



The Adoption of Artificial Intelligence in UAE Education Sector

تبني الذكاء الاصطناعي في قطاع التعليم بدولة الإمارات العربية المتحدة

by

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Abstract

Artificial Intelligence is a very emerging trend in the field of technology and it has the potential to revolutionize and transform the way humans interact with the help of machines. The role played by Artificial Intelligence in the field of education across UAE is derived in this report through identifying the way it impacts the efficiency and effectiveness of the education sector. The research paper aims to derive the different AI based technologies that can be adopted across the education sector of UAE, retrieve the several advantages that the adoption can have and to identify the key issues observed while implementing the AI based devices across the education sector of UAE.

The aim of the research is derived using literature review and surveys. With the help of reviewing highly credible sources of literature pertaining to the subject, the key domains of the AI based technologies are derived, their benefits while implementing in UAE education sector are derived and the problems or issues that are faced while implementing these devices are also retrieved. Deep learning, Learning Analytics, Computer Assisted Learning (CAL) and advanced data analytics are the key domains of AI that can be used for improving the efficiency and effectiveness of teaching and learning across the education sector of UAE. It is also derived that the use of these technologies would help in providing detailed insights to the teachers about the students and using it, the teachers can customize the method of teaching for every student. It will help in making the teaching process more effective and efficient by saving the teacher's time in many unproductive activities.

Key problem identified in the adoption of AI based technologies in the education sector of UAE is the resistance from the teachers due to the training required in it. The AI based devices and technologies need to be available and accessible easily and hence, this paves the way for the future research in this field.

الخلاصة

الذكاء الاصطناعي هو اتجاه ناشئ للغاية في مجال التكنولوجيا وينطوي على إمكانات إحداث ثورة وتحويل للطريقة التي يتفاعل بها البشر بمساعدة الآلات. وقد استمد هذا التقرير الدور الذي يلعبه الذكاء الاصطناعي في مجال التعليم في الإمارات العربية المتحدة من خلال تحديد الطريقة التي يؤثر بها على كفاءة وفعالية قطاع التعليم. وتهدف الورقة البحثية إلى استنباط التقنيات المختلفة التي تعتمد على الذكاء الاصطناعي والتي يمكن تبنيها في قطاع التعليم في الإمارات العربية المتحدة، واستخراج المزايا العديدة التي يمكن الحصول عليها نتيجة تبني الذكاء الاصطناعي وتحديد المشكلات الرئيسية التي لوحظت أثناء تطبيق الأجهزة المعتمدة على الذكاء الاصطناعي في قطاع التعليم في الإمارات العربية المتحدة. .

ويتحقق الهدف من البحث باستخدام استعراض الأدبيات السابقة والاستبيانات. بمساعدة مراجعة مصادر موثوقة للغاية من المؤلفات المتعلقة بالموضوع، يتم استخلاص المجالات الرئيسية للتقنيات المستندة إلى الذكاء الاصطناعي، وفوائدها أثناء التنفيذ في قطاع التعليم في الإمارات العربية المتحدة، والمشاكل أو القضايا التي تواجهها أثناء تنفيذ الأجهزة المستندة إلى الذكاء الاصطناعي. يعد التعلم المتعمق وتحليلاتية التعلم والتعلم بمساعدة الكمبيوتر وتحليل البيانات المتقدم من المجالات الرئيسية للذكاء الاصطناعي التي يمكن استخدامها لتحسين كفاءة وفعالية التعليم والتعلم في قطاع التعليم في الإمارات العربية المتحدة. وقد أثبت أن استخدام هذه التقنيات من شأنه أن يساعد في توفير رؤى مفصلة للمعلمين حول مستخدميها من الطلاب، يمكن للمدرسين تخصيص طريقة تدريس كل طالب. سوف يساعد في جعل العملية التعليمية أكثر فاعلية وكفاءة من خلال توفير وقت المعلم في العديد من الأنشطة غير المنتجة.

المشكلة الرئيسية التي حُددت في تبني التقنيات المعتمدة على الذكاء الاصطناعي في قطاع التعليم بدولة الإمارات العربية المتحدة هي مقاومة المعلمين بسبب التدريب المطلوب فيها. يجب أن تكون الأجهزة والتقنيات المستندة إلى الذكاء الاصطناعي متاحة ويمكن الوصول إليها بسهولة، وبالتالي، هذا يمهد الطريق للبحوث المستقبلية في هذا المجال.

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Chapter I: Introduction

Introduction

Artificial Intelligence (AI) is a promising and trending technology that has the potential to change the interactions between the people through altering the systems of communication. The use of AI has seen a huge growth over the last few years and even greater number of researches are carried out to increase the utility of the AI into different sectors to enhance the efficiency, effectiveness and impact of these sectors respectively. There are different technologies associated with AI that need to be aligned perfectly in synchronization to ensure that the systems in which these technologies are implemented are not disrupted and they function smoothly.

The use of AI in the education sector is limited as of now, but there are many promising solutions derived and new AI based technologies developed that can change the course of the education sector for the good. New Learning solutions that are obtained through the adoption of AI consists of inculcating machine learning and interpretation among the human interactions. Different methods and techniques of teaching can be introduced in the class for teaching with the help of AI technologies. These technologies are aimed to increase the efficiency and effectiveness of the education sector. The teaching material that can be blended well with the AI technologies is limited currently. However, owing to the huge number of companies investing in the research and development (R&D) related to the adoption of AI in the education sector, there is bright future for these technologies to be implemented in the education sector across the globe.

UAE aims at focusing on its happiness index and also make Dubai, one of the smartest city of the world. This cannot be achieved without due support and development of the AI technologies. The development of a country is very much inclined towards the state of the education sector in that country. Hence, UAE needs to adopt and develop several fruitful and

highly promising as well as effective AI technologies in the teaching sector. The major impact of adopting these technologies is on the learning of the students through the techniques and methodologies used while implementing these technologies.

The different technologies that involve the use of artificial intelligence provide promising solutions to the problems witnessed across the education sector in UAE. The teaching and learning systems can be revolutionized with the help of adopting AI technologies in it. There is an extensive research yet to be carried out for deriving AI technologies and systems that are feasible and appropriate enough for improving the effectiveness and efficiency across the UAE education sector. A very advanced system of computers and other devices is required to be developed while ensuring that innovative technologies and strategies based on AI are adopted for learning and teaching across the education sector in UAE.

The benefits obtained through the adoption of AI based technologies in the field of education are derived in this paper. The potential of these technologies is determined and discussed by taking into consideration certain highly promising AI based technologies and powered systems. The issues that are witnessed while implementing these technologies and systems across the teaching and learning system adopted in the schools across the UAE are also discussed in this paper. The research is carried with an aim to derive feasible solutions for improving the education imparting system across the UAE schools. There are school teachers contacted in this research for obtaining useful and relevant information about the needs of the school and the potential issues that are faced while implementing AI based technologies to attain the needs of the education sector in UAE.

Research Background

The advancements in technology has led to the development of artificial intelligence that provides a promising solution to improving the efficiency across the businesses in UAE. The implication of artificial intelligence on the organizations in UAE by determining the

importance and the effect of adopting AI across the performance of the businesses in UAE is determined in this paper. In this paper, the factors that help in improving the efficiency and the performance of the logistics companies in UAE through the benefits obtained by the implementation of AI in it are identified. Smart tools tend to provide a good and feasible solution that will help in tracking the performance of each and every student which would not be possible manually as carried through the traditional process of teaching. Hence, learning analytics would help in identifying the needs of each and every student and also help the teachers and the administrative staff to customize and develop plans for teaching the students accordingly. A deeper level of learning is acquired when the students can interact with the faculty in a better way and also get any information that they want related to their curiosity.

The use of advanced data analytics would help in ensuring that the process of teaching becomes interactive and that regular feedback from the students is collected throughout the process of teaching. Analyzing and getting the most out of data is no easy task. For this purpose, advanced data analysis techniques are used, which in turn relay on other disciplines such as statistics-based big data technologies to efficiently handle large data volumes, machine learning algorithms that learn from the data and visualization tools for efficient communication with people who must ultimately make decisions. All these software layers for intelligent data processing will allow us to draw insights, detect learning patterns, predict future situations or give recommendations to optimize available resources. The resources that are available for implementing AI based technologies are still to be developed to a greater extent so that these technologies can be adopted at a much deeper level. Making these technologies affordable and easily available is another challenge that is facing the world currently. This is the background related to the research that would help in ensuring that the aim of this research paper related to determining the impact that the adoption of AI technologies has on the education sector of UAE is accomplished.

The data collected through these highly equipped and effective softwares would help in improving the outcome of the learning analytics and help in imparting education to the kids in a much more effective and efficient manner. Analysis is also a very important step in developing future AI solutions that, with the help of powerful libraries, including yet not limited to natural language recognition, language translation and game theory, will enable us to, for instance, create avatars that simulate the behavior of a virtual teacher for students or an assistant for teachers. The bright prospects of the future allow us to visualize an AI ecosystem that can help us overcome the different challenges in learning analytics. The background of the research is associated with determining the need to globalize the education system adopted across the UAE schools to ensure that the students are not left away from the other students from the developed and developing countries. The education system of UAE is also an important sector where Smart Dubai initiative is to be implied and it will help in bringing the students passing from the UAE schools on the global map and they will be able to face any challenges that the world poses in front of them.

Problem Statement

The method of learning and the effectiveness of learning is a critical problem witnessed across the education sector due to the differences in the method of teaching and the psychological framework of the students. Due to this, the teaching process becomes futile and a very restricted amount of knowledge and skills are transferred through the traditional teaching system. There is a need to focus on the needs of the students and also understand that every student is different and they need to be taught differently to ensure that they grasp the exact information and knowledge that the teachers want them to learn.

There are certain ethical issues associated with the implementation of AI across the education sector as stated by the Dubai Government. Dubai Government aims at achieving its ‘Smart Dubai’ initiative through adopting AI based highly innovative and useful technologies

across different sectors of Dubai and the entire country. However, there are certain ethical considerations which are to be considered when implementing AI based technologies across the teaching sector. For this purpose, the UAE government developed an “*Ethical AI Toolkit*” that would be governing the ethicality across the performance of the companies and individuals that offer AI services to the people in Dubai and the other cities in UAE(Smart Dubai: Ethical AI Toolkit, 2019).

