is intelligence in their hearts, and there is speech in them and strength, and from the immortal gods they have learned how to do things". (Rajmohan, 1995., Mccorduck et al.,1997). Apart from many such instances of the presence of AI in ancient Greeks' the clock computers (Antikythera) are the milestone revelation of the presence of AI then. It is an intricate wheel work that simulates heaven. "Modern computer simulation is a direct development of the Greek Antikythara mechanism and its still earlier forebears. These mechanisms were however dedicated to a particular set of computations, following a single conceptual model…. What is new, essentially, about modern computers, is their ability to represent very different conceptual models and perform very different functions according to program instructions" (Rajmohan, 1995). Instances of creating "talking Heads" by the mediaeval European pope Selvester II and the "thinking Machine "called Jaljira by the Arab astrologers are evidences enough to prove that mankind was paving a way for an intelligent machine who could simulate humans.

In the sixteenth century we find the Swiss physician Paracelsus inventing a "little man Homunculus". He wrote "We shall be God; we shall duplicate God's greatest

miracle- the creation of Man" (Corduck, 1979). Babbi Loew the Talmudic scholar during that same period is said to have created a living Clay man named Joseph Golem but soon had to dismantle it because of its over aggressive nature.

Such innovative ideas were not only prevalent in the west but one can find this even in the Hindu tradition even before the Greek philosophy, acquisition of knowledge and intelligence goes back to the Vedas and Upanishads which raise profound questions about intelligence. Like the Antikythara mechanism of the Greek the Hindu astronomy studied the movements of the heavenly bodies and the positions of the planet. The study of astronomy which is the study of objects and matter outside the earth's atmosphere goes long Back to 400BC.Mention of automated vehicles and wooden robots could be found in Hindu literature. Different kind so machines have reference in Bhoja's Samarangana-Sutradhar "Many other mechanical devices like wooden robots, Astronomical models of heavenly bodies in motion…. Have been described in detail in the same text". (Ray and Sen,1986) . Stories of Panchatrantra, Mahabharata, Vaisesika- Sutras of Kanada talk of intelligence among other species in plant and Animal kingdom. (Tomkins and Barl 1974, Ryder 1992). Apart from the Hindu tradition the concept of AI could be seen in Chinese tradition as well. The Astronomical clock of Su Sun1088 A.D stand as a testimony of AI in the Chinese tradition. (Gregory 1981).

Thus, we can conclude with the statement that ever since the evolution of human civilization started the idea of creating an intelligent machine that could do the task of humans also took shape. An idea or a thought of an intelligent machine that could be as equal to human or even surpass human was always there in the minds of mankind, it's not a one-day innovation, no doubt it took shape in the modern era.

B) AI in the modern Era:

Nabiyev (2005) roughly defines AI "as the ability of a computer-controlled device to perform tasks in a human like manner. Human like manner is the behavior of thinking, reasoning, generalizing, learning from past mistakes and even feeling and understanding".AI has taken the world by storm, its impact could be felt globally and

exponentially and its promises are unprecedented, not a single field has been left untouched by it and it has completely changed the very nature of work wherein machine would be engaged in performing the tedious and routine task executed by humans and humans would be relieved to pursue work of creative value. (Butler, 2016; Davenport & Kirby, 2016). Daugherty & Wilson (2018) believes that AI would enhance human potential by learning and acting human ways, by sensing and comprehending human thoughts and feeling and by grasping human emotions. While some critics believe that AI would replace humans in many jobs leaving more and more unemployed, disrupting the work force and disbalancing the employment equilibrium (Bughin et al.., 2017; Østerlund et al.., 2021). Yet the proponents of AI believe in the positive aspect of AI as it would leave human beings with plenty of time to be engaged with value creation jobs. They also suggest that developing competencies of AI and AI related applications would go a far way in retaining employability. (Ågerfalk, 2020; Sullivan et al.., 2020).

Artificial intelligence in the modern era has taken over almost all the tedious, mundane and mechanical work of human beings like collecting and analyzing data, preserving and documenting, scheduling and inspecting equipment etc. (Huang et al.., 2019; Huang & Rust, 2018). In developing countries like India and China technology has over taken 71-77 of its work force (Chaudhury et al., 2020). Such technological advancement in countries has become possible mainly due to the functionalities of AI like data mining, machine learning, neural network etc. (Akerkar, 2019; Lecun et al., 2015). Multinational companies today are heavily investing on data driven technology which are based on logic and knowledge, which could handle big data and which has the potential of taking better and faster decision (Corea, 2019). India out stands as an emerging economic superpower (Budhwar et al., 2019), due to its fast progress in adapting technology in almost all its sphere. In 2018, the Indian government think- tank, National Institution for Transforming India (NITI) Aayog, started a nation-wide programme wherein the entire economy of the country was driven towards digitization and AI and its industrial applications. Its mantra of “AI for all” is focused on designing, deploying and developing of AI for maximizing its benefits and mitigating its risk. It stresses on the seven principles of

"safety and reliability", "inclusivity and non- discrimination", "equality, privacy and security", "transparency, accountability and protection", and "reenforcement of positive human values". (NITI Ayog 2022). By 2035, it is expected that AI would add up to US$957 billion, or 15% of India's current gross value (Menon et al.., 2017). The IT industry has gained global recognition due to its "global service delivery model "reaching out to countries by providing back-office operating services (Jain et al., 2019; Malik et al., 2020; Pereira et al., 2020).

The INDIAai website which was launched by the Indian government in 2020 is a platform to high light India's journey related to the development and global importance of AI (INDIAai, 2020). Along with the push in the economic sector the Indian Government is also working on educating the school children at different level on technology by launching NEP 2020 where procedures of disseminating education on AI and computer science have been clearly laid down. (NEP, 2020).

C) **Scope of Artificial intelligence:**

The scope of AI extends far and wide and encompasses almost every aspect of human lives, from Agriculture to health, from Education to employment, from manufacturing to banking and finance and from security to companionship AI does it all. From dawn to dusk we are engulfed with AI little knowing that the modern sophistication is but a boon of AI.

Medical and health sector: The use of AI in medicine started somewhere in the early 1970's almost 15 years later after it was coined by Mc Carthy at the Darmonth college in 1956. The application of AI was first discovered in life sciences with the Dendral project which was used to identify unknown molecules from mass spectra in 1960 (Lindslay et al..,1980.). The first rule based medical AI system which came around 1972 with the effort of Ted Shortliffe was MYCIN. It was derived from the Dendral project and was used to supervise and suggest anti biotic doses to human patients and also to give medical advice to medical practitioners (Shortliffe, 2012) AI in medical sector has a vast potential from diagnosing the symptoms to developing a bridge of thrust by communicating with the patients, from giving personalized care

to patients, to predicting and preventing diseases, epidemics to analyzing the clinical history of patients AI does it all (Piccialli et al., 2021.Bhargava and Bansal,2021). The greatest challenge in medical history so far has been diagnosing the disease as diagnosis were purely evidence based but evidence at times was not very helpful in giving the right decision but with AI diagnosis is backed with data driven knowledge and discovery. large data (Simon, 1995; Merida et al.. 2019., Szalanski, 1998) discovery and analysis of data to understand the clinical history of patients have worked as a boon in medical science. It has helped in giving personalized treatment to patients. The presence of virtual assistant and virtual nurses with their prompt and tireless responses has helped in easing the patients. Covid 19 saw the use of AI in different aspect from detection to diagnosis, from monitoring to giving treatment, from contact tracing to projecting mortality cases from development of drugs and vaccines to reducing the work load of health workers and prevention of disease (Vaishya, 2020) The Automatic prediction of deterioration risk of corona virus patients was done with a deep neural network technology during the pandemic outbreak. (Shamout et al., 2021). India too is accelerating its implementation of AI in medical sector through certain flagship programs like Ayushman Bharat, Forus health and certain other e- health projects. Researchers point out that AI is not only helpful for a reliable diagnosis of diseases but also for an accurate prognosis.

Manufacturing sector: AI technologies are seen as the key drivers in manufacturing sector. according to a report of The World Economic Forum (WEF) AI has the potential to have a positive impact on industrial automation and economy of a country. As per its study, more than 20% of existing jobs in the United Kingdom is directly impacted by AI driven technologies (Vinuesa et al.., 2020) and in developing countries like India and China, the overall impact of AI assessed is more than 26% in the manufacturing sector. By the end of 2022 it was expected that nearly 133 million jobs would be created through the manufacturing sector in India (Sharma et al., 2022) The manufacturing sector is one of the most promising sectors in India for implementing AI technologies. (Jaiswal et al., 2021) they are accelerating their economic growth with the ‘Make in India’ policy, A flagship program of the Indian government for promoting local products. (NITI Aayog, 2018). Also, the government

is targeting the contribution of manufacturing output to 25% of GDP by 2025 (Rizvi et al., 2021). India stands as the largest manufacturing nation with the objective of creating 100 jobs and holding the sixth position in the world. In past years, the government has provided motivation to the manufacturing industry by introducing a national manufacturing policy with the objective of creating 100 jobs in new employment.

Finance Sector: AI technologies like neural networks and fuzzy logics are used for "stock prediction, sales forecasting and market segmentation problems" (Tiwari et al., 2020). AI is highly relevant to financial services as finance deal with big data which are not just diverse but also delivered worldwide. Global bank deal with millions of equity exchange and international transaction, to handle such big data AI plays a significant role (Veloso, 2021). India has also implemented certain IT policies to upgrade banking and finance. Chat automation, fraud detection technique and virtual assistant are some of the AI based application used in the banking sector in India (Mallalai & Gopalakrishnan, 2020). Fintech has grown tremendously in India over the last three years, with 1.3 billion of population India is a promising growing market for Fintech where over half a billion of dollars flows for investments and start-ups. Apart from fintech being used in start-ups and investment, the corporate sectors and government regulatory bodies have come up with certain innovative solutions for easy finance like the UPI- Universal payment interface.

Education: Artificial intelligence opens up new possibilities to augment human capabilities in teaching and learning. It is accelerating at a tremendous pace overhauling the traditional method of teaching and learning. Education no longer remains only a human endeavor rather it has become a technological solution with intelligent tutoring system, natural language processing system, machine learning, deep learning, learning analytics etc enhancing teaching and learning (Popenicini & Kerr, 2017). Devices like IBM's super computer Watson are available the whole 365 days to advice students on academic issues in Deakin university, Australia (Deakin University 2014), Cobots (colleague robots) are used to perform routine task like spelling ad pronunciation. (Chen and Chen, 2020). Similarly other web based and on-

line education platform adapt intelligent behaviour to adjust according to the learner's behaviour in order to provide enriched experiences to the learner (Devedzic, 2004; Chassignol et al., 2018; Kahraman et al., 2010; Peredo, 2011). AI is not just used in teaching and learning but also in administration and assessment. The digitalization of educational resources, gamification, and personalized learning experiences, are some of the many opportunities where AI can be applied to education (Zhai et al. 2021.)

AI can provide the following things for the learners:

1. Intelligent tutoring system for personalized learning.
2. It can provide intelligent support system for collaborative learning.
3. It can provide authentic virtual learning environment.
4. It can provide flexible learning Environment.

AI can provide the following things for the teachers:

1. Freedom from routine and time-consuming task.
2. Helpful in developing research skills among teachers.
3. Helpful in gaining increased technological literacy and developing technological skills.
4. Helpful in developing management skills and team working attitude as they would be working with not only human colleagues but also with AI assistants (Lukin, 2016).

Apart from all these AI can be used for:

Gaming purpose: AI has the ability to adapt to the different structures or rules of different games like that of chess, Checkers, Kalah, Go etc. and easily transform these rules into a learning platform where one is able to develop creativity, problem solving attitude, reasoning skills and learning abilities (Verma, 2018).

For Entertainment purpose: The world of entertainment is over flowed by AI technology. Whether its composing music or pitching the voice or giving special effects AI does it all. It can restore to life the dead stars by preserving their work.

D) Challenges of AI: AI has reasons enough to rule the global scenario. Not a single

sector in the human world is left untouched by AI. It is the focus of our attention, the reason behind our entertainment, the driving force of our knowledge and reasoning and is at the centre of our existence. It is a very strong companion, a stronger confidant and an equally stronger competitor. But AI too has its own loopholes and issues. Some of the issues have been discussed below.

Legal Challenges: Whom to hold accountable when untoward accidents happen due to the autonomy of AI? Is it the machine, the manufacturing company or the owner of the vehicle? What actions to be permitted as non-punishable and what actions to be considered as punishable? What are the criteria for choosing a particular action etc are the biggest legal challenges of AI (Karelov et al., 2018). The questions like whose life to be given priority in a self-driven vehicles 'the lives of the pedestrian or the lives of the passengers'? The legal debate does not end here rather it goes deeper to the unpredictable nature of the self-adaptive technology when the technology takes its own decision against the will and knowledge of its creator.AI specially the robots learn about their environment as the algorithms that control them learns as the technology emerges (Stilgoe, 2018). Proposals for adopting the laws of animals to AI have been suggested and different countries have been adopted it for example the civil code of Russian Federation Article 1064 is a replica of the animal code of Article137 which holds the owner responsible for the damage done by the animal. Similarly, the responsibility in case of any damage or harm done to others by technology would be compensated by the owner of the autonomous technology (Vasiliev et al., 2019). It has also been suggested to give AI a legal entity status to grant AI all the rights, Powers and obligations and also to it give free will (Arikhipov & Naumov, 2017; Wrinkler, 2018)

Ethical Challenges:

a) Trust and transparency: biases and discrimination in AI system occurs due to non- transparency of data as AI algorithm and models demand confidentiality opacity is hard to acquire. This leads to trust issue and question of accountability (USACM 2017). Replication of gender biases and racial biases in recruitment have been found to be perpetuated by machine learning in probation processes (Raso et al., 2018). This discrimination on such protected characteristic has led to ethical concern of human right

infringement by AI (Access Now Policy Team, 2018).

b) Privacy and Data protection: The key concern of AI is maintaining information privacy and safeguarding this information privacy.AI has the potential to generate a large set of data and it has the ability to access this data to develop new patterns and infer information through it (Buttarelli, 2018). It even goes further to generate personal emotional data totally risking data protection and creating ethical concern (Tao et al. 2005, Flick, 2016). Data protection issue immediately raises the questions of data security, data vulnerability and data exploitation in the AI system making the system more vulnerable to model poisoning attack (Jagielski et al., 2018). It also raises ethical concern over reliability of AI systems as these systems rely completely on the quality of training data a slight glitch on the technical aspects or organizational aspect can lead to security bridge threatening the very integrity of data (Topol 2019)

c) Safety and security: Safety and security of not only how data are collected, stored and reproduced but also on the broader aspect when AI gets physically engaged with humans say suppose with autonomous transport or with health care the risk of safety becomes an issue of concern and of serious debates as it would be a harm to bodily integrity (BmVI, 2017).

Social Challenges: Various studies have illustrated that AI systems have entered different spheres of human society but it has not entered without certain unanticipated complexities specially to the disadvantaged section of the society like the differently abled group or face racial or gender biasness or economically discriminated group or similar another biased group. Social awareness and social interconnection have increased the swiftness of information many folds due to AI but it has reduced social tolerance and social etiquettes. A slight comment can instigate violence, an innocent can be proclaimed victim, a victim an innocent. The horde speak for the majority and the minorities are victimized, opinions seem to appear or disappear without humans being aware of its consequences. Technology thus plays the role of a mediator in misleading opinions it also reduces individual's autonomy by deciding our way of thinking (Ryan & Gregory 2019).

Metaphysical challenges: Metaphysical challenges arise from the concern whether any entity having human reasoning ability be subject to moral responsibility (Fischer 1999). Moral responsibility befalls on a person or subject when it fulfils certain requirements like its role to a certain incident, its ability to think, act and take decisions and artificial intelligence being a simulation to human brains comes almost at par with human thought process hence it has been argued to give moral status to AI. However, arguments vary as morality is a human condition, a status given to one who is vulnerable, corporeal and mortal and who is empathetic to situations and people around him and AI does not come in this realm. But the argument does not end here as supernatural powers or artefacts have been given moral status by human beings since time immemorial and hence AI- supported artefacts, AI-supported human brain computers need to change humans' perception of morality and assigning responsibility to AI (Bostrom & Sandberg, 2009, Coeckelbergh, 2011).

1.1.2 Types of Artificial intelligence and its major Dimensions:

Artificial intelligence is generally of two types:

1. AGI Artificial general (AGI)intelligence or Strong AI
2. Artificial Narrow intelligence (ANI) or weak AI.

A strong AI has a mind of its own and can think and act as human beings. It is developed by combining different programs to tackle different problems. It has a consciousness of itself and can recall memories and look into the future. It is in fact a "thinking Machine" (Sadiku et al., 2022).

Weak AI on the other hand is less ambitious and thus has less controversial issues. It is specialized to undertake specific task and although it can think its thinking is. directional like the industrial robots, internet search machine, virtual assistant like siris and google etc, Automatic vehicles, IBM Watson supercomputer etc. (Sadiku et al., 2022).

Dimensions of Artificial intelligence: The dimensions of AI stretches far and wide It encompasses various techniques and approaches; it stretches to different fields and areas and its scope ranges to almost all the aspect of human life. It's an umbrella term for all the techniques. that come together to make this technology. It's a

collection of different computational models and algorithm that enables a computer to simulate human intelligence, solve knowledge-based problems, executes tasks that need human intelligence, Understands the relationship between perception and action, manifests intelligent human behaviour, can comprehend from new situations and can explain, advise and demonstrate the action to its user (www.javatpoint.com). Some of the dimensions of AI are given below.

Expert system: Expert system or knowledge-based system or intelligent system is a computer software that simulates human behaviour. It is a specialized branch of AI which has the ability to infer new facts through the existing knowledge base. It gives expertise assistant to a computer in problem solving, diagnosing failures and designing new equipment (Buchanan, 1998). The main reason behind the expert working of ES is the transfer of human expertise, human knowledge and human skill to a computer system and allowing a non-expert to get benefit from the system (Sadiku et al., 2018)

Fuzzy logic: Fuzzy logic was introduced by Lotfi Zadeh in 1960s. Instead of giving variables a binary digit of either true or false or yes or no fuzzy logic recognizes variables of having a true value which can range between 0 and 1. It allows the system to have human reasoning and knowledge-based understanding. The two areas in which fuzzy applications can be categorized are 1) Fuzzy control application.2) fuzzy complex application. Fuzzy control applications are generally powerful representation of knowledge and are used in auto focusing cameras, washing machines, The other one as the name suggests have the ability to replace even human brains and are used in medical diagnosis, security, portfolio, fuzzy expert system, traffic control and fuzzy scheduling system. (Klement and Slany, 1994).

Neural Network:

"Artificial neural networks are data processing systems which simulate the data processing systems of the human beings" (Elmas, 2003, p. 22). Artificial neural network which is an imitation of the functioning of human brain was first invented by a e neurophysiologist Warren McCulloch and a mathematician Walter Pitts (Bishop, 2014). A single layer neural network has an input layer, a processing layer and an output layer but a multi-layer neural network has many multi or hidden processing layers apart from the input and output layer. (Kantardzic, 2011., Mijwel,

2017). A single layer neural network is generally used for solving simple problem but for solving complex problem a multi layered neural network is used. Apart from the different layers a neural network also has a learning algorithm which learns from the different layers and makes predictions (Trifonov et al., 2017). Neural network has certain characteristics like "Network structures Parallel processing Collective solution Learning ability Distributed memory Fault tolerance" (Kumar & Sharma, 2014).

Machine Learning: Machine learning is one of the widest and the most promising field in the application of AI in today's world. Automated vehicles, pattern recognition, computer vision, education, bioinformatics, natural language processing is all but applicant of machine learning (Alpaydin, 2009). Machine learning enables a computer to learn from data and improve itself through experience, it consists of a wide range of statistical models and algorithms which helps a system in identifying different patterns., drawing different inferences and learning through experiences without any specific instructions. It doesn't require any explicit programming but its results are unbiased and reliable (Kim and Lim, 2019).

Deep learning: Deep learning is one of the biggest breakthroughs in the field of Machine learning and it is due to deep learning that most of the practical applications of machine learning has been enabled. Deep learning has the ability to process abstract and complex non liner problems and can develop models that can relate input to output (Sadiku et al., 2022).

Natural language Processing: Natural language processing as the name suggests is the field of study which involves the communication of computers in human language. It is an interdisciplinary field involving, linguistics, computer science, logic and psychology and has computational approach to language analysis (Sadiku et al., 2022). The main function of NLP is to interpret human language by forming concepts from different words or phrases by translating or mapping them. This process involves the following steps:

1. breaking a sentence into tokens (tokenization);
2. Lemmatizing each token (lemmatization); and
3. Mapping each lemma (the standard form of a word) onto one or more concepts" (Charry et.al., 2018).

NLP is used in machine translation, text mining, automated question answering, text generation, automated speech recognition, expert system, computer aided instruction, data- based queries etc.

Robotics: It is a branch of computer science and engineering and it mainly revolves round the idea and design behind manufacturing and operations of robots. Manufacturing and operations of the Bionic Robots like the "mechanical mule", the unmanned vehicles and unmanned aircraft to Robots which act and think like human beings when programmed with input data have made robotics an interesting field of study and research (Pan, 2016) Robots are being used in almost every field from agriculture to industry, from education to entertainment, from house hold to employment, from manufacturing to transportation, from space to aerospace, from medicines to engineering. Robots are also used for surveillance and security purpose; China uses robot police to patrol in the streets. Research on robots working in collaboration with cloud services and control system is gaining momentum in the recent times (Sadiku et al., 2018. Sadiku et al., 2022).

1.1.3 AI and Machine learning:

Machine learning has emerged as one of the exciting technologies of Artificial intelligence. The search engine of google and Bing, the verbal assistant Alexa and Siris, the Facebook that recognizes a friend and reminds us of earlier events are all programmed with machine learning algorithm (Das et al.., 2015). Arthur Samuel describes Machine learning as the ability of a computer to act and behave like an intelligent being without explicit programming. Machine learning is the means through which the goals of AI can be achieved.AI intends to develop human like machines which is not possible without the learning algorithms which try to mimic the human brain. There are different types of machine learning algorithm like supervised learning, unsupervised learning, re reinforced learning and recommender system. These learnings are all inspired from the biological learning systems and hence like the biological learning they also learn from the past, deepens with the experience and gives out future insights (Das et al.., 2015).

1.1.4 Artificial intelligence and human cognition:

The main function of AI is to develop computer systems that are based on theories of human intelligence and human reasoning such as decision making, perceptron,

control and recognition (Russel, 2010). The goal of human brain on the other hand is to process information, make decisions, learn from and interact with the environment (Nishiyama and Yasuda, 2015) thus we can say that AI is a simulation of human brain and to relate it with human cognition is but very natural as we can see the pioneers of artificial intelligence like Alan Turing (Turing, 2012), Marvin Minsky and Seymour Papert (Minsky and Papert,1987), John McCarthy (McCarthy,1996), and Geoffrey Hinton (Hinton, 1984), were interested in brain science and they have contributed a lot on AI to make it think, act and behave like a human Brain But unlike biological intelligence the machine forgets the data quickly that was processed in it as it was lacking in the working memory that biological brain had, hence the task of incorporating a memory module which could remember the past data began long back in 1970's. One such memory module is the LSTM (Long Short Term Memory network) which helps the machine to perform inference task and complicated reasoning (Goldman,1991; Jonides et al.., 1993). To incorporate another characteristic of the human brain continual learning (learning new tasks without forgetting the old ones) in the computer system a new learning algorithm EWC (Elastic Weight Consolidation) was proposed which helps the system to retain earlier knowledge while learning new knowledge. Reinforcement learning which is widely used in machine learning is also a common characteristic of the biological brain (Kilpatric et al.., 2017, Denk et al..,1990). Thus, we can say that AI is closely related to human cognition.

1.1.5. Artificial intelligence and its interception in Education.

Audrey Azoulay, the Director- General of UNESCO (2019), claims: "Education will be profoundly transformed by AI...Teaching tools, ways of learning, access to knowledge, and teacher training will be revolutionized." Artificial intelligence is a tool for "modernising education, providing learning analytics accelerating the pace of our understanding and informing educational strategies" (Microsoft, 2021). To accelerating the educational sectors different policies have been adopted to upgrade the economic sector of the country like improving economic efficiency by optimizing the productivity of the labour force (Nermorin et al., 2023; OECD 2021; World Bank 2018). Debates on how AI should be given centre stage on pedagogy, learning and

school governance so that school curriculum is rebooted to come at par with the OECD 21st century skill development and economic efficiency programme of labour productivity. To spur the digital innovation, transformation and growth in education sector several countries have taken initiatives like PPP (Private Public Partnership), EFA (Education for All), MDG (Millenium Development Goal), SDG (Sustainable Development Goal) (Unterhalter, 2017).

With AI taking the front stage education ceases to be a human endeavour only rather it has become a seamless experience of technological intervention with intelligent tutoring system, natural language processing system, machine learning, deep learning, learning analytics etc enhancing teaching and learning (Popenicini and Kerr, 2017).The eco system of AI has been harnessed in such a way that it intends to change the global scenario of Education especially after the covid 19 era where education has shifted from board, chalk, paper and pen to mouse and curser. Now all the mundane administrative responsibilities like taking attendance, organizing activities, developing lesson plans and in some cases examining bundles of answers scripts are done by intelligent assistant (UNESCO, 2021; Ba0ker et al., 2019). Even learning has become active and interesting with remote learning taking its round on traditional learning.

1.1.6 Artificial intelligence and teaching and learning:

"Innovation in education is not just a matter of putting more technology into more classrooms; it is about changing approaches to teaching so that students acquire the skills they need to thrive in competitive global economies" (Schleicher, 2012).

1. AI has the potential to make teaching and learning adaptive and innovative. Different AI techniques like Fuzzy Logic, Neural Networks, Decision Trees, Bayesian Networks, Hidden Markov Models, Genetic Algorithms etc have different approaches and different learning theories which facilitates learning style and learning behaviour among students. These AI techniques could easily configurate and easily access various learning environment (Ferguson et al., 2015)
2. AI in education can help in achieving the educational goals in a better way. Teachers can analyze students' weaknesses, whether the weakness lies in

understanding a particular topic or the weakness lies in some area could be detected with AI (Mikhael & Bogacz, 2016).

3. Artificial intelligence has the potential to tailor classes according to 'students' profile and students' interest'. It can stimulate interest to various courses and content and draw interest to topics that needs to be improved according to the students' choice and interest (Popenici & Kerr, 2017).
4. AI helps in building the same kind of conceptual understanding among the students by offering clues to correct answers. It not only lessens errors but also d4evelops understanding of a content (Liebowitz, 2001. Martin, 2012).
5. AI could identify students' behavioural pattern and students' engagement which would help teacher in managing their classroom appropriately helping them to spend less time in paper work and more time in innovative tasks (Kelley & Knowles, 2016).
6. Mundane and repetitive tasks like grading the students, maintaining attendance, etc are being done by AI giving teacher more time to work for professional growth.
7. AI could be programmed to give Constructive and Instant feedback, ask questions and find information on any materials, provide knowledge suggests solutions. In fact, AI system has completely changed the way students acquire knowledge it has shifted from trial-and-error learning to hands on learning (Kena et al., 2015; Lanctot, 2017).

1.1.7 Artificial intelligence and ICT in Education: ICT in the educational sector has directly affected teaching and learning. Researchers have analyzed that ICT impacts student's cognition on both ways "what students think and how students think". In other words, it effects both intellectual content and intellectual competence (Carnoy, 2004). ICT in education has passed through four stages namely CAI (computer assisted instructions) a self-scoring mechanical teaching machine developed by S.L. Pressey in the 1920s (Smith and Smith, 1966). Computer science which was specifically programmed as a school subject became the second development with educators like Dwyer and Critchfield (1978) and Luehrmann and Peckham (1984) insisting on learning to program a computer before handling it. Thus,

computer literacy which began from elementary stage to higher stage of computer programming became the second stage of ICT. It could be wrapped up as "vocational" ICT education. The third stage is the cognitive development and problem-solving ability in ICT education. Books like «The Process of Conceptualization» (1968) by Brown and Lewis and Seymour Papert's "Mindstorms" (1980) indicates the influence of thinking on ICT in education (Chen and Paisley, 1985). The final, and most recent, stage is the use of Internet for gathering information, how internet could be used for gathering information for cognitive development and for problem-solving skill and how it could be used for accessing learning software. It takes ICT a step forward by improving networking among learners and teachers.

1.1.8 Artificial intelligence revolution in India:

Revolution since 1986 to 1994: DoE (currently MeitY) & UNDP launched the Knowledge Based Computer Systems (KBCS) program in November 1986, which aims towards Research and capacity development & PoCs Revolution since 1992-till date are Technology Development in Indian Languages, Language scripts/fonts, Prototype Machine Aided Translation Systems. OCR, Speech Synthesis systems for the Blind, Screen readers etc.

Revolution since 2012- Perception Engineering: Gaming Electronic Nose, e-tongue, Vision etc.

Revolution since 2015- Over 300 start-ups and more than 100 Indian companies are working towards facilitating AI (Conference of state IT, 2018).The union Government understanding the potential of AI allocated substantial investment in research, skilling, up skilling and training on AI technologies long back in 2018. Its digital India initiative aims at transforming India into a 'digitally empowered society and knowledge economy' (Sharma, 2016). Digital India anticipates digitization in governance as well as providing digital infrastructure to every citizen leading to their empowerment. Every single initiative on AI from funding to research, to training and skilling in emerging technologies is carried out under the umbrella of the Digital India programme. The Government has also taken initiative on ensuring that AI technology is made in India, and it is made to work for India, thus enhancing its Make in India programme (http://www.makeinindia.com/about), a government of India initiative for promoting India as a global manufacturing hub. Apart from digital

India initiative a number of other initiatives like:

a) **Artificial intelligent task-** In august 2017 The Union Ministry of Commerce and Industry started an Artificial Intelligence Task Force with a view to 'embed AI in our Economic, Political and Legal thought processes so that there is systemic capability to support the goal of India becoming one of the leaders of AI-rich economies' (Hickok et al., 2022). This task force on their March 2018 report identified 10 sectors on which AI can play a significant role in mitigating problems and in coordinating AI related activities by establishing nodal agency like the national artificial intelligence mission. These sectors include manufacturing, financial technology or FinTech, agriculture, health, technology for the differently abled, national security, environment, public utility services, retail and customer relationships and education.

b) **Ministry of electronics and information technology** The Union Ministry of Electronics and Information Technology has shifted its focus on AI since February 2018, and has set up four committees to develop a guide line for a national AI programme (Marda., 2018). The four committees are working on citizen centric services; data platforms; skilling, reskilling, Research &Development; and legal, regulatory and cybersecurity perspectives.

c) **NITI Aayog's National Strategy for Artificial Intelligence: #AIFORALL** NITI Aayog the National Institution for Transforming India, a think tank of the government of India has been entrusted with producing a national AI policy to direct Indian government's efforts on AI (Marda., 2018). To boost the economic productivity of India, In May 2018 NITI Aayog had collaborated with Google to teach and nurture start-ups in the financial sectors. It had also collaborated with ABB India to 'make key sectors of Indian economy ready for a digitalized future and realize the potential of AI, big data and connectivity' in late May 2018 (Hebbar, 2018). The mission of NITI Aayog is to 'leverage AI for economic growth, social development and inclusive growth, and finally as a "Garage" for emerging and developing economies (Kashinathan, 2020). NITI Aayog transcends its role from just recommendation to implementation and deployment as well. It also goes a

step further Firstly by acknowledging that AI adoption has so far been largely commercially driven, and recognizing the 'need to strike a balance between narrow definitions of financial impact and the greater good.' And secondly by recognizing that AI applications should be adopted for their gradational value, rather than for their transformational value in various sectors. NITI Aayog Stresses on giving these five sectors a push education, agriculture, health care, smart cities and infrastructure, and smart mobility and transportation (Bailey et al., 2018) Other initiatives of the Indian Government like India Artificial intelligence (USIAI) initiative, YUVAi (Youth for Unnati and Vikash with AI, INDIAai (the national AI portal of India), PM-STAIC (prime minister's science technology and innovation advisory council. The artificial intelligence (AI) mission of the PM-STAIC (Chaurasia., 2023)

1.1.9 Artificial revolution in the world: Countries and continents have developed strategies to have a proper code of conduct for AI world-wide such as:

a) In 2016 USA Released 3 reports "Preparing for the Future of AI","AI for Cyber defense and fraud detection"; "Shared public datasets for AI".
b) In China, "Next Generation Artificial Intelligence Development Plan" July 2017, Roadmap for 2030 include application of AI in agriculture, medicines and manufacturing.
c) South Korea Long term Master Plan is to prepare for an Intelligent Society: "Managing for the 4th Industrial Revolution, Establish World Class Infrastructure AI; Intelligent IT to all Industries; & Steps towards Reforming and Strengthening the Social Support System".
d) Canada has Launched three AI Research centres in Toronto, Montreal and Edmonton mainly to emphasis on skill development and research.Canada.ai - AI web portal.
e) UK had Spent 17 million pounds in 2017 to support AI research by the Engg & Physical Research Council (EPSRC). Start -ups at Cambridge & Oxford universities have achieved major AI breakthroughs.
f) Germany identified AI as intrinsic to the industry 4.0 initiative
g) Japan Investments Future Growth Strategy – "Society 5.0 in AI Robotics, Big

data, IoT. It focusses on A Areas like Health, Self-Driving Trucks and Drones" (Conference of state IITs, 2018).

h) The United States national policy on AI is overseen by the science and technology office of the white house.
i) The national AI strategy in Estonia's is created by the Ministry of Economic Affairs and Communications.
j) In France the implementation of AI is coordinated from within the Prime Minister's Office assigning responsibilities to a ministry or a particular department.
k) The United Kingdom coordinates with the UK Government's Office for policies on Artificial Intelligence. It has a Centre for Data Ethics and Innovation (CDEI)
l) The U.S. White House has established the National AI Initiative Office. It has a committee of expert advisory group under the National Science and Technology Department that looks on the affairs on AI
m) Singapore has an independent body to coordinate the implementation of its policy
n) Austria has a separate Council on Robotics and AI
o) Canada has Advisory Councils on AI
p) Spain has Artificial Intelligence Advisory Council
q) Germany' has a Data Ethics Commission to deal with AI strategies.
r) New Zealand, too has created a data ethics advisory group.
s) Singapore has Advisory Council on the Ethical Use of AI and Data (Galindo, 2021).

1.2 Rationale of the Study

The main idea behind studying the philosophy of Artificial intelligence is to understand its approach, its intent and to analyze the concept of AI in education. The researcher has decided to undertake the study of AI in education to develop critical thinking of how Artificial intelligence can be beneficial to our education system and in what ways. The researcher would explore and examine the different aspects of AI like feedback-based learning, personalized and equity-based learning, virtual

learning, etc and their pedagogical implications in education as the researcher feels that the area of AI in education has not much been explored and there is much to know in this field. Artificial intelligence is the need and the demand of the present society, it is only by achieving knowledge and educating ourselves in artificial intelligence can we enhance our understanding of the benefits of AI in education. The researcher aims to achieve a widespread understanding of AI in education by systematically analyzing the different components of AI in the educational sector. The existing literature review also suggests that there is very less understanding of the uses and implications of AI in education which has already entered our lives and society in various ways. (Estevez, 2019; Chen et al., 2020).

Besides, the New National Education Policy (MHRD, 2020) clearly mentions the use and application of AI in every aspect of education The application of AI in education would be mandatory in the near future as it would be transforming the whole concept of teaching and learning; hence an in-depth understanding of artificial intelligence and its different components like personalized and customized learning, adaptive learning, feed based learning, virtual learning, inclusive learning, interactive and innovative learning is the demand and need of the present times. This research will be beneficial to all stakeholders for a better understanding of the concept of AI and further, it would be helpful to all the upcoming researchers who would refer to this work for their further research. The researcher feels that AI can offer to our education system a more structured form of teaching and learning which would not only augment personal experience but also academic growth at the same time. Hence a critical study of philosophy of artificial intelligence and its connotation in education has been taken as the research topic by the researcher.

1.2.1 Existing Knowledge: As per the review of literature conducted by the researcher a lot of work on AI, types of AI, components of AI, scope of AI, its ethical and moral issues and considerations has been done however scope of AI in education has still not been fully explored and more so its implication and its benefits in teaching and learning, assessment and administration and a comprehensive understanding of AI in the educational scenario still needs to be updated.

1.2.2 Knowledge Gap: Need for rigorous research to assess the true effectiveness and impact of AI driven educational intervention as well as the philosophical aspect of AI like its nature, capabilities and implications has been found as the knowledge gap by the researcher.

The researcher also assumes that the research would prove to be beneficial to the various stakeholders of education and policymakers as the research would augment the findings of other studies and help in fostering relevant information to the stakeholders and policy makers. The research would make a worthy contribution to the growing study of artificial intelligence in education which has become a necessity in today's world.

1.3 Foundational Assumptions for the study:

1) Artificial intelligence has deep-rooted philosophy to provide sustainable growth in various aspects of human life.
2) Artificial intelligence has a multifaceted aspect that can be highly beneficial for enhancing and strengthening the education system.

1.4 Statement of the problem

The topic for the study was entitled as:
A critical analysis of philosophy and connotations of artificial intelligence in education.

1.5 Operational definitions of key terms

Analyse: Analyse in general terms means to look at the different parts of something very carefully to understand or explain the nature and relationship of the parts. Analyse in this research context is to study closely the different aspects of AI in education and try to understand their importance in augmenting education.

Connotations: Connotation in general means an idea that is associated with a word. Connotation in the present context means the intellectual process of reasoning, generalizing and learning from past experiences the idea that is associated with AI (Copeland, 2022).

Philosophy: Aristotle defines philosophy as a science which has the ability to discover the real nature of super natural elements. According to Karl Marx, "philosophy is the interpretation of the world in order to change it". Philosophy in

this context of the research is the understanding of epistemological, metaphysical, Axiological and existentialism aspects of artificial intelligence.

Artificial intelligence: Artificial intelligence commonly means the ability of a robot to do human like task or having humanlike characteristics of reasoning, generalizing, discovering new things and learning from past. Artificial intelligence in the present context refers to a computerized technology that helps the overall educational system by giving a human like intelligence.

1.6 Objectives of the study

1. To study the philosophical foundation of artificial intelligence and its implications to education.
2. To critically examine the philosophical foundation of artificial intelligence to education.
3. To analyze the educational components of artificial intelligence and its connotations with respect to:
    a) Teaching
    b) Learning
    c) Assessment
4. To explore the learning analytics of artificial intelligence and its implications in education.
5. To develop a framework of educational components of artificial intelligence and their implications in teaching learning process.

1.7 Delimitations of the study

The present study has the following delimitations:

1. The present study will be delimited to the philosophical inquiry of artificial intelligence only.
2. The present study will be delimited to the connotations of artificial intelligence in education only.
3. The present study will be delimited to the learning analytics of artificial intelligence in education only.

Chapter- II

REVIEW OF RELATED LITERATURE

1.1 Introduction

Review of literature is a technique through which the researcher can find out the relevant literature existing in one's study of interest. Literature reviews are the meticulous study of academic writings on a particular topic. They help a researcher to get proper directions on how the research has to be conducted. Through the different research reviews a researcher would have a proper knowledge on the research methodology, research design, Research questions and the like. The main motive behind reviewing of literature is to help understand the research gap. It makes the researcher aware of problem that had been least attempted or not attempted at all.

In the present study, the reviews had been done by consulting books, journals, theses, Magazines, periodicals and different websites. The researcher has reviewed 106 literatures based on the relevance of the research topic and these reviews has been put under different categories according to their nature of studies.

1.2 History of Artificial intelligence:

COPELAND (2000) in his paper tried to clarify Turing's test which had been misunderstood over the time. He analyzed the different lectures of Turning. Turing had talked of machine intelligence before 1941. He had distributed a typewritten paper on machine intelligence at the Government Code and Cypher School. It was probably the first paper on machine learning and heuristic problem-solving. In 1945, Turing also made the first remark that computer could play very good chess. His proposal of an Automatic Computing Engine (ACE) was probably the first complete statement of an electronic stored-program for common use. Thus, Turing test had surpassed time and it was a great turning stone in the field of AI.

Honaver (2016) made an attempt to study the historical growth of AI and its co relation with ancient Greek and Vedic civilization. He also explored the relationship

of AI with other disciplines so as to find its scope, problems and major areas. He tried to survey the relationship of AI with other disciplines by analyzing thoroughly different literature reviews and broadly concluded by saying that AI was one of the most significant technology developments of today's times which is intellectually challenging and exciting at the same time.

Simon (1995) firstly tried to delimit the boundaries of artificial intelligence, and secondly tried to justify AI as a science. To understand AI as a science he detoured the lane of History. AI was born to construct programmes for computers. It was a multicell organism capable of building systems that exhibited intelligence. Apart from building intelligent systems it became a social system that understood human mind and emotions. An empirical method was used to show that AI exhibit all the features of science and hence should be considered a science.

1.3 Philosophy of Artificial intelligence:

Han et al. (2021) tried to answer the question of Schank (1980) on "How much intelligence is there in artificial intelligence?" They reviewed papers of about 40 years since Schank's paper to understand the main techniques behind AI, such as deep learning and reinforcement learning and found out that they were deeply related with psychology. They discovered that AI could be the main leap in enhancing the knowledge of AI. However, the question could AI system be as intelligent as human and could they surpass human intelligence test they concluded with Schank's study that whereas intelligence was more about induction, AI was more about deduction and hence had nothing to do with generalization.

Lepskiy (2021) tried to examine the reflexibility of Artificial intelligence which had become a necessity in today's world to control as well to support the activities of Artificial intelligence. Philosophical and methodological analysis of the existing literature were conducted to find out the function and role AI plays in supporting reflexivity in its procedures in controlling the social systems. Subject paradigms and ontologies were examined to understand the reflexivity of Artificial intelligence.

Pieters (2021) in his book talked of the philosophical concept of free will of

intelligent machines. Free will was viewed more as a social concept and with the objective of studying free will of the machine an empirical approach to understand the relationship between machines and environment was conducted. Based on a case study and the "CREEK system developed at NTNU in Trondheim", these relations were analyzed both from the phenomlogical and from an actor network perspective and it was concluded that it was important to consider free will issues when building machines that were required to serve human society.

Inozemtsev et al. (2017) tried to understand the concept of epistemology of AI and found out that the concept of epistemology dealt with the problem of computer understanding and perception, which included the problem of manipulation, generalization, representation, acquisition and replenishment. The researcher analyzed the different stages of the development of AI through a historical survey of the classical and the non-classical stages of AI.

Peters (2006) tried to develop a mapping for the field of philosophy of technology and its importance in education through the content analysis of different literature reviews and concluded that philosophy of technology helps in understanding not only the concept of technology but also helps in conceptualizing intellectual approaches to the study of technology. He suggested that understanding philosophy of technology can be helpful in structuring the largely inchoate and disparate field of teaching and learning.

Rajmohan (1995) tried to understand the philosophical implication of Artificial intelligence as a discipline of knowledge through empirical studies of different literature. He also analyzed the sociological implication and ethical questions related to AI and concluded that like all other branch of philosophy the philosophy of AI is also based on the acquisition of knowledge and there are numerous ways of acquiring knowledge of AI. He however puts human acquisition of knowledge above the acquisition of knowledge of AI as AI do not possess the power of passing knowledge to other machines as we humans have.

Aaron (1979) tried to understand the philosophical foundation of AI, the relationship

between computation processing and physical processing, and the behavioral aspect, the semantic aspect of AI as well as the possibility of the presence of neurons in AI.

1.4 Rights and Ethics of AI:

Stahl et al. (2022) talked of human and ethical rights that has to be legally initiated through a regulatory body or agency so that AI could be beneficial for human progress and flourishment. The paper proposed the agency to be like the European union which is exemplary as it works both at the regional and state level. AI too being global in nature should have regulation which could deal both with geographical as well jurisdiction level. The research was conducted through stake holders' meetings, focus group, interviews and feedback of stake holders. The paper concluded that just like AI which is a part of the larger eco system of many interrelated technologies this regulatory body will also be a part of a larger regulatory body or environment.

The paper by **Huang et al. (2021**) is an initiative to establish a framework of ethical guidelines for music. An attempt to connect between technological ethics and non-Western philosophies such as Confucianism, Shintoism, Buddhism, and Daoism had been found in this paper. Also, an emphasize to interrelate between AI and traditional values and cultural heritage had been done. An overview of existing ethical guidelines for AI had been conducted through different journals and articles to understand the connection between East Asian philosophies and their relation to technology, interpretation of the ethical guidelines and their current relationship with various cultural and traditional values to understand the intercultural perspective on ethics of music AI had been the main concern of this paper.

Mardha (2018) talked of Artificial intelligence governance, its ethical, legal and technical opportunities and challenges. It sought to propose a framework for comprehending the implications of AI in its data, model and application stage. It focused on the limitations and potential risks of data driven decision and sought to provide solutions Firstly, by addressing the current social and ethical issues of adopting AI by providing alternative approach to current policy. Secondly, by calling for a cross disciplinary discussion to address AI policies in India, Thirdly, by opening up to global or international discussion on AI its ethics, policies and legal

issues.

1.5 Application of Artificial Intelligence in Education and other sectors:

Nemorin et al. (2023) The study sought to understand how the ecosystem of Artificial intelligent can be involved in the production of knowledge that could represent a particular kind of epistemology over others. This paper used text mining and thematic analysis to offer a study of the various topics that have come out over the years regarding the debate of AIEd. Digital methods were used for the collection and analysis of data. The paper also examined the different criteria of deploying AI in the global education context. Findings were categorized according to geopolitical dominance, market niches, and perceptions, narratives and norms.

Namatherdhala et al. (2022). This research, elaborately discussed the function of AI in education, the different AI technologies and their role in the education sector. It also analyzed the different aspects of educational sector that was innovated by AI tools and technologies. Different area like education administration, instructional design and learning were differently categorized and explored by reviewing literatures in those field. As this research has covered almost all the areas of education sector that has been influenced by AI it could prove to be guiding path to other research in this field.

The aim of **Ahmad et al. (2022**) was to explore the academic and administrative applications of Artificial Intelligence. Artificial Intelligence Applications (AIA) not only assist education in academics and administration but also enhances their efficacy. A scoping review was done to understand the scope of AIA, and it was found out that AIA had various role to play in Learning Analytics (LA), Virtual Reality (VR), Grading/Assessments (G/A), and Admissions. It could minimize the official tasks of a teacher and could add a significant contribution to enhance student learning. The study however has to be quantitatively analyzed before it could be accepted and generalized.

Peifer et al. (2022) stated the enormous generation of data due to digitalization of technologies which had led companies to use AI more frequently. This has not only

influenced the work environment and work culture but has also brought new challenges to leaders and leadership qualities. They conducted analytical rese arch by studying the previous research work and found out four cluster where leaders need to abreast themselves to face the future challenges. They are “Strategic transformation process”, “Qualification and competencies”, “Culture”, and “Human AI interaction”. They concluded that leaders need to imbibe the above four strategies in order to create AI work environment.

Felice et al. (2022) explores the different academic papers to answer certain queries regarding AI like the role and the application of Ai in today’s world, its social, economic and social standings, its loopholes and shortcomings. They try to understand AI from both the technical and theoretical perspective and thus seek to find out its opportunities and draw backs. The definition of AI according to them changes with time from a mere game winning robot it has touched almost every aspect of human lives from neurology to computer, from neurobiology to neurophysiology. This is an analytical study that has compared data of different papers and examined the role played by AI in medicine and health sector, finance and manufacture. The paper also tried to understand the ethics of AI, its global trends and its challenges.

Huang (2021) tried to explore the efficiency of teaching under the influence of artificial intelligence technology. The methodology applied was framing of different teaching design by analyzing existing literature reviews. The results showed that the use of artificial intelligence in education had led to changes in various aspect of teaching and learning like content and objective, media and environment, and in evaluation. It was found that artificial intelligence technology had the ability to enhance learning and cognitive ability of the students and thus could improve teaching learning efficiency.

Zhang et al. (2021) did an empirical study on different articles on AI published between 1993-2020 and was able to find out the current state of AIED in research and education, its practical implications and the prospect for future research. The researcher found out the possible benefits of AI in education as AI enhances the access to learning

opportunities, helps in customized learning experience, and provide better methods and strategies for desired learning outcome.

Neubauer (2021) tried to understand the threat of AI which might supersede human intelligence and suggested in enhancing human intelligence. Through his findings he suggested on a dire need for self enhancement and adopt transhumanism as well as post humanistic approach in dealing with AI. The researcher made an overview of different literature reviews on intelligence research, neuro and pharma technology research, on psychological and societal research and concluded that more knowledge on human intelligence, social competencies, emotional and creativity understanding lead to a better understanding of AI and would also lead towards better research on AI.

Greutzemachar and whittlestone (2021) in their paper the transformative potential of AI suggested that AI had to be transformative to have greater impact on human lives and societies. They proposed three different levels on how AI could be transformative like "narrowly transformative AI", Transformative AI", and radically transformative AI". Existing literature had been studied thoroughly to find out the potential transformative quality of AI and recommendations were also put forward as to how Ai could be transformative without however exceeding human level cognitive abilities.

Chen et al. (2020) Adopted a qualitative research approach to study the outcome of AI in learning, administration and instruction and the researchers concluded that AI has a major impact on different aspect of education. The researcher had undertaken a retrogressive approach by assessing secondary data and materials and found out that AI had augmented education sector in different forms including teaching, decision making, richer learning experience, practical or experimental learning, administration and instruction.

The main purpose of **Luan et al. (2020**) was to present the ongoing place, position, possibilities, and challenges of big data and AI in education. The work had emerged from the minutes, discussions, judgement and opinions of prominent researchers

from various disciplines at The International Learning Sciences Forum, 2019, The article started with a survey of the progress of big data and AI in education. It then went on to highlight the challenges and trends. Finally, suggested the future scope of it in education. This position paper was a result of the study of different journals and book chapter, a systematic review, bibliometric study, qualitative and social network analysis of different research paper from various area.

The paper by **Renz and Hilbig (2020)** focused on EdTech companies, their impetus and hurdles in affecting data-based teaching and learning. The results showed that LA integrated itself with the ongoing business models of EdTech companies on three levels, "basic Learning Analytics, Learning Analytics and algorithmic or human-based recommendations, and Learning Analytics and adaptive teaching and learning (AI based)". The research was conducted on two levels firstly an interview based on qualitative content analysis was done taking 25 edtech companies to understand their business models in implementing LA and AI in instruction and secondly discourse analysis was done to understand the relationship between convention ideals of education and the recent concept of educational technology.

UNESCO (2019) in its Beijing consensus declared Artificial Intelligence had the prospective to change the education system by taking it toward by innovative learning teaching thereby accelerating the progress of SDG 4. UNESCO has been taking various steps for promoting AI for all irrespective of challenges that hamper the implementation of policy and regulatory frame work. However, the rapid developments in technology usher risks and challenges outpacing policy discourse and administrative structure. UNESCO is bound to bring equity and equality in education through AI. The disposal of artificial innovation in education should be utilized to protect human rights and promote human machine relation for sustainable development.

Fahimirad and Kothamjani (2018) talked of innovative educational technologies and their revolutionary methods of teaching and learning. This review paper attempted to examine the use of artificial intelligence in teaching and learning in education and the outcome of these technologies on teaching and learning. This study

was conducted with the intention of predicting the role of artificial intelligence in education in days to come. The paper highlighted the consideration that although artificial intelligence can improve the quality of teaching and learning; yet the threat of amalgamating artificial intelligence in educational is tremendous and has to be addressed sincerely to effectively apply AI in teaching and learning.

Rathi (2018) focused on the benefits of AI in human resource services, the advantages of AI, the challenges faced in implementing AI and the road ahead. According to the researcher AI and ML are the two essential factors for obtaining inch-perfect decision-making and effective people management. The objectives of the study were to comprehend the concept of artificial intelligence, to investigate the role of artificial intelligence in HR and to study the challenges for implementing AI and to give necessary recommendations.

Chassignol et al. (2018) tried to pinpoint the prospective impact of AI in education and tried to predict the changes it would bring to different aspect of education. The researcher conducted a literature review of electronic data bases to understand and define the influence of AI in education and concluded that AI was changing and reshaping the educational landscape by opening opportunities for intelligent tutoring system, intelligent assessment system, personalized learning environment and offering opportunities for different on-line courses.

Bajaj and Sharma (2018) talked about adaptability of learners and how students learn by different learning styles. The researchers reviewed the various AI models and the existing learning theories and made a comparative study as to how by implementing AI techniques to the learning theory models one can successfully determine the learning styles of students. The researcher concluded that student's adaptability and their learning would be enhanced by the combination of AI and the different learning theory models.

Raja and Nagasubramani (2018) conducted a review of literature to find out the utility of technology in education and tried to understand the advantage and disadvantage of technology in education. According to them digital footprint, round

the clock connectivity, online degrees are some of the boons of technology however declining writing skills, online cheating, lack of focus are some of the curses of technology. However, they concluded with the findings that personalized learning, collaborative and cooperative learning, active learning, globalized learning, and unlimited learning was possible only through technology.

Srivastava (2018) had revived national as well as international journals to find out the status of AI and its adaptation in various sector like health care, education, business and finance, employment, transport etc. Data of different countries like United states, United Kingdom, China, South Korea, Singapore and India were collected and it was found out that although AI had the potentiality of meeting all the targets in different fields as compared to conventional methods yet there was considerable threat of having adverse effect in job sector. The report also suggested that with proper policies and regulations, Research and development, Proper infrastructure, technology development, and further survey in this field the job issue could be addressed.

To understand the major strengths and new opportunities of AI in education, **Roll & Wylie (2016)** analyzed 47 papers of around thirty years from the Journal of AIED (1994, 2004, and 2014). The results were used to suggest two parallel strands of research, one was an evolutionary process, while the other was a revolutionary process. The evolutionary process was used to study the current classroom practices, the revolutionary process was to imbed technologies in everyday lives of the students, to understand their cultures, communities, goals and practices. The paper concluded with the remark that while each of the domain has its own potential a combination of evolutionary and revolutionary approach would bring greater good to larger community.

Luckin (2016) explored the application of AI in education through the use of different models like pedagogical models, subject learned models (domain models) and learner models, and concluded that all these three models need to be embodied together so as to get the best of human and machine. Luckin in his book concluded that AI in education has to be blended with digital technology and traditional class

room activities. It should be a combination of pedagogy, technology, learning environments, Teachers, students and parents so that AI would have a more participatory outlook

1.6 Artificial intelligence and Environmental sustainability:

He et al. (2021) suggested the use of Artificial intelligence in treating desalination of sea water which had to go through four processes like selection of site, prediction of energy, selection of technology for desalination and parameter for systematic optimization. In this paper, they tried to analyze the use of artificial intelligence in desalination sea water with renewable energy. Different papers were reviewed to understand the impact of AI in controlling sea water and the conclusion reached was that the use of artificial intelligence technologies can contribute to the improvement, efficiency and productivity of freshwater by at least 10%.

Nti et al. (2021) presented a review paper on AI and its importance on environmental sustainability in tackling certain issues of biodiversity, energy transportation and water management. The methodology applied in this paper is systematic study and examination of the already existing literature. This paper tried to answer certain climatic global challenges and how it could be handled through AI. The paper however highlighted the risk of involving AI in solving environmental challenges as it would lead to hacking of important data and documents.

1.7 Artificial Intelligence in K 12:

Sharma and Chaurasia (2023) conducted a research review to understand how AI has transformed our education system. Intelligent tutoring system, Natural language processing, educational robots, educational data mining system, etc has not only increased the efficiency and efficacy of education but also has improved the educational administrative services. This article also talked about the different connotations of AI in education and how it is viewed both subjectively and objectively. It also talked about the barriers of AI in education and its future prospect.

Sanusi et al. (2021) aimed to study the competencies required for students to actively take part, understand effectively and prosper in the study of artificial intelligence in K-12, taking into consideration the ethical prospect of AI as well. This study was conducted on the K-12 students of Nigeria to understand the benefits of AI and also to have a proper grasp of it in education. A quantitative methodology approach was used and data was collected from secondary school students in the form of questionnaire. It was found that rational approach, Man machine cooperation, self-learning, skill competency, and ethics influence AI significantly. The findings of the study contributed on the significance of competencies among students in understanding AI through the content provided. The outcome of this study could help students in developing the right competencies needed to steer AI.
Understanding the impetus of the national education policy 2020 and the rich global potential of AI in the near future CBSE had incorporated AI from 2020-2021 session as a non- compulsory subject from class IX. AI has been introduced to ensure skilled based learning as opposed to only knowledge-based learning among the secondary school students. The book begins with the definition of intelligence and goes on to defining artificial intelligence. The book highlights on the application and workings of AI in today's world. It also talks about the difference between AI and other automation, it shows the similarities and dissimilarities between machine learning, deep learning and AI. The book also mentions about the rights and ethics of AI.

Zhou et al. (2020) carried out a study on newly published articles relating to Learning Experiences of AI from K-12. It was a fact-finding review of different literatures and tools and a frame work was designed to apprise about the expansion and growth of the learning experiences of AI for K-12 students. They pinpointed several guidelines and opportunities to help students, support teachers and researchers, would benefit designers and parents in creating learning experiences of AI for K12

Estevez et al. (2019) sought to understand the power and limitations of AI through a work shop on the introduction of AI fundamentals that can be performed at schools with scratch. The researcher used design-based research to develop solution to the

understanding of AI among students of higher section and found out that the workshop effectively changed the mindset of the students towards AI helping them to have a more realistic approach towards AI and understanding its potential threat and benefits

Artificial Intelligence according to the **facilitator hand book for class 10** was both an opportunity and a problem resolver for social development and economic growth .AI could be helpful in promoting skill-based education and valuing activity-based work in order to "effectively harness the potential of AI in a sustainable manner". Being introduce in the CBSE curriculum CBSE at Class IX from the Session 2019-2020 onwards it has enhanced the multidisciplinary outlook in teaching and learning AI "inspire module" was started from class V111 onwards. The book was curated by Intel and the main aim of the book was to incorporate AI in education to not only improve instruction but also to make the students ready to for the AI world.

1.8 Artificial Education in early childhood education:

Su at al. (2021) conducted research to find out how Artificial intelligence (AI) technologies were used in early childhood education (ECE) to strengthen learning and mental growth among young children. Scoping review was conducted and 17 eligible studies from 1995 to2021 from different countries were analyzed, evaluated and synthesize to understand the significance of AI in ECE. this review aimed to exhibit the recent literature on AI in ECE through different research questions. The conclusion revealed that there was lack of proper research on this field of AI teaching and tutoring system for young children and more research work had to be conducted to come to a valid conclusion.

1.9 Artificial education in information and computer technique:

Penalvo et al. (2023) conducted a systematic review on the tools and scientific production of generative artificial intelligence technologies especially the latest emergent tool ChatGPT to understand the potential, advantages, disadvantages, challenges and limits of generative technologies in the field of education. The article concluded that although generative technology tools have significant impact on

teaching and learning but they lack the ability for reasoning and comprehension hence they are more receptive to mistakes as they rely on large language models with probabilistic basis.

Haderer et al. (2022) in their paper presented an AI advocated task and designing system for students including analysis, ideas for mobile operating systems, and interfaces for graphic users for smartphones. The objective of the paper was to incorporate traditional learning with technology-based learning. Reports and data were surveyed from different journals to understand how the fourth revolution in education was mandatory and helpful for future generation. The author however concluded that Different kinds of challenges like policies for sustainable development on Artificial intelligence, ensuring inclusive and equity education, preparing teachers, development of quality and inclusive data systems, doing significant research on education in AI, ethics and clarity in collection and dissemination of data was encountered by different researchers while incorporating AI in education

Ouyang and Jiao (2021) observed that AI in education, with the development of information processing and computing technique in recent years had undergone several paradigmatic shifts, they are Artificial intelligence-directed learning that is when learner was a recipient, Artificial intelligence-supported learning, when learner was a collaborator, and Artificial intelligence- empowered learning when learner was a leader. The objective of this paper was to sum up the various paradigms with the relevant representation of different conceptual research, existing theories, and practical usages of AI in education through different literature searched through different academic databases.

Guzman and Lewis (2019) conducted research on people's interactions with AI to find out how the paradigm of communication has changed as communication so far had been only human to human communication. To address this issue and to articulate the difference between emerging technology and human communication a theoretical base to understand human– machine communication (HMC) was developed. A framework was outlined and an agenda was developed to focus on

three aspects of communicative AI technologies: (1) the functional aspects. (2) the relational dynamics between people and technology (3) the metaphysical inferences among human, communication and machine.