These issues need to be overcome to ensure that people in Dubai use the AI technologies that are developed specially for them without any hesitation or security concern. Hence, the main problem witnessed across the adoption of these technologies consists of the privacy and the confidentiality associated with the information that would be stored and shared across these technologies. The resistance to the adoption of new technology in the teaching system is also an important issue that needs to be tackled for successfully adopting AI based technologies in UAE Education sector. A sufficient amount and type of training is required for inculcating the use of AI based technologies across the UAE education sector.

Significance of the study

The education sector in UAE is a sector that needs to have consistent reforms so as to ensure that the method of teaching and learning adopted in the schools and colleges in UAE are at par excellence as compared to the international standards. The education system should help the UAE students to mark their own identity on the global map. It therefore, needs to be constantly upgraded with the latest technologies and methods of learning. The development of AI technologies is one such domain that serves to be very promising for improving the efficiency and effectiveness of the education sector in UAE. The solutions that AI based technologies can provide to the education sector would help in improving the learning of the students and as a result of it, the teaching process would be more successful in imparting the required knowledge and skills to the students.

Education plays a critical role in efforts to make future workforces AI-ready. Bridging the AI skills gap goes beyond the adoption of increasingly powerful technologies to facilitate learning. It also means rethinking the content and methods used to deliver instruction at all levels of education. The curricular reform efforts cited in this paper show a clear need to define ‘AI competencies’ beyond basic ICT competencies, which is how many countries defined them when incorporating 21st century skills in their respective educational programs, towards skills that would allow learners to identify and solve problems using computing techniques, methods and technologies. The research is very important as it helps in deriving the potential that AI based systems and devices has in improving the efficiency and effectiveness of the teaching and the learning process. There are many factors identified through reviewing highly credible and peer reviewed sources of literature related to the impact the AI based technologies would have on the education sector of UAE.

In the context of a near future society empowered by AI, it is important to develop new skills to create and decode digital technologies. The research would help in highlighting some of the highly promising AI driven technologies that can be adopted across the UAE education sector. It also involves the problems that might be witnessed while adopting the AI based technologies across the UAE education sector. The influence of the AI based technologies on the futuristic requirement of the education system in UAE is determined along with the issues that may be witnessed in its wide scale implication across the teaching and learning system of UAE.

Scope and Limitations of the research

The research helps in determining the benefit that AI based technologies would have on improving the efficiency and effectiveness across the UAE education sector. It also helps in deriving the key issues that would be observed while implementing these technologies. However, owing to the time and cost constraints the methodology of the research is limited to

obtaining data from limited number of private and public school teachers in UAE. The implementation of AI based technologies is discussed and derived at a general level due to the resource and time limitations. As a result of this, the actual problems that might be witnessed when AI based technologies are adopted across the Uae education sector are not derived. An in-depth research is required to be carried out for expanding the outcome obtained in this research and this generates the future scope of this research. The results indicate that the scope of the research can be used for deriving the usefulness of different AI based technologies in improving the learning and teaching analytics across the education sector of UAE.

Research Objectives

- To derive the benefits of adopting AI in UAE education sector
- To identify the AI technologies that can be adopted in UAE education sector.
- To derive the issues faced while adopting AI in UAE education sector.

Research Questions

The main research question of this research paper is as follows:

What is the impact of adopting Artificial Intelligence based technologies in the UAE education sector?

The main research question mentioned above provides a framework for developing sub-questions that would help in achieving all the research objectives and help in guiding the research paper. The sub-questions for this research are:

- What are the benefits of adopting AI in UAE education sector?
- Which AI technologies can be adopted in UAE education sector?
- What are the issues faced while adopting AI in UAE education sector?

Chapter 2: Literature Review

Introduction

Artificial Intelligence is one of the most emerging trends in the recent decade that has the potential to change the functioning of different sectors across a country (Russell & Norvig, 2016). Artificial Intelligence is a promising technology that provides a huge opportunity to improve the learning and teaching across the globe. The development of the AI technology needs to be fostered so as to ensure that there are many more devices developed that help in increasing the efficiency and effectiveness of the teaching sector (McArthur, Lewis, & Bishary, 2005). For this purpose, there are different articles studied, reviewed and critically analyzed for identifying the key benefits of adopting AI in UAE education sector. It then involves determining the AI technologies that would serve the education sector and help in improving the learning and teaching system. The issues related to the adoption of AI across the education sector are also derived from relevant articles and other secondary sources like books and reports. The aim of implementing AI in UAE education sector is to ensure sustainable development of the education sector across the country.

Artificial Intelligence

Artificial Intelligence refers to the simulation of the processes related to human intelligence with machine. It is a science and technology that involves machine learning. The evolution of Dubai as one of the smartest city across the globe is possible with the help of incorporating artificial intelligence across the different segments of its economy (Wang Y. , On abstract intelligence: Toward a unifying theory of natural, artificial, machinable, and computational intelligence., 2009). Artificial Intelligence helps in ensuring that the systems and machines are functioning as required that would help in generating the best results for the society and the environment on the whole. It is a technology that will help in boosting the Smart Dubai initiative of the Dubai government (Lootah & Mialhe, 2017).

Artificial Intelligence is a pool of different type of devices that are developed to help and assist humans to carry their activities in a better way and also help in improving the efficiency of doing work. It also consists of devices that help in guiding humans to make better decisions by carrying out thorough analysis of the needs and requirements that are derived by analysis carried by these type of devices. Artificial Intelligence is one of the most promising technologies of this century as it helps in paving the way for the development of other technologies on the basis of a concept that is better known as ‘machine learning’(Ghahramani, 2015). There has been a continuous research carried throughout the world to develop and implement technologies based on artificial intelligence that would help in achieving sustainable growth amongst the industries across the globe. Companies can use Artificial Intelligence to boost their business by understanding the needs of their potential customers in a better way with the help of using devices that track and analyze consumer’s behavior and factors affecting their behavior. Artificial Intelligence does not only help in increasing the efficiency of several businesses, but it is very much useful and promising in other sectors of the economy like education and administration(Kok, Boers, Kusters, Van der Putten, & Poel, 2009).

The adoption of AI across different businesses is aimed to have a better understanding and knowledge about the way the business works and the very important activities and behavior that affects the business(Dirican, 2015). Retail industry has therefore, a huge potential of adopting artificial intelligence based technologies that can help it reach greater number of customers and obtain a higher level of satisfaction amongst their customers(Zhou, 2018). The tasks that require human intelligence in the form of visual perception, recognition of speech, sensory activities and decision making related to different activities are carried out by artificial intelligence through different devices based on it(Lichtenthaler, 2018). There are AI based augmentation and automation technologies developed that help in making decisions on the basis of critical evaluation and analysis from the data available. Such technologies aim at

achieving automation across the monotonous and complicated activities that are carried by humans.

Artificial Intelligence based devices and technologies can also help in tracing social interactions between humans and the machines. These devices can predict the strategies that need to be implemented on the basis of evaluating these interactions and help in framing decisions that would be more rational and logical. Decision making is one of the core element and reason for which artificial intelligence based technologies are adopted and implemented(Jarrahi, 2018). However, the implementation of AI requires a highly integrated system of devices that are updated with the latest technology and have an infrastructure that can support these technologies. It is with the help of evaluating and analyzing the current state of artificial intelligence based technologies that the developed countries can help the developing countries to create an infrastructure that has a loop of these technologies that would help their economies grow exponentially and sustainably(Wang & Lin, 2018).

Learning analytics is one of the key domain of artificial intelligence that helps in determining the decision making process that it carried through the devices based on these technologies(Kitto & Knight, 2019). It includes a powerful method of deriving information, analyzing it, tracking the patterns of human behavior in it and then predicting the future behavior or the future requirement on the basis of the algorithms that help in using the available information to predict the future requirements(Bannert, Molenaar, Azevedo, Jarvela, & D., 2017). Learning analytics is one such domain of AI based technologies that would help in improving the method of learning and also help in retrieving key information about humans. The interaction between humans and machines can be optimized and used with the highest efficiency with the help of AI based technologies. These technologies can be implied in various fields ranging from sociology, psychology to ethics and human pedagogy. Human ergonomics that refers to the movements within which the required tasks can be done can be retrieved with the help of artificial intelligence based technologies(Sciarrone, 2018). It will help in ensuring

that there are a number of smart tools that would be carried for ensuring that the administration of the tasks and its execution is carried out accordingly.

Advanced data analytics is a key attribute that helps in developing learning analytics across the machine. It helps in retrieving the information, analyzing the patterns and then predicting the future behavior that needs to be carried out across the systems worldwide(Lin, et al., 2019). The use of statistics and factual data is the highest while developing an AI based technology. It can also be stated that the use of visualization tools related to managing effective communication amongst the people is observed to have a huge influence on the way things are accomplished and organizational goals are achieved across the companies.

The software layers related to data processing that are available through artificial intelligence helps in retrieving the learning patterns, identify the relationship between them and then help in predicting the future situations and act accordingly. Analyzing the patterns is very important as it will help in identifying the future actions that can be taken and this in turn will help in avoiding any mishap or mistake that is bound to happen. The probabilities of making a mistake is reduced by a great margin with the use of artificial intelligence. Language detection, processing and simulation is required when adopting AI across the education sector as it serves to be a good assistant to the teachers. It cannot completely replace the traditional method of teaching that is carried by the teachers, but, instead it can enhance the effectiveness and efficiency with which the teachers are teaching and the students are learning. A proper understanding of the knowledge imparted to the students is obtained by retrieving learning based analytics using AI devices.

Each and every aspect of human interaction can be revolutionized with the help of using Artificial Intelligence. It has the potential to revolutionize and completely transform the teaching and learning methods. AI based technologies are producing new learning and teaching solutions that can be implemented across the education sector. A complete implementation of

these processes and devices is possible after testing the highly integrated prototypes and models of AI based devices into the education sector. The key force driving the innovators is the availability and accessibility of these devices. They are researching intensively to develop AI based technologies that can be afforded by even developing countries and they are looking to making it so compatible that such devices can be available anywhere and everywhere.