1.10 Artificial Intelligence in Higher Education:

George and Wooden (2023) critically evaluated the framework of AI in "smart universities". The objective was to make a comprehensive review of the recent use of AI in higher education, to outline the functional characteristics and theoretical design of smart universities and also to survey the prospective responsibilities and roles of smart universities and lastly, to analyze the opportunities and challenges while incorporating AI in the framework of higher education. A systematic review combining of meta-analysis and narrative review was used as methodology to understand the role of Smart Universities in reshaping the administrative and academic process with AI and quantum technologies.

Ng Kit et al. (2021) stated that to promote Artificial intelligence literacy among the students' educators throughout the world employ different pedagogical strategies. To conduct a study on this the researchers invited 82 students from the primary section in Hong Kong for a three- month digital story writing program to learn AI which was accomplished by a knowledge test. It was found out that students were able to create meaningful and new solutions based on their AI knowledge. Inquiry based pedagogical survey was conducted to reach to the conclusion that DSW as a pedagogy tool not only helped in scaffolding students but also helped them in real life problems.

Wang and Chung (2021) in their paper explored the student cantered education plan to find out students' efficiency. The Apriori algorithm of association rules was used to understand the patterns of the score data of college students and establish a teaching method accordingly. Secondly The decision tree model was used to study the' academic performance of the students and the likely relationship between different courses. Finally, the Apriori algorithm of association rules was combined with decision tree model to find out the early warning mechanism of students'

achievement, the course performance of students was examined empirically. The results showed that: C language has two sides of dependence on many subjects and the teaching scheme of C language C++ Java conforms more to the learning mechanism of college students.

Baker (2000) speculated on the future AI research in Education with the objective that different models of artificial intelligence would be beneficial for different educational goals and purposes. He proposed three different models and their uses in educational processes: "models as scientific tools, models as components of educational artefacts, and models as bases for design of educational artefacts". In conclusion he proposed that AIED research should focus on these three roles of models. He surveyed European countries, focusing particularly on France with students from age group 5 to 18 years to reach the conclusion.

This article of **Nieto et al. (2019**) sought to analyzed the South American's HEIs decision's structure and the control of institutional governance in it. The article aimed at representing the responsibility and impact of decision making not only in the academic arena but also in the whole environment of Higher Educational. A thorough review was conducted to understand the role of Information and Communication Technologies (ICT) and the use of ML in HEIs. The main goal was to the compare the effectiveness of Machine Learning (ML) algorithms Decision Trees, Random Forests and Logistic Regression in predicting graduate students' and their role in supporting decision making process in HEIs from their academic performance. The experiment was done with 6100 engineering students from Colombia.

Popenici and Kerr (2017) in their paper tried to explore the circumstances on the use of Artificial intelligence in higher education and its emerging trend in teaching and learning. The paper tried to investigate how students learn and how the institutions teach and develop. They pinpointed some challenges on how students adapt and adopt to this new culture as well as how institutions could maximize the use of technology for education purpose. Different papers had been reviewed to understand the education implication of modern technologies. The paper concluded

with the fact that the rapid progress of technology might lead to job displacement and this needs to be seriously addressed when universities think about a sustainable future. Like the complex algorithms of AI has made many teaching practices redundant so also biasness of the programmers might enter into AI operating system making the whole system bias.

Lucas and Gaag (1991) published an introductory text book for computer science undergraduates' students and it covers subjects of expert systems. The main motive behind this book was to provide a suitable book for teaching computer science to undergraduate's students. Formalisms are the main topics of this book. The main objective of including formalism was on one hand to understand its importance on expert system and on the other to acknowledge its importance as being the foundation of current research since a considerable period of time. The book had in paid more attention to formalisms as they are of practical importance for building expert systems. Thus, the book dealt more on illustrated principle than on recency of tools or methodology. Most of the principles of expert systems work on programs which are either written in PROLOG or in LISP, or sometimes in both programming languages. Thus, the book focuses on learning at least one of the two languages to comprehend the expert system properly.

1.11 AI based Evaluation:

The paper by **Dolia (2004)** tried to justify technology-based evaluation both offline on line on the grounds of applicability, effectiveness, relevance and efficacy. The objective of the study was to identify the effectiveness of A1 based evaluation, to understand its problems and to suggest measures for objective based evaluation. The methodology applied was performance test verbal and nonverbal given to kindergarten and first grade students The result found was that the test substantially saved time and energy as compared to traditional method of testing. It was also found to be more reliable and effective.

1.12 Artificial intelligence in Finance and Economy:

OECD (2019) described Artificial intelligence as a promising prospect that would

reshape economy and improve productivity. However, the book also talked of AI as inflaming anxieties and upgrading ethical concerns. To answer the questions of trustworthiness of AI systems the members of OECD in 2018 drafted a standard policy to felicitate innovation and adaptation of trust in AI. It was the first intergovernmental standard on AI – adopted by all OECD members and by several partner countries on 22 May 2019.The main aim of the OECD AI Policy was to bring out an analytical and observatory measurement to form expertise policy on AI.

Yan (2019) studied the interpretability of AI models in finance. The paper analyzed different methods like hidden neuron method, interpretability method, model mimicking method to understand the practicability of interpretation of artificial intelligence models and concluded that some AI models has the feasibility of interpretation while some did not have.

Cockburn (2018) stated that artificial intelligence did not only increase the efficiency of the existing economy but also enhanced different methods of invention. This paper tied to distinguish between robotics and the prospective for recent developments in deep learning. The paper tried to have an in dept study on application-oriented learning research by analyzing the existing qualitative papers and the empirical documents since 2009 towards deep learning and its role in application-oriented research. This exploratory paper concluded with the evidence that AI had the potential of inventing new methods of research.

Ghosh et al. (2018) in their book Artificial intelligence tried to analyze the potential of a computer in processing information and producing outcomes that resembled the thought process of humans in decision making, problems solving and learning. The objective of the survey was to identify which areas of human lives and business were mostly affected by technology. The book also tried to understand the perception of the people in embracing technologies in their personal as well as work lives. survey was conducted across different sectors of Indian business-like finance, technology and manufacture to understand the attitude of employers and thereby to understand the present and future prospect of technology.

1.13 AI in Science and engineering Education

Fitriani et al. (2023) did bibliometric analysis to understand the research trend of AI. The analysis was done with online data bases on research articles from the year 1976 to 2023. Around 491 articles were analyzed and the findings revealed that the research on AI has increased tremendously in recent years and the number of articles published has also increased significantly. Articles are mostly written in English and students from the Federal University of Alagoas, Central China Normal University, and Monash University have made greater contribution. The key words in most of the articles are AI in education, computer aided instruction, learning system, machine learning etc. The article gives a comprehensive view of research trend in AI in education and emphasizes on further research.

Heras et al. (2021) suggested on having process simulation for engineering students as it would have different practical aspects of different simulation processes and it would flexibility in teaching learning process. It would also have abundant scope for students' participation in teaching and learning n. The objective of the study is to propagate education simulators in engineering colleges. The methodology applied was modelling of different design for simulation. The students were taught through simulation and questionnaire and survey was done to collect their feedback. The conclusion of the study was a positive impact as it led to better participation and better understanding of the concept.

Karthikeyan (2021) in their book talked about the different research papers written by engineering students. The book was the outcome of such research conducted in the form of theoretical research. The students collected information from different authentic academic portal and arranged their information according to the standard format. Even though the subheading was common the literature review, the way of writing of different students was different. The outcome of such an initiative was an exposure to the students which not only arouse their interest in research but also brought out the creativity of the students and exposed them to the nuances of academic writing.

Zawacki-Richter et al. (2019) in their paper through a systematic review sought to provide an outline of research on applications of AI in higher education. Around 2656 publications between the period 2007 and 2018were randomly selected out of which 146 articles were taken for the study. The descriptive results showed that computer science and STEM were the most involved disciplines in AIEd research and that quantitative method was most frequently used. The results depicted four main areas of AIEd uses in educational institutions including administrative services. They were "profiling and prediction," "assessment and evaluation", "adaptive systems and personalization", and "intelligent tutoring systems".

1.14 Artificial intelligence in Medicines:

Gerich et al. (2022) talked of AI and use of technologies in health care. Around 7610 articles published between January 2010 to march 2021 were reviewed and majority of the articles confirmed the use of technological advancement in different nursing institute. Non experimental studies were excluded. A scoping review was done to find out the advance use of artificial intelligence in the field of nursing and the review found out that yet -educating the nurses on AI at all professional level was found to be in adequate, Use of technology was reported to be insufficient. The paper suggested that educating nurses on technology on a mandatory basis had to be accelerated at all the nursing institute.

Revali et al. (2021) stated that artificial intelligence has the capacity of mimicking almost all the aspect of human intelligence and particularly it has benefitted immensely in medicines. AI recently has been in tremendous use in treating bone related problem and hence the idea and objective that it could be used in paediatric physiotherapy led the researcher to research on this field. The method adopted by them was a systematic search from various academic and research data bases like google scholars, PubMed etc. Published in between 2011 march to 2021 march. They concluded by writing that AI has far reaching implications on health care and especially on physiotherapy however they recommended on upgrading and improvising all medical setup and improve the doctor patient's relationship.

Vaishya et al. (2020) talked of AI as a decisive technology for fighting against the deadly pandemic like corona virus It can easily track the spread of virus, identify patients who are at high risks, predict mortality rate and can control the spread of the virus. The research was based on review of literature from journals from Scopus, PubMed and google scholar. The result of the study was the identification of seven significant applications of AI on covid 19 namely Early detection and diagnosis, monitoring and prediction of the virus, contact tracing, Prediction of mortality cases, Development of vaccines, lessening the work load of health care workers, Prevention of disease.

Naqa et al. (2020) talked on the importance of AI in clinical studies especially in diagnostic imaging and therapy. The study showed how AI not only helped in detection and diagnosis of disease but also in prognosis and decision making. The study was based on a historical study of AI and its evolution to the present day which saw a tremendous rise of AI specially in radiology science" automation of segmentation, improving image quality, and developing decision-support systems for personalization of detection and treatment" are but some of its improvements. It has in fact, completely changed the way of how patients are being managed and how doctors reached their clinical decisions however the study concluded with the risks involved with AI like privacy and security when handling big data.

1.15 Machine learning and Education:

Saxena et al. (2023) reviewed 80 scholarly articles based on SPIDER frame work approach to understand the blended mode of learning before and after the pandemic 19. This article concluded that AI not only enhanced the blended mode of learning by giving a real-life experience to students but also addressed administrative issues and challenges. It also played a pivotal role in enhancing the efficacy and quality of blended learning by enhancing adaptive adjustment of the learners to match with the complex content and thereby enhancing their cognitive ability.

Sanusi et al. (2022) reviewed around 43 journal and conference articles to focus on ML teaching and learning in K-12 on four perspective areas they were curriculum

and pedagogy development, technology and teacher training/professional development. The findings of the study were (a) additional resources were required for kindergarten to middle school for ML teaching (b) Integration of ML into subject domains should be done adequately, (c) focusses should be given on pedagogical and professional development of teachers, and (d) Study on ethical implications and societal evidence of ML needed to be geared.

Gresse von Wangenheim et al. (2022) presented a systematic mapping of tools for supporting teaching of ML at K-12. They also analyzed the different tools and identified the tools as per their educational features. The study also included the study of the development of different AI models including how these tools have been developed and designed to support ML learning They identified 16 tools that could upgrade the comprehension of students on ML.

Shaikh et al. (2021) in this paper claimed that the pandemic had changed the whole scenario of teaching and learning and the future of education totally depend on remote learning and machine learning. They had emerged as a viable option to accomplish educational goals. The research paper had evaluated ten international science journals along with other relevant material through the internet search engine to understand about artificial intelligence in education during the pandemic and the future of learning. A qualitative approach and a phenomenological technique were used to ascertain those results and to answered the research questions. The findings were summarized by confirming that automated learning was the need of the hour and the future of education depended on it.

Tedre et al. (2021) conducted a scoping analysis that mapped the entire evolution in educational theory and practice the and technology related to machine learning at the K-12 levels. The paper focused on the main features of the changes that were required to integrate ML into K-12 curriculum successfully.

Sanusi and Oyelere (2020) conducted a narrative review approach with 24 literatures from 2010 to 2020 to find out the pedagogical association of ML while teaching K-12. The findings of the study suggested that learner-centred pedagogical

approach such as active learning, participatory learning, Task based learning, project-based learning, design-oriented learning, are suitable for teaching ML in K-12. These approaches are helpful in making the students active while learning and gain learning experiences.

Marques et al. (2020) carried out a systematic mapping study (SMS) to identify the different instructional components present in teaching ML in K-12. They found out 30 instructional units (IU) with regards to its concept, complexity and its fundamental processes. The instructional units include data management and model learning and testing. The key finding of the paper is the clustering of the numerous IU features for ML education across K-12 learning, featuring mainly on the content and context of ML and how it could be established and appraised in the education systems. They however specified that there was a lack of organized demonstration of the IUs due to lack of scientific reviewed articles.

Kim et al. (2017) talked of machine intelligence in smart class rooms in days to come which would not only impart instructions but also provide instant feedback to learners regarding their body language, voice modulation and other nonverbal behaviour during their practice session so as to avoid embarrassment and anxiety among the learners. The researcher through a model of AI tried to quantify the input of the presenter and the listener and also tried to understand the relationship of the behaviour of the presenter. The Research was conducted in a smart class room that was well equipped with cameras, micro phones and observation rooms.

Kucak (2018) tried to evaluate the possibilities of using and applying machine learning in education and found that machine learning was helpful in grading students, identifying the reasons of student's failure and helping student's retention. The researcher also concluded that machine learning was also helpful in school metrics, reputation, financials, ranking, evaluating students, identifying their weakness and struggle and providing students' feedback

1.16 Games and Robotics in Education:

The review conducted **by Giannakos et al. (2020**) addressed games and its uses in

the field of K12 education. They showed how with the help of different games different topics and concepts can be presented uniquely. The review provided unique and comprehensive opportunities to stakeholders to apply and explore different games according to the needs and demands in educational field. They had identified 17 games/projects after reviewing several articles

Mubin et al. (2013) represented a review on robots in education. Prior studies in this area were ventured through classification criteria. The classification criteria included different types of robots and their role, robotic behaviour, the area of learning activity and location of activity. It was found out that robots could be used for language learning, science and technology education and that it could undertake the role of a teacher, it could be used as a teaching tool, or a peer in the learning. The paper concluded with the statement that robots are advance technology capable of providing physical and tangible representation of learning outcomes.

1.17 Natural language processing and Education:

The paper by **Mathew et al. (2021**) sought to explore the notion of natural language processing (NLP) and artificial intelligence based intelligent tutoring system (ITS) in teaching computers in primary and secondary schools. To understand whether ITS could be an effective learning assistant a pilot prototype chatbot was developed, to assist the subject Scratch (Scratch is a visual programming to teach school children to develop their stories, games or animations). With the help of natural language unde2rstanding (NLU) or NLP library, and a user interface, student queries were feed into the chatbot, to pursue the desired explanation. A two- stage testing process was conducted to test the chatbot's NLP extraction and information retrieval performance. The evaluation results showed that the learning assistant was relatively accurate in creating an ontology modelling which would be beneficial for a cloud-based solution in future.

Pokrivcakova (2019) in his paper talked about the influence of modern technology and communication in foreign language teaching and learning. Technology like natural language processing, adaptive learning, data mining, machine learning had

brought about tremendous change in foreign language education. The objective of the study was to suggest different AI powered tools for foreign language education. By reviewing different papers and articles the author suggested eight different AI tools and their significant role in foreign language learning. The author also suggested different frames for the teachers to incorporate in their teaching which would empower them to use Artificial intelligence tools for effective teaching.

Buchkremer **et al. (2019**) applied a combinatorial approach of complementing reading of different scientific articles with the help AI technologies to gain a comprehensive overview of scientific findings. A "double funnel of artificial intelligence.'' approach that cleansed and enriched the excess data collected at the beginning of data collection in order to give substantial data. Text visualization and natural language processing techniques was used to discover findings that could not be discovered by human reader previously because of thier inability to process huge amounts of work. With this methodology, findings could be reproduced from any review papers; and new and additional findings could also be discovered from different fields.

According to **Antoniadis and Desmet** (2016) Foreign Language Learning and Teaching in general, and Computer-Assisted Language Learning (CALL)in particular, is premier in integrating natural language processing techniques and insights in educational fields. Since then, different electronic and instructional method have crept into education to enhance self- directed and blended mode of learning. However, the use of Natural Language Processing in CALL has not got its due till date due to technological and pedagogical restrain. Technological readiness being one of the major concerns of NLP Although NLP has progressed tremendously, yet challenges loom larger.

1.18 Artificial Neural network and Education:

The study by **Duykuluoğlu (2021**) aimed at shedding some light on the role and functionality of artificial neural networks in educational research by referring to the different studies that were being done through artificial neural networks analysis.

A systematic review and qualitative research model were applied for carrying out this study to understand the role of artificial neural network in educ2ational research and its future prospect. The research papers that were scanned in this study showed that artificial neural network had a great role to play in
educational research as they provide predictive accuracy which could be beneficial for estimation and classification research. They also perform better in statistical analysis and should be used in place of conventional statistical model for classification and predictive research

According to **Okewua (2021**) Artificial neural network-based education data mining play a vital role in acquiring huge amount of data from students studying in higher institutions which could be utilized for adaptive learning and progression of students, for retention and for saving cost. Although ANN-based EDM could be used successfully used to predict students' performance and classify students learning behaviour yet this field is yet to get its desired attention. this study takes up the challenges and gaps of ANN based EDM through a systematic literature to understand it. They analyzed 190 studies between 2010–2018.Theire findings revealed that the challenges lied with hardware, training. Theory and quality Understanding the alarming rates of dropouts in educational institutions.

Tan and Shao (2015) conducted research to find out the reason of dropouts among students. Academic performance and personal traits of the students were selected as attributions for the study. Predicting models like Artificial Neural Network (ANN), Decision Tree (DT) and Bayesian Networks (BNs) were created and Sample from 62,375 students was used for testing and training of model. The results of these models gave accurate and precise prediction of students drop out.

1.19 Data Mining in education:

Windl et al. (2022) This paper sought to understand how AI has been changing design processes and how structured understanding has become a necessity of designers to improve not just the design process but also to educate future designers. Interviews with designers who work on AI projects were conducted. Diverse sample

from different interaction designers were collected and the results showed that integrating AI with interactive system not only effect the design process but also effect the design team who try to adapt and accommodate AI to their design process the design process. Four approaches were developed based on their data: “a priori, post-hoc, model-centric, and competence-centric”.

Algarni (2016) Education Data mining techniques are useful for extracting information from raw data of students that could be used for decision making and improving teaching learning process. This paper studied the relevance of EDM in different literature and tried to analyze the methodologies used. The paper discussed in detail the different EDM techniques like1) Prediction, 2) Clustering,3) Relationship mining. 4)Data distillation, 5) Discovery with models, etc and studied their objectives and their applicability in education.

1.20 Virtual reality and Education:

Zhai et al. (2021) did content analysis of different studies to find out the application of artificial intelligence in education and also to understand the challenges and trends of AI research in education. 63 empirical papers and 37 analytical papers were reviewed to find out the different layers of research questions. Four different research trends were classified and suggested for more investigation. The challenges in education according to them were mainly due to inappropriate use of AI techniques, social and ethical issues and the changing roles of teachers and students.

Aylett (2000) reviewed the issues that come along with producing intelligent virtual environments by combining artificial intelligence and virtual environments. The autonomous creatures and agents are embodiment of such kind of combination with give graphic representation and interaction. Discussion were given with examples to show that this virtual agents receive knowledge from environments to assist them. The paper suggested that intelligent agents should be playing the role of presenting knowledge instead of using their knowledge and skill.

Freina and Ott (2015) conducted a study on the scientific literature in the year 2013 and 2014 to show the potentials of Immersive Virtual Reality in Education. It highlighted how VR in general, and immersive VR in particular is beneficial for

university students. It then focused on the advantages and disadvantages of its use in education with reference to children with down syndrome and some other kinds of cognitive disabilities. The paper concluded by outlining strategies that could be carried out to confirm these ideas.

1.21 Role of Intelligent tutoring system in Education:

Wambsganss et al. (2020) presented a science-based research project to show how adaptive dialog-based tutoring system was beneficial for students to learn and argue. It could support individual learning, independent of any human instructor, and independent of any time and place. This study is designed in DSR approach (Design science research). They followed eight steps which are" Problem formulation"," Deriving requirements from scientific literature", "Deriving requirements from user interviews", "Deriving design principles for initial version of Argue tutor", "Evaluation of initial version of Argue Tutor", "Revising of design knowledge and implementing of Argue Tutor Evaluation of second version Documentation of evaluated design knowledge".

Sharma et al. (2019) reviewed different papers and journals to identify the role of artificial intelligence in education and also to understand how AI had shaped modern education. Artificial intelligence had led to adaptive and personalized learning, it had led to standardized tutoring system, it had been beneficial to administrative work. In fact, not a field had been remained untouched by AI. The paper however as acknowledged by different papers expressed concern on the degradation of students' creativity. The paper concluded with a mixed thought that Artificial intelligent was neither a boon nor a curse to the society rather like all other technologies it was a tool of the human brain to be used by the humans in a fruitful way.

Walkington1 and Bernacki (2019) explored the possibility of connecting students' individual interests to personalize learning using Intelligent Tutoring System (ITS) for algebra. They examined the idea that students personalized learning can be moderated with their engagement with out of school interest. They also examined whether individual interest was affected by math problem at a deeper level or at the

surface level. Results suggested that connecting math instruction to students' out-of-school interests could be beneficial for learning in an ITS. However,
benefits of personalized learning can be realized only when the degree of students' quantitative engagement matches with their out-of-school interests. They also found that problems with deeper personalization gives better positive affect.

According to **Conati (2018)** Intelligent Tutoring Systems (ITS) is an interdisciplinary field that is mainly helpful in devising educational systems which could tailored instructions according to the individual needs of the learner. Although other educational activities could also provide adaptive support to students yet when it comes to giving individualized support, they require an ITS model that can adapt to students' behaviour and understand students' skills and mental states. This paper presented a variety of projects that represented some of the challenges faced by computer-based teaching instructions and proposed solutions, and future opportunities by providing intelligent tutoring for meta-cognitive skills.

Wang et al. (2015) conducted a research on Personalization and intelligent tutoring system two most effective factors of learning .Intelligent tutoring system (ITS) imitates a teachers' actions to give personalized teaching .This research discussed the methods and concepts of developing problem solving oriented ITS, it then developed the current intelligent Tutor based on the extended model of ITS. The research adopted a quasi-experimental design to enquire into the effectiveness of intelligent Tutor in acquisition of skills in problem solving and effective learning. It was found out that students in intelligent tutor were more competent than students of controlled groups. Also, the students with no prior knowledge was found to be improving

Sottilare (2011) reviewed the challenges and emerging tools, methods and technologies that had influenced the development of adaptive, intelligent tutors for team training of geographically-distributed areas Team tutoring is a challenging concept more for Computer-based tutors as they face additional challenges like recognizing and appraising the cognitive state of each team member, understanding the readiness to learn, measuring team performance; discerning and weighing the team members contributions ; and selecting instructional strategies for optimizing

team performance. The paper also suggested that performance measures, behavioural and physiological measures, historical and self-reported data can also provide the tutor with the information needed to model the trainee's state and their relationship with other team members and the tutor.

Baker et al. (2006) studied how in recent years students have used intelligent tutoring systems to exploit the properties of the systems rather than to learn the materials provided by the systems in order to tackle educational problems. In this paper, Baker introduced a "gamming system with supplementary exercises" which gives the students the exact materials which they get bypassing the game. It also gives a negative emotion to gaming students with the help of animated agent, thus making the students less engaged in gaming, and making them perform better than other students.

Self (1990) in his paper considered the idea of giving a formal status to intelligent tutoring systems in order to have more reliable implementation in learning. According to him till date informal theories were studied empirically to build formal theories. The objective of this paper was to find out the loop in which informal theories were subject to empirical studies which led to experimental implementations. through different stages of experimental study, he evaluated semi-formal theories through simulations before complete execution of this theory for empirical study

1.22 Role of Fuzzy logic in Education:

Krouska et al. (2019) Although intelligent tutoring systems is used widely in education, yet the evaluation process in ITS still follow the classical way of calculating the average grades of students without taking into considerations other assessment units and factors like difficulty level of the exercises, students' efforts etc. Considering this issue, this paper presented a new way of improving students' evaluation performance with the help of fuzzy logic. The researcher to test how far fuzzy logic can be beneficial in evaluating students designed and implement ITS having social networking characteristics to teach "compliers" to engineering

students. The researcher discovered that the system was efficient enough to acquire students' information about their grades, about their misconception, about the difficulty level of the test and about the students' efforts through their social interaction, their comments and participation in educational forums regarding educational processes etc. The researcher used t-test to diagnose the fuzzy logic model and found out that it provided accuracy and objectivity in evaluating students' performance.

Voskoglou (2013) described Fuzzy logic as sets theory introduced by Zadeh in 1965, In this article a fuzzy logic model had been developed for assessing group students 'knowledge and skill'. problem-solving and analogical reasoning skills and subject matter knowledge constitute as fuzzy subsets in this model and they are taken as the main trait for assessment. their performance is characterized and their profiles are calculated. Thus, a detailed quantitative/qualitative analysis of the students' group performance is obtained. And by applying centroid and defuzzification method group students' assessment is done. This method is also applicable for assessing individual students.

Fourali (2010) highlighted the fact that fuzzy logic is a relatively new quantitative methodology which is very useful in measuring educational achievement. Different principles behind fuzzy logic were illustrated to highlight how these principles could be applied by educators for assessing portfolio evidence. The paper particularly focused on the UK assessment criteria where portfolio assessment is viewed as an important measuring unit. The paper also argued that fuzzy logic can offer some rightful insight when it comes to rationalize teachers' deliberations while assessing complex portfolio. To support this argument Illustrations are drawn from the UK's National Council for Vocational Qualifications (NCVQs). The paper also expressed the need to improve the current educational measurement by demonstrating the examples of developments in other fields of enquiry, that had adopted newer perspectives of assessment. The paper concludes with the statement that although fuzzy logic has had been successful in various industries its contribution in social science is very significant as it provides the social scientist with new tools that are

very relevant in different areas of enquiry.

According to **Gokmen et al. (2010)** educational systems normally adopt classical methods of performance evaluation where student performance is dependent on exam results. Fuzzy logic can provide an alternative, non-classical performance evaluation, it is a set-theory based on mathematical technique helpful for various kind of decision-making This study proposed fuzzy logic systems of evaluation and conducted research on Student performance at Marmara University with fuzzy logic and found out that fuzzy logic method was flexible and could provide numerous options of evaluation as compared to classical method which used only one constant calculation. samples were taken from twenty students from the control technique laboratory course.

Nolan (1998) explored the development and design of expert fuzzy classification scoring system for grading students writing. This system supports teachers in evaluating student writing samples by providing a uniform framework to them. The response from actual students has been used as a data to test the system. A controlled experiment suggested that this system could assists teachers in assessing students with accuracy and in less time as compared to teachers using classical method of assessment. The paper Advocated the concept of rule- based scoring models which give consistent and uniform scoring results and which could be done with fuzzy classification scoring system.

1.23 Artificial intelligence for students with special needs:

Garg and Sharma (2022) analyzed how and in what ways AI has affected education of special needs students. The data collected was based on qualitative research which was conducted through focused interviews from among teachers and students with special needs. The data was also collected from the various literature present in databases EBSCO which comprised of Web of Science, Scopus and Science Direct, newspapers, magazines, blogs etc. Content analysis was used to see the impact of AI on (a) Special Need Education; (b) helping teachers to foster special need education. Based on focused interview the study also proposed a framework for an inclusive future of Special Need Education.

Lokeshwar et al. (2021) proposed an android application device for differently abled people to communicate among themselves. 'TensorFlow Lite Object Detection API' which allowed 'voice enabled object detection' and 'distance estimation assistance' is used to make communication accessible, 'image to speech conversion' by using 'OCR text recognition' with an Open CV and 'Text to Speech API' can be used to assist the blind. It also has navigation features like 'Map box and Geocoder' library which could be helpful for the blind people. It also has 'text- to-speech conversion 'and speech-to- text conversion features to facilitate easy chatting among themselves. It also provides chatting option built using Firebase.

Chapter- III

Research Design and Procedures

3.1 Introduction

The present chapter discusses the methodology used in the study. The chapter also elaborates the various kind of data sources considered in the study for retrieving them as primary and secondary data. Research methodology is the process of solving a particular research problem in an organized or structured manner. It provides an adequate frame work to conduct the study and acts as a blue print to the entire study. It is in fact a concatenation of research activities starting from identification of the research gap to finding the solution. "Research approaches comprise strategies and methods for research that extend the decisions from general assumptions to thorough methods of data gathering and reasoning" (Creswell, 2014). A research methodology thus is an outline or sketch of how certain research is to be carried out. It can be defined as techniques and procedures that are applied to study, identify and analyze a particular information to meet out the research objectives.

3.2 Design of the Study

The main purpose of the present study is to elucidate the philosophical basis of AI and its connotations in Education and its different aspects like teaching, learning and assessment. Therefore, the nature of the study is purely qualitative and the researcher has adopted the basic techniques of qualitative analysis of primary and secondary data. The research design highly relies upon the technique of analyzing and interpreting the concepts, ideas, and findings part by part in order to arrive at meaningful conclusions. Qualitative research is "an inquiry process of understanding a social or human problem based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting" (Creswell, 1994.). Denzin and Lincoln, (2000) stated that qualitative research embraces an interpretive and naturalistic approach: "This means that

qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them".

In qualitative researches sometimes deeper analysis and natural enquiry for studying and analyzing the narratives is also required. The researcher has also utilized enquiry technique to complete the analysis of different themes of Artificial intelligence and its connotations in the present education system. It is "engaging in naturalistic inquiry and studying rich narrative descriptions of specific topics to determine patterns / themes" (Michael Quinn Patton, 2005) The various researches which depict the philosophical analysis of the subject like metaphysical aspects, epistemological aspects, and axiological aspects combine together to make a deeper qualitative analysis which is Multi focusing method that gives an interpretative and naturalistic approach to the philosophical analysis of the subject. Thus, qualitative research is an umbrella term that covers a variety of data collection methods such as observations, interviews, focused group discussions, drawings, projective tools, narratives, biographies, texts, images, videos etc (Khan,2023, Shodh ganga).

The present study "A Critical Analysis of philosophy and connotations of Artificial intelligence in Education" is a qualitative enquiry and content analysis of different literatures collected from various sources. It is an in-depth study and analyses of the existing literature to answer the following research questions:

1) What are the basic presumptions and foundations for the development of artificial intelligence?
2) How artificial intelligence can provide support and nurture to education?
3) What kind of learning analytics do artificial intelligence support for the betterment of education?

The present study is based on content analysis of primary and secondary data obtained. Since the researcher is interested to understand the philosophical foundation of Artificial intelligence and its connotations in education an attempt has been made to understand the data part by part and its analysis for meaningful interpretations. As the ancient Greek philosophers have suggested that analyzing the larger content's part by part not only make meaningful interpretations but also support the concept of holism emphasizing the idea that the part of a whole is intimately interconnected and that they cannot exist independently of the whole or cannot be understood without the reference of the whole and is thus regarded as greater than the sum of its part.

3.2.1 Research Methodology

In the present study the existing literatures based on philosophy of AI and its different aspects were deeply analyzed part by part. In order to analyze the different literatures, the researcher has initially classified the data into different categories related to AI like Intelligent tutoring system, adaptive education system, neural networks, data mining, machine learning, Virtual reality etc. Apart from this, separate analysis of the philosophical support and background of AI has also been done with reference to Naturalism, pragmatism, cognitivism, ethics and morality,

3.3 Data used in the study

Since the present study deals with critical analysis of the qualitative data available in various forms and sources and collected from books, journals, on line repositories, websites, UNESCO monograms, Government records, news bulletin, national and international seminars, conferences and proceedings.

The study contains two different kinds of data source:

a) Primary data source and
b) Secondary data source.

The Data was collected from:

a) Books on AI and its related aspects in education and other disciplines
b) Online repositories like Shod ganga and Google Scholar.
c) Libraries of Different universities like Mizoram university, Tezpur university

Guwahati university and some other district libraries were visited by the researcher for consultation of books, doctoral and post graduate's thesis and journals.

d) Recommendations of UNESCO on Artificial Intelligence and digital education National Education Policy (NEP)- 2020, NCTE guidelines and various curriculum models based on AI from different prestigious institutes line NCERT, NIOS and CBSE were consulted and thoroughly analyzed by the researcher.

3.3.1 Primary Source of Data

Primary books on artificial intelligence, guidelines based on AI from various institutions, other existing data base based on artificial intelligence and its philosophy were used for obtaining the data.

3.3.2 Secondary Sources

Various recommendations/suggestions from government organizations (national and international), research articles, write ups, articles, dissertations and Ph.D. based on artificial intelligence and its intercepts in the different disciplines had been used for obtaining the data.

Assumptions of the Study:

a) Artificial intelligence has deep-rooted philosophy to provide sustainable growth in various aspects of human life.

b) Artificial intelligence has a multifaceted aspect that can be highly beneficial for enhancing and strengthening the education system.

3.4 Instrument and Tools Used in the Study

Since the present study was primarily focusing on the philosophy and connotations of artificial intelligence in education. It was a philosophical inquiry based on the selected themes. Therefore, researcher has prepared the proforma for the identification and thematic analysis on the prior selected themes in concern with artificial intelligence. Finally thematic content analysis was done to arrive at meaningful conclusions. The detail description of the themes used are given in the following table on the basis of which data was collected.

Parameters for thematic content analysis:

Table 3.1 Parameters for thematic content analysis.

Serial Number	Aspect of AI
1	AI and naturalism.
2	AI and Pragmatism.
3	AI and cognitivism.
4	AI and ethics and morality.
5	AI and consciousness.
6	AI and its connotations in Education.
7	Adaptive Educational system.
8	Neural Network.
9	Data Mining.
10	Machine Learning.
11	Virtual Reality.
12	Natural Language Processing.

3.5 Procedure for Data collection

During the whole process of data collection, coding, preparation of master table the researcher had tried and made her best effort to gather relevant and authentic data as per the objective of the study. To meet the nature and demand of the research 12 primary sources and more than 100 relevant documents were systematically collected and coded and a master table had been prepared. Due to the huge number of data sources available it was challenging for the researcher to select the data; therefore, prior decided aspects of AI were considered as a parameter for data collection.

3.6 Data Organization

The study has gone through the following steps while organizing the data:

1) Studied historical background of Artificial intelligence in educational context.
2) Studied the traits of artificial intelligence and its different dimensions with regard to teaching and learning.
3) Studied the different learning analytics of the different components of artificial intelligence.
4) Developed a framework of educational components of artificial intelligence and their implications in teaching learning.
5) Studied the education implication of AI and its various components.
6) Developed the analysis strategy of its uses in educational settings.

3.7 Techniques Used for Analysis in the Study

All the literature obtained on the basis of different aspects of AI and its connotations to Education has been carefully coded and filled in the master table as per the requirement. After that an in-depth content analysis has been done component wise and interpretations was done part by part as per the objectives. Since, the data analysis of qualitative research is an ongoing process and does not start with the end of data collection the researcher has analyzed as well as drew conclusion and based on the outcome the research process has been modified.

Chapter- IV

Analysis and Interpretation of Data

4.1 Introduction:

The present chapter is a detailed study of the analysis and interpretation of the data. Data analysis is the summarization of the data collected and data interpretation is the attempt to find meaning of the data collected. The researcher had undertaken five objectives for the research work and each objective has been analyzed and interpreted separately to reach the findings of the research.

4.2 Findings Related to Objective 1

Objective 1: To study the philosophical foundation of artificial intelligence and its implications to education

The researcher has analyzed the different primary and secondary sources based on AI and its different intercepts. Different components of AI has been studied and analyzed to understand how AI and its different components are interconnected with philosophy.

Artificial Intelligence and Epistemology

The different components of AI as studied in the different objectives focus on giving a naturalistic experience to students to enhance teaching and learning. virtual learning which provides real-life learning experiences to students is closely related to naturalistic philosophy, as naturalistic philosophy talks about bringing humans and nature to proximity (Ferdiana,2023) The naturalistic philosophy of free will can very much be seen in AI as AI advocates the cause of free will, Personalized learning, learning at one's own pace etc.

a) It is helpful for simulating medical activities like surgery and other complicated practical learnings.
b) Helpful in performing practical skills like Aircraft drills, fire drills.
c) Useful in teaching history by taking students virtually to the historical period.

d) Helpful for architect student to visualize the design of different buildings and houses without actually visiting the site.

Artificial Intelligence and Pragmatism

Artificial intelligence is having a strong connectivity with pragmatism, one can draw the conclusion that it has a very pragmatic approach. When the natural intelligence is reproduced in the form of artificial intelligence not just the content is reproduced but also the "context" and the "relevance" bringing AI at a close proximity to human thought and action (Ekbia and Maguitman, 2001). The principles of pragmatism like learning by doing, Enquiry and experiential learning, interconnectedness between knowing, experiencing and acting etc. can all be found in AI.

The following are the principles of Pragmatism:

a) It provides real-life experiences to the child.
b) It has certain social functions.
c) Man is the Centre of all thinking.
d) No truth is final; it changes according to its practical utility.
e) The results of any experiment are concrete and particular rather than abstract and general.
f) It believes in the pluralism of truth and ideas.
g) last but not least it stresses on the harmonious co-existence of man and nature. (Sharma, Devi, Kumari,2018).

- The researcher has identified and interpretated the following pragmatic qualities in AI.
- AI is helpful in personalized and adaptive learning.
- It Promotes individualized learning thus giving learners the opportunity of learning at their own pace.
- Identifies students' needs by collecting information on students' performance and provide education according to their needs.
- It provides goal base and need-based education.
- customizes learning materials according to the learning style of different students.
- It also customizes learning according to different courses and schools.

- Is helpful in prioritizing students need and academic agenda and helping student to undertake activities according to their ability. Thus, enhancing their academic achievement.
- Encourages Participation and interactivity to increase motivation and attention, helps Learning to be more enjoyable and effective.
- Promotes learning by doing.
- Learning becomes interested and students get motivated to learn.
- Helpful in simulating infeasible activities and giving a real like experience.

Artificial intelligence and Axiology:

Ethics and morality raise the question of accountability and responsibility. When AI takes independent or biased decision, whom to put blame to or when AI causes harm who is to be held responsible. Exploring the ethical framework and moral implications of AI is a necessity in today's world. The researcher has also tried to explore this aspect of AI and has found out that since a huge amount of data has to be collected for the smooth functioning of AI technologies in the educational sector data privacy, data safety and security become a matter of concern.

The researcher has found out that data mining technique and artificial neural network which has predictive quality are more prone to issues of privacy and security. The following traits of data mining and artificial neural network raise questions of ethics and morality.

a) Helps in taking the right decision or action as it gives information about student's dropout rate.
b) It helps institutions in allocating resources more efficiently by predicting the accurate number of students attending a particular course the following year.
c) ANN can identify students 'behavioral pattern and can determine "interventions for struggling students".
d) It helps in predicting student's outcomes or performance based on their learning style.
e) It is an effective way of finding out at-risk students and can determine

different ways of their retention. Thus, to predict students' behaviors, their retention rate, their strength in a particular course, their dropout rate etc. require huge amount of data and this raises questions of data privacy and security.

Artificial intelligence and metaphysics:

The question of Turing Can a Machine think? Raise the philosophical thought of machine possessing consciousness (Turing, 1950). Can it achieve human intelligence as proposed by Alan Turing in its famous Turing's test gives AI a strong base of philosophical consideration. The researcher has also tried to understand whether AI possess consciousness while dealing with teaching and learning and has found out that understanding students' capabilities and providing need base education, providing instant feedback, giving real life problems to help students understand real life situations, providing adaptive and personalized education is the doing of an intelligent mind.

a) It predicts students' strength and weaknesses.
b) It specifies their skills.
c) It predicts placement performance.
d) Helpful in Providing recommendation and remediation to students
e) It is helpful for resource planning.
f) It is useful for curriculum design.
g) It is useful for teachers' management.

AI are highly intelligent machines and possess consciousnesses to take decisions by understanding students' strength and weaknesses. It can Provide cognitive support to students by giving step wise guidance and hint features. Cognitive support can be given by someone who has cognition, thus Artificial intelligence can be said to have consciousness of its own.

4.3 Findings related to Objective 2:

To critically examine the philosophical foundation of artificial intelligence to education

Every evolution has an underlying philosophy and no creation exists without a guiding principle. Hence even cognitive venture has a hidden philosophy (fundamental base about its nature and existence), an ontology (theory of being or becoming) and an epistemology (the theory of knowledge). Although scientist claim that philosophy has no place in science and neuro science but science and technology is all about mental and cognitive phenomena and in order to understand the mechanics underlying these phenomena, one has to understand the experimental concept or the scientific method of how it works and it is at this point the rationale of philosophy is applied (Bunge,2006).In order to know the philosophy of Artificial intelligence one has to take a detour to the pre historical times and look into mythologies, legends, fictions (Both scientific and unscientific) see how it migrated to philosophy and then finally to pure scientific knowledge. In fact, to understand the nature and mechanism of AI one has to understand the mechanism of existence (Naumenko,2021). Artificial intelligence after Allen Turing's statement "can Machine think", raises certain philosophical concern on social and ethical issues of accountability and decision making (Porayska and Rajendran, 2021) and to study the philosophical implications of AI becomes even more mandatory in present times.

Table 4. 1. Intelligent Tutoring System

Key Statement	Utility in teaching	Utility in learning
Sadiku et al. (2022). "ITS provide immediate and customized instruction or feedback to learners usually without required intervention from a human teacher".	1) ITS is a "one to one" personal tutoring system that can work or function without the intervention of teachers.	1) ITS provides individual support to learners by adopting different learning algorithms and letting learners to learn according to their pace, time and ability.
Baker (2020). ITS is a program that attempts to address different issues of a student's problem by letting the student to interact with it.	1) ITS can be used as a teaching model for students to give adapted instruction to an individual student. 2) Helpful in reducing teachers' responsibility.	1) It helps in learning "out of school", "learning for leisure", and "adult learning" 2) It encourages students to learn at one's own pace and one's own time. 3) Helpful in increasing learners' autonomy.
Wang (2015). ITS imitates human teacher's actions "To implement one to one personalised teaching". It is an effective tool for training the ability of problem solving among students.	1) Helpful in giving "One to one "teaching. 2) Helpful for "individualized instruction	1) Helpful in collaborative learning.
Jennifer et al. (2014)	1) Helpful in enhancing knowledge through "knowledge learning instruction framework" (KLI) which helps students in acquiring both simple and complex knowledge or concepts	1) Helpful in collaborative learning. 2) Provides cognitive support to students by giving step wise guidance and hint features. 3) Helpful for individualized learning.

		4) Helpful in acquiring both conceptualized and procedural knowledge.
Conati (2009) ITS in order to be used in education must be backed up with the following "Knowledge about the target instructional domain, Knowledge about the students, Knowledge about the relevant pedagogy strategy and knowledge about communication"	1) It can be used to address problems of the students according to their abilities and preferences. 2) It can be used to monitor students' solutions to different problems. 3) To compare the solution with the standard or known solution and finally To know whether the student's solution is appropriate or need some pedagogical intervention.	1) ITS is an adaptive support. 2) Useful for giving instant feedback. 3)Encourages learning from examples and learning from educative games helpful for enhancing peer learning and interactive simulations
Rodriques et al. (2005). "ITS are distributed systems capable to support on line tutoring functionalities for learning and evaluation in multidisciplinary domains". They are capable of diagnosing students "knowledge structures, skills and styles" and they diagonized it by using" principles rather than pre-programmed responses"	1) Helps a teacher to understand students' needs and aspirations. 2) Helps a teacher in "delivering the content to the right user, in the right form at the right time". 3) Helps in assessing students 'progress by monitoring their learning schedule individually and collaborately	1) Provides diagnostic help to students by performing "intelligent interactive analyses "among students. 2) Helps students to develop their own suitable study schedule. 4) Learning with groups Boost confidence level and enhances reasoning capacity (Robert et al. 2011)

Deduction:

1. Artificial intelligence acts as a substitute support for providing equity, quality, excess, affordability and accountability of education. These very features have been adopted by NEP 2020 for a fair and equitable right to education for all.
2. Artificial intelligence in its core is pragmatic science. Pragmatism believes in the practical consequences of things and that reality changes according to one's progress and evolution. The concept of ultimate truth does not exist and that it changes with the process that one seeks out through experience (Ozmon and Craver, 2008). Dewey believed that "experience is not a mental state that is within us; instead, we are within experience". (Boisvert, 1988; Campbell, 1995; Gouinlock, 1972; Sleeper, 1987; Welchman, 1995)
3. Artificial intelligence is very pragmatic in its approach as it imbibes almost all the characteristics of pragmatism and the principles of deriving truth from abduction, deduction and induction is very much applied in Artificial intelligence.AI seeks to give personal experiences through intelligent tutoring system. It encourages one-to-one teaching and learning and believes in individualization of education.

Table 4.2 Adaptive Educational System

Key Statement	Utility in Teaching	Utility In Learning
Munoz et al. (2022) Adaptive Educational system plays an important role in educational institutions to teachers, students and different stake holders.	1) Helpful in providing data about students ability and progress of learning. 2) Serves as an effective platform for teachers to plan "an effective personalized teaching experience for every students, build customized resources and activities that can address each student's unique learning needs" 3) Helps in providing instant feedback.	1) Helpful for saving students' time. 2) Helpful in developing personal potential as it boosts individualized instruction. 3) Students 'learn at a fast pace and in the best possible way that suits their capability.

Pokrivcakova (2019) "Adaptive Educational system are design to adapt some of the key functional characteristic (e.g. Content, sequence, activities or navigation support) to the learners need".	1) Provides an environment where teaching is more flexible to both the teacher and students. 2) It reduces monotony and burden of teaching.	1) AES customizes learning materials according to the learning style of different students. 2) It also customizes learning according to different courses and schools. 3) It can create personalized textbook providing an alternative to traditional text book and materials which are based on "one size fit all "perspective.

Bajaj and Sharma (2018). “The need of the hour in present day education environment s adaptivity. Adaptive education system aims to customize content and learning paths of students. These aids in minimizing disorientation and cognitive over load; thus, maximizing individual needs preferences”.	1) Adaptive teaching can be used by determining students ‘attributes and selecting learning models from different learning theories given by different educationist. This can be done by a virtual teacher on a cloud environment.	1) AES is helpful in mapping the content and learning paths for personalized education. 2) Students can learn anytime anywhere and in their own learning style.

Brusilovsky and Peylo (2003). Adaptive Educational system focuses on "building a model of the goals, preferences and knowledge of each individual student and using this model throughout the interaction with the student in order to adapt to the needs of that student".	1) With the help of AES, a teacher can monitor and evaluate students' activity. 2) 2) Provides ample scope to teachers to give individual attention to students. 3) AES has also been proved helpful in identifying content that are too easy or too difficult thus providing opportunity to teachers to change their teaching style according to the content.	1) Learns at his / her own pace. 2) Identifies students' needs by collecting information on students' performance and provide education according to their needs. 3) It provides goal base and need base education.

Deduction:

1. Artificial intelligence has basically emerged as the science of the brain and its connotations can be seen as having a close similarity to human civilization. It has emerged from the field of computer science and psychology from ancient times and it focusses on improving human efforts and productivity. Therefore, it stands as a strength to the different endeavors of human civilization. From discovery of fire to computer programming human endeavors have led to progress and civilization. Thus, AI too has arisen out of human curiosity, human necessity and human urge to do something new and unique and that's how human psychology and AI is closely interwind.
2. Artificial intelligence has a deep-rooted philosophy of enhancing the capacities of human brain with the support of information and communication technology and like any other philosophy AI too has some philosophical questions like:

a) Does AI possess self-awareness or consciousness?
b) What are the ethical considerations of AI? The biasness and privacy of data, the impact on employment, the influence on creativity and productivity are all philosophical thoughts and needs careful contemplation.
c) Does AI really understand the information they acquire and process?
d) Can a machine have the free will to take decision on its own?
e) Like any other philosophy AI has been influencing the society by and large from health care to education, from economics to politics, from Agriculture to industry.
f) And last but not the least the question of Turing Can a Machine think? (Turing, 1950) Can it achieve human intelligence as proposed by Alan Turing in its famous Turing's test gives AI a strong base of philosophical consideration.

Table 4.3 Neural Networks

Key Statement	Utility in teaching	Utility in learning
Okewu(2021) Artificial neural network is a useful technique to obtain unbiased andunprejudiced information from students to improve their academic performance. It uses regression, classification and predictive technique to predict students 'performance and classify their learning so as to improve students' retention and motivation. It is a cost saving technique that helps in promoting smart education by enhancing intelligent tutoring system and offering quick feedback and academic advices.	1) Helps in improving learning outcomes through predictive and classification analyses of students 'activities. 2) ANN helps in identifying students' behavior like at risk students, slow learners, gifted children etc. 3) Helps in predicting outcomes of course selection thus reducing failure of students due to wrong choice of subject. 4) Helps in assessing students 'outcome thus boosting retention rate.	1) Helps students' in taking the right decision in terms of course selection. 2) Helps students in knowing their strength and weaknesses. 3) Promotes low-cost study as it promotes distance and personalized education.
Hernandez et al. (2021) ANN is an "information processing system" that helps in processing different inputs on an output. The multi-layer perceptron is the most common ANN used in education and it is well known for its predictive utility. It generally works on a three-layer basis the input, the hidden layer and the output. It is more helpful in classifying supervised data.	1) Helpful in predicting the outcomes from a pile of supervised and unsupervised data. 2) It is useful for teachers to know the high achievers, slow learners and the distinctive skills of different learners and at-risk students thus letting a teacher teach according to the needs of different students. 3) Helps in enhancing retention and reduce failure rates.	1) Helps in taking decisions as it can predict the outcomes of different courses/programs. 2) Helps in customized learning. 3) Helps in choosing course according to their diverse interest and personal choice. 4) helps to know their level of readiness and performance. 5) Helps enhancing educational research.

	4) helps in analyzing their academic performance and grouping students according to their performance.	
Duyloluoglu, (2021) "Artificial neural Networks are data processing systems which simulates the data processing system of the human beings (Elmas,2003)." The credit of creating the first ANN goes to neurophysiologist Warren McCulloch and mathematician Walter Pitts. ANN perceptron was developed by Frank Rosenblatt and till date research on different ANN systems and their development for effective use in education are in progress. The crux factor of ANN is its ability to identify and learn from patterns associated with the input data and forecast or predict the target result or values. It simulates the biology neutrals and works exactly as a human brain.	1) ANN out passes traditional statistical tools like regression in analyzing data for decision making in educational institutions. 2) ANN can identify students 'behavioral pattern and can determine "interventions for struggling students". 3) It helps in predicting student outcomes or performance based on their learning style. 4) It is an effective tool of finding out at-risk students and can determine different ways of their retention.	1) Ann has a high utility in educational research as it has greater accuracy in predictive and classification analysis of input data. 2) Helps in promoting need base education by predicting the behavioral pattern of students. 3) Effective in enhancing adaptive and individualized education.
Valko and Osadchyi (2020) "The education is a communication system, and it can be described as an artificial neural network of influences. It has a	1) It's an effective component of distance learning. 2) Useful in determining the level of educational	1) As it is an effective component of distance education it helps learners to learn from anywhere anytime. 2) Promotes individualized

function with many variables at the input and a fixed result at the output". The recent interest of applying ANNin education is because of its ability to respond quickly to changing situation, adapt and analyzed these changed situation and fixed favorable conditions to solve it.	achievement of different students. 3) Identifying individualized or personalized "educational trajectory and selecting the appropriate training modules" (Streltsov and Slavinskaya, 2010). 4) It optimizes interaction between different students. 5) Identifies and determines the likelihood of entrants of higher educational institute.	learning thus giving learners the opportunity of learning at their own pace. 3) Connects a large range of learners thus enhancing interaction among learners and boosting their confidence.

Deduction:

As Artificial Intelligence can take its own decision regarding students likes and dislikes, students' choice of subjects, students' compatibility, students' dropout and retention. Thus, it gives rise to the following assumptions:

a) The philosophical foundation of AI raises questions on the consciousness and cognition of machine whether machine possess consciousness and whether it has its own mental state. This becomes relevant as machines not only learn and acquire information, they also make their own decisions. The ethics and morality, the reliability and validity of its knowledge and decision becomes a matter of debate and discussion.

b) Ethics and morality raise the question of accountability and responsibility when AI takes its independent decision. Whom to put blame on when AI causes harm or makes biased decision. Exploring the ethical framework and moral implications of AI is a necessity in today's world.

Table 4.4. Data Mining

Key Statement	Utility in Teaching	Utility in Learning
Wang and Chung (2021) "Data Mining is regarded as a set of technologies that allow automatic or semi-automatic extraction of much useful information, models and trends from many data sets such as clustering, classification, association, and regression". AI algorithm such as Apriori algorithm, Bayesian algorithm and Neural network is use to extract pattern from data and these patterns are used to interpret or predict the characteristics of different data.	1) Helps in taking the right decision or action as it gives information about student's dropout rate. 2) It helps institutions in allocating resources more efficiently by predicting the accurate number of students attending a particular course the following year. 3) Helps educators in understanding the learning pattern of different students by predicting their outcomes. 4) Helps in finding relevant course materials for teaching. 5) 5) Assist the teachers in identifying 6) the factors that affect the performance 7) of the students.	1) Helps in decision making as it gives knowledge of different courses and programs, their utility, their employability, their benefits and their demand. 2) Helps to choose institutions according to the feasibility of the students. 3) Helps students in giving instant feedback on the course materials delivered to them. 4) Helps in finding the relevant course materials.
Algarni (2016) "Data mining is powerful Artificial Intelligence (A tool, which can discover useful	1) Gives a better and deeper understanding of teaching and learning phenomena.	1) Gives a better understanding of learners and their learning process. 2) Education data mining is helpful for both offline and online

information from many angles or dimensions, categorize that information, and summarize the relationships identified in the data base. subsequently this information helps make or improve decision". Education data mining is used in four different ways (1) Predicting. (2) Clustering. (3) Relationship mining. (4) Distillation of data for the purpose of human judgement and it is on this point that education data mining differs from other ordinary data mining.	2) Helpful in determining the relationship between students' success in different courses or programs and the concepts included in different chapters. 3) Helpful in identifying at risk students. 4) Helpful in customized teaching. 5) Provides recommendation to teachers. 6) Helpful in course development.	education to determine the cognitive skill of the students. 3) Intelligent tutoring system, Adaptive educational system, learning management system etc. use data mining technique to build user profile. 4) Data mining technique monitors and visualizes learners' behavior by capturing the performance data and storing the activity data of the learners.
Ali (2013) describes data Mining as a useful tool for predicting and classifying the data collected from a large number of people for achieving the desired objectives. Data Mining is used in almost every sector to understand one's client and customer and to obtain a knowledge about them. Even in education sector it has	1) Helpful in understanding students' preferences towards choices of subjects or courses and selection of area of specialization. 2) Helpful in identifying their needs and patterns trends. 3) helpful in predicting students' final grades assessing their knowledge. 4) Beneficial in easy construction of	1) helpful for students in decision making as it can predict the outcome and employability of a particular course or program.

adopted a forefront position in understanding and obtaining knowledge about students' needs and aspirations through the data collected from them.	student's profiles.	

Goyal and Vohra (2012) define Data Mining as an effective analytical tool to extract meaningful knowledge from large data set. Educational institutions are heavily burdened with huge growth of explosive Data and to manage these Data for managerial purpose like finding out at risk students, planning future course of action for them, Scheduling and Rescheduling courses for different purpose, planning resource allocation, developing curriculum etc. Data Mining techniques are used.	1) Helpful for teachers as it can predict students' performance. Linear Regression technique is used to find out the duration and effort a student needs to give to a particular course to get the desired outcome. 2) As it can predict the Reason of success or failure of a particular course or Exam. A teacher can work towards the desired goal by adopting teaching style according to the demand. 3) It enhances personalized teaching by grouping students according to their personal characteristics and customized feature. 4) Helps in improving students' performance and analyzing retention rate of the students.	1) Helps in personalized and customized learning. 2) Helps in choosing and selecting courses and universities according to one's interest and needs.

Deduction:

1. The philosophy of language also plays an important role in AI. Natural language processing, Chat bots and conversational AI that interact with humans in human language.
2. The epistemic logic of AI can be explored with the pertinent question of what AI know or believe as AI system have strong reasoning which is essential for decision making and problem solving.
3. Existentialist philosophy delves into questions of individual existence, freedom, and responsibility. In AI, existentialist philosophy can be explored with the consequences of AI development, its impact on human employment and society

Machine learning: Machine learning is a term that is used to denote human like intelligence of a machine to do human like works. Tom Mitchell defines machine learning as “A computer program which can learn from experience with respect to some tasks and some performance measure and improves its performance with experience.”

Table 4. 5. Machine Learning

Key Statement	Utility in Teaching	Utility in Learning
Villegas et al. (2021) Machine learning in an Artificial intelligent system integrated into online learning system and provides security and support to students and help them in managing their academic activities and performance	Since Machine learning learns from previous experiences and examples it is helpful for teachers in teaching, understanding student's problems, evaluating and assessing them, preparing academic data and finding academic errors.	1) Machine learning helps students in knowing their performance. 2) It is helpful in prioritizing students need and academic agenda thus helping student to undertake activities according to their ability and enhance their academic achievement.
Kim (2019) "Machine learning is a type of AI that gives computers the ability to learn. It is based on data analysis, through which new patterns are identified that allow modification of your behavior"	**1)** Machine learning enhances on line learning like MOOCS and LMS thus promoting intelligent Tutoring system, 2) Collaborative learning, Knowledge sharing Interactive communication by collecting students' academic data	1) Machine learning is an asset for adult learning as it promotes lifelong learning and learning at one 's own pace. 2) " It provides convenient and portable learning options". 3) Beneficial for skill development and exploration of knowledge
Nieto et al. (2019) Machine learning can be used for calculated decision making at higher education. It uses supervised algorithms to predict students' behavior like their academic performance, their level of acquiring knowledge, their failures, their accuracy level and their specific skills for specialization thus helping an institution in	**1**) It is helpful for resource planning. 3) It is useful for curriculum design. 4) It is useful for teachers' management	1) It predicts students' strength and weaknesses. 2) it specifies their skills. 3) It predicts placement performance. 4) Helpful in Providing recommendation and remediation to students.

identifying and paying attention on students.		
Kucak (2018) Machine Learning is used to predict students 'performance, tests students grades and support teachers in their academic venture. It is a part of Artificial intelligence where the machines learn from themselves by accessing data. The term Machine Learning was coined by Arthur Samuel in 1959 and he defined them as automated learning device.	1) Helps teachers in grading students fairly. 2) Helps teachers and institutions to reach out to students and provide them with necessary help. 3) Helps in identifying students' weakness and suggest remedy for improvement. 4) Helps in students' retention, enhances enrolment in schools and colleges by predicting institutions ranking and position. 5) Machine learning based assessment helps in providing feedback to teachers, students, stakeholders thus helping one and all in taking accurate decision.	1) Helps in optimizing students' performance. 2) Improving students' retention. 3) Helpful in predicting students' performance. 4) Grading students
Conati et al. (2018) Artificial intelligence in education needs Machine learning for the following reasons. 1)"For emergence of big data, e.g in learning and teaching at scale contexts such as through MOOCS." 2) To shift within the field towards more complex instructional domain, for which it may be harder to engineer and represent knowledge	1) Helpful for intelligent tutoring system which relies on big data to understand student's efficacy, Students emotional states or reactions, predicting students' ability and generating feedback or hints. 2) Beneficial for enhancing "Exploration base learning."	1) It is useful for "Open learner modelling" (OLM) This term was used by Bull,1995 and Bull and Kay 2016 describe a student model that gives access to users with different level of interactivity. 2) Machine learning is adopted for IPA (Intelligent process automation) to find patterns in data and use this pattern in predicting students' outcomes or in generating a fruitful

based on traditional knowledge eliciting from human expert".		knowledge from the heap of data.