There are two key domains of AI that needs to be understood and developed for implementing the AI based devices into the education sector. These domains include the learning analytics and the advanced data analytics. Learning analytics refers to identifying the understanding the way humans interact which involves human psychology, sociology, ethics and pedagogy. The use of a simulator that captures all these things and processes it is required. These devices would then provide an estimation of the required information related to the future activities after simulating the data that is processes. In the education field, these devices can be very useful and helpful in retrieving the type of behavior that the students portray while they are learning and according to this, the teachers can alter their teaching to ensure that they are able to achieve their desired target using it. Advanced data analytics is related to collecting data in the form of numbers related to the human behavior and providing results that help in generating solutions for better and effective learning among the students.

Artificial Intelligence and Education Sector

AI is becoming a critical and integral part of human lives and the solutions that it provides creates a huge potential for its implementation across the education sector. The benefits of implementing artificial intelligence based devices across different businesses are seen in the above section. One of the most important advantage of implementing AI based technologies is increase in efficiency observed through their application and this can be seen in the case of the education sector too. It would also help in increasing the creativity of the students as they will be learning with fun and in an interactive manner (Boden, 1998).

The use of AI based technologies in the education sector has increased across the last decade and there is an extensive research carried regarding this implication of AI based technologies(Haupt, Pasini, & Marzban, 2008). The use of AI in the field of education helps in improving the teaching process by deriving the needs of each and every students with the help of using a tracker of the student's performance and needs. The performance of the student can be easily tracked by integrating AI based technologies with the system followed by the school and colleges. This would help in improving the information that the schools and colleges have about the students and would in turn help the teachers to derive customized and creative strategies of teaching these students.

Benefits of adopting AI in education sector

The use of AI can help in improving the learning processes across the teaching systems and help in better student management programs. This has been closely evaluated and analyzed in different studies by many researchers (Luckin, Holmes, Griffiths, & Forcier, 2016), (Mayer-Schonberger & Cukier, 2014), (Mallia-Milanes & Montebello, 2017). The learning opportunities that are created with the help of AI based technologies are suggested by many technological scholars and the scope that these technologies have in improving the learning and teaching systems across the globe is identified. Quality education and learning opportunities is what everybody deserves and this is the major goal while ensuring sustainable development across a nation.

The use of AI technologies would help in ensuring that equitable and inclusive education is imparted. It will also ensure that the marginalized people and communities, people with disabilities, refugees, those out of schools, and those living in isolated communities get an access to appropriate learning opportunities. For example, telepresence robotics allows students with special needs to attend schools at home or hospital, or maintain continuity of learning in emergencies or crises. In this way, it is able to support inclusion and ubiquitous

access(Han, 2012). One of the most important attribute that is achieved with the help of AI technologies in the field of education is inclusive learning. The use of AI technologies helps in ensuring that students of varied backgrounds, with different needs and from different ethnicity can get access to quality education (Sheehy & Green, 2011).

Collaborative learning is another benefit obtained using AI based devices in the field of teaching. When learners are not present physically at the same location, AI based technologies makes it possible for them to interact, acquire knowledge and learn at the same time (McLaren, Scheuer, & Miksatko, 2010). The students are provided with different options and alternatives of learning and this helps in increasing the reach of education. The teaching process would become more effective and detailed through the advancements in technology that would help in collaborative learning. AI systems can help in organizing and managing discussion groups' online using machine based learning and text processing. This would help the teachers in carrying their activities in a much lucid and effective manner when the students are present at different locations.

AI can help create a better professional environment for teachers to work more on students with difficulties(Frasson & Gauthier, 1990). Teachers spend plenty of time on routine and administrative tasks such as making assignments and answering frequently asked questions over and over again in school settings. A dual-teacher model entailing a teacher and a virtual teaching assistant, which can take over the teacher's routine task, frees up teachers' time, enabling them to focus on student guidance and one-to-one communication. Teachers have already started working together with AI assistants for the best outcomes for their learners.

The Computer Assisted Learning (CAL) field creates alternatives to support students' learning strategies with digital and AI technology (Schitteck Janda, 2005). AI can help map each student's individual learning plans and trajectories, their strengths and weaknesses, subjects that cost more and are easily assimilated or learned, and learning preferences and activities.

Using algorithms to help students navigate through different content paths, AI can personalize learning and improve opportunities for students with the help of their teachers and schools. Intelligent Tutoring Systems are part of the new technological possibilities to expand educational learning in developing countries as shown in recent reviews (Nye, 2015).

Moreover, when considering the tremendous amount of time spent on grading tests and homework, AI as an assessment tool can be applied to learn how a teacher grades and thus free up the teacher's time. AI is not only being used to grade multiple choice tests, but also to assess essays. These opportunities are starting to unfold in developed countries. There is a myriad of applications presently undergoing tests across public and private initiatives alike (Blanchard, Volfson, Hong, & Lajoie, 2009).

The benefits of adopting AI based technologies across the education sector of UAE are derived in the above section. It can be seen that it helps in improving the learning analytics through the use of advanced data analytics and simulations, helps in carrying collaborative learning and computer assisted learning (CAL). It also helps in ensuring that 'deep learning' objectives are accomplished across the teaching sector and that it would help in improving the efficiency, effectiveness and influence of the teaching process in the education sector. These are the several benefits of adopting AI based technologies in the field of education sector. The different types of AI technologies that can be used across the education sector are provided, discussed and studied in the following section.

Use of AI technologies for education sector

An Education Management Information System (EMIS) is an organized group of information and documentation services that collects, stores, processes, analyses and disseminates information for educational planning and management (Hua & Herstein, 2003). It is widely used for education leaders, decision-makers and managers at the regional, local and school levels and for the generation of national statistics. Data-Driven Decision Making

(DDDM) applied to student achievement testing data is a central focus of many school and district reform efforts, in part because of federal and state test-based accountability policies (Marsh, Pane, & Hamilton, 2006). The use of EMIS across developing countries like Tanzania is seen and studied by Wicander with the help of analyzing the mobile supported e-government systems present in the country. The perspective of distance education is also derived and discussed in his paper. He has compared how a developing country can maximize the efficiency and effectiveness of teaching across its education sector by implementing technology based education systems across their core functioning areas (Wicander, 2011).

With massive data collected from EMIS, AI algorithms are able to make data driven decisions to improve school education. A well-designed and well-functioning EMIS lets members across all levels of the education community access useful information for managing and administering an education system more efficiently, developing feasible and cost-effective plans, formulating responsive policies, and monitoring and evaluating educational outcomes (Aldarbesti & Saxena, 2014). An EMIS that helps in focusing on delivering the best quality service is the need of the day that would help the education system generate the required results. Constructing such a system would help in enhancing the effectiveness and accuracy of the education system as the algorithms would help in predicting the future requirements of the students (Wang & Zhao, 2010).

The collection of data that is reliable and authentic would help the countries across the globe in executing an effective administration process. The availability of an effective EMIS would help in enhancing the quality of education that is imparted to the students across the schools and colleges. It would help in increasing the capacity of the education system to take decisions on a much better and comparatively more reliable model of decision making. Prediction would become very easy and accurate through incorporating the AI based technologies in the education sector. The EMIS acts as an intelligent agent that would help in

imparting education in the best possible way to the students (Baylor, 1999). Implementing AI based technologies in the education sector helps in developing an integrated and dynamic learning management systems that can effectively support real-time decision-making in every aspect of education sector management(Villanueva, 2003).

Deep Learning consists of an important element of machine learning that involves developing information from the data and retrieving it in such a way that it can be meaningfully represented at the right time, at the right place and in the right way (Arel, Rose, & Karnowski, 2010). It consists of developing a better understanding of the needs of the subjects, that is, the students in this case while implementing AI based technologies and devices across the education sector of UAE. The successive layers of information when retrieved need to be analyzed keeping a mind a cause and deep learning helps in identifying this cause. The process of analyzing information is carried out with the help of identifying the deep learning model(Lemley, Bazrafkan, & Corcoran, 2017). Deep learning helps in maintaining the required level of effectiveness and efficiency across the data analytics system. Deep learning is a new frontier in the field of machine learning and it helps in collecting the sensory data across the system.

The sensory data that is collected from the system is then evaluated and analyzed using the way human brain processes information. It is a simulator of the human brain and it tries to retrieve solutions across the system using the key modes of analytics and simulation. It is therefore, equally important to understand, visualize and interpret deep learning models across the AI based systems (Samek, Wiegand, & Muller, Explainable artificial intelligence: Understanding, visualizing and interpreting deep learning models, 2017).

The true challenge to artificial intelligence proved to be solving tasks that are easy for people to perform but hard for people to describe formally, e.g. problems that we solve intuitively and feel automatic like recognizing spoken words or faces in images. Deep learning

allows computers to learn from experience and understand the world in terms of a hierarchy of concepts, with each concept defined in terms of its relation to simpler concepts. By gathering knowledge from experience, this approach avoids the need for human operators to formally specify all the knowledge that a computer needs (Samek, Wiegand, & Muller, Explainable artificial intelligence: Understanding, visualizing and interpreting deep learning models. , 2017). The hierarchy of concepts allows computers to learn complicated concepts by building them out of simpler ones. A graph showing how these concepts are built on top of each other would be deep (with many layers). For this reason, this approach to AI is referred to as deep learning.

Big data refers to the large data sets that are collected with the aim to analyze and retrieve trends or patterns relevant to the subject about which the information is collected. The traditional data processing softwares and systems cannot deal with too complex data and this is when big data comes into the scenario. Big Data is a type of AI technology that helps in collecting a large amount of information in the form of database which is then used for retrieving the patterns among the individual or systems about which the information is collected (O'Leary, 2013). The key insight related to the collection of data is achieved with the help of Big Data. It helps in processing the data in a much better way than the traditional methods like excel and other such applications. The convergence of big data and its AI is possible through text analytics and this is achieved by scanning each and every text that is collected in the form of information (Moreno & Redondo, 2016). The texts are sorted and bifurcated into different categories and on the basis of these categories, the texts that are scanned are analyzed. Analyzing these texts involves forming patterns between them and understanding the flow of information across these texts.