Deduction:

The developmental process of AI is based on the fundamental principles of life *i.e.* evolution. Evidences from paleontology, molecular biology, and evolutionary theory confirms that all features of biological agents, including intelligence, have arisen roughly through Darwinian evolutionary processes (Lee, 2016). However, pre-Darwinian thinkers oppose the idea that Artificial intelligence could not have a natural evolutionary process however considering AI as an intelligent computer program designed by intelligent humans the idea of evolutionary processes explicitly match with AI as well. For example, Dean et al. (1995). define AI as "the design and study of computer programs that behave intelligently."

Table 4. 6. Virtual Reality

Key Statement	Utility in Teaching	Utility in Learning
Elmqaddem (2019) Virtual reality (VR) is a manmade technological replication of the real world or universe that allows the user to completely immersed in the artificial world. Since the term "Virtual reality" was proposed by Jaron lanier it has been catching public attention but it was only after 2012 that this technology has been used to exploit different areas including education, The main reason of adopting virtual reality in education is mainly due to the fact that it has the capacity to improve and facilitate learning, enhance memory and help in making better decisions.	1) Microsoft HoloLens has augmented Virtual reality and this new technology is expected to exploit every aspect of education giving a completely new meaning to teaching and learning. 2) VR is seen as a new technology that would enrich teaching and learning by making it possible to interconnect with objects and things that belong to a virtual world. 3) Teaching can be made effective and interesting through experimentation and participation of the students.	1) Participation and interactivity of the students help to increase motivation and attention 2) VR helps Learning to be more enjoyable and effective. 3) Becomes easier to explore abstract concepts and complex phenomena with the help of visualization and realization of difficult concepts.

Kavanagh (2017). Virtual reality in education is used to raise intrinsic motivation of students. It is also used in increasing long term retention, fun filled learning, collaborate learning and gamification learning by creating a virtual environment to help students know or understand real life situation.	1) Helpful for simulating medical activities like surgery and other complicated practical learnings. 2) Facilitating rehabilitation for patients suffering from attention deficit disorder and cerebral palsy. 3) Helpful in performing practical skills like Aircraft drills, fire drills. 4) Useful in teaching history by taking students virtually to the historical period. 5) Helpful for chemical, Engineering and construction related studies.	1) Promotes learning by doing. 2) Learning becomes interested and students get motivated to learn. 3) Helpful in simulating infeasible activities that would have been impossible but giving a real like experience. 4) Helpful in distance learning.

Hussein (2015) "Virtua1 reality is an illusion to illustrate a collection of objects in an environment that fulfil the imagination of the creator." It's a "simulated environment" an "imaginary space "that give a detour to the user about the real world.	1) A new technological innovation that offers newer and versatile way of teaching students and reaching out to a large number of pupils. 2) Useful in delivering "Hands on learning experience". 3) Helpful in enhancing teaching and learning, motivating students by simulating education. 4) Reduces the involvement of risk while giving practical education. 5) Helpful in professional practicum education which involves risks to students.	1) Allows students to be more focused mostly because they feel involved and immersed in the VR world as compared to the non-VR world. 2) VR makes the content very interesting making the students intrigued and interested to know and learn more. 3) It helps in better understanding specially those practical and lab related subjects as it gives them the feeling of doing while observing.

Nooriafshar, (2004) Virtual reality means artificial creation of the real world with the help of computers and humans for the purpose of giving training or life like experimentation to people, it is generally ideal for situation where real-life object or environment becomes difficult to access, or is unsafe or hazardous to use the actual object or the cost of gaining real life experiences become too expensive. It provides for a very effective teaching and learning environment by Incorporating features that are very realistic and visualist. Letting the users to completely immerse themselves in the environment.	1) Easier to transform deeper concept and re enforce information with the help of VR. 2) It is an effective teaching aid that makes learning interesting, enjoyable and does not let attention get diverted. 3) Beneficial to eliminate certain risk involved in certain hazardous educational practices like collecting of live tissue samples etc. 4) 4) Removes boredom and monotony in teaching and learning.	1) Helpful for Medical students to practice complex and varied surgical procedures virtually and in an interactive way. 2) Helpful for architect student to visualize the design of different buildings and houses without actually visiting the site. 3) Using virtual reality students can interact and enter a world where they can exchange ideas, express their opinions and perspective, and open up to a vast world which in reality would not be feasible.

Deduction:

1. Aesthetics explores questions of beauty and artistic expression. Virtual reality in AI provides realistic environment to the users letting them immerse in the aesthetic beauty of men made creation of an AI-generated art, music, dance, drama literature. This quality of Artificial Intelligence relates it with the philosophy of aesthetic as well as the question of whether AI can possess creativity or produce aesthetically pleasing works.
2. In AI, metaphysical questions arise concerning the ontology of artificial beings, such as whether AI systems have a form of existence and what their relationship is to the physical world.

4.4 Finding Related to objective 3

Objective 3: To analysis the education components of AI and its components with respect to -

a) Teaching
b) Learning
c) Assessment

The following themes have been identified and on the basis of this thematic content analysis:

a) Machine Learning
b) Natural Language Processing
c) Intelligent Tutoring System
d) Data Mining
e) Neural Network
f) Virtual reality

Table 4.7. Matrix Representing the Thematic Analysis of AI and its Role in Teaching, Learning and Assessment

Sl. No	Themes of AI	Use in Teaching	Source of References
1.	Machine learning	1) Predict Students performance by understanding students' weakness and providing means to improve their learning. 2) Assess teachers in grading and assessing students. 3) Helps in students' retention by identifying the weak and at risks students. 4) Gives constant feedback to teachers helping them to adapt teaching according to the needs of the students. 5) Helps in strategic decision making in Higher educational institutions (HEIs). 6) It helps in analyzing big data by identifying new patterns and processing information regarding students' performance, students' achievements and predict students' behaviors. 7) Machine learning is beneficial for both supervised and un supervised learning. In supervised learning it is used for classification and regression learning and in unsupervised it is used for clustering the data into homogenous group by identifying different patterns. 8) LMS which had almost become obsolete and redundant had gained its importance during COVID 19 times due to its integration with machine learning. It has become an important tool for interaction and management of student's performance and for providing security and support to students in their academic's activities. 9) Machine learning by analyzing the personal characteristics and academic performance of students can predict student's dropout factors helping educational institutions in retaining students/	Anozie and Junkir (2006), Luckin et al. (2016), El-Alfy and Abdel-aaj (2008), Nieto et al. (2019), Villegas et al. (2020), Darcy et al. (2016), Tan and Shao (2015).

2.	Natural language processing	1) NLP is an integration of neuro (neurological processes) linguistic (thought and language patterns) and programming (analyzing behavior patterns to help achieve language proficiency.) to help achieve the desired goal in interpersonal and communication development. 2) NLP tools can be used to provide hands on experiences to students. 3) Useful in analyzing learners' response. 4) It has provision for instant feedback. 5) Can automatically generate learning exercises and has the potential to monitor students learning progress. 6) It can detect plagiarism, Compile parallel corpora and annotated learner corpora. 7) It can develop ontologies for different domain. 8) It is helpful in processing and accessing students text input with the help of computational technologies and linguistics. 9) NLP is used in different chatbots like Eliza, Alice, Jabberwacky which not only simulate human interaction but also is able to have conversation with users. 10) NLP is not just effective in improving learning but is also helpful in developing the language process	Siddiqui, (2018), Antoniadis and Desmet (2016). Gamper & Knapp (2002), Emran and Shaalan (2014), Aljameel et al. (2017), Alice et al. (2006), Khaled (2014).

3.	Intelligent tutoring system.	1) ITS is helpful in filling up the gap in students learning by giving personalized instruction based on their learning capabilities 2) Deep tutor, a dialogue based ITS is helpful for students to deal with the science topics. It is especially helpful in solving physics problems where students are given several hints to help them to find solution themselves. 3) A conversational intelligent tutoring system (CITS) is used to augment the learning style of autistic children it adopts to the learning needs of these children with the help of a visual audio kinesthetic learning style. It has three main components- knowledge and log files components, conversational component and the intelligent tutoring component. 4) ITS which are specifically trained on general knowledge questions and answers are used to assist high school students for learning general knowledge. They use NLP Techniques to find the answers for queries given by students. 5) An emotionally intelligent tutoring system (EITS)uses various hints like the facial expression of the learners, speed of typing, mouse movements and clicks to analysis the learner's emotional disposition and give instruction accordingly. 6) ITS is helpful in delivering the right content to the right person at the right time by Presenting contents to students according to their wish, in a way that suits their individual learning style and their psychological disposition. 7) ITS is helpful in giving advice to student, on how he/she should learn the content and how to work on a suitable learning schedule; 8) It monitors the students study schedule by co-working with the students. 9) Monitoring of students is done and learning schedule is maintained so that students are aware of each other's learning activities which would augment collaborative learning.	Vasile (2015), Aljameel (2017), Dutta (2017), Sandu and Gide (2019), Mohanan et al. (2017), Liegle and Woo (2000), Negoita et al. (2004), Rodrigues, (2005).
4.	Data mining	1) Data Mining is helpful in understanding student's behavior, students' success rate and course popularity. And a knowledge of all these will help any institutions in improving the quality of education.	Agarwal et al. (2012), Myla et al. (2021), Maqsood (2013).

		2) Teachers can predict and generate new observation of students through the existing data with the help of data mining which employs a mixture of base knowledge, analytical capabilities and domain expertise to explore the hidden patterns and trends of student's behavior. identifying students' needs and preferences towards course choices, and selection of specialization 3) Helpful in predicting students' conceptual knowledge, students grades, and students' final results. 4) in supporting automatic exploration of data 5) 5) Is helpful in constructing students' profile. 6) Helping in administration to understand the cause of student's failures and reasons of drop outs. 7) There are many data mining techniques used by various educational institutions and industries. They are Prediction, classification, association and clustering. • Prediction models are used to predict secondary education placements-test by using students' previous year grade, Scholarship availing, number of siblings and the overall performance of the students. • Classification is used to Classify data into a fixed number of groups. It has two types supervised and unsupervised classification. It can be used for categorical variables. • Association data mining works by finding the association or relationship among data items. It can be used in educational institutions to find the relationship of different characteristics of students. It is 'discovering of if-then rule'. Association rules are "derived from patterns in a dataset that correspondent to a particular situation".	Sen et al. (2012), Soman et al.. 2006), Nisbet (2009), Gorunescu (2011), Aggarwal et al.. (1999), Larose (2005), Gopalan and Sivaselvan (2009), Romero et al. (2008), Aggarwal et al. (1999), Baker (2010)., Rajamani et al. (1999), Rajshree et al. (2010), Larose (2005), Romero et al., (2008), (Berry and Linoff, (2004). Hossein Bidgoli (2004), Khosrow-Pour (2006), Shields, M. G. (2004).

		• Clustering characteristics help in Clustering students into homogenous or heterogenous group according to their characteristics. Clustering helps in enrolments, Selection of courses and specialization, transfer, readmission, age, gender and behavior of students. 8) 9) Enterprise resource planning (ERP) manages a large range of activities in educational institutions like marketing of institutions for admission, for student's placements, for management of internal operations like smooth functioning of classes or recruitment of faculty members and for financial and cash related planning, and for coordinating with regulatory and statutory bodies. 9) 10) OLTP (On-Line Transaction Processing) facilitates students and faculty to get a vigorous and advanced learning ambience.	

5.	Neural network	1) 1) Artificial neural network is one of the best technologies in eliciting unbiased and unprejudiced information from a large set of students' data. 2) It uses regression and classification technique to predict and analyze students behaviors and students' performance thus helping in students retention and progression. 3) Adaptive and flexibility: A neural network has the capacity of learning the different ways of how tasks are carried out and hence can adjust to any situation. It is especially beneficial to cater to the different learning needs of the students. 4) Self-organization: Since a neural network learns by itself it creates its own representation of the information it receives. 5) Pattern recognition: Neural network is beneficial in Pattern recognition which is not only effective for data security but also for understanding students' behavior. 6) Learning capacity: A neural network system is developed by learning and hence they easily catch the patterns in the data sets relieving teachers from the monotonous work of analyzing students' behaviors and students' achievements. 7) Artificial neural networks serve as an effective tool for resolving complex educational problems. It has tremendous applications in disciplines like computer science, data mining, medicine, business and aviation 8) Artificial neural networks serve as an effective analysis tool in educational research although it is yet to attain desirable attention. 9) Artificial neural network analysis is installed in the SPSS packet program for analyzing educational research making it more available and applicable to researchers.	Brocardo et al., (2017), Sak, Senior, and Beaufays (2014), Emmanuel Okewua et al. (2021), Kumar & Sharma, (2014), Hanrahan, (2011), Abrahart, et al., (2014), Kohli et al.., (2014), Lancashire, et al., (2009), Saravanan, & Sasithra, (2014). Kumar, & Sharma, (2014).
6.	Virtual reality	1)The main characteristics of immersive virtual reality is that it can create a complete replica of the real world and thus gives the feeling to the students that they are interacting with the real world.	Beier (2004), Nooriafshar

		3) various surgical procedures can be learnt in an interactive manner by medical students further complicated and intricate infectious diagnosis could be done virtually without touching the patients. 4) An architect can take his/her lessons virtually fixing, replanning, re organizing which would if done on real platform would be very expensive 5) Different students at different locations can become part of the same learning. They can interact with common objects and environments and communicate with each other from their perspectives. 6) Virtual reality is very helpful for performing risky practical lessons like lessons on Aviation, or fire related hands-on training. 7) Virtual reality is very helpful in transforming deeper concept and re enforcing information easily. 8) It is helpful in reducing boredom and monotony to both students and teachers as the same thing is taught with newer concept. 9) This technology helps students to learn through interactivity helping them in gaining experimentation and full participation which increases their level of motivation and attention. 10) VR helps in concretizing abstract concept and reducing cognitive loads. 11) Helpful for individualized learning as one can learn at one's own pace 12) It also helps in developing creativity.	et al. (2004), Singhal et al., (2012), Klopfer, & Squire, (2008), Sumadio, & Rambli, (2010), Kurubacak, et al., (2017) Kaufmann, & Papp, (2006), Elmqaddem, (2019).

Deduction:

From the above table we have found out the following points

Teaching with AI:

a) Teaching with AI helps in Personalized Learning which can help a teacher in analyzing individual student's strengths and weaknesses and provide tailored learning materials and activities. This adaptability can enhance the learning experience as well.
b) AI-powered chatbots and virtual tutors can assist students with questions, homework, and provide explanations on various topics, offering support 24/7.
c) AI tools can generate educational content, such as quizzes, study materials, and even lesson plans, making it easier for teachers to prepare and deliver high-quality instruction.
d) NLP algorithms can help teachers analyze and improve the clarity and comprehensibility of their teaching materials, ensuring that students can better understand the content.

Learning with AI:

a) AI helps in Adaptive Learning by creating personalized learning paths based on a student's progress, adjusting the difficulty and pace of content to match their needs.
b) AI can recommend educational resources, books, videos, or courses that align with a student's interests and goals. It can also translate content into different languages and assist students with disabilities by providing text-to-speech or speech-to-text capabilities.
c) AI-powered simulations can help students apply theoretical knowledge to practical scenarios, making learning more engaging and relevant.

Assessment with AI:

a. It helps in Automated Grading. It can grade multiple-choice, short- answer, and even some essay questions reducing the burden on teachers and providing immediate feedback to students.
b. AI tools can scan assignments and essays for plagiarism, ensuring academic integrity. Thus, playing the role of plagiarism detector.

c. AI can analyze student data to identify patterns and provide insights into their learning behaviors, helping educators make to data-driven decisions and exploring learning analytics.
d. AI can predict a student's future performance based on their past activities, allowing early intervention for those at-risk students.
e. AI can analyze students' facial expressions and tone of voice to gauge their emotional state, potentially identifying stress or frustration and providing appropriate support.
f. AI can help educators create customized assessments based on learning objectives, ensuring that assessments align with what students have been taught.

Findings related to Objective 4:

To explore the learning analytics of artificial intelligence and its implications in education:

Learning analytics. Learning analytics, is described as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Long and Siemens, 2011). Learning analytics are often implemented to analyze huge amounts of data (Aldowah et al., 2019). Machine learning and AI techniques expand the capabilities of learning analytics (Zawacki-Richter et al., 2019).

Learning analytics is the process of collecting, analysing, and interpreting data related to educational activities and learning environments. It involves the use of data and technology to gain insights into how students are learning, how they are performing, and how instructional methods and resources can be improved to enhance the learning experience. Here are some key aspects of learning analytics:

Learning analytics has gained significant importance in education as institutions seek to improve learning outcomes, enhance student engagement, and make data-informed decisions. It relies on a combination of technology, data analysis, and pedagogical expertise to achieve these goals.AI plays a significant role in leveraging data analysis in education. The various components of AI like the intelligent tutoring system, neural network, adaptive learning system, machine learning, data analysis etc plays important role in exploring learning analytics in education.

Machine learning and learning analytics:

Machine learning plays an important role in defining the learning analytics of Artificial intelligence in education. Following are the fields in which Machine Learning can be applied in exploring learning analytics in education:

a. Machine learning models can be used to predict various educational outcomes. Machine learning algorithms can be used to predict student performance, identify at-risk students, and forecast dropout rates through data based on past grades, attendance, and engagement (Kobayashi., and Shinohara, 2009.)
b. Machine learning is often employed as a recommendation system suggesting learning materials, courses, or resources to students. These recommendations are based on a student's past behavior, preferences, and the behavior of similar learners (Lindsey et al., 1980)
c. Machine learning can help divide students into different groups based on similar characteristics or learning styles. These segments can be used to tailor educational content or interventions to specific student groups (Lee. and Grauman, 2011).
d. Machine learning models can power adaptive learning platforms that adjust the difficulty and content of learning materials in real-time based on a student's progress and performance (Mei .and Zhu, 2015).
e. Machine learning can be used to build early warning systems that identify students who may be struggling academically. These systems can then trigger interventions or support mechanisms to help those students (Angluin and Krikis,2003).
f. Machine learning can enhance the capabilities of learning analytics dashboards by providing predictive insights, automated data interpretation, and anomaly detection.
g. Machine learning can assist educational institutions in optimizing resource allocation, such as scheduling classes, assigning teachers, and managing course materials, based on historical data and student demand (Bach, 2013).
h. In the context of online learning, machine learning can be used to detect and prevent cheating or academic dishonesty through techniques like plagiarism

detection.

i. Machine learning models can personalize the learning experience by adapting content, assignments, and assessments to match individual student needs and ability (Huang, 2018).

Natural language processing and learning analytics: - Learning analytics in natural language processing supports NLP techniques to analyse and improve language learning processes. It empowers educators and institutions to make data-driven decisions, personalize learning experiences, and enhance the overall effectiveness of language education

a) Learning analytics in NLP starts with the collection of relevant data. This data can include a wide range of information, such as student essays, responses to quizzes, discussion forum posts, and more. It may also include data from language learning apps, online courses, or virtual language tutors.
b) NLP techniques are used to process and analyze the collected data. NLP tools can be used to perform tasks such as text mining, sentiment analysis, topic modelling, and language proficiency assessment. These techniques help in extracting valuable insights from the textual data (Gamper, and Knapp, 2002).
c) Learning analytics in NLP can be used to monitor students' progress in language learning. By analysing their written assignments, spoken language samples, or responses to language exercises, educators can gain insights into individual students' strengths and weaknesses (Biswas et al., 2014).
d) NLP-based learning analytics can be used to personalize the learning experience. By understanding a student's language proficiency level and learning style, educators can tailor learning materials and activities to better meet their needs (Lende and Raghuwanshi, 2016).
e) Learning analytics can identify students who may be struggling with language learning early in the process. Educators can then provide additional support or interventions to help these students improve their language skills (Mathew, 2021)

f) NLP can assist in automating the assessment of language skills. Automated scoring systems can evaluate essays, spoken responses, or language exercises, providing instant feedback to students and reducing the workload on educators. (Lee et al..,2018)

g) Learning analytics in NLP can also contribute to research in the field of language learning. It can help researchers identify trends, patterns, and effective teaching strategies by analyzing large datasets of language learning interactions. (Khaled, 2014).

h) It's important to consider ethical concerns when implementing learning analytics in NLP. This includes data privacy and security, as well as ensuring that the technology is used to benefit students without compromising their rights (Stahl, 2022).

i) Learning analytics provides an ongoing feedback loop for educators and institutions. By analyzing data over time, they can refine and optimize language learning programs to achieve better outcomes. (Kolb and Kolb, 2005).

ITS and learning analytics

1) ITS can provide personalized feedback and guidance to students based on their performance data. This Learning analytics can help provide appropriate feedback that is tailored to each student's needs. (Conati et al., 2009).
2) Learning analytics can automatically assess students' understanding of the material and track their progress toward mastery of specific skills or concepts. This allows the system to adjust the difficulty of tasks in real-time. (Sottilare et al., 2011)
3) ITS is used to identify students who may be struggling or falling behind in their learning. Early intervention strategies can then be employed to provide additional support to these students.
4) ITS optimizes the content and instructional strategies by analyzing which materials and approaches are most effective, in helping to improve the learning analytics of students.

5) Based on data analysis, ITS can adapt the learning path for each student. It can select appropriate content, activities, and assessments to match the student's current level and learning pace (Shute and Psot.,1994).
6) ITS can provide educators and administrators with insights into how students are performing and where they may need additional support. This information can inform teaching strategies and curriculum design (Rodrigues et al., 2005).
7) Adaptive learning systems lke ITS can adjust the difficulty and content of educational materials in real-time based on a student's performance. This ensures that students are continuously challenged at an appropriate level (Olsen et al., 2014. Wambsganss et al., 2020. Hagras, 2017).
8) It helps in automating the grading and assessment of assignments, quizzes, and exams. It can provide immediate feedback to students, reducing the burden on educators and enabling faster feedback loops. (Walkington &Bernacki 2018).
9) NLP techniques of ITS can analyse written assignments, essays, or forum posts to assess the quality of students' work, their writing skills, and their understanding of the material. It can also provide recommendations for improvement (Alice et al., 2006).

Data mining and learning analytics:

1) Data mining in education can uncover valuable insights from educational data, helping educators and institutions make data-informed decisions. For example, it can identify the most effective teaching methods, the impact of specific curriculum changes, or trends in student performance over time. (FRASSON, 1997).
2) It can help institutions allocate resources more efficiently by identifying areas where additional support or resources are needed and where they can have the most significant impact (Self., 1999).
3) It can incorporate ethical considerations into their decision-making processes, ensuring fair and responsible use of data and avoiding biases in recommendations and assessments (Aleven and Koedinger, 2000).
4) It can provide a feedback loop for educators and institutions, allowing them

to continually improve their teaching methods, curriculum, and learning materials based on data-driven insights (Cohen et al., 1982).

Robotics in enhancing learning analytics:

Robotics and learning analytics: Robotics can provide hands on training to students which in turn is helpful in enhancing students' problem-solving skills, creativity and team work.

1) Robots in education often come with sensors and programming capabilities which are valuable in evaluating students' performance by tracking their actions and decisions. In group based robotic project the data on students' contribution, communication, and team work enhances the learning analytics. Sensors in Robots can monitor students' engagement level which would be helpful in refining and modifying curriculum (Curto, & Moreno, 2016).
2) Data in robotics can help identifying at risk students struggling with technical or conceptual framework. It can help in deploying early intervention strategies that would be helpful to take measures before the damage is done (Rodriguez & Cuesta, 2020)
3) It is helpful in enhancing collaborative learning (Cervera et al., 2016)

Neural networks and learning analytics.:

1) Neural networks excel at recognizing complex patterns in data. In the context of learning analytics, this can be used to identify trends and patterns in student performance, such as identifying which types of questions or topics students struggle with the most.
2) Neural networks can be used to build predictive models that forecast future student performance based on historical data. These models can help educators and institutions identify at-risk students who may need additional support or intervention (Oliver et al., 2002).
3) Neural networks can be used to create personalized learning experiences for students. By analyzing a student's past performance and learning style, a neural network can recommend specific resources or adapt the difficulty level of content to match the student's current level of proficiency (Colchester., et

al., 2017).

4) NLP-based neural networks can analyze text-based data, such as student essays or forum discussions, to assess writing quality, sentiment, or topic relevance. This can help educators provide feedback and support for improving writing skills.
5) Neural networks are often used in recommendation systems to suggest relevant learning materials, courses, or resources to students based on their preferences and past behaviour. This can enhance the overall learning experience.
6) Neural networks can be employed to analyze sentiment in student feedback or course evaluations. This can help institutions understand student satisfaction and identify areas for improvement.
7) Neural networks can be integrated into adaptive learning platforms to continuously assess a student's performance and adjust the difficulty and content of learning materials in real-time to maximize learning outcomes. (Lo and Shu, 2005).
8) Neural networks can generate automated feedback for students on their assignments and assessments, providing timely and constructive guidance. (Roll, & Wylie, 2016).
9) Neural networks can power data visualization and analytics dashboards that provide educators and administrators with insights into student progress and performance trends. (Bernard et al. 2015).
10) Neural networks can detect unusual or suspicious behavior in the learning environment, such as cheating or plagiarism, helping maintain academic integrity.
11) Neural networks can be used to understand and analyze the context of student questions or queries, allowing for more intelligent and context-aware responses in chatbots or virtual teaching assistants. (Baker et al., 2006)
12) Neural networks can assist in optimizing resource allocation within educational institutions by predicting resource demands and student enrolment trends.

13) To effectively leverage neural networks in learning analytics, it's essential to have access to high-quality data, clear objectives, and domain expertise to ensure that the models are trained and deployed appropriately. Additionally, privacy and ethical considerations must be addressed when collecting and using student data for these purposes.

Overall, the learning analytics of Artificial intelligence plays a vital role in personalizing education, improving learning outcomes, and making education more adaptive and effective. It leverages data-driven insights to create a more tailored and supportive learning environment for students. However, it also come with certain challenges and issues.

The following are the challenges of Learning analytics of Artificial intelligence in Education:

1) Machine learning techniques involves some uncertainty and randomness in todays "dynamic and stochastic learning".
2) Machine learning algorithms and its data should be designed carefully as notable gap could be pursued between theoretical design and its applicability. A theoretical model is required for guiding "the development, interpretation, and validation of algorithms "(Gobert et al., 2013; Hew et al., 2019).
3) Privacy erosion, data safety, Ethical biasness is some of the concerns related to AI learning algorithms (Dufy, 2020).
4) AI models used in learning analytics can be highly complex and difficult to interpret, making it challenging for educators and administrators to understand how decisions are made. Interpretability is crucial for gaining trust in AI-driven insights and for making informed decisions (Huang et al. 2020).
5) Implementing AI learning analytics may require faculty and staff to acquire new skills and adapt to new technologies. From collection of students data to training and professional development are necessary to ensure that educators can effectively use AI- driven insights in their teaching practices. (Bottles, Begoli, & Worley, 2014; Brown, 2012).
6) Resistance to change is a common challenge when introducing new technologies in educational settings. Faculty, staff, and students may be

hesitant to embrace AI learning analytics, and there can be cultural and organizational barriers to adoption. (Avella, 2016).

7) Many educational institutions face resource constraints, both in terms of budget and expertise. Developing and maintaining AI learning analytics systems can be costly, and finding skilled personnel to implement and support these systems can be challenging (Jagdish et al. 2014. Luan et al. 2020).
8) AI learning analytics often rely on quantitative data, which can lead to an overemphasis on measurable outcomes, potentially neglecting the qualitative aspects of education, such as creativity, critical thinking, and soft skills (Buckingham Shum & Ferguson, 2012).
9) Measuring the long-term impact of AI learning analytics on student outcomes and institutional performance can be difficult. It may take time to see the full benefits and drawbacks of these systems (Dyckhoff et al., 2012).
10) Evaluation process to be accurate and precise data is needed to be updated timely (Picciano, 2012).

Addressing these challenges requires a collaborative effort among educators, administrators, technologists, and policymakers to ensure that AI learning analytics is used in ways that are ethical, effective, and beneficial for all stakeholders in the education ecosystem.

Deduction:

The following table would highlight the learning analytics of Artificial Intelligence in Education:

Table 4.8 Learning analytics of artificial intelligence and its implications in education.

Sl. No.	Name of learning analytics	Features	Usability	Challenges
1.	Predictive analysis.	Identifies at risk students, forecast, Dropouts and failures	Helpful in tailoring curriculum according to students' needs and interest.	Ethical concerns when implementing AI in education needs to be considered.
2.	Recommendation analysis	Studies students past records, behavior, preferences.	Recommend materials, study books, courses	Analysis of big data might not give accurate findings.
3.	Adaptive learning Analysis	Personalize and customize learning	Maximizes learning by allowing learning pace and adjustment to difficult content.	It is essential to have access to high-quality data.
4	Plagiarism detection analysis	Prevention and Detection of cheating and dishonesty in academic fields.	Helpful in enhancing Creativity and innovation in teaching and learning.	Involve ethical and legal aspects of plagiarism detection. Requires advanced text analysis techniques
5.	Assessment analysis	Hands on training to students which in turn is helpful in enhancing students' problem-solving skills, creativity and team work.	Evaluating students' performance by tracking their actions, activities, interest and decisions.	Privacy considerations must be addressed when collecting and using student data for these purposes.

6.	Automated grading system analysis	Automated scoring systems Can evaluate essays, spoken responses, or language exercises	Provides instant feedback to students and reduces the workload on educators.	Requires vigorous training of teachers and educators.
7.	Data informed educational decision analysis	To process and analyze the collected data	Can identify the most effective teaching methods, the impact of specific curriculum changes, or trends in student performance over time	Clear objectives, and domain expertise is required for data driven decision
8.	Pattern recognition analysis	To analyze students' behavior.	In the context of learning analytics, this can be used to identify trends and patterns in student performance.	This includes data privacy and security, as well as ensuring that the technology is used to benefit students without compromising their rights.
9.	Language Learning Analytics	Contribute to research in the field of language learning	It can help researchers identify trends, patterns, and effective teaching strategies by analyzing large datasets of language learning interactions.	NLP is highly ambiguous and lacks deep language understanding.