Data Mining is an important aspect of AI that involves retrieving the patterns of human behavior and also involves analyzing the large chunks of data to make some sense out of it.

The use of AI based technologies would require the process of data mining as it involves collecting as much information as possible and then analyzing it for predicting the activities to be carried in the future. Deriving the patterns of behavior is very important so as to identify the techniques that would work while teaching the students and this is derived using AI and data mining aspect of the AI based technologies. Data mining helps in deriving the patterns from the collected chunks of information about an individual or a system on the whole. The unexpected relationships between the data owner and the participants related to the data is derived using data mining (Sivakumar, Venkataraman, & Gombiro, 2015).

Quality evaluation is also an important aspect of higher education that can be achieved by merging data mining and artificial intelligence together. It involves deriving the strategies and technologies that can be adopted across the education sector for ensuring high quality evaluation is achieved throughout the system (Tastimur, Karakose, & Akin, 2016). The evaluation across the education system is very important as it helps in deciding the future of the students and also helps in guiding them towards the mistakes that they are making while learning. The results that are derived at the end of a quality evaluation system across the education sector would help in ensuring that the effectiveness of the teaching and the learning process across the schools is retained. The actual progress of an economy depends on the inclusiveness of its education system and the way the country handles and manages it.

Issues in adopting AI for education

Developing a comprehensive view of public policy on AI for sustainable development: The complexity of the technological conditions needed to advance in this field require the alignment of multiple factors and institutions. Public policies have to work in partnership at international and national levels to create an ecosystem of AI that serves sustainable development.(Spiro, Bruce, & Brewer, 2017).

Ensuring inclusion and equity for AI in education: The least developed countries are at risk of suffering new technological, economic and social divides with the development of AI. Some main obstacles such as basic technological infrastructure must be faced to establish the basic conditions for implementing new strategies that take advantage of AI to improve learning.

Preparing teachers for an AI-powered education: Teachers must learn new digital skills to use AI in a pedagogical and meaningful way and AI developers must learn how teachers work and create solutions that are sustainable in real-life environments.

Developing quality and inclusive data systems: If the world is headed towards the datafication of education, the quality of data should be the main chief concern. It's essential to develop state capabilities to improve data collection and systematization. AI developments should be an opportunity to increase the importance of data in educational system management.

Enhancing research on AI in education: While it can be reasonably expected that research on AI in education will increase in the coming years, it is nevertheless worth recalling the difficulties that the education sector has had in taking stock of educational research in a significant way both for practice and policy-making.

Dealing with ethics and transparency in data collection, use and dissemination: AI opens many ethical concerns regarding access to education system, recommendations to individual students, personal data concentration, liability, impact on work, data privacy and ownership of data feeding algorithms. AI regulation will require public discussion on ethics, accountability, transparency and security.

Hence, the issues that are witnessed while adopting artificial intelligence based technologies across the education sector in UAE can be summarized to the outst associated with it, the time required for its adoption, the level of extensive training required to implement these technologies across the system and the infrastructure that is to be developed for implementing AI based devices across the education system of UAE. The results that are obtained as a result

of reviewing the highly credible sources of literature pertaining to the subject also indicate that the other issues observed while adopting AI based technologies across the UAE education sector is the privacy and confidentiality issue associated with it.

The benefits that are identified in the above section related to the implementation of AI based technologies and devices across the education sector of UAE are evaluated with the help of the research methodology adopted in the paper. The methodology also includes deriving the key problems that are witnessed by the teachers while adopting the AI technologies across the education system in UAE. The collection of information that would help in accomplishing research objectives across the paper is described and discussed in the following section along with the methods that are used for it and the type of data and data collection instrument adopted for it.

Chapter 3: Methodology

Introduction to Research Methodology

Research methodology consists of the method that is implemented across the research to attain the research objectives and obtain solution to the research questions. Methodology helps in providing a framework that would be followed for collecting data and analyzing it to derive a conclusion in the paper (Kothari, 2004). The information that would be collected in this research helps in determining the type of research methodology that would be adopted in this paper. In this research, the aim is to determine the different devices based on Artificial Intelligence that can help in improving the efficiency and effectiveness of the education sector. It also aims at deriving the issues that are faced in successful implementation of these devices in the education sector of UAE. The methodology that is to be adopted in the research consists of determining the research approach, the design of the research methodology to be adopted, the type of data that is collected and the method of sampling adopted for collecting the data required. There are ethical considerations that are followed in this research and these considerations are provided at the end of the research methodology along with the reliability and validity of the methodology adopted in the research.

Research approach

The research approach that is adopted in the paper plays a very important role in identifying the nature of the research. It involves identifying whether the research to be carried would be inductive or deductive in its approach (Burney, 2008). Inductive research approach refers to the research where the direction of the research would be towards deriving an altogether new concept through analyzing the data collected. A new concept or a conclusion is developed in inductive research approach with the help of the data collected in it and analyzing this data using a definite method of analysis (Thomas, 2006). In this research, inductive approach is more suitable as it involves deriving a new concept which has not been specifically

researched before. The aim of this research is to identify the impact that the implementation of AI based technologies would have on the education sector in UAE. It also involves identifying some of the most useful and promising technologies based on AI and the issues that are observed while adopting these AI based technologies in the education sector of UAE. Inductive approach would help in assimilating all the factors that will help in highlighting the influence that AI based technologies have on the process of learning and teaching in UAE's education sector and therefore, involves deriving a new conclusion based on the methodology adopted.

While, deductive approach is a research approach where the aim of the research would be to test a hypothesis or a concept which already exists. Deductive research approach helps in deriving results across the research that would either be affirming or opposing a concept or hypothesis relevant to the research. Deductive approach is usually adopted in a research when the researcher wants to evaluate any theory or a theoretical concept (Hyde, 2000). The use of deductive approach is recommended when there is a theory to be tested in the research or the research revolves around evaluating a particular concept or model. It is an ideal approach when the effectiveness of a specific theoretical model is to be tested on the target audience. For adopting deductive approach, the research topic should be very extensive and it should have been researched upon by a number of highly credited and well-known research scholars. However, in our research, there is no specific theory involved and the methodology involved consists of retrieving the benefits at grass root level observed by the teachers while implementing AI based technologies in teaching across the UAE education sector. Therefore, deductive research is not recommended for this research.

Hence, the use of inductive approach is recommended as it involves developing a new conclusion on the basis of identifying the key relationships between the different concepts and does not involve testing any theory or theoretical framework in the paper. The use of inductive approach is observed in the paper to derive the influence of AI based technologies on UAE's education sector and also to identify the key technologies that can be implemented and the

issues observed while implementing these technologies. The use of inductive approach in this research would ensure that the results that are derived would be generated on the basis of the information collected in the research and are not dependent on any other theory of model.

Research Design

Research method that can be adopted in the paper for collecting data can be bifurcated into three types which are qualitative, quantitative and mixed methodology. The nature of the information collected in the paper helps in determining the research method for the paper. Qualitative research method involves deriving detailed data in the form of behavioral characteristics which would further be evaluated through carrying an in-depth and extensive analysis. The information that cannot be quantified is derived using qualitative methodology and none of the statistical tests can be carried on such data (Newman & Benz, 1998). Hence, qualitative methodology is suitable when the nature of the research is such that the psychology of the participants or behavioral characteristics and trends are to be derived through methods like conducting interviews, focus groups, observations, etc.

Quantitative method, on the other hand, refers to the method of collecting data in which the data would be numerical in nature and can be analyzed using different statistical tests. Any information that can be put into numbers, that is, can be quantified is collected using quantitative method. Quantitative method is used in the research paper when the information collected is purely in the form of numbers or values that would be analyzed to accomplish the research objectives (Neuman, 2013). Quantitative method is generally carried with the help of surveys, retrieving numerical data from external sources, etc.

In this research, a mixed methodology is adopted that involves adopting qualitative as well as quantitative methodology. The use of qualitative methodology is through collecting useful information related to the benefits of AI, the new and promising technologies related to the adoption of AI in the education sector and the issues that are faced while adopting AI across

the UAE education sector. This methodology consists of reviewing highly credible sources of literature pertaining to this subject and these sources constitute the secondary sources of data for the research. Quantitative research methodology and design is adopted with the help of conducting surveys that would help in quantifying the implementation of AI in the education sector across UAE. The use of quantitative method is seen that involves analyzing the data collected from the participants and quantifying them to generate conclusions out of it. The influence of adopting AI based technologies in the education sector of UAE is derived using the quantitative method design that involves using a survey questionnaire that would help in deriving the actual benefits and problems faced while implementing these technologies in the field of teaching. The scope for future implication of these technologies is also derived and discussed at the end.

Research data

The research data consists of the information that is collected in the research with the help of different methods. Research data helps in determining the analytical methods that is to be carried in the paper based on the nature of the data collected. There are two types of research data and they are primary and secondary (Hox & Boeije, 2005). Secondary data refers to the data that is collected from different sources of literature that are available online or through any reliable published media. This type of data involves carrying an extensive literature review and analysis and hence, the sources that are used for collecting secondary data are called as secondary sources. Secondary data is used when the research to be carried out involves variables or values that are available online and such variables are not affected by an individual's behavior or characteristics (Trzesniewski, Donnellan, & Lucas, 2011). While, primary data refers to the data that is collected directly from the participants through contacting them either personally or over any electronic medium. The type of sources used for collected primary data are called as primary sources and they consist of interviews, focus groups, surveys, etc. (Driscoll, 2011). Primary data is suitable when the research that is to be

carried out involves active participation of the target population that are influenced by the variables selected in the research.

Secondary data is collected in this research with the help of reviewing highly relevant and useful sources of literature pertaining to the subject. It will help in ensuring that the key benefits that are observed while adopting AI across the education sector are studied and derived for measuring their impact using a questionnaire. The highly promising AI technologies for improving the efficiency and effectiveness of the education sector are also derived through reviewing and analyzing secondary sources of literature pertaining to it.