10.	Optimizing resources in educational institutions	Analyze data based on past history and present demand	Scheduling classes, assigning teachers, and managing course materials	
11.	Context analytical learning	Analyze the context of student questions or queries	Allows for more intelligent and context-aware responses in chatbots or virtual teaching assistants	Lack of context can lead to difficulty while processing long documents.
12	Instructional strategies.	Analyses the most effective approaches and methods for teaching.	To help improve learning analytics of Students	Developing instructional strategies to accommodate every student specially the disabled students. Require proper planning and resources.
13.	Provide feedback	Analyze data over time	Provides feedback for ongoing loop Educators and institutions. Helpful in Refining and optimizing language learning programs to achieve better outcomes	Lack of empathy and privacy concern are two major issues of providing feedback.
14.	Monitor students' progress in language learning.	Analyses students written assignments, spoken language samples, or responses to language exercises	Educators can gain insights into Individual student's strengths and weaknesses	NLP performs less accurately when there is low language resources and limited data.

15.	Learning analytics for visually impaired and hearing difficulty.	Assist in deciphering natural language.	NLP tools could be used to aid disabled and people with diverse language to communicate easily.	Accessibility, lack of data representation, privacy and data security can be some of the challenges.
16.	Class room management analytics.	Beneficial in saving time and improving learning experiences.	Attendance tracking, Automated updates of student's progress to parents and guardians.	Requires big data. Could lead to privacy and data safety issues.
17.	Emotional and Mental health support.	Helpful in monitoring the emotional and mental well-being of students	Provides an early alert to educators or counsellors when signs of mental distress is detected in students particularly among differently abled students.	Addiction and over use of technologies, cyber bullying and security, privacy concerns can be some of the issues related to mental and emotional health

Findings related to Objective 5:

To develop a framework of educational components of artificial intelligence and their implications in teaching learning process.

The Beijing Consensus on Artificial Intelligence and Education [UNESCO, 2019)] lays down certain common guidelines for including AI and its various aspects in school and university curricula. The most significant among them are: “develop strategies for AI in education that are aligned and integrated with education policies, within a lifelong learning perspective”; “take institutional actions to enhance AI literacy across all layers of society”; “develop local AI talent, to create a massive pool of local AI professionals who have the expertise to design, program and develop AI systems”; “be mindful of the importance of adopting principles of ethics-, privacy- and security-by design”; “support the integration of AI skills into ICT competency framework. The following table shows how AI is used at different level of educational institutions and how it has been included in curriculum at K12 and higher educational institutes.

Table 4.9 Dimensions of the framework.

Sl. No.	Component of Artificial Intelligence	Uses in school	Curriculum	Level of grades	Some major contents
1.	Machine Learning.	In teaching, learning and school administration.	1) Itcan be used to teach computer science and data science at school level (Heys's 2018). 2) At university level it is Taught in different courses outside the computer science course (Rattadilok and Roadknight, 2018)	1) K-12 and even at university level. 2) 2) In CBSE schools 3) From grade VI computer science is introduced. 3) In CISCE and ICSE schools from grade IX onwards to introduce AI subjects (Mullick, 2022).	1) Giannakos et al. (2020) highlights the prospect of using ML in games to provide opportunities to teach different subjects, concepts and topics to K 12 students. 2) Topics related to data science, programming and machine learning are introduced. 3) Topics like robotics, data science, machine learning etc. are included and even exams are held regularly on these subjects.

2.	Natural language processing.	1) In teaching and assessing language of abled and differently abled students. 2) In analyzing and understanding the sentiments behind a write up.	Basically, used for language teaching and language assessment.	Used at K-12	1) Effectively evaluates students' proficiency in speaking, reading and writing. 2) Used to detect and correct writing errors for ESL and deaf students (Michaud and McCoy 2006; Tetreault and Chodorow 2008; Gamon et al., 2008). 3) Used for detecting grammatical error (Ng et al., 2014), and decipher sign language (Lee and Xu,1996).
3.	Intelligent tutoring system.	To teach different curricular and co-curricular subjects.	Helpful in mathematics, reading passages and combining different curricular subjects with co -curricular subjects to arouse interest to school students.	K 12 and even for college students.	1) To solve mathematical problems (Walkington et al.,2013) 2) It personalizes reading passages (Heilman et al., 2010) 3) Helpful for context personalization where curricular elements are matched to non- or co-curricular elements like sports, dance. music, games etc. (Cordova and Lepper, 1996). 4) Helpful in enhancing motivation, cognition, and learning (Walkington and Bernacki, 2014).

4.	Data Mining.	It can be used to teach the different puzzled based problems to enhance problem-solving abilities	Helpful in mathematics learning and different curricular subjects with respect to reasoning abilities	1) Higher educational institutions especially engineering institute. (Monika Goyal and Rajan Vohra 2012). 2) Medical institute (Dash et al., 2019) 3) Finance and Management institute (George,et al., 2016) 4) Institute of Earth science (Baumann et al., 2016.)	1) Data science helps engineering students to develop tools and techniques to visualize and analyze data, predictive maintenance models to predict potential failures and to develop IOT devices (Internet of Things) and sensors to create and develop interconnected systems. 2) Helps in diagnosing patients' ailment, Discovering the right kind of drug to the patients, optimizing treatment and boosting health care management. 3) To help understand students the analytics of marketing, fraud detection technique, market credit risk customer and marketing relationship. 4) It is specially used in environmental studies. Use particularly to identify and analyze the potential environmental hazards.

5.	Robotics	Helpful in teaching STEM subjects.	STEM is introduced from elementary to secondary level.	In CBSE schools and ICSE syllabus STEM is incorporated from elementary level itself.	Helpful in STEM learning, Hands on learning, Coding and programming, Creative thinking and innovative learning, Problem solving, Interdisciplinary learning, Team work and collaborative learning, Real world experience learning, inclusive learning and carrier-oriented learning. (Gorakhnath and & Padmanabhan., 2020).
6.	Cognitive computing	Helpful in assisting students and teachers in decision making by guiding their thought process.	Helpful in giving upto date information regarding instructional and administrative queries to students, teachers and parents.	1) Used in computer programming classes (Coccoli et al., 2011). 2) Used in AI related studies in Schools (Coccoli et al.,2 011).	1) Enhances students' performances particularly in computer sciences and AI related studies. 2) Ease teacher's job. 3) Helpful in taking accurate decisions.

7.	AI Assistive technology.	Helpful in enhancing education of special need children.	1) Helpful in mobilizing physically disabled students. 2) Helpful in assisting visually impaired students. 3) Helpful in assisting hearing impaired students. 4) Helpful for Autistic and dyslexic students.	1) Helpful in K-12. 2) Helpful in higher education.	AI assistive technology like chat bots and virtual assistants create a friendly environment, non-judgmental and non-intimidating environment. Thus, letting the special needs students to learn at their own pace and at their comfort zone.
8.	AI mental health therapy	Helpful in diagnosing mental disorder and offering therapeutic interventions (D'Alphonso,2020).	1) Helpful in instilling positive 2) Psychology among students. 3) Helpful in boosting strength and positive values. 4) Enhances self-compassion.	1) Useful to students of K 12. 2) Useful among students of higher education.	1) ChatGPT therapy, Alexa and other AI therapeutic tools have the ability to identify and classify different mental health disorders and give counselling and guidance accordingly. They are so convincing that they give the impression of chatting to real therapist to the patients (Weizenbaum, 1976, Mullins, 2005). 2) They are cost effective and a genuine replacement to human treatment. (Minerva and Giubilini, 2023).

9.	Generative AI	Helpful in creating human like content, ideas, images, words etc. (Villarreal et al., 2023).	1) Provides 24/7 support system. 2) Helpful in enhancing personalized teaching and learning. 3) Develops language and communication skills. 4) Provides innovative learning experiences. 5) Helpful in continuous monitoring and evaluation. 6) Enhances research and data analysis.	1) Helpful for students of K12. 2) Helpful for students of higher education. 3) Helpful in Research.	1) Helpful in both instruction and assessment. 2) Helpful in research and innovative findings. 3) Helpful in customized and personalized learning and teaching. 4) Helpful in gaining learning experiences and learning outcomes. (Kasneci et al., 2023, Al Afnan et al., 2023, Rahman et al., 2023, Sanchez-Ruiz et al., 2023, Panke et al., 2023, Gupta et al., 2023).

Deduction:

Artificial Intelligence and its different components play pivotal role in teaching and learning right from primary to higher level. In India the following major components of AI are included in teaching learning process at various institutional levels:

1) It has been found to be implemented in CBSE schools across India from K12.
2) STEM education has been implemented from elementary to 12th in CBSE, ICSE and some state board schools.
3) Topics related to data science, Machine learning, Robotics, programming occupies an important place in school curriculum from class VI onwards.
4) Exams are also held regularly to test students' knowledge on AI and its uses.
5) Artificial intelligence is also used in Higher education like medicines, engineering, management, physical sciences, earth sciences and in other basics and professional courses.
6) AI is also included in school curriculum to assist SLA and to assist students with visual and audio impairment.
7) AI is used in school curriculum to solve mathematical problems from elementary to higher classes.
8) AI is used to match curricular elements with non-curricular subjects like dance, sports, music, games etc. at school level to enhance cognitive development.
9) AI is used to detect writing errors, grammatical errors and to enhance speaking and learning skills at school level.

Chapter- V

Summary, Findings and Conclusion

5.1 Introduction

This chapter provides a comprehensive and detailed discussion on the philosophy and connotations of artificial intelligence in education. The use of Artificial Intelligence (AI) in education has gathered huge amount of significance in recent years. AI technologies offer tremendous opportunities in educational sector, they not only enhance teaching and learning but also help in running educational administration, assist in educational management and strengthen the overall functioning of education in society. This chapter encompasses the deduction of different objectives undertaken by the researcher for the research. It also encompasses the views expressed by different writers in the 100 reviews conducted by the researcher. Further, it also offers a detailed discussion on the understanding of the researcher on AI and its role in education.

5.2 Summary of the Study

5.2.1 Statement of the Research Problem

"A Critical Analysis of Philosophy and Connotations of Artificial Intelligence in Education."

5.2.2 Foundational Assumptions for the Study

1. Artificial intelligence has deep-rooted philosophy to provide sustainable growth in various aspects of human life.
2. Artificial intelligence has a multifaceted aspect that can be highly beneficial for enhancing and strengthening the education system.

5.3 Objectives of the Study

1. To study the philosophical foundation of artificial intelligence and its implications to education.
2. To critically examine the philosophical foundation of artificial intelligence to education.
3. To analyse the educational components of artificial intelligence and its connotations with respect to:
    a) Teaching
    b) Learning
    c) Assessment
4. To explore the learning analytics of artificial intelligence and its implications in education.
5. To develop a framework of educational components of artificial intelligence and their implications in teaching teaching-learning process.

5.4 Research Design

This present research is a piece of ***philosophical research***. Which inclines towards analysis of content concerning the genesis of the concept i.e. ***artificial intelligence and its evolution and present status of understanding the researcher and academicians across the discipline of knowledge.*** The research has used a content analysis technique for achieving the objectives of the study. The nature of the present study is ***qualitative.***

As it has been understood in the traditional philosophy of both Indian and Western philosophies the analysis is the process of understanding the conscious phenomena by ***dividing it into smaller or simpler sub-concepts***, finally to arrive at a holistic understanding of the concept of phenomena. The researcher has identified the data

theme wise and conducted a ***thematic content analysis*** to reveal the understanding as per the prior decided themes for the study. With the help of content analysis philosophical bend and intercept of artificial intelligence with reference to its implication in education has been studied. As such implications are necessary expectation for the researcher in order to contribute in the discipline of education and its applied aspects in order to address to prepare a strong theory building along with an understanding of concept, it's evaluation, analysis of the problem and finally arriving at the conclusion which is objective in nature and based on the rationally acceptable methodology. In the nutshell, the entire process of methodology adopted by the researcher has been adjacent to philosophical research. Which can initiate the dialogue between philosophy and science, education and artificial intelligence.

The study has attempted the following steps for studying the literature and conducting a thematic content analysis.

1. Study the different concepts and evolution of artificial intelligence.
2. Looking into its understanding in education as well in the other disciplines of knowledge such as education, social science, science, computer science and humanities.
3. Consulting and reviewing the authentic literature available in the field of artificial intelligence.
4. Exploring the different kinds of research in the field of artificial intelligence and interpretation of AI in various disciplines or sources of knowledge.
5. Deriving and determining the basic themes such as AI and naturalism, AI and Pragmatism. AI, Consciousness and Machine, AI and cognitivism, AI and ethics and morality, Intelligent Tutoring System, Adaptive Educational System and Neural Networks.
6. Analysis of content in a systematic and organized manner by putting the data according to various themes in a matrix arrangement.

The main purpose of the present study is to elucidate the philosophical basis of AI and its connotations in Education and its different aspects like teaching, learning and assessment. The present study is based on thematic content analysis of primary and secondary data reviewed. Since, the researcher is interested to understand the

philosophical foundation of Artificial intelligence and its connotations in education an attempt has been made to understand the data part by part and its analysis for meaningful interpretations.

1. Data was collected from books and on-line repositories.
2. Online repositories like Sodhganga and Google Scholar were consulted.
3. Different libraries like Mizoram University Central Library, Tezpur University Library, Punjab Rao Deshmukh Krishi Vidyapith, Akola. Maharashtra and some other district libraries were visited by the researcher for consultation of books, research thesis and journal.
4. National Education Policy 2020, NCERT books, NCTE guidelines, etc were thoroughly read and consulted by the researcher

5.5 Data Used in the Study

Since the present study deals with critical analysis of the qualitative data available in various forms and sources and collected from books, journals, on line repositories, websites, UNESCO monograms, Government records, news bulletin, national and international seminars, conferences and proceedings. The study contains two different kinds of data source

1) Primary data source and (2) Secondary data source.

a) Data was collected from books and on-line repositories.
b) Online repositories like Sodhganga and Google scholar were consulted.
c) Different libraries like Mizoram university central library, Tezpur university library, Guwahati university library and some other district libraries were visited by the researcher for consultation of books, research thesis and journal.
d) National Education Policy 2020, NCERT books, NCTE guide lines etc were thoroughly read and consulted by the researcher

5.5.1 Primary Sources

Literatures, guidelines, data base and books based on artificial intelligence and its philosophy were used for obtaining the data.

5.5.2 Secondary Sources

Various recommendations/suggestions from government organizations (national and international), research articles, write-ups, articles, dissertations and Ph.D. based on artificial intelligence were used for obtaining the data.

5.6 Instrument/ Tool Used in the Study

In the present study content analysis of the primary and secondary data has been done based on prior selected parameters of AI and its connotations in education. The detailed description of the parameters used is given in the following table based on which data was collected.

Table 5.1

Parameter for Thematic Content Analysis

Serial Number	Themes of AI for Thematic Content Analysis
1	AI and Naturalism
2	AI and Pragmatism
3	AI, Consciousness and Machine
4	AI and Cognitivism
5	AI, Ethics and Morality
6	Intelligent Tutoring System
7	Adaptive Educational System
8	Neural Networks
9	Data Mining
10	Machine Learning
11	Virtual Reality
12	Natural Language Processing

5.7 Techniques Used for Analysis in the Study

All the literature obtained based on different aspects of AI and its connotations to Education has been carefully coded and filled in the master table as per the requirement. After that an in- depth theme-wise content analysis was done and interpretations were done part by part as per the objectives. The analysis of the review conducted was thematically arranged in the master table ***(which generally provides a detailed systematic picture of the responses and interpretation cell-wise in a rectangular arrangement known as a matrix).*** The researcher has

analyzed each themes identified priorly one by one and drew conclusion on the line of research objectives.

5.8 Findings of the Study Findings Related to Objective 1

Objective 1: To study the philosophical foundation of artificial intelligence and its implications to education

Artificial Intelligence and Naturalism

The different components of AI as studied in the different objectives focus on giving a naturalistic experience to students to enhance teaching and learning. virtual learning which provides real-life learning experiences to students is closely related to naturalistic philosophy, as naturalistic philosophy talks about bringing humans and nature to proximity (Ferdiana,2023) The naturalistic philosophy of free will can very much be seen in AI as AI advocates the cause of free will, Personalized learning, learning at one's own pace etc.

1) It is helpful for simulating medical activities like surgery and other complicated practical learnings.
2) Helpful in performing practical skills like Aircraft drills, and fire drills.
3) Useful in teaching history by taking students virtually to the historical period.
4) Helpful for architect students to visualize the design of different buildings and houses without actually visiting the site.

Artificial Intelligence and Pragmatism

Artificial intelligence has a strong connectivity with pragmatism one can conclude that it has a very pragmatic approach. When natural intelligence is reproduced in the form of Artificial intelligence not just the content is reproduced but also the "context" and the "relevance" bringing AI at proximity to human thought and action (Ekbia and Maguitman, 2001). The principles of pragmatism like learning by doing, inquiry and experiential learning, the interconnectedness between knowing, experiencing and acting etc. can all be found in AI.

The following are the principles of Pragmatism.

a) It provides real-life experiences to the child.
b) It has certain social functions.
c) Man is the center of all thinking.
d) No truth is final; it changes according to its practical utility.
e) The results of any experiment are concrete and particular rather than abstract and general.
f) It believes in the pluralism of truth and ideas.
g) Last but not least it stresses on the harmonious co-existence of man and nature. (Sharma, Devi, Kumari,2018).

The researcher has identified and interpreted the following pragmatic qualities in AI.

a) AI is helpful in personalized and adaptive learning.
b) It Promotes individualized learning thus giving learners the opportunity of learning at their own pace.
c) Identifies students' needs by collecting information on students' performance and providing education according to their needs.
d) It provides goal-based and need base education.
e) Customizes learning materials according to the learning style of different students.
f) It also customizes learning according to different courses and schools.
g) Is helpful in prioritizing students need and academic agenda and helping student to undertake activities according to their ability and thus enhance their academic achievement.
h) Encourages Participation and interactivity to increase motivation and attention. Helps Learning to be more enjoyable and effective.
i) Promotes learning by doing.
j) Learning becomes interesting and students get motivated to learn.
k) Helpful in simulating infeasible activities that would have been impossible but giving a real-like experience.

Artificial intelligence and Ethics and Morality:

Ethics and morality raise the question of accountability and responsibility. When AI makes independent or biased decisions, whom to blame to, or when AI causes harm who is to be held responsible? Exploring the ethical framework and moral implications of AI is a necessity in today's world. The researcher has also tried to explore this aspect of AI and has found out that since a huge amount of data has to be collected for the smooth functioning of AI technologies in the educational sector data privacy, data safety and security become a matter of concern.

The researcher has found out that data mining technique and artificial neural network which has predictive quality are more prone to issues of privacy and security. The following traits of data mining and artificial neural network raise questions of ethics and morality:

a) Helps institutions in taking the right decision or action as it gives information about student's dropout rate.
b) It helps institutions in allocating resources more efficiently by predicting the accurate number of students attending a particular course the following year.
c) ANN can identify students 'behavioral pattern and can determine "interventions for struggling students".
d) It helps in predicting student outcomes or performance based on their learning style.
e) It is an effective way of finding out at-risk students and can determine different ways of their retention. Thus, to predict students' behaviors, their retention rate, their strength in a particular course, their dropouts rate, which requires huge amount of data and this raises questions of data privacy and security.

Consciousness and Machine

The question of Turing Can a Machine think? Raise the philosophical thought of machines possessing consciousness. (Turing 1950) Can it achieve human intelligence as proposed by Alan Turing in its famous Turing's test gives AI a strong base of philosophical consideration. The researcher has also tried to understand whether AI possesses consciousness while dealing with teaching and learning and has found out

that understanding students' capabilities and providing need base education, providing instant feedback, giving real-life problems to help students understand real-life situations, providing adaptive and personalized education is the doing of an intelligent mind.

1) It predicts students' strengths and weaknesses.
2) it specifies their skills.
3) It predicts placement performance.
4) Helpful in Providing recommendations and remediation to students
5) It is helpful for resource planning.
6) It is useful for curriculum design.
7) It is useful for teachers' management.

AI are highly intelligent machines and possess consciousnesses to take decisions by understanding students' strength and weaknesses. It can Provide cognitive support to students by giving step wise guidance and hint features. Cognitive support can be given by someone who has cognition, thus Artificial intelligence can be said to have consciousness of its own.

Findings Related to Objective 2

Objective 2: To critically examine the philosophical foundation of artificial intelligence to education

Every evolution has an underlying philosophy and no creation exists without a guiding principle. Hence even cognitive venture has a hidden philosophy (fundamental base about its nature and existence), an ontology (theory of being or becoming) and an epistemology (the theory of knowledge). Although scientists claim that philosophy has no place in science and neuroscience but science and technology is all about mental and cognitive phenomena and to understand the mechanics underlying these phenomena, one has to understand the experimental concept or the scientific method of how it works and it is at this point the rationale of philosophy is applied.(Bunge,2006).In order to know the philosophy of Artificial intelligence one has to take a detour to the pre-historic times and look into mythologies, legends, fictions (Both scientific and unscientific) see how it migrated to philosophy and then finally to pure scientific knowledge. In fact, to understand the nature and mechanism of AI one has to understand the mechanism of existence.

(Naumenko,2021). Artificial intelligence after Allen Turing's statement "Can machine think" raises certain philosophical concern on social and ethical issues of accountability and decision making (Porayska and Rajendran ,2021) and to study the philosophical implications of AI becomes even more mandatory in present times. The findings of the objective 2 can be summaries as

Artificial intelligence acts as a substitute support for providing equity, quality, excess, affordability and accountability of education. These very features have been adopted by NEP 2020 for a fair and equitable right to education for all. Artificial intelligence in its core is pragmatic science. Pragmatism believes in the practical consequences of things and that reality changes according to one's progress and evolution. The concept of ultimate truth does not exist and that it changes with the process that one seeks out through experience (Ozmon and Craver, 2008). Dewey believed that "experience is not a mental state that is within us; instead, we are within experience". (Boisvert, 1988; Campbell, 1995; Gouinlock, 1972; Sleeper, 1987; Welchman, 1995). As Artificial Intelligence can make its own decisions regarding students likes and dislikes, students' choice of subjects, students' compatibility, students' dropout and retention. Thus, it gives rise to the following assumptions. The philosophical foundation of AI raises questions on the consciousness and cognition of machine whether machine possess consciousness and whether it has its own mental state. This becomes relevant as machines not only learn and acquire information, they also make their own decisions. The ethics and morality, the reliability and validity of its knowledge and decision becomes a matter of debate and discussion. The epistemic logic of AI can be explored with the pertinent question of what AI know or believe as AI system have strong reasoning which is essential for decision making and problem solving. Existentialist philosophy delves into questions of individual existence, freedom, and responsibility. In AI, existentialist philosophy can be explored with the consequences of AI development, its impact on human employment and society.

The developmental process of AI is based on the fundamental principles of life i.e evolution. Evidences from palaeontology, molecular biology, and evolutionary theory confirms that all features of biological agents, including intelligence, have arisen roughly through Darwinian evolutionary processes(Lee,2016).However pre

Darwinian thinkers oppose the idea that Artificial intelligence could have a natural evolutionary processes however considering AI as an intelligent computer program designed by intelligent humans the idea of evolutionary processes explicitly matches with AI as well. For example, Dean et al. (1995) defined AI as "the design and study of computer programs that behave intelligently"

Findings Related to Objective 3

Objective 3: To analyze the educational components of artificial intelligence and its connotations with respect to:

a) **Teaching**
b) **Learning**
c) **Assessment**

On the basis of the Matrix Representing the Thematic Analysis of AI and its Role in Teaching, Learning and Assessment, following deductions has been drawn:

Teaching with AI helps in Personalized Learning which can help a teacher in analyzing individual student's strengths and weaknesses and provide tailored learning materials and activities. This adaptability can enhance the learning experience as well. AI-powered chatbots and virtual tutors can assist students with questions, homework, and provide explanations on various topics, offering support 24/7. AI tools can generate educational content, such as quizzes, study materials, and even lesson plans, making it easier for teachers to prepare and deliver high- quality instruction.

AI helps in Adaptive Learning by creating personalized learning paths based on a student's progress, adjusting the difficulty and pace of content to match their needs. AI can recommend educational resources, books, videos, or courses that align with a student's interests and goals. It can also translate content into different languages and assist students with disabilities by providing text-to-speech or speech-to-text capabilities. It helps in Automated Grading. It can grade multiple-choice, short-answer, and even some essay questions reducing the burden on teachers and providing immediate feedback to students. AI tools can scan assignments and essays for plagiarism, ensuring academic integrity. Thus, playing the role of plagiarism detector.AI can predict a student's future performance based on their past activities,

allowing early intervention for those at-risk students.

Potential of AI in Teaching:

a) Can identify students' weakness and provide means to improve their learning.
b) Can predict students drop out by analysing their characteristic and academic performance.
c) provide hands on experiences to students. Virtual reality is very helpful for performing risky practical lessons like lessons on Aviation, or fire related hands-on training
d) Useful in analyzing learners' response.
e) Helpful in giving personalized instruction based on the learning capabilities of the students.
f) AI helps in concretizing abstract concept and reducing cognitive loads.
g) AI is very helpful in transforming deeper concept and re enforcing information easily.
h) It is helpful in reducing boredom and monotony to both students and teachers as the same thing is taught with newer concept.
i) Helps in students' retention by identifying the weak and at risks students

The Potential of AI in Learning

a) Gives constant feedback to teachers helping them to adapt teaching according to the needs of the students.
b) Deep tutor (a dialogue based ITS) is helpful for students to deal with science topics, especially it is helpful in solving physics problems where students are given several hints to help them to find solution themselves.
c) A conversational intelligent tutoring system (CITS) is used to augment the learning style of autistic children, it adopts to the learning needs of these children with the help of a visual audio kinaesthetic learning style.
d) ITS which are specifically trained on general knowledge questions and answers are used to assist high school students for learning general knowledge.

e) An emotionally intelligent tutoring system (EITS)uses various hints like the facial expression of the learners, speed of typing, mouse movements and clicks to analysis the learner's emotional disposition and give instruction accordingly.
f) ITS is helpful in delivering the right content to the right person at the right time by Presenting contents to students according to their wish, in a way that suits their individual learning style and their psychological disposition.

Potential of AI in Assessment and Administration:

a) AI like data mining is Helpful in analyzing the cause of student's failures, reasons of students drop outs, students' behaviour, students' success rate, popularity of a course etc. which help in the smooth functioning of an institution.
b) Assess teachers in grading and assessing students.
c) Helps in students' retention by identifying the weak and at risks students.
d) AI like EDM (Education data mining) Helps in strategic decision making in Higher educational institutions HEIs
e) Enterprise resource planning (ERP) manages a large range of activities in educational institutions like marketing of institutions for admission, student's placements, management of internal operations like smooth functioning of classes or recruitment of faculty members and financial and cash related planning, and co- ordinating with regulatory and statutory bodies
f) OLTP (On-Line Transaction Processing) facilitates students and faculty to get a vigorous and advanced learning ambience.

Findings Related to Objective 4

Objective 4: To explore the learning analytics of artificial intelligence and its implications in education.

Learning analytics. Learning analytics, is described as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Long and Siemens, 2011). Learning analytics are often implemented to analyze

huge amounts of data (Aldowah et al.., 2019). Machine learning and AI techniques expand the capabilities of learning analytics (Zawacki-Richter et al.., 2019). Here are some key aspects of learning analytics:

Learning analytics has gained significant importance in education as institutions seek to improve learning outcomes, enhance student engagement, and make data-informed decisions. It relies on a combination of technology, data analysis, and pedagogical expertise to achieve these goals.AI plays a significant role in leveraging data analysis in education.

Machine learning plays an important role in defining the learning analytics of Artificial intelligence in education. Following are the fields in which Machine Learning can be applied in exploring learning analytics in education. Machine learning models can be used to predict various educational outcomes. machine learning algorithms can be used to predict student performance, identify at-risk students, and forecast dropout rates through data based on past grades, attendance, and engagement (Kobayashi., and Shinohara,2009.) Machine learning can assist educational institutions in optimizing resource allocation, such as scheduling classes, assigning teachers, and managing course materials, based on historical data and student demand (Bach., 2013.). Machine learning models can personalize the learning experience by adapting content, assignments, and assessments to match individual student needs and ability (Huang.,2018)

Learning analytics in natural language processing supports NLP techniques to analyse and improve language learning processes. It empowers educators and institutions to make data- driven decisions, personalize learning experiences, and enhance the overall effectiveness of language education**.** Learning analytics in NLP starts with the collection of relevant data. This data can include a wide range of information, such as student essays, responses to quizzes, discussion forum posts, and more. It may also include data from language learning apps, online courses, or virtual language tutors.

Learning analytics in NLP can be used to monitor students' progress in language learning. By analysing their written assignments, spoken language samples, or responses to language exercises, educators can gain insights into individual students' strengths and weaknesses (Biswas et al..,2014)

NLP-based learning analytics can be used to personalize the learning experience. By understanding a student's language proficiency level and learning style, educators can tailor learning materials and activities to better meet their needs (Lende and Raghuwanshi.,2016). Learning analytics can identify students who may be struggling with language learning early in the process. Educators can then provide additional support or interventions to help these students improve their language skills (Mathew, 2021).

Learning analytics can automatically assess students' understanding of the material and track their progress toward mastery of specific skills or concepts. This allows the system to adjust the difficulty of tasks in real-time. (Sottilare et al.., 2011). ITS is used to identify students who may be struggling or falling behind in their learning. Early intervention strategies can then be employed to provide additional support to these students.

ITS can provide educators and administrators with insights into how students are performing and where they may need additional support. This information can inform teaching strategies and curriculum design (Rodrigues et al.., 2005). Data mining in education can uncover valuable insights from educational data, helping educators and institutions make data-informed decisions. For example, it can identify the most effective teaching methods, the impact of specific curriculum changes, or trends in student performance over time. (Frasson,1997). It can provide a feedback loop for educators and institutions, allowing them to continually improve their teaching methods, curriculum, and learning materials based on data-driven insights (Cohen et al..,1982)

Robotics can provide hands-on training to students which in turn is helpful in enhancing students' problem-solving skills, creativity and team work. Robots in education often come with sensors and programming capabilities which are valuable in evaluating students' performance by tracking their actions and decisions. In group based robotic project the data on students' contribution, communication, and team work enhances the learning analytics. Sensors in Robots can monitor students' engagement level which would be helpful in refining and modifying curriculum (Curto, & Moreno, 2016). Data in robotics can help identifying at risk students struggling with technical or conceptual framework. It can help in deploying early intervention strategies that would be helpful to take measures before the damage is

done (Rodriguez, & Cuesta, F. 2020).