The technologies that are derived using this method are then measured for their effectiveness and feasibility using a survey questionnaire. The problems witnessed during the implementation of AI based technologies in the education sector of UAE are also derived through reviewing highly credible sources of literature. The influence of these problems and their prevalence is determined by using the survey questionnaire that helps in retrieving the intensity of the problems witnessed while adopting AI based technologies for the education sector of UAE. There are important factors derived regarding the impact that AI based technologies have on teaching and learning and the issues that are observed while implementing it and these factors are used as a framework to develop the survey questionnaire which is used for collecting primary data in this research.

Primary data is collected in this research with the help of conducting surveys which is developed on the basis of a survey questionnaire. The questionnaire contains various elements of AI for the education sector that are derived using the secondary sources of literature in the literature review section. The questionnaire is based on themes which consists of the feasibility and advantages of adopting different types of AI technologies across the UAE education sector. The opinion of the participants of the survey that are the faculty members of UAE schools is obtained related to the benefits that can be obtained by implementing AI across the UAE

education sector. The issues observed while adopting these technologies are also measured for their impact by including these issues in the survey questionnaire and making the participants rate the issues faced on the level of their intensity.

In this research paper, the research methodology adopted consists of collecting primary as well as secondary data. It also involves adopting a mixed methodology that involves using primary as well as secondary data. The secondary data is collected by reviewing and critically analyzing highly credible and relevant sources of literature pertaining to the adoption of AI in UAE education sector. The primary data is collected with the help of a survey questionnaire developed by retrieving important factors derived using secondary sources of literature.

Hence, the type of research data that is collected in this paper is primary and secondary data. A mix of primary and secondary is collected in this research with the help of retrieving information pertaining to the different benefits of adopting AI in the UAE education sector and the different ways through which it can be adopted across it. Therefore, the use of primary as well as secondary data would help in providing the required level of reliability and validity to the research and the results derived using this methodology would help in improving the effectiveness and efficiency of the UAE education sector with the help of the AI technologies. The level of learning and teaching that is imparted to the kids in the UAE schools through the adoption of AI based technologies by the teachers across their system is derived with the help of the primary data collected in this research.

Data Collection

The method adopted for data collection is survey questionnaire where 30 school teachers from different UAE schools, private as well as public are the participants. The problems observed in adopting AI across the UAE education sector are derived with their level of significance and the solutions that can be implemented by incorporating AI based technologies in the UAE education sector are also derived. The survey questionnaire is

developed keeping in mind the participants that would be contacted for filling it and the key research questions of the research paper. Graphical representation of the data collected from the participants is carried out to show the impact of the AI based technologies on the UAE education sector. The method that is used for collecting data involves conducting an interview, focus groups, observations, survey, etc. when the data to be collected is primary. For secondary data, reviewing highly credited sources of literature would help in obtaining the required data for analysis and drawing conclusions. The survey questionnaire design and framework is shown in the following section.

Survey Questionnaire

The data collection instrument that is adopted in this research paper consists of conducting interviews and surveys that would help in retrieving the data from the participants related to the adoption of AI in UAE education sector. The Design of the Questionnaire is carried out by identifying the type of information which is to be collected in the research(Bagozzi, 1994).The first and the second question, as seen in the Appendices, are the demographic type question that helps in obtaining the gender and the work experience demographics, respectively, of the participants. While, the remaining questions are differential scaling type of questions where a rating from ‘Strongly agree to strongly disagree’ is obtained about the view of the participants on the three factors and other sub-factors that are to be evaluated for the feasibility, benefits and issues observed during the implementation of AI across the UAE education sector. A 5 point scale that involves different levels of agreement in a decreasing order is used for measuring the responses that are collected from the participants in this research. This scale is called the Likert Scale.

Determining the responses in the Likert scale that involves ranking from highest degree of acceptance to highest degree of disapproval would help in obtaining the actual impact of implementing AI based technologies for teaching and interactive learning between the teachers

and the kids across the UAE education sector. The survey questionnaire that has been used for collecting information from the participants constituting of the UAE school teachers is provided in the Appendices. The survey questionnaire as explained and provided is circulated among the participants which are determined with the help of reviewing the different types of data sampling method which are described and discussed as follows.

Data Sampling

Data Sampling involves the method adopted for the selection of the participants for collecting data across the research (Cooper, Schindler, & Sun, 2006). There are two main types of data sampling and they are probability and non-probability type of sampling that can be adopted across the research for identifying samples and sample size pertaining to the research topic (Devers & Frankel, 2000). While determining the data sampling method and sample size in a research, there are three factors that are to be considered and they are as under:

- A. *“Who would be surveyed?”*
- B. *How to collect the sample?*
- C. *How many respondents would be participating in the survey?”*

In the first type, that is, probability type of sampling, the samples are selected with random probabilities and there is no specific background for selecting the participants. There is no bias in the selection of the participants in the probability type of sampling. Probability sampling provides the target population an equal chance of getting selected as samples in the research. While, the second type of sampling, that is, the non-probability type of data sampling refers to the sampling in which the samples are selected on the basis of certain predefined parameters and the subjective judgement of the researcher (Mendenhall, Sincich, & Boudreau, 2016). The population taken into consideration cannot be entirely represented by non-probability sampling as it focuses on a specific trait of the population while selecting samples.

In this research, probability sampling is carried out where all the school teachers belonging to private and public schools have equal chances of getting selected for the survey. This increases the consistency of the results developed as the outcome of the research would help in representing the entire population and not only a specific part of it. The size of the data sample is based on the time and cost constraint. In this research, owing to the limited time and cost availability, the sample size is 30.

Method of Data Analysis

Data is collected with the help of the methodology, research approach, research design, sampling method and survey questionnaire as described above and this data is then evaluated and analyzed for drawing conclusions pertaining to the research objective and research question that are framed in the research. For this purpose, the method of data analysis adopted in the paper is graphical response analysis that involves deriving the opinions of the participants regarding the influence of implementing AI based technologies in the education sector of UAE. The responses obtained from the participants are bifurcated into five categories that represent Likert's 5 point scale. The number of respondents are categorized into these 5 options and a graph is shown in the form of a bar chart that represents the respondents under each category. An analysis of the graphs will help in determining the weightage given by the respondents with respect to the options that they have selected in the survey questionnaire. The questionnaire is formed on the basis of the several factors that are identified using different sources of literature as discussed in the literature review section. This method of data analysis will help in identifying the direct responses of the teachers in UAE regarding the impact that the adoption of AI based technologies would have on the teaching and learning of the students in UAE. With the help of analyzing the data collected into three categories, the information collected is analyzed. These three categories involve the benefits of adopting AI in education sector of

UAE, the technologies that can be implemented for it and the issues that are observed while implementing Ai based technologies and devices across the education sector of UAE.

Reliability and Validity of the research

Reliability across the research refers to the consistency of the results that are obtained through it. It helps in obtaining the applicability of the results over the period of time. While, Validity across the research refers to the extent upto which the results derived help in measuring the desired objective of the research. The research has high reliability and validity owing to the mix methodology adopted which ensures that the reliability of the quantitative method and the validity of the qualitative method is achieved in the paper (Morse, Barrett, Mayan, Olson, & Spiers, 2002). The use of mixed method ensures that the results are not biased and would be reliable for carrying further research about the subject in the future. It helps in obtaining the applicability of the results over the period of time. While, Validity across the research refers to the extent upto which the results derived help in measuring the desired objective of the research. The research has high reliability and validity owing to the mix methodology adopted which ensures that the reliability of the quantitative method and the validity of the qualitative method is achieved in the paper.

The results that are obtained in the form of numbers and are evaluated using graphical analysis are more reliable as the conclusion drawn using these results would be having a firm basis of quantifiable data that can be shown. While, the results obtained using the qualitative method is useful in framing the survey questionnaire that is used for collecting primary data. The use of secondary data with respect to the highly credible sources of literature would help in obtaining high validity across the results that are generated. The use of primary data ensures that the research is authentic and that the results derived are on the basis of the data collected using genuine and reliable methods.

Ethical Considerations:

The research is carried out with the help of adhering to the ethical considerations that are followed throughout the paper. The ethical considerations consist of the research ethics that would be followed in the paper and these ethics are related to safeguarding the identity and privacy of the source of information. In this research, primary data is taken into consideration and hence, the Data Protection Act (1998) that involves ensuring that the confidentiality and privacy of the participants taking part in the survey is retained (Iversen, Liddell, Fear, Hotopf, & Wessely, 2006). It is important to adhere to this act as it helps in assuring the participants that they can provide true and honest opinions in the survey without any fear of getting their identities disclosed in public through the paper. Providing the participants with high level of privacy, confidentiality and security throughout the paper helps in obtaining genuine information from them as they will not be under the fear of getting judged or recognized for their inputs.

In this research, the participants are the teachers of the UAE schools and they will be made to fill the survey regarding the implication of AI based technologies in UAE education sector. It can be seen that the responses that they provided needs to be true, honest and genuine as it has helped in deriving conclusions that are more reliable and valid. It is taken utmost care that the identity of the teachers that are the participants in this paper is not disclosed anywhere and that the information provided by them will not be used by any means against them. The information collected in this paper will not be disclosed to any other third party apart from this research. Attaining high standards of confidentiality and privacy ensured that the research is carried with complete integrity and confidentiality and that all the research ethics are adhered to in this research. The non-disclosure of their names would help in ensuring that the teachers at the UAE schools provide honest replies to the surveys that would help in identifying the core factors affecting the development and implementation of AI in UAE education sector. The results that are derived from the research would be authentic and genuine owing to the use of

participants relevant to the subject and retrieving their honest opinion about the advantages of implementing AI based technologies in UAE's education sector. Along with this, some of the key issues were also identified with their significance while adopting AI based technologies in the education sector of UAE.