Neural networks excel at recognizing complex patterns in data. In the context of learning analytics, this can be used to identify trends and patterns in student performance, such as identifying which types of questions or topics students struggle with the most.

Neural networks can be used to build predictive models that forecast future student performance based on historical data. These models can help educators and institutions identify at-risk students who may need additional support or intervention (Oliver et al..,2002). Neural networks can assist in optimizing resource allocation within educational institutions by predicting resource demands and student enrolment trends.

Overall, the learning analytics of Artificial intelligence plays a vital role in personalizing education, improving learning outcomes, and making education more adaptive and effective. It leverages data-driven insights to create a more tailored and supportive learning environment for students. However, it also come with certain challenges and issues.

Findings Related to Objective 5

Objective 5: To develop a framework of educational components of artificial intelligence and their implications in teaching learning process

The different Component of Artificial intelligence, their Uses in school Curriculum, and Level of grades are designed systematically in a form of a matrix (Table 4.5) on the ground of which it can be deduced that Artificial intelligence can have a deeper impact over the school education, curriculum and its transaction. To promote the quality of education and promote better learning among the schools. Components like Machine Learning, Natural language processing, Intelligent tutoring system, Data Mining, Robotics, Cognitive computing, AI Assistive technology, AI mental health therapy and Generative AI have found to have a valuable uses and intercept in the education system.

It can be used to teach computer science and data science at school level. (Heys's 2018). At university level it is taught in different courses, outside the computer science course (Rattadilok and Roadknight, 2018). Basically, used for language

teaching and language assessment. Helpful in mathematics, reading passages and combining different curricular subjects with co-curricular subjects to arouse interest to school students. Helpful in mathematics learning and different curricular subjects with respect to reasoning abilities. STEM is introduced from elementary to secondary level.

5.9 Conclusion of the Study

Artificial intelligence has had a long journey after it was coined by Mc Carthy at the Darmonth college in 1956 along with Marvin Minsky, John McCarthy, Allen Newell, Nathaniel Rochester, Claude Shannon, and Herbert Simon who came together for a summer school at Dartmouth College (Hanover, New Hampshire) under the premise "that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" (McCorduck & Cfe 2004., Lungarella, et al. 2007).Undoubtedly AI can simulate human brain be it teaching, learning, assessing, administrating and organising. A small step had been taken by the researcher to understand the role AI plays in teaching and learning and to add up to the already existing knowledge of AI and its different components in education. In education Artificial intelligence plays the role of **assisted intelligence, augmented intelligence and autonomous intelligence.**

Artificial intelligence assists teachers for professional development, assists students with adaptive learning and personalized learning, assists administration by predicting the outcomes of courses, at risks students and assists as a recommendation system. It assists the differently abled students and support students with visual or auditory impairments. It is also helpful for developing writing skills. These tools can provide feedback on grammar, style, and content, helping students to enhance their writing abilities.

AI can create immersive educational experiences through virtual learning and thus augment learning. This technology enhances subjects like history, science, and geography by allowing students to explore virtual environments. Helpful for providing hands on experiences specially for performing hazardous experiments in professional courses. It can help one to reach at places which otherwise would have been impossible. AI-powered tools can automate the grading process, saving

teachers time and providing faster feedback to students. This allows educators to focus on more interactive and personalized aspects of teaching. Automated machines can analyze large sets of data to identify patterns and trends in student performance and help in taking data driven decision. This enables early intervention strategies for students at risk of falling behind, allowing educators to address learning challenges promptly. However, concern about the ethical use of AI in education, including issues related to data privacy, algorithmic bias, and the potential impact on the role of teachers need to be addressed with utmost sincerity. Striking the right balance between technology and human involvement is crucial and is the demand of the modern times.

While the use of AI in education holds great promise, it is important to address these challenges and ensure that AI applications are implemented thoughtfully and ethically to maximize their benefits for students and educators alike. Ongoing research and discussions are essential to refining and improving the integration of AI in educational settings.

5.10 Educational Implications of the Study

The conclusions based on the findings of the present study direct to some educational implications for the future researchers. They are:

1) The findings of the study can be utilized for the stakeholders of education to reshape and set the further goal of education by integrating the AI.
2) The findings of the study can be utilized for the curriculum developers to strengthen and re shape the curriculum by integrating the AI. And its different learning analytics.
3) The findings of the study can be utilized for better and deeper understanding of the intercept of the AI in the field of the education and other related disciplines.
4) The findings of the study can be utilized directly by the school teacher in order to improve their classroom teaching.
5) The findings of the study can be utilized by the institutions involved for policy planning of school education and higher education.

5.11 Limitations of the Study

The conclusions and findings of the present study were subject to following limitations. This study suffers from the normal limitation of the philosophical inquiry. It may be that, the themes selected for the thematic content analysis may have more diverse range. Since the researcher has analyzed the literature available from the different sources, it may be case that some strong argument might not have been included in the research due to general human selection abilities. The results should be applied cautiously to schools, higher educational institutes and classroom settings, as per the requirement and concerns based on AI.

The above limitations should always be considered while generalizing the results of this study to larger population.

5.12 Suggestions for Further Research

Based on experiences and findings of the present study, the investigator has proposed the following suggestions for further research: -

The present study can be replicated over:

1) Different schools of philosophies.
2) Some other identified themes of the Artificial intelligence.
3) Different learning analytics.
4) Comparison among Different schools of philosophies over its connotation with AI.

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BRIFE BIO-DATA OF THE CANDITATE

NAME	: SANDHYA SHARMA
FATHER'S NAME	: DURGA DUTT SHARMA
D.O.B	: 13/1/1973
ADDRESS	: MIZORAM UNIVERSITY
GENDER	: FEMALE
RELIGION	: HINDU
MARITAL STATUS	: MARRIED
EDUCATIONAL QUALIFICATION	: B.ED, M.ED.
Ph.D. REGISTRATION NO. & DATE	: MZU/Ph.D./1851 of 27.08.2021
DEPARTMENT	: EDUCATION

TITLE OF THE THESIS: **A Critical Analysis of Philosophy and Connotations of Artificial Intelligence in Education**.

ANNEXURE-I

MIZORAM University (A Central University)

Name of Research Scholar	**Sandhya Sharma**	
Ph.D. Registration Number	MZU/Ph.D./17 of 27.08.2021	
Title of the PhD thesis	A Critical Analysis of Philosophy and Connotations of Artificial Intelligence in Education.	
Name & Institutional Address of the Supervisor	Dr. Prateek Chaurasia, Department of Education, Mizoram University, Aizawl.	
Name of the Department and School	Department of Education, School of Education.	
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DEGREE	: Doctor of Philosophy
DEPARTMENT	: Education
TITLE OF THESIS	: A Critical Analyss of Philosophy and Connotations of Artificial Intelligence in Education.
DATE OF ADMISSION	: 27/08/2021
APPROVAL OF RESEARCH PROPOSAL	
1. DRC	: 31/03/2022
2. BOS	: 19/05/2022
3. SCHOOL BOARD	: 10.06.2022
MZU REGISTRATION NO.	: 1807301
Ph.D. REGISTRATION NO. & DATE	: MZU/Ph.D./1851 of 27.08.2021
Extension (if Any)	: NIL

Head

Department of Education

ABSTRACT

A CRITICAL ANALYSIS OF PHILOSOPHY AND CONNOTATIONS OF ARTIFICIAL INTELLIGENCE IN EDUCATION

AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

SANDHYA SHARMA
MZU REGISTRATION NO.: 1807301
Ph.D. REGISTRATION NO.: MZU/Ph.D./1851 of 27/8/2021

DEPARTMENT OF EDUCATION
SCHOOL OF EDUCATION
SEPTEMBER, 2024

A CRITICAL ANALYSIS OF PHILOSOPHY AND CONNOTATIONS OF ARTIFICIAL INTELLIGENCE IN EDUCATION

BY

SANDHYA SHARMA

DEPARTMENT OF EDUCATION

SUPERVISOR

Dr. PRATEEK CHAURASIA

Submitted

In partial fulfillment of the requirement of the Degree of Doctor of Philosophy in Education of Mizoram University, Aizawl.

Introduction

Artificial intelligence (AI) though in its infancy stage has penetrated almost every aspect of human lives and it would not be long before we witness AI thinking, acting and behaving like humans. Artificial Intelligence is concerned with understanding the nature of human intelligence and designing intelligent artifacts which can perform the tasks that, when performed by humans, are said to require intelligence. Although, still a dream till the recent past, has now become one of the greatest realities in today's time, where researchers and scientists are engaged to understand the morals, values, and ethics attached to Artificial intelligence. The word Artificial intelligent was first used at a work shop in 1956 held at Darmouth College, A US Ivy league University (McCarthy et al. 2006). Zhong (2006) defined AI as "a branch of modern science and technology aiming at the exploration of the secrets of human intelligence on one hand and the transplantation of human intelligence into machines as much as possible on the other hand, so that machines would be able to perform the function as intelligently as they can"

The role of AI in education started with the introduction of microcomputers in the 1970s which got enhanced with the development of program instructions and other related computing technologies. The mid of 1900s saw the flourishing of CAI and CAL in educational institutions. Artificial intelligence in education plays an important role in shaping and re-shaping the future of education. AI enhances education in numerous ways. According to the UNESCO report (2019) Artificial intelligence in education should incorporate three areas **"learning with AI". "Learning about AI", and" Preparing for AI".** Artificial intelligence can assist in **innovative teaching and personalized learning** and can address some of the biggest challenges faced by education today.AI can accelerate the progress towards Sustainable Development Goals by **achieving inclusive and equitable quality education and lifelong learning opportunities** for all (UNESCO, 2021).

Artificial intelligence has been incorporated into **instructions, Teaching and learning**, **and administration**. Chasignot et al. (2018). It can be used for **adaptive and personalized learning experiences**, it can be used as an **intelligent tutoring**

system, and it can also be used as **a future component of educational processes** Gotsel and Bozkurt (2019). AI in education is also used for **promoting instant feedback and virtual reality learning** (Alam,2020) which not only helps in reinforcing knowledge but also saves learners from embarrassment. and Apart from these uses, AI in education is also used for bringing **inclusiveness in education**, **predicting students' Performa**, and helping in **retaining students**. It is also used as **assistance to teachers in assessment and evaluation,** Zawacki-Richter et al. (2019.) The role of AI in education is multi-dimensional. Not only does it help in teaching and learning but also in **administration, evaluation, and even in curriculum**. AI helps in enhancing the concept of **Learning for all** by responding to the diverse need of the students, by developing different teaching methods to meet **individual differences**, and by helping students to gain **technology experience**. (Alam, 2020).

a. Historical Back ground of AI

one can trace the seeds of AI in Greek Mythology where Homer in the Iliad talks of Hephaestus, the great craftsman, who because he was crippled himself has to create assistant who could make him move. He is described as the creator of "robot-like machines". In one paragraph he talks of automated waiters," Three legged tables he was constructing, twenty in all, to stand out the wall. To these he had feted wheels wrought of gold, so that they could run by themselves to the banquet of the Gods, at his wish, and back home, leaving everyone staggered." In another paragraph he talks of girl assistants to assist him "Handmaidens, fashioned of gold, gave ready support to their master, looking like genuine girls. They proved their understanding by their intelligent speech, their proficient and their skilful performance. These are golden, and in appearance like living young women. There is intelligence in their hearts, and there is speech in them and strength, and from the immortal gods they have learned how to do things". (Rajmohan, 1995., Mccorduck et al,1997).

Such innovative ideas were not only prevalent in the west but one can find this even in the Hindu tradition even before the Greek philosophy, acquisition of knowledge and intelligence goes back to the Vedas and Upanishads which raise profound questions about intelligence. Like the Antikythara mechanism of the Greek the Hindu astronomy studied the movements of the heavenly bodies and the positions of the

planet. The study of astronomy which is the study of objects and matter outside the earth's atmosphere goes long Back to 400BC.Mention of automated vehicles and wooden robots could be found in Hindu literature.

b. Artificial Intelligence in the modern Era

Artificial intelligence in the modern era has taken over almost all the tedious, mundane and mechanical work of human beings like collecting and analysing data, preserving and documenting, scheduling and inspecting equipment etc (Huang et al., 2019; Huang & Rust, 2018). In developing countries like India and China technology has over taken 71-77./. of its work force (Chaudhury et el.,2020). Such technological advancement in countries has become possible mainly due to the functionalities of AI like data mining, machine learning, neural network etc (Akerkar, 2019; Lecun et al., 2015). Multinational companies today are heavily investing on data driven technology which are based on logic and knowledge, which could handle big data and which has the potential of taking better and faster decision (Corea, 2019). India out stands as an emerging economic superpower (Budhwar et al., 2019), due to its fast progress in adapting technology in almost all its sphere. In 2018, the Indian government think-tank, National Institution for Transforming India (NITI) Aayog, started a nation-wide programme wherein the entire economy of the country was driven towards digitization and AI and its industrial applications.

Types of Artificial intelligence and its major Dimensions:

Artificial intelligence is generally of two types:

a) AGI Artificial general (AGI)intelligence or Strong AI
b) Artificial Narrow intelligence (ANI) or weak AI.

A strong AI has a mind of its own and can think and act as human beings. It is developed by combining different programs to tackle different problems. It has a consciousness of itself and can recall memories and look into the future. It is in fact a "thinking Machine" (Sadiku et al., 2022).

Weak AI on the other hand is less ambitious and thus has less controversial issues. It is specialized to undertake specific task and although it can think its thinking is.

directional like the industrial robots, internet search machine, virtual assistant like siris and google etc, Automatic vehicles, IBM Watson supercomputer etc. (Sadiku et al., 2022).

Dimensions of Artificial intelligence: It's an umbrella term for all the techniques. that come together to make this technology. It's a collection of different computational models and algorithm that enables a computer to simulate human intelligence, solve knowledge-based problems, executes tasks that need human intelligence, Understands the relationship between perception and action, manifests intelligent human behaviour, can comprehend from new situations and can explain, advise and demonstrate the action to its user. Some of its dimensions are Expert system, Fuzzy logic, Neural network, machine learning, Deep learning, natural language processing, Robotics.

Rationale of the Study

The main idea behind studying the philosophy of Artificial intelligence is to understand its approach, its intent and to analyse the concept of AI in education. The researcher has decided to undertake the study of AI in education to develop critical thinking of how Artificial intelligence can be beneficial to our education system and in what ways. The researcher would explore and examine the different aspects of AI like feedback-based learning, personalized and equity-based learning, virtual learning, etc and their pedagogical implications in education as the researcher feels that the area of AI in education has not much been explored and there is much to know in this field. Artificial intelligence is the need and the demand of the present society, it is only by achieving knowledge and educating ourselves in artificial intelligence can we enhance our understanding of the benefits of AI in education. The researcher aims to achieve a widespread understanding of AI in education by systematically analysing the different components of AI in the educational sector. The existing literature review also suggests that there is very less understanding of the uses and implications of AI in education which has already entered our lives and society in various ways. (Estevez, 2019; Chen et al. ,2020).

Besides, the New National Education Policy (MHRD, 2020) clearly mentions the use and application of AI in every aspect of education The application of AI in education would be mandatory in the near future as it would be transforming the whole concept of teaching and learning; hence an in-depth understanding of artificial intelligence and its different components like personalized and customized learning, adaptive learning, feed based learning, virtual learning, inclusive learning, interactive and innovative learning is the demand and need of the present times. This research will be beneficial to all stakeholders for a better understanding of the concept of AI and further, it would be helpful to all the upcoming researchers who would refer to this work for their further research. The researcher feels that AI can offer to our education system a more structured form of teaching and learning which would not only augment personal experience but also academic growth at the same time. Hence a critical study of philosophy of artificial intelligence and its connotation in education has been taken as the research topic by the researcher.

Existing Knowledge

As per the review of literature conducted by the researcher a lot of work on AI, types of AI, components of AI, scope of AI, its ethical and moral issues and considerations has been done however scope of AI in education has still not been fully explored and more so its implication and its benefits in teaching and learning, assessment and administration and a comprehensive understanding of AI in the educational scenario still needs to be updated.

Knowledge Gap

Need for rigorous research to assess the true effectiveness and impact of AI driven educational intervention as well as the philosophical aspect of AI like its nature, capabilities and implications has been found as the knowledge gap by the researcher. The researcher also assumes that the research would prove to be beneficial to the various stakeholders of education and policymakers as the research would augment the findings of other studies and help in fostering relevant information to the stakeholders and policy makers. The research would make a worthy contribution to

the growing study of artificial intelligence in education which has become a necessity in today's world.

Foundational Assumptions for the Study

1. Artificial intelligence has deep-rooted philosophy to provide sustainable growth in various aspects of human life.
2. Artificial intelligence has a multifaceted aspect that can be highly beneficial for enhancing and strengthening the education system.

Statement of the Problem

The topic for the study was entitled as

A Critical Analysis of Philosophy and Connotations of Artificial Intelligence in Education

Objectives of the Study

1. To study the philosophical foundation of artificial intelligence and its implications to education.
2. To critically examine the philosophical foundation of artificial intelligence to education.
3. To analyse the educational components of artificial intelligence and its connotations with respect to:
    - **a)** Teaching
    - **b)** Learning
    - **c)** Assessment
4. To explore the learning analytics of artificial intelligence and its implications in education.
5. To develop a framework of educational components of artificial intelligence and their implications in teaching teaching-learning process.

Delimitations of the Study

The present study has the following delimitations

- The present study will be delimited to the philosophical inquiry of artificial intelligence only.
- The present study will be delimited to the connotations of artificial intelligence in education only.
- The present study will be delimited to the learning analytics of artificial intelligence in education only.

Research Design

This present research is a piece of ***philosophical research***. Which inclines towards analysis of content concerning the genesis of the concept i.e. ***artificial intelligence and its evolution and present status of understanding the researcher and academicians across the discipline of knowledge.*** The research has used a content analysis technique for achieving the objectives of the study. The nature of the present study is ***qualitative.***

As it has been understood in the traditional philosophy of both Indian and Western philosophies the analysis is the process of understanding the conscious phenomena by ***dividing it into smaller or simpler sub-concepts***, finally to arrive at a holistic understanding of the concept of phenomena. The researcher has identified the data theme wise and conducted a ***thematic content analysis*** to reveal the understanding as per the prior decide themes for the study. With the help of content analysis philosophical bend and intercept of artificial intelligence with reference to its implication in education has been studied. As such implications are necessary expectation for the researcher in order to contribute in the discipline of education and its applied aspects in order to address to prepare a strong theory building along with an understanding of concept, it's evaluation, analysis of the problem and finally arriving at the conclusion which is objective in nature and based on the rationally acceptable methodology. In the nutshell the entire process of methodology adopted by the researcher has been adjacent to philosophical research. Which can initiate the dialogue between philosophy and science, education and artificial intelligence.

The study has attempted the following steps for studying the literature and conducting a thematic content analysis.

1. Study the different concepts and evolution of artificial intelligence.
2. Looking into its understanding in education as well in the other disciplines of knowledge of such as education, social science, science, computer science and humanities.
3. Consulting and reviewing the authentic literature available in the field of artificial intelligence.
4. Exploring the different kinds of research in the field of artificial intelligence and interpretation of AI in various disciplines or sources of knowledge.
5. Deriving and determining the basic themes such as AI and naturalism, AI and Pragmatism. AI, Consciousness and Machine, AI and cognitivism, AI and ethics and morality, Intelligent Tutoring System, Adaptive Educational System and Neural Networks.
6. Analysis of content in a systematic and organized manner by putting the data according to various themes in a matrix arrangement.

The main purpose of the present study is to elucidate the philosophical basis of AI and its connotations in Education and its different aspects like teaching, learning and assessment. The present study is based on thematic content analysis of primary and secondary data reviewed. Since, the researcher is interested to understand the philosophical foundation of Artificial intelligence and its connotations in education an attempt has been made to understand the data part by part and its analysis for meaningful interpretations.

- Data was collected from books and on-line repositories.
- Online repositories like Sodhganga and Google Scholar were consulted.
- Different libraries like Mizoram University Central Library, Tezpur University Library, Punjab Rao Deshmukh Krishi Vidyapith, Akola. Maharashtra and some other district libraries were visited by the researcher for consultation of books, research thesis and journal.

- National Education Policy 2020, NCERT books, NCTE guidelines, etc were thoroughly read and consulted by the researcher

Data Used in the Study

Since the present study deals with critical analysis of the qualitative data available in various forms and sources and collected from books, journals, on line repositories, websites, UNESCO monograms, Government records, news bulletin, national and international seminars, conferences and proceedings. The study contains two different kinds of data source (1) Primary data source and (2) Secondary data source.

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- Online repositories like Sodhganga and Google scholar were consulted.
- Different libraries like Mizoram university central library, Tezpur university library, Guwahati university library and some other district libraries were visited by the researcher for consultation of books, research thesis and journal.
- National education policy 2020, NCERT books, NCTE guide lines etc were thoroughly read and consulted by the researcher

Primary Sources

Literatures, guidelines, data base and books based on artificial intelligence and its philosophy were used for obtaining the data.

Secondary Sources

Various recommendations/suggestions from government organizations (national and international), research articles, write-ups, articles, dissertations and Ph.D. based on artificial intelligence were used for obtaining the data.

Instrument/ Tool Used in the Study

In the present study content analysis of the primary and secondary data has been done based on prior selected parameters of AI and its connotations in education. The detailed description of the parameters used is given in the following table based on which data was collected.

Table 1

Proforma for Thematic Content Analysis

Serial Number	Themes of AI for Thematic Content Analysis
1	AI and Naturalism
2	AI and Pragmatism
3	AI, Consciousness and Machine
4	AI and Cognitivism
5	AI, Ethics and Morality
6	Intelligent Tutoring System
7	Adaptive Educational System
8	Neural Networks
9	Data Mining
10	Machine Learning
11	Virtual Reality
12	Natural Language Processing

Procedure of Data Collection

During the whole process of data collection, coding, and preparation of the master table the researcher had tried and made her best effort to gather relevant and authentic data as per the objective of the study. To meet the nature and demand of the research 12 primary sources and more than 100 relevant documents were systematically collected and coded and a master table has been prepared. Due to the huge number of data sources available, it was challenging for the researcher to select the data, therefore prior decided aspects of AI were considered as a parameter for data collection.

Data Organisation

The study has gone through the following steps while organising the data

- Studied the philosophical and historical background of Artificial intelligence in an educational context.
- Studied the traits of artificial intelligence and its different dimensions with regard to teaching and learning.
- Studied the different learning analytics of the different components of Artificial intelligence.
- developed a framework of educational components of artificial intelligence and their implications in teaching learning.
- Studied the education implication and its various components.
- Developed the analysis strategy of its uses in educational settings.

Techniques Used for Analysis in the Study

All the literature obtained based on different aspects of AI and its connotations to Education has been carefully coded and filled in the master table as per the requirement. After that an in-depth theme-wise content analysis was done and interpretations were done part by part as per the objectives. The analysis of the review conducted was thematically arranged in the master table ***(which generally provides a detailed systematic picture of the responses and***

interpretation cell-wise in a rectangular arrangement known as a matrix). The researcher has analyzed each themes identified priorly one by one and drew conclusion on the line of research objectives.

Findings of the Study

This section presents a summary of the findings derived after thematic content analysis and interpretations of the literature reviewed. The major findings of the study, objective wise of the study are as follows:

Findings Related to Objective 1

Objective 1: To study the philosophical foundation of artificial intelligence and its implications to education

The researcher has analyzed the different primary and secondary sources based on AI and its different intercepts. components of AI and has tried to understand how AI and its different components are interconnected with philosophy.

Artificial Intelligence and Naturalism

The different components of AI as studied in the different objectives focus on giving a naturalistic experience to students to enhance teaching and learning. virtual learning which provides real-life learning experiences to students is closely related to naturalistic philosophy, as naturalistic philosophy talks about bringing humans and nature to proximity (Ferdiana,2023) The naturalistic philosophy of free will can very much be seen in AI as AI advocates the cause of free will, Personalised learning, learning at one's own pace etc.

- It is helpful for simulating medical activities like surgery and other complicated practical learnings.
- Helpful in performing practical skills like Aircraft drills, and fire drills.
- Useful in teaching history by taking students virtually to the historical period.
- Helpful for architect students to visualize the design of different buildings and houses without actually visiting the site.

Artificial Intelligence and Pragmatism

1. Artificial intelligence has a strong connectivity with pragmatism one can conclude that it has a very pragmatic approach. When natural intelligence is reproduced in the form of Artificial intelligence not just the content is reproduced but also the "context" and the "relevance" bringing AI at proximity to human thought and action (Ekbia and Maguitman, 2001). The principles of pragmatism like learning by doing, inquiry and experiential learning, the interconnectedness between knowing, experiencing and acting etc can all be found in AI.

- The following are the principles of Pragmatism.

  a) It provides real-life experiences to the child.

  b) It has certain social functions.

  c) Man is the center of all thinking.

  d) No truth is final; it changes according to its practical utility.

  e) The results of any experiment is concrete and particular rather than abstract and general.

  f) It believes in the pluralism of truth and ideas.

  g) last but not least it stresses on the harmonious co-existence of man and nature. (Sharma, Devi, Kumari,2018).

The researcher has identified and interpreted the following pragmatic qualities in AI.

- AI is helpful in personalized and adaptive learning.
- It Promotes individualized learning thus giving learners the opportunity of learning at their own pace.
- Identifies students' needs by collecting information on students' performance and providing education according to their needs.
- It provides goal-based and need base education.
- customizes learning materials according to the learning style of different students.
- It also customizes learning according to different courses and schools.

- Is helpful in prioritizing students need and academic agenda and helping student to undertake activities according to their ability and thus enhance their academic achievement.
- Encourages Participation and interactivity to increase motivation and attention

  helps Learning to be more enjoyable and effective.
- Promotes learning by doing.
- Learning becomes interested and students get motivated to learn.

  Helpful in simulating infeasible activities that would have been impossible but giving a real-like experience.

Artificial intelligence and ethics and morality:

Ethics and morality raise the question of accountability and responsibility. When AI makes independent or biased decisions, whom to blame to, or when AI causes harm who is to be held responsible? Exploring the ethical framework and moral implications of AI is a necessity in today's world. The researcher has also tried to explore this aspect of AI and has found out that since a huge amount of data has to be collected for the smooth functioning of AI technologies in the educational sector data privacy, data safety and security become a matter of concern.

The researcher has found out that data mining technique and artificial neural network which has predictive quality are more prone to issues of privacy and security. The following traits of data mining and artificial neural network raise questions of ethics and morality.

- Helps in taking the right decision or action as it gives information about student's dropout rate.
- It helps institutions in allocating resources more efficiently by predicting the accurate number of students attending a particular course the following year.
- ANN can identify students 'behavioural pattern and can determine "interventions for struggling students".
- It helps in predicting student outcomes or performance based on their learning style.

- It is an effective way of finding out at-risk students and can determine different ways of their retention. Thus, to predict students' behaviour, their retention rate, their strength in a particular course, their dropouts rate require huge amount of data and this raises questions of data privacy and security.

Consciousness and Machine

The question of Turing Can a Machine think? Raise the philosophical thought of machines possessing consciousness. (Turing 1950) Can it achieve human intelligence as proposed by Alan Turing in its famous Turing's test gives AI a strong base of philosophical consideration. The researcher has also tried to understand whether AI possesses consciousness while dealing with teaching and learning and has found out that understanding students' capabilities and providing need base education, providing instant feedback, giving real-life problems to help students understand real-life situations, Providing adaptive and personalized education is the doing of an intelligent mind.

- It predicts students' strengths and weaknesses.
- it specifies their skills.
- It predicts placement performance.
  Helpful in Providing recommendations and remediation to students
- It is helpful for resource planning.
- It is useful for curriculum design.
- It is useful for teachers' management. AI are highly intelligent machines and possess consciousnesses to take decisions by understanding students' strength and weaknesses. It can Provide cognitive support to students by giving step wise guidance and hint features. Cognitive support can be given by someone who has cognition, thus Artificial intelligence can be said to have consciousness of its own.

Findings Related to Objective 2

Objective 2: To critically examine the philosophical foundation of artificial intelligence to education

Every evolution has an underlying philosophy and no creation exists without a guiding principle. Hence even cognitive venture has a hidden philosophy (fundamental base about its nature and existence), an ontology (theory of being or becoming) and an epistemology (the theory of knowledge). Although scientists claim that philosophy has no place in science and neuroscience but science and technology is all about mental and cognitive phenomena and to understand the mechanics underlying these phenomena, one has to understand the experimental concept or the scientific method of how it works and it is at this point the rationale of philosophy is applied.(Bunge,2006).In order to know the philosophy of Artificial intelligence one has to take a detour to the pre-historic times and look into mythologies, legends, fictions (Both scientific and unscientific) see how it migrated to philosophy and then finally to pure scientific knowledge. In fact, to understand the nature and mechanism of AI one has to understand the mechanism of existence. (Naumenko,2021). Artificial intelligence after Allen Turings statement "Can machine think " raises certain philosophical concern on social and ethical issues of accountability and decision making Porayska and Rajendran (2021) and to study the philosophical implications of AI becomes even more mandatory in present times.

Intelligent Tutoring System

- Artificial intelligence acts as a substitute support for providing equity, quality, excess, affordability and accountability of education. These very features have been adopted by NEP 2020 for a fair and equitable right to education for all.
- Artificial intelligence in its core is pragmatic science. Pragmatism believes in the practical consequences of things and that reality changes according to one's progress and evolution. The concept of ultimate truth does not exist and that it changes with the process that one seeks out through experience (Ozmon and Craver, 2008). Dewey believed that "experience is not a mental state that is

within us; instead, we are within experience". (Boisvert, 1988; Campbell, 1995; Gouinlock, 1972; Sleeper, 1987; Welchman, 1995)

Adaptive Educational System

Deduction:

- Artificial intelligence has basically emerged as the science of the brain and its connotations can be seen as having a close similarity to human civilization. It has emerged from the field of computer science and psychology from ancient times and it focusses on improving human efforts and productivity. Therefore, it stands as a strength to the different endeavours of human civilization. From discovery of fire to computer programming human endeavours have led to progress and civilization. Thus, AI too has arisen out of human curiosity, human necessity and human urge to do something new and unique and that's how human psychology and AI is closely interwind.
- Artificial intelligence has a deep-rooted philosophy of enhancing the capacities of human brain with the support of information and communication technology and like any other philosophy AI too has some philosophical questions like

  a) Does AI possess self-awareness or consciousness?

  b) What are the ethical considerations of AI? The biasness and privacy of data, the impact on employment, the influence on creativity and productivity are all philosophical thoughts and needs careful contemplation.

  c) Does AI really understand the information they acquire and process.

  d**)** Can a machine have the free will to take decision on its own?

  e) Like any other philosophy AI has been influencing the society by and large from health care to education, from economics to politics, from Agriculture to industry.

  f) And last but not the least the question of Turing Can a Machine think? (Turing 1950) Can it achieve human intelligence as proposed by Alan Turing in its famous Turing's test gives AI a strong base of philosophical consideration.

Neural Networks

Deduction:

As Artificial Intelligence can make its own decisions regarding students likes and dislikes, students' choice of subjects, students compatibility, students' dropout and retention. Thus, it gives rise to the following assumptions.

- The philosophical foundation of AI raises questions on the consciousness and cognition of machine whether machine possess consciousness and whether it has its own mental state. This becomes relevant as machines not only learn and acquire information, they also make their own decisions. The ethics and morality, the reliability and validity of its knowledge and decision becomes a matter of debate and discussion.
- Ethics and morality raise the question of accountability and responsibility when AI takes its independent decision. Whom to put blame on when AI causes harm or makes biased decision. Exploring the ethical framework and moral implications of AI is a necessity in today's world.

Data Mining

Deduction:

- The philosophy of language also plays an important role in AI. Natural language processing, Chat bots and conversational AI that interact with humans in human language.
- The epistemic logic of AI can be explored with the pertinent question of what AI know or believe as AI system have strong reasoning which is essential for decision making and problem solving.
- Existentialist philosophy delves into questions of individual existence, freedom, and responsibility. In AI, existentialist philosophy can be explored with the consequences of AI development, its impact on human employment and society

Machine Learning

The developmental process of AI is based on the fundamental principles of life i.e evolution. Evidences from palaeontology, molecular biology, and evolutionary theory confirms that all features of biological agents, including intelligence, have arisen roughly through Darwinian evolutionary processes(Lee,2016).However pre Darwinian thinkers oppose the idea that Artificial intelligence could not have a natural evolutionary processes however considering AI as an intelligent computer program designed by intelligent humans the idea of evolutionary processes explicitly matches with AI as well. For example, Dean et al. define AI as "the design and study of computer programs that behave intelligently" (Dean et al.,)

Virtual Reality

- Aesthetics explores questions of beauty and artistic expression. Virtual reality in AI provides realistic environment to the users letting them immerse in the aesthetic beauty of men made creation of an AI-generated art, music, dance, drama literature. This quality of Artificial Intelligence relates it with the philosophy of aesthetic as well as the question of whether AI can possess creativity or produce aesthetically pleasing works.
- In AI, metaphysical questions arise concerning the ontology of artificial beings, such as whether AI systems have a form of existence and what their relationship is to the physical world.

Findings Related to Objective 3

Objective 3: To analyse the educational components of artificial intelligence and its connotations with respect to:

a) Teaching

b) Learning

c) Assessment

On the basis of the Matrix Representing the Thematic Analysis of AI and its Role in Teaching, Learning and Assessment, following deductions has been drawn:

Teaching with AI

- Teaching with AI helps in Personalized Learning which can help a teacher in analyzing individual student's strengths and weaknesses and provide tailored learning materials and activities. This adaptability can enhance the learning experience as well.
- AI-powered chatbots and virtual tutors can assist students with questions, homework, and provide explanations on various topics, offering support 24/7.
- AI tools can generate educational content, such as quizzes, study materials, and even lesson plans, making it easier for teachers to prepare and deliver high-quality instruction.
- NLP algorithms can help teachers analyze and improve the clarity and comprehensibility of their teaching materials, ensuring that students can better understand the content.

Learning with AI:

- AI helps in Adaptive Learning by creating personalized learning paths based on a student's progress, adjusting the difficulty and pace of content to match their needs.
- AI can recommend educational resources, books, videos, or courses that align with a student's interests and goals. It can also translate content into different languages and assist students with disabilities by providing text-to-speech or speech-to-text capabilities.
- AI-powered simulations can help students apply theoretical knowledge to practical scenarios, making learning more engaging and relevant.

Assessment with AI:

- It helps in Automated Grading. It can grade multiple-choice, short-answer, and even some essay questions reducing the burden on teachers and providing immediate feedback to students.

- AI tools can scan assignments and essays for plagiarism, ensuring academic integrity. Thus, playing the role of plagiarism detector.
- AI can analyse student data to identify patterns and provide insights into their learning behaviors, helping educators make to data-driven decisions and exploring learning analytics.
- AI can predict a student's future performance based on their past activities, allowing early intervention for those at-risk students.
- AI can analyse students' facial expressions and tone of voice to gauge their emotional state, potentially identifying stress or frustration and providing appropriate support.
- AI can help educators create customized assessments based on learning objectives, ensuring that assessments align with what students have been taught.

Potential of AI in teaching: The researcher has analysed the following potential of AI in teaching.

- Can identify students' weakness and provide means to improve their learning.
- Can predict students drop out by analysing their characteristic and academic performance.
- provide hands on experiences to students. Virtual reality is very helpful for performing risky practical lessons like lessons on Aviation, or fire related hands-on training
- Useful in analyzing learners' response.
- Helpful in giving personalized instruction based on the learning capabilities of the students.
- AI helps in concretizing abstract concept and reducing cognitive loads.
- AI is very helpful in transforming deeper concept and re enforcing information easily.
- It is helpful in reducing boredom and monotony to both students and teachers as the same thing is taught with newer concept.
- Helps in students' retention by identifying the weak and at risks students

The potential of AI in Learning

- Gives constant feedback to teachers helping them to adapt teaching according to the needs of the students.
- Deep tutor (a dialogue based ITS) is helpful for students to deal with science topics especially it is helpful in solving physics problems where students are given several hints to help them to find solution themselves.
- A conversational intelligent tutoring system (CITS) is used to augment the learning style of autistic children, it adopts to the learning needs of these children with the help of a visual audio kinaesthetic learning style.
- ITS which are specifically trained on general knowledge questions and answers are used to assist high school students for learning general knowledge.
- An emotionally intelligent tutoring system (EITS)uses various hints like the facial expression of the learners, speed of typing, mouse movements and clicks to analysis the learner's emotional disposition and give instruction accordingly.
- ITS is helpful in delivering the right content to the right person at the right time by Presenting contents to students according to their wish, in a way that suits their individual learning style and their psychological disposition.

Potential of AI in assessment and administration:

- AI like data mining is Helpful in analysing the cause of student's failures, reasons of students drop outs, students' behaviour, students' success rate, popularity of a course etc which help in the smooth functioning of an institution.
    - Assess teachers in grading and assessing students.
    - Helps in students' retention by identifying the weak and at risks students.
    - AI like EDM (Education data mining) Helps in strategic decision making in Higher educational institutions HEIs
    - Enterprise resource planning (ERP) manage a large range of activities in educational institutions like marketing of institutions for admission, student's placements, management of internal operations like smooth functioning of classes or recruitment of faculty members and financial and cash related planning, and co-ordinating with regulatory and statutory bodies

- OLTP (On-Line Transaction Processing) facilitates students and faculty to get a vigorous and advanced learning ambience.

Findings Related to Objective 4

Objective 4: To explore the learning analytics of artificial intelligence and its implications in education.

Learning analytics. Learning analytics, is described as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Long and Siemens, 2011). Learning analytics are often implemented to analyze huge amounts of data (Aldowah et al., 2019). Machine learning and AI techniques expand the capabilities of learning analytics (Zawacki-Richter et al., 2019). Here are some key aspects of learning analytics:

Learning analytics has gained significant importance in education as institutions seek to improve learning outcomes, enhance student engagement, and make data-informed decisions. It relies on a combination of technology, data analysis, and pedagogical expertise to achieve these goals.AI plays a significant role in leveraging data analysis in education.

Machine learning and learning analytics:

Machine learning plays an important role in defining the learning analytics of Artificial intelligence in education. Following are the fields in which Machine Learning can be applied in exploring learning analytics in education:

- Machine learning models can be used to predict various educational outcomes. machine learning algorithms can be used to predict student performance, identify at-risk students, and forecast dropout rates through data based on past grades, attendance, and engagement (Kobayashi., and Shinohara,2009.)
- Machine learning is often employed as a recommendation system suggesting learning materials, courses, or resources to students. These recommendations are

based on a student's past behaviour, preferences, and the behaviour of similar learners (Lindsey,201

- Machine learning can help divide students into different groups based on similar characteristics or learning styles. These segments can be used to tailor educational content or interventions to specific student groups (Lee., and Grauman, 2011)
- Machine learning models can power adaptive learning platforms that adjust the difficulty and content of learning materials in real-time based on a student's progress and performance (Mei, .and Zhu, 2015)
- Machine learning can be used to build early warning systems that identify students who may be struggling academically. These systems can then trigger interventions or support mechanisms to help those students (Angluin and Krikis,2003)
- Machine learning can enhance the capabilities of learning analytics dashboards by providing predictive insights, automated data interpretation, and anomaly detection.
- Machine learning can assist educational institutions in optimizing resource allocation, such as scheduling classes, assigning teachers, and managing course materials, based on historical data and student demand (Bach., 2013.)
- Machine learning models can personalize the learning experience by adapting content, assignments, and assessments to match individual student needs and ability (Huang.,2018)

Natural language processing and learning analytics

Learning analytics in natural language processing supports NLP techniques to analyse and improve language learning processes. It empowers educators and institutions to make data-driven decisions, personalize learning experiences, and enhance the overall effectiveness of language education

- Learning analytics in NLP starts with the collection of relevant data. This data can include a wide range of information, such as student essays, responses to

quizzes, discussion forum posts, and more. It may also include data from language learning apps, online courses, or virtual language tutors.

- NLP techniques are used to process and analyse the collected data. NLP tools can be used to perform tasks such as text mining, sentiment analysis, topic modelling, and language proficiency assessment. These techniques help in extracting valuable insights from the textual data (Gamper, and Knapp., 2002)
- Learning analytics in NLP can be used to monitor students' progress in language learning. By analysing their written assignments, spoken language samples, or responses to language exercises, educators can gain insights into individual students' strengths and weaknesses (Biswas et al.,2014)
- NLP-based learning analytics can be used to personalize the learning experience. By understanding a student's language proficiency level and learning style, educators can tailor learning materials and activities to better meet their needs (Lende and Raghuwanshi.,2016).
- Learning analytics can identify students who may be struggling with language learning early in the process. Educators can then provide additional support or interventions to help these students improve their language skills (Mathew, 2021)
- NLP can assist in automating the assessment of language skills. Automated scoring systems can evaluate essays, spoken responses, or language exercises, providing instant feedback to students and reducing the workload on educators. (Lee et al.,2018)
- Learning analytics in NLP can also contribute to research in the field of language learning. It can help researchers identify trends, patterns, and effective teaching strategies by analysing large datasets of language learning interactions. (Khaled.,2014)
- It's important to consider ethical concerns when implementing learning analytics in NLP. This includes data privacy and security, as well as ensuring that the technology is used to benefit students without compromising their rights (Stahl.,2022)

- Learning analytics provides an ongoing feedback loop for educators and institutions. By analysing data over time, they can refine and optimize language learning programs to achieve better outcomes. (Kolb and Kolb.,2005)

ITS and learning analytics

- ITS can provide personalized feedback and guidance to students based on their performance data. This Learning analytics can help provide appropriate feedback that is tailored to each student's needs. (Conati et al.,2009)
- Learning analytics can automatically assess students' understanding of the material and track their progress toward mastery of specific skills or concepts. This allows the system to adjust the difficulty of tasks in real-time. (Sottilare et al., 2011)
- ITS is used to identify students who may be struggling or falling behind in their learning. Early intervention strategies can then be employed to provide additional support to these students.
- ITS optimizes the content and instructional strategies by analysing which materials and approaches are most effective, in helping to improve the learning analytics of students.
- Based on data analysis, ITS can adapt the learning path for each student. It can select appropriate content, activities, and assessments to match the student's current level and learning pace (Shute and Psot.,1994)
- ITS can provide educators and administrators with insights into how students are performing and where they may need additional support. This information can inform teaching strategies and curriculum design (Rodrigues et al., 2005)
- Adaptive learning systems og ITS can adjust the difficulty and content of educational materials in real-time based on a student's performance. This ensures that students are continuously challenged at an appropriate level (Olsen et al., 2014. Wambsganss et al.,2020. Hagras,.2017)
- It helps in automating the grading and assessment of assignments, quizzes, and exams. It can provide immediate feedback to students, reducing the burden on educators and enabling faster feedback loops. (Walkington &Bernacki 2018)

- NLP techniques of ITS can analyse written assignments, essays, or forum posts to assess the quality of students' work, their writing skills, and their understanding of the material. It can also provide recommendations for improvement. (Alice,.Et al2006)

Data mining and learning analytics:

- Data mining in education can uncover valuable insights from educational data, helping educators and institutions make data-informed decisions. For example, it can identify the most effective teaching methods, the impact of specific curriculum changes, or trends in student performance over time. (FRASSON., 1997)
- It can help institutions allocate resources more efficiently by identifying areas where additional support or resources are needed and where they can have the most significant impact (Self., 1999)
- It can incorporate ethical considerations into their decision-making processes, ensuring fair and responsible use of data and avoiding biases in recommendations and assessments (Aleven and Koedinger.'2000)
- It can provide a feedback loop for educators and institutions, allowing them to continually improve their teaching methods, curriculum, and learning materials based on data-driven insights (Cohen et al.,1982)

Robotics in enhancing learning analytics:

Robotics can provide hands-on training to students which in turn is helpful in enhancing students' problem-solving skills, creativity and team work.

- Robots in education often come with sensors and programming capabilities which are valuable in evaluating students' performance by tracking their actions and decisions. In group based robotic project the data on students' contribution, communication, and team work enhances the learning analytics. Sensors in Robots can monitor students' engagement level which would be helpful in refining and modifying curriculum (Curto, & Moreno, 2016).

- Data in robotics can help identifying at risk students struggling with technical or conceptual framework. It can help in deploying early intervention strategies that would be helpful to take measures before the damage is done (Rodriguez, & Cuesta, F. 2020)
- It is helpful in enhancing collaborative learning (Cervera, et al., 2016)

Neural networks and learning analytics.:

Neural networks excel at recognizing complex patterns in data. In the context of learning analytics, this can be used to identify trends and patterns in student performance, such as identifying which types of questions or topics students struggle with the most.

- Neural networks can be used to build predictive models that forecast future student performance based on historical data. These models can help educators and institutions identify at-risk students who may need additional support or intervention (Oliver et al.,2002)
- Neural networks can be used to create personalized learning experiences for students. By analysing a student's past performance and learning style, a neural network can recommend specific resources or adapt the difficulty level of content to match the student's current level of proficiency Colchester., et al.,2017).
- Neural networks are often used in recommendation systems to suggest relevant learning materials, courses, or resources to students based on their preferences and past behaviour. This can enhance the overall learning experience.
- Neural networks can be employed to analyze sentiment in student feedback or course evaluations. This can help institutions understand student satisfaction and identify areas for improvement.
- Neural networks can generate automated feedback for students on their assignments and assessments, providing timely and constructive guidance. (Roll, & Wylie, 2016)
- Neural networks can power data visualization and analytics dashboards that provide educators and administrators with insights into student progress and performance trends. (Bernard et al., 2015)

- Neural networks can be used to understand and analyse the context of student questions or queries, allowing for more intelligent and context-aware responses in chatbots or virtual teaching assistants. Baker, et al.,2006)
- Neural networks can assist in optimizing resource allocation within educational institutions by predicting resource demands and student enrolment trends.
- To effectively leverage neural networks in learning analytics, it's essential to have access to high-quality data, clear objectives, and domain expertise to ensure that the models are trained and deployed appropriately.

Overall, the learning analytics of Artificial intelligence plays a vital role in personalizing education, improving learning outcomes, and making education more adaptive and effective. It leverages data-driven insights to create a more tailored and supportive learning environment for students. However, it also come with certain challenges and issues. The following table would highlight the learning analytics of Artificial Intelligence in Education:

Table 2

Sl. No.	**Name of learning analytics**	**Features**	**Usability**	**Challenges**
1	Predictive analysis.	identifies at risk students, forecast dropouts and failures,	Helpful in tailoring curriculum according to students needs and interest.	Ethical concerns when implementing AI in education needs to be considered.
2	Recommendation analysis	Studies students past records, behaviour, preferences.	Recommends study materials, books, courses	Analysis of big data might nor give accurate findings.
3	Adaptive learning Analysis	Personalize and customize learning	Maximizes learning by allowing learning pace and adjustment to difficult content.	it's essential to have access to high-quality data, ,
4	Plagiarism detection analysis	Prevention and detection of cheating and dishonesty in academic fields.	Helpful in enhancing creativity and innovation in teaching and learning.	Involve ethical and legal aspects of plagiarism detection. Requires advanced text analysis techniques

5	Assessment analysis	hands on training to students which in turn is helpful in enhancing students' problem-solving skills, creativity and team work.	Evaluating students' performance by tracking their actions, activities, involvement and decisions.	privacy and ethical considerations must be addressed when collecting and using student data for these purposes.
6	Automated grading system analysis	. Automated scoring systems can evaluate essays, spoken responses, or language exercises	provides instant feedback to students and reduces the workload on educators.	Requires vigorous training of teachers and educators. teachers and educators
7	Data informed educational decision analysis	to process and analyse the collected data	can identify the most effective teaching methods, the impact of specific curriculum changes, or trends in student performance over time	clear objectives, and domain expertise are required for data driven decision
8	Pattern recognition analysis	To analyse students' behaviour.	. In the context of learning analytics, this can be used to identify trends and patterns in student performance.	This includes data privacy and security, as well as ensuring that the technology is used to benefit students without compromising their rights.
9	Language Learning analytics	contribute to research in the field of language learning	. It can help researchers identify trends, patterns, and effective teaching strategies by analysing large datasets of language learning interactions.	NLP is highly ambiguous and lacks deep language understanding.
10	Optimizing resources in educational institutions	Analysed data based on past history and present demand	Scheduling classes, assigning teachers, and managing course materials	
11	Context analytical learning	analyse the context of student questions or queries	Allows for more intelligent and context-aware responses in chatbots or virtual teaching assistants	Lack of context can lead to difficulty while processing long documents.

12	Instructional strategies.	Analyses the most effective approaches and methods for teaching.	To help improve learning analytics of students	Developing instructional strategies to accommodate every student specially the disabled students require proper planning and resources.
13	Provide feed back	Analyses data over time.	provides ongoing feedback loop for educators and institutions. Helpful in refining and optimizing language learning programs to achieve better outcomes	Lack of empathy and privacy concern are two major issues of providing feedback.
14	Monitor students' progress in language learning.	Analyses students written assignments, spoken language samples, or responses to language exercises	Educators can gain insights into individual students' strengths and weaknesses	NLP performs less accurately when there is low language resources and limited data
15	Learning analytics for visually impaired and hearing difficulty.	Assist in deciphering natural language.	NLP tools could be used to aid disabled and people with diverse language to communicate easily.	Accessibility, lack of data representation, privacy and data security can be some of the challenges.
16	Class room management analytics.	Beneficial in saving time and improving learning experiences.	Attendance tracking, Automated updates of student's progress to parents and guardians.	Requires big data. Could lead to privacy and data safety issues.
17	Emotional and mental health support.	Helpful in monitoring the emotional and mental well-being of students	Provides an early alert to educators or counsellors when signs of mental distress are detected in students particularly among differently abled students.	Addiction and over use of technologies, cyber bullying and security, privacy concerns can be some of the issues related to mental and emotional health

Findings Related to Objective 5

Objective 5: To develop a framework of educational components of artificial intelligence and their implications in teaching learning process

The Beijing Consensus on Artificial Intelligence and Education (UNESCO, 2019) lays down certain common guidelines for including AI and its various aspects in school and university curricula. The most significant among them are: "develop strategies for AI in education that are aligned and integrated with education policies, within a lifelong learning perspective"; "take institutional actions to enhance AI literacy across all layers of society"; "develop local AI talent, to create a massive pool of local AI professionals who have the expertise to design, program and develop AI systems"; "be mindful of the importance of adopting principles of ethics-, privacy- and security-by design"; "support the integration of AI skills into ICT competency framework. The following table shows how AI is used at different level of educational institutions and how it has been included in curriculum at K12 and higher educational institutes.

Table :3

Educational components of artificial intelligence and their implications in teaching learning process

S. No.	Component of Artificial intelligence	Uses in school	Curriculum	Level of grades	Some major contents
1	Machine Learning.	In teaching, learning and school administration.	It can be used to teach computer science and data science at school level. (Heys's 2018). At university level it is	1. K-12 and even at university level. 2. In CBSE schools from grade VI computer science is introduced.	1. Giannakos et al. (2020) highlights the prospect of using ML in games to provide opportunities to teach different subjects, concepts and topics to K 12 students. 2. Topics related to data science, Programming and machine learning are introduced.

			taught in different courses outside the computer science course (Rattadilok and Roadknight, 2018)	3. In CISCE and ICSE schools from grade IX onwards to introduce AI subjects (Mullick,2022)	3. Topics like robotics, data science, machine learning etc are included and even exams are held regularly on these subjects
2	Natural language processing.	In teaching and assessing language of abled and differently abled students. In analysing and understanding the sentiments behind a write up.	Basically, used for language teaching and language assessment	1. Used at K-12	1. Effectively evaluates students' proficiency in speaking, reading and writing. Used to detect and correct writing errors for ESL and deaf students. (Michaud and McCoy 2006; Tetreault and Chodorow 2008; Gamon et al. 2008) Used for detecting grammatical error. (Ng et al. 2014), and decipher sign language. Lee and Xu (1996)
3	Intelligent tutoring system.	To teach different curricular and co- curricular subjects.	Helpful in mathematics, reading passages and combining different curricular subjects with co - curricular subjects to arouse interest to school students.	1. K 12 and even for college students.	1. To solve mathematical problems (Walkington et al.2013) It personalizes reading passages (Heilman et al. 2010) Helpful for context personalization where curricular elements are matched to non- or co-curricular elements like sports, dance. music, games etc (Cordova and Lepper 1996). Helpful in enhancing motivation, cognition, and learning. (Walkington and Bernacki 2014)

4	Data Mining.			1. Higher educational institutions especially engineering institute. (Monika Goyal and Rajan Vohra 2012). 2. Medical institute (Dash et al.,2019) 3. Finance and Management institute, (George,et al.,2016) 4. Institute of Earth science etc. (Baumann et al.,2016.)	1. Data science helps engineering students to develop tools and techniques to visualize and analyse data, predictive maintenance models to predict potential failures and to develop IOT devices (Internet of Things) and sensors to create and develop interconnected systems. 2. Helps in diagnosing patients' ailment, Discovering the right kind of drug to the patients, optimising treatment and boosting health care management. 3. To help understand students the analytics of marketing, fraud detection technique, market credit risk customer and marketing relationship. 4. It is specially used in environmental studies Use particularly to identify and analyse the potential environmental hazards.
5	Robotics	Helpful in teaching STEM subjects.	STEM is introduced from elementary to secondary level.	1. In CBSE schools and ICSE syllabus STEM is incorporated from elementary	1. Helpful in STEM learning, Hands on learning, Coding and programming, Creative thinking and innovative learning, Problem solving, Interdisciplinary

				level itself.	learning, Team work and collaborative learning, Real world experience learning, inclusive learning and carrier oriented learning. (Gorakhnath and & Padmanabhan.,2020).
6	Cognitive computing	Helpful in assisting students and teachers in decision making by guiding their thought process.	Helpful in giving up To date information regarding instructional and administrative queries to students, teachers and parents.	1.Used in computer programming classes (Coccoli et al,2011). 2 Used in AI related studies in Schools (Coccoli et al,2011).	1 Enhances students' performances particularly in computer sciences and AI related studies. 2 Ease teacher's job. 3 Helpful in taking accurate decisions.
7	AI Assistive technology.	Helpful in enhancing education of special need children.	1.Helful in mobilizing physically disabled students. 2. Helpful in assisting visually impaired students. 3 Helpful in assisting hearing impaired students. 4 Helpful for Autistic and dyslexic students.	1 Helpful in K-12. 2 Helpful in higher education.	AI assistive technology like chat bots and virtual assistants create a friendly environment, non-judgemental and non-intimidating environment.Thus letting the special needs students to learn at their own pace and at their comfort zone.

8	AI mental health therapy	Helpful in diagnosing mental disorder and offering therapeutic interventions (D'Alphonso,2020)	1 Helpful in instilling positive psychology among students. 2 Helpful in bosting strength and positive values. 3. Enhances self-compassion.	1 Useful to students of k 12. 2 Useful among students of higher education.	1 ChatGPT therapy, Alexa and other AI therapeutic tools have the ability to identify and classify different mental health disorders and give counselling and guidance accordingly. They are so convincing that they give the impression of chatting to real therapist to the patients (Weizenbaum,1976.Mullins,2005). 2 They are cost effective and a genuige replacement to human treatment. (Minerva and giubilini,2023)
9	Generative AI	Helpful in creating human like content, ideas, images, words etc.(Villarreal et al,2023)	1 Provides 24/7 support system. 2 Helpful in enhancing personalised teaching and learning. 3 Develops language and communication skills. 4 Provides innovative learning experiences. 5 Helpful in	1 Helpful for students of K12. 2 Helpful for students of higher education. 3 Helpful in Resaerch.	1 Helpful in both instruction and assessment. 2 Helpful in research and innovative findings. 3 Helpful in customized and personalised learning and teaching. 4 helpful in gaining learning experiences and learning outcomes.(Kasneci et al 2023,AlAfnan et al,2023,Rahman et al,2023,Sanchez-Ruiz et al 2023,Panke et al,2023,Gupta et al, 2023.)

			continuous monitoring and evaluation. 6 Enhances research and data analysis.		

Deduction

Artificial Intelligence and its different components play pivotal role in teaching and learning right from primary to higher level (Table 5). In India the following major components of AI are included in teaching learning process at various institutional levels:

- It has been found to be implemented in CBSE schools across India from K12.
- STEM education has been implemented from elementary to 12^{th} in CBSE, ICSE and some state board schools.
- Topics related to data science, Machine learning, Robotics, programming occupies an important place in school curriculum from class VI onwards.
- Exams are also held regularly to test students' knowledge on AI and its uses.
- Artificial intelligence is also used in Higher education like medicines, engineering, management, physical sciences, earth sciences and in other basics and professional courses.
- AI is also included in school curriculum to assist SLA and to assist students with visual and audio impairment.
- AI is used in school curriculum to solve mathematical from elementary to higher classes.
- AI is used to match curricular elements with non-curricular subjects like dance, sports, music, games etc at school level to enhance cognitive development.
- AI is used to detect writing errors, grammatical errors and to enhance speaking and learning skills at school level.

Conclusion of the Study

Artificial intelligence has had a long journey after it was coined by Mc Carthy at the Darmonth college in 1956 along with Marvin Minsky, John McCarthy, Allen Newell, Nathaniel Rochester, Claude Shannon, and Herbert Simon who came together for a summer school at Dartmouth College (Hanover, New Hampshire) under the premise "that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" (McCorduck & Cfe 2004., Lungarella, et al 2007).Undoubtedly AI can simulate human brain be it teaching, learning, assessing, administrating and organising. A small step had been taken by the researcher to understand the role AI plays in teaching and learning and to add up to the already existing knowledge of AI and its different components in education. In education Artificial intelligence plays the role of **assisted intelligence, augmented intelligence and autonomous intelligence.**

Artificial intelligence assists teachers for professional development, assists students with adaptive learning and personalized learning, assists administration by predicting the outcomes of courses, at risks students and assists as a recommendation system. It assists the differently abled students and support students with visual or auditory impairments. It is also helpful for developing writing skills. These tools can provide feedback on grammar, style, and content, helping students to enhance their writing abilities.

AI can create immersive educational experiences through virtual learning and thus augment learning. This technology enhances subjects like history, science, and geography by allowing students to explore virtual environments. Helpful for providing hands on experiences specially for performing hazardous experiments in professional courses. It can help one to reach at places which otherwise would have been impossible. AI-powered tools can automate the grading process, saving teachers time and providing faster feedback to students. This allows educators to focus on more interactive and personalized aspects of teaching. Automated machines can analyse large sets of data to identify patterns and trends in student performance and help in taking data driven decision. This enables early intervention strategies for

students at risk of falling behind, allowing educators to address learning challenges promptly. However, concern about the ethical use of AI in education, including issues related to data privacy, algorithmic bias, and the potential impact on the role of teachers need to be addressed with utmost sincerity. Striking the right balance between technology and human involvement is crucial and is the demand of the modern times.

While the use of AI in education holds great promise, it is important to address these challenges and ensure that AI applications are implemented thoughtfully and ethically to maximize their benefits for students and educators alike. Ongoing research and discussions are essential to refining and improving the integration of AI in educational settings.

Educational Implications of the Study

The conclusions based on the findings of the present study direct to some educational implications for the future researchers. They are:

- The findings of the study can be utilised for the stakeholders of education to reshape and set the further goal of education by integrating the AI.
- The findings of the study can be utilised for the curriculum developers to strengthen and re shape the curriculum by integrating the AI. And its different learning analytics.
- The findings of the study can be utilised for better and deeper understanding of the intercept of the AI in the field of the education and other related disciplines.
- The findings of the study can be utilised directly by the school teacher in order to improve their classroom teaching.
- The findings of the study can be utilised by the institutions involved for policy planning of school education and higher education.

Limitations of the Study

The conclusions and findings of the present study were subject to following limitations.

This study suffers from the normal limitation of the philosophical inquiry. it may be that that themes selected for the thematic content analysis may hive more diverse range. Since the researcher has analysed the literature available from the different sources, it may be case that some strong argument may not be include in the research due to general human selection abilities. The results should be applied cautiously to schools, higher educational institutes and classroom settings, as per the requirement and concerns based on AI.

The above limitations should be always considered while generalizing the results of this study to larger population.

Suggestions for Further Research

On the basis of experiences and findings of the present study, investigator has proposed the following suggestions for further research: -

The present study can be replicated over:

- Different schools of philosophies.
- Some other identified themes of the Artificial intelligence.
- Different learning analytics.
- Comparison among Different schools of philosophies over its connotation with AI.

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