Chapter 4: Data Analysis and Interpretation

Data Analysis and Interpretation consists of identifying the responses of the participants and categorizing it on the basis of the significance of the factors obtained through their responses. The result obtained in this research are analyzed on the basis of the survey responses as well as the secondary sources of literature that are reviewed and critically analyzed in this paper. The results that are derived in the research paper are bifurcated on the basis of the demographics of the participants and their opinion regarding the implementation of AI based technologies across the education sector of UAE. Analysis of the data collected is carried in this paper in such a way that it helps in obtaining solutions to the research questions identified in this paper.

Demographics of the participants

The first two question of the survey consist of informative questions which would help in determining the gender and work experience demographics of the teachers that are the participants in the research. The first question helps in deriving the gender of the participants which is very important to ensure that the research is not biased towards any one gender. The results obtained are shown in the pie chart given below.

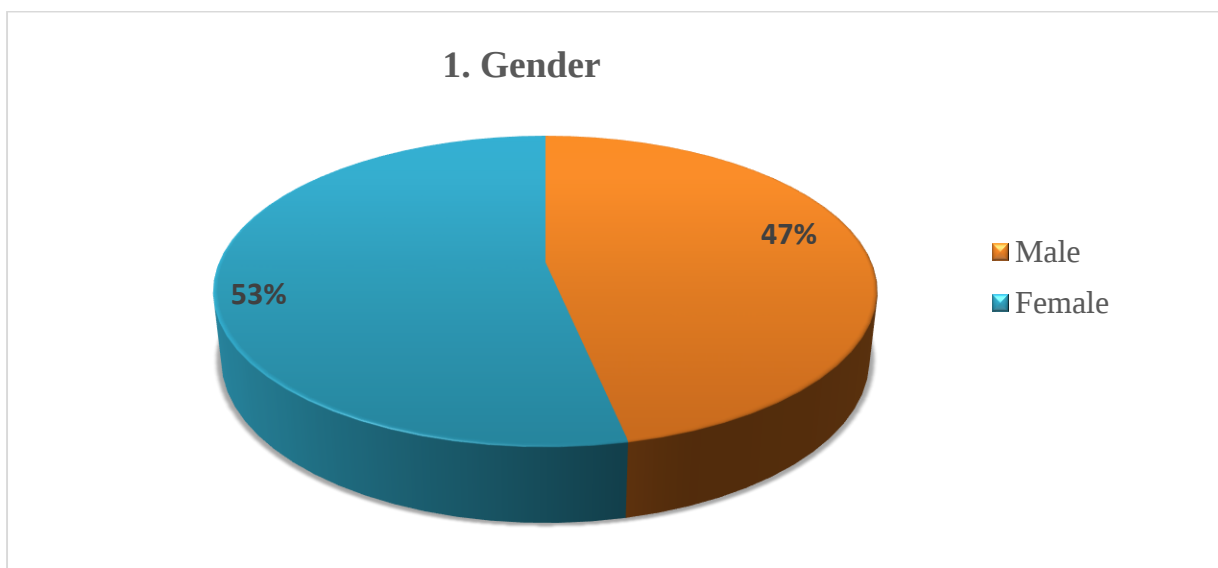


Figure 1: Gender demographics of the survey participants

With the help of the above pie-chart, it can be seen that the percentage of male and female is almost equal in the research. About 53% of the participants are female and around 47% are male. This indicates that the results generated in this research at the end is not biased on the basis of the gender of the participants. Both the genders have a significant amount of contribution to the results of the research. It is very important to ensure that both the genders get equal weightage in the research as it will help in ensuring that the research results can be implied to both the genders and that the reliability of the results generated would also be high with respect to both the genders.

The second question is related to retrieving the work experience demographics of the participants that are filing the survey questionnaire in this research. It involves determining the number of months or years that the participants have spent in the field of education. Determining the work experience demographics is very important as it will help in ensuring that the research is not biased on the basis of the experience of the participants. The work experience of the participants in this research is derived and shown in the pie-chart give below.

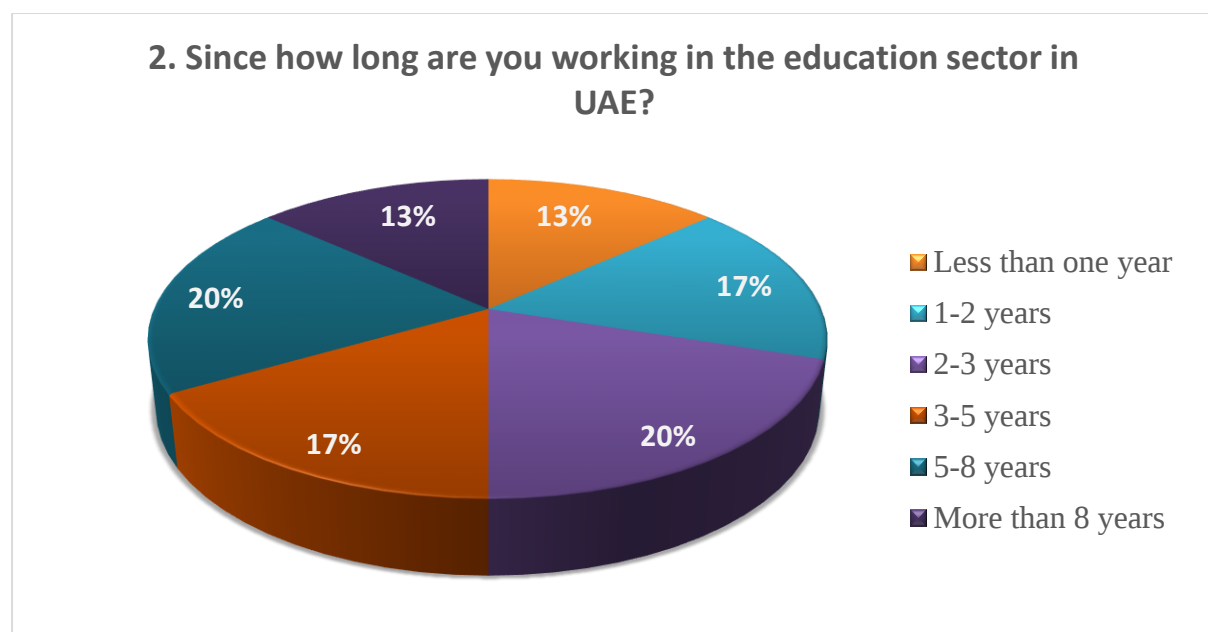


Figure 2: Work-experience related demographics of the survey participants

With respect to the above diagram, it can be seen that teachers, that are the participants in this research are having varied work experience in terms of the years they have spent in the

education sector. The number of years that teachers have spent in the education sector is important to determine in this paper as it will ensure that the data collected in the research is not inclined towards the opinion of the teachers who are either very new in this field or teachers who have been into this field for more than 10 years. A perfect balance among the participants contacted is seen with respect to the years that they have spent in the education sector.

The results indicate that 13% of the participants are new to the field of education in UAE as they have been into this field since less than one year. 17% of the participants have an experience of 1-2 years in UAE education sector, while 20% of the participants have an experience of 2-3 years in the field of education. Another 17% have an experience of 3-5 years and 20% have an experience of 5-8 years in the education field. Participants with the highest experience in this field that is, the ones possessing an experience of over 8 years constitute 13% of the participants. With the help of the results obtained pertaining to the work experience based demographics, it can be stated that the results of the research are not inclined towards the opinion of the participants having a specific amount of experience in the education sector of UAE. An unbiased opinion irrespective of the years of experience that the participants have in the field of education in UAE is ensured with the help of this even distribution of the participants in terms of their work experience. It ensures that the results derived are more reliable and that they are not affected by participants belonging to one particular category or group of work experience.

Impact of implementing AI based technologies in UAE education sector

The influence of the AI based technologies on the education sector in UAE is determined with the help of the survey questionnaire framed in this research. The survey questionnaire is given in the appendices at the end. The third question of the survey questionnaire helps in determining the fun quotient of adopting AI based technologies in the education sector. The perception of teachers with reference to the fun experience that

implementing AI in the teaching process would give to the students is retrieved with the help of this question. The results obtained from the teachers are shown in the following chart.

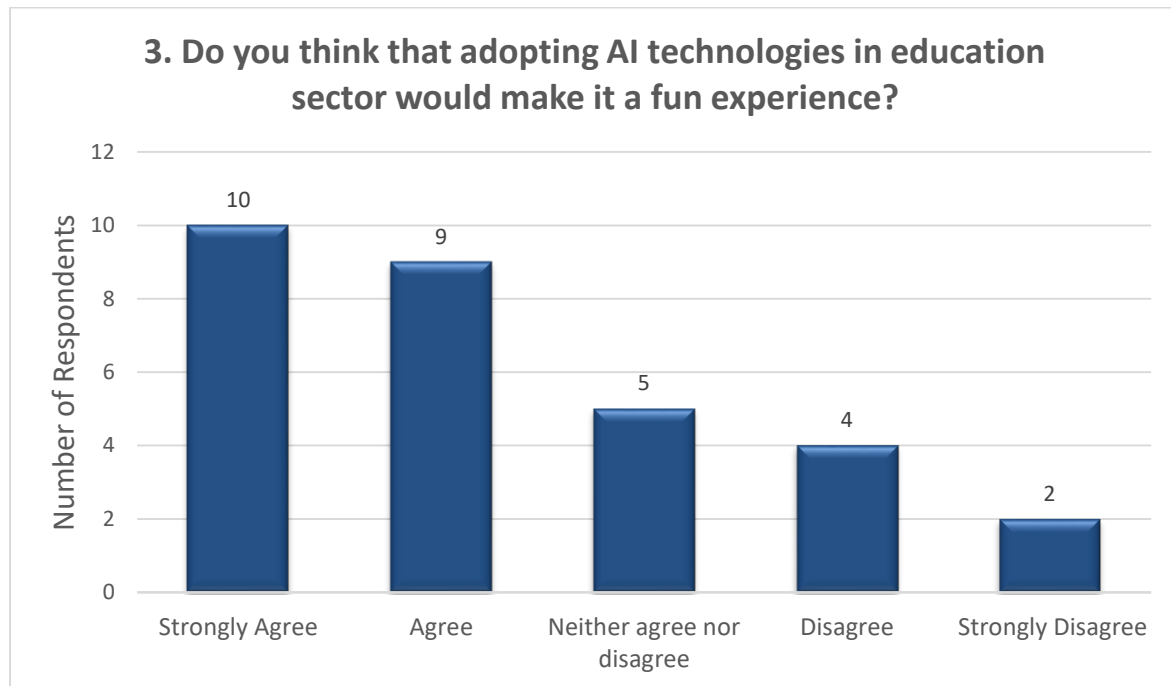


Figure 3: Fun experience related to AI based technologies adopted in education sector

With respect to the chart obtained above as per the responses of the participants, it can be seen that 33% of the participants strongly agreed and another 30% agreed that the use of AI based technologies in the field of education sector would make it a fun experience. It would add to the fun quotient of the learning process. Making the learning process full of fun experiences can help in developing an advanced form of learning that the students would like and at the same time, it would keep the students continuously engaged during the teaching process. Teaching process would become much more convenient with the use of AI based technologies in the education as it will help in carrying out interactions among the teachers and the students in a much better manner.

Around 17% of the participants were not sure about the influence that AI based technologies have on the fun experience of the students. While, the remaining 20% did not agree to the addition of fun experience among the students due to the implementation of AI based technologies in the education sector. However, majority of the teachers are inclined

towards the notion of supporting the conclusion that the use of AI based technologies in UAE's education sector would help in adding the fun quotient and this is in favor of the learning and the teaching process.

The fourth question of the survey is related to determining the influence that the AI technologies would have on the teaching process by helping the teachers provide useful and timely feedback to the students in a much organized and detailed manner than the traditional methods of teaching. The results of this are shown in the following chart.

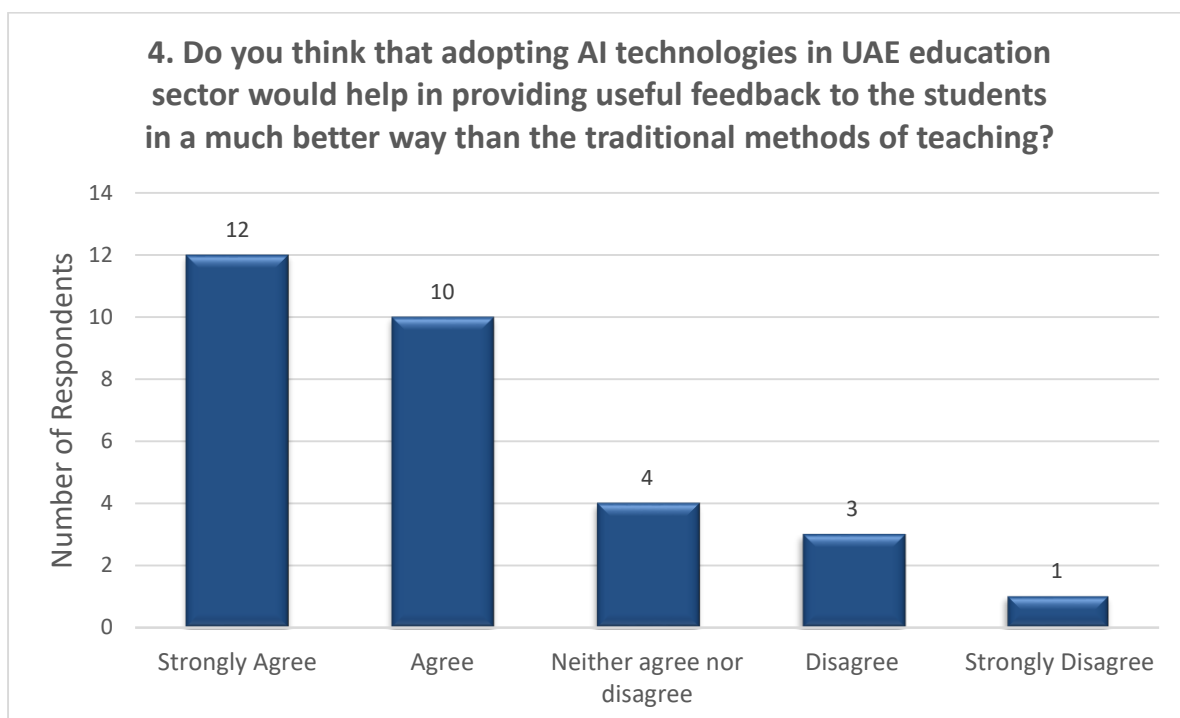


Figure 4: Impact of AI technologies on provision of feedback to the students

The results obtained in the chart given above indicate that the methods including implementation of AI based technologies would help in ensuring that effective feedback is provided to the students on timely basis. This was not possible in the traditional method of teaching which mostly focused on classroom oriented teaching on a white, green or blackboard. Over 73% of the participants strongly confirmed or confirmed that through effective utilization of AI based technologies, teachers can provide very much relevant and useful feedback to the students regarding their performance by comparing it with their previous performance using the data analytics option of AI. Very few participants comprising of 13% of the participants

disagreed to the provision of useful feedback for the students through the use of AI based technologies. The remaining 14% of the participants were not sure about the influence that the use of AI based technologies had on the feedback that was provided to the students in the UAE schools. Hence, it can be retrieved that one of the very important benefit of adopting AI in UAE education sector is the ability to provide very much effective and useful feedback to the students that will help in directing them towards the right approach for their performance in the school.

The fifth question of the survey is regarding the global exposure that is provided to the students through the use of AI based technologies across the UAE education sector. Providing a global exposure is very important as it will help the students to stand apart from the crowd and create an identity of themselves at a global level. Thinking global is very important while teaching students because it will help them in developing a more holistic approach towards all the activities and will develop a vision of global welfare and well-being amongst the students. The results derived about this theme are shown in the following chart.

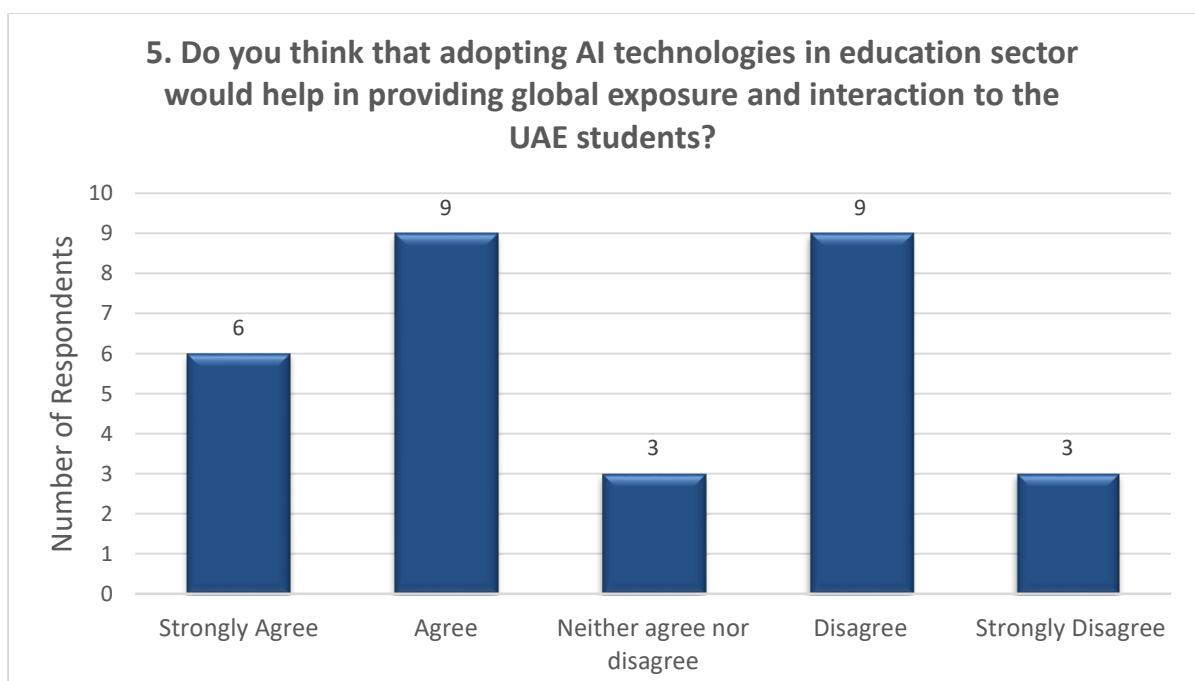


Figure 5: Global exposure and interaction to UAE students through AI based technologies

The above chart indicates that the use of AI based technologies helped in providing global exposure to UAE students was strong agreed by 20% and agreed upon by 30% of the

participants. Around 10% were not sure about it while the remaining 40% were either disagreeing or strongly disagreeing to the notion of obtaining global exposure amongst the UAE students through using AI based technologies across the teaching and learning sector.

The sixth question of the survey involves deriving how the use of AI based technologies would help in tracking the performance of the students in a much better and effective manner. It involves determining the effectiveness of using AI technologies for improving the performance of the students and this serves to be one of the core element driving the teachers at the school. The use of analytics using AI would help in tracking the performance of each and every student in a much effective and better way. The results for this question are shown in the following chart.

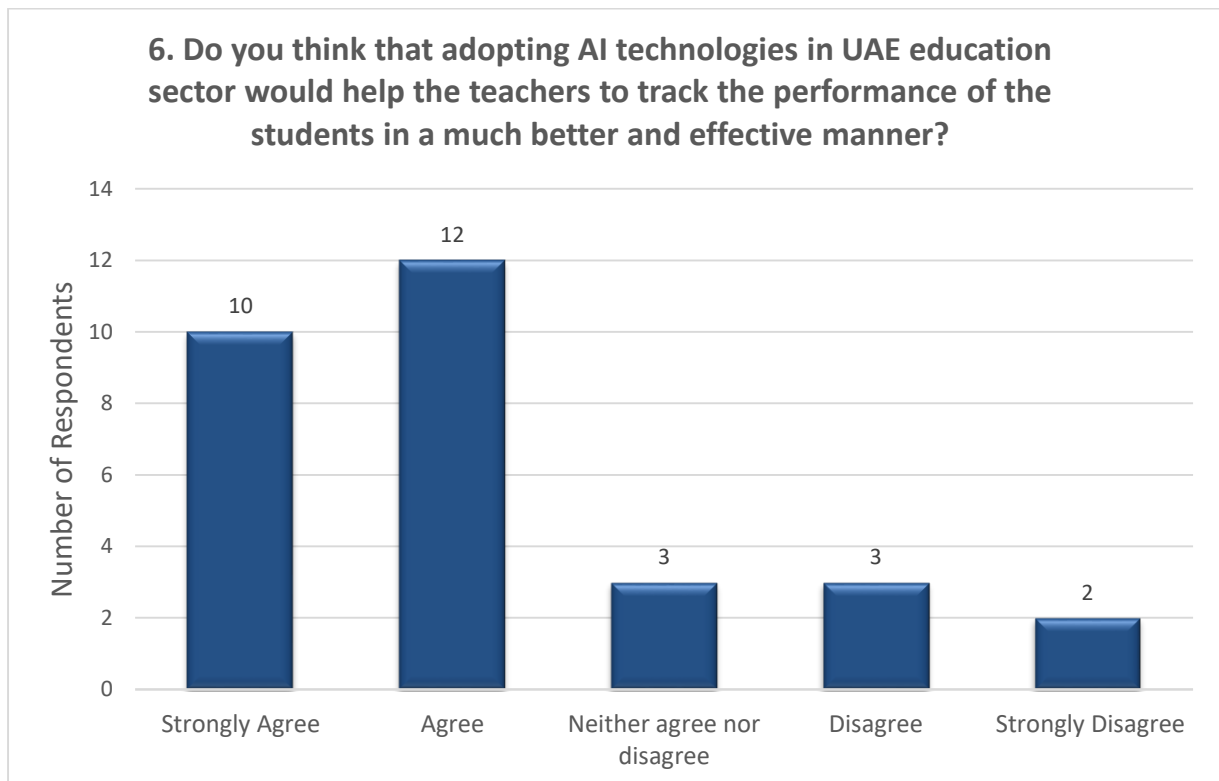


Figure 6: Statistics related to the influence of AI technologies in tracking the student's performance

About 73% of the participants agreed that the use of AI based technologies would help in tracking the performance of the students and help them take the necessary action based on it. Teachers will be able to get a better idea about the psychology of the students and will help in determining their standard behavior and functioning patterns. These participants think that

they as the teacher would be able to retrieve the progress of their students in a much better and effective manner. The aim of this question is to identify the level of influence that the adoption of AI has on the performance of the students.

The 7th question involves deriving whether the use of AI technologies would help in customizing the teaching as well as the learning process that would contribute to the attainment of AI enabled hyperpersonalization. Customizing the teaching process is a key attribute that is obtained with the help of implementing AI based technologies across the teaching and learning process in UAE schools. The results obtained for this question are shown in the following chart.

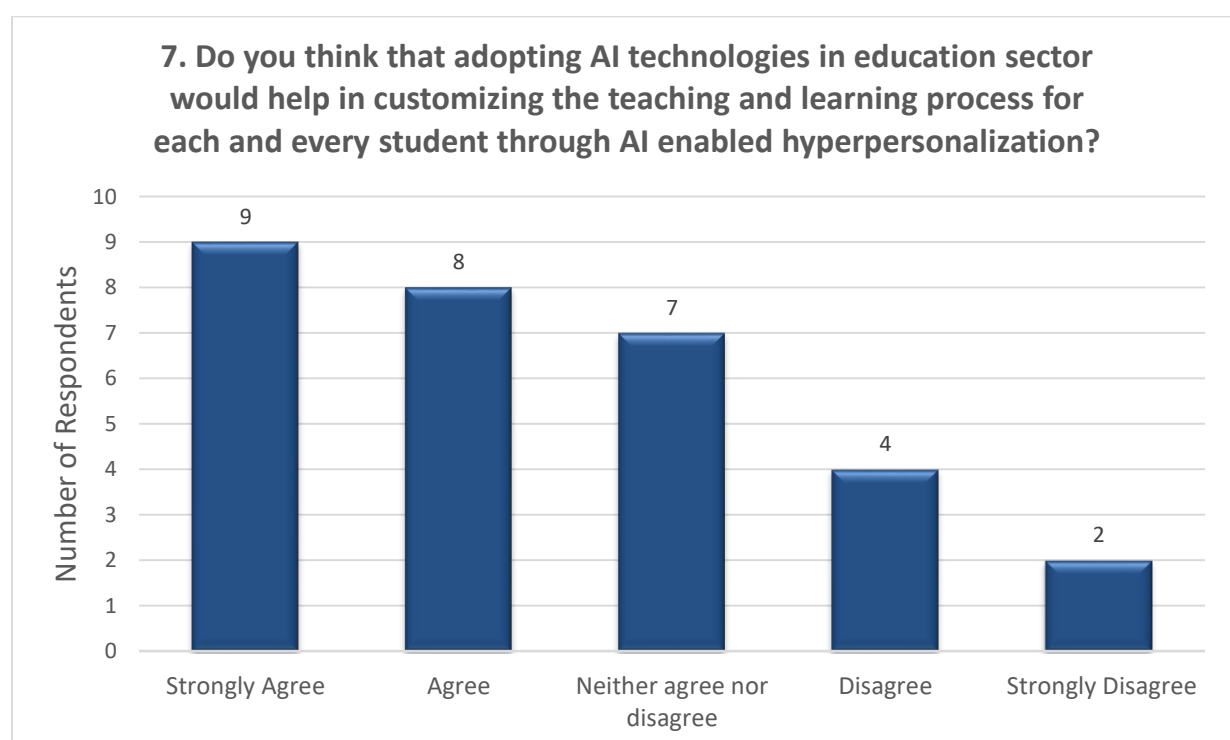


Figure 7: Customization and hyperpersonalization obtained across the UAE education system using AI technologies

With the help of the above chart, it can be seen that around 57% of the participants agreed or strongly agreed to the notion that AI based technologies would help in customizing the teaching process for the students. The aim of achieving hyperpersonalization is possible through identifying the needs of each and every student and developing tailored custom teaching strategies that would help the students in effective learning. While around 23% of the participants were not sure about the customization that is achieved through the use of AI based technologies in the field of learning and teaching. The remaining 20% of the participants

disagreed or strongly disagreed to the attainment of customization in the learning and teaching process through the use of AI technologies. Hence, customization of the learning and the teaching strategies and techniques is a benefit of adopting AI based technologies across the education sector in UAE.

The eight question refers to the operational costs associated with the process of teaching incurred at the educational institutions. The potential of AI powered systems to reduce the operational costs across these educational institutions in UAE is determined with the help of this question. The result obtained from the participants is shown in the following chart.

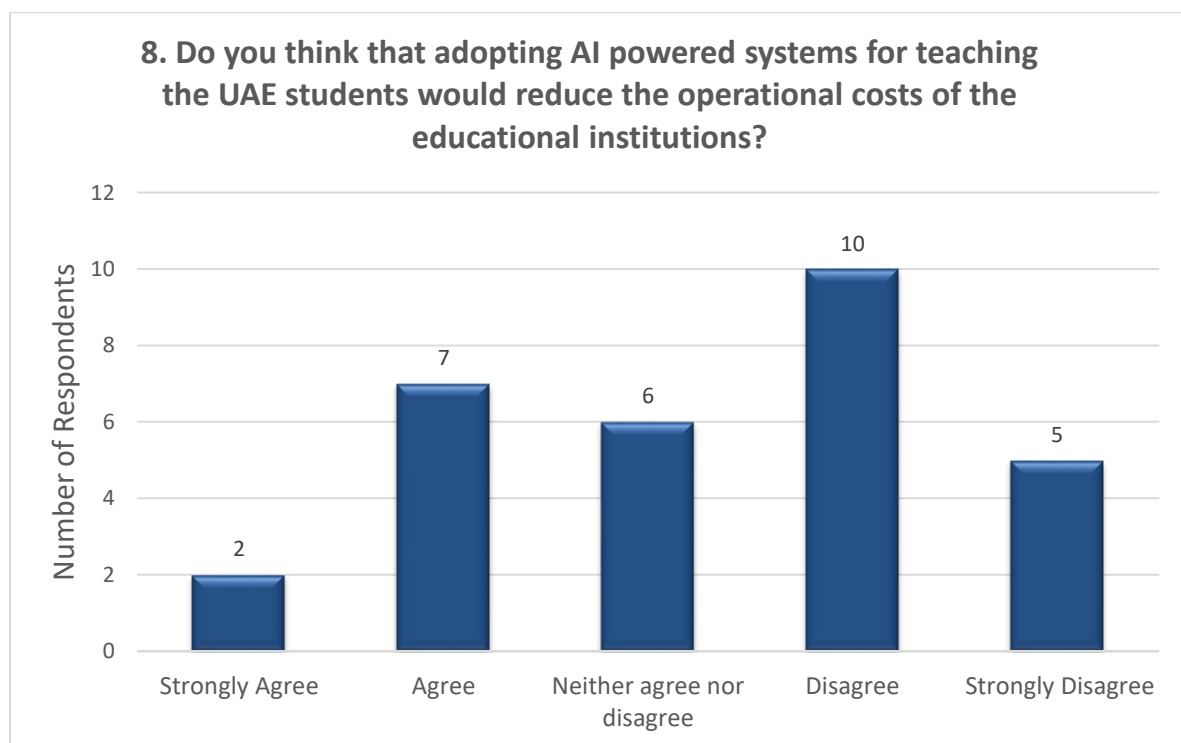


Figure 8: Impact of AI powered systems on Operational Costs of educational institutions

The above chart indicates that there are mixed responses obtained for this question. The use of AI powered systems for reducing operational costs across the educational institutions is not observed to have the desired result where 50% of the participants disagreed with the potential of the AI powered systems to reduce operational costs. This means that they feel that the adoption of AI powered systems would not reduce the operational costs and instead, on the other hand would increase it in the initial phase of its adoption. This increase in costs would be due to setting up a AI based powered system and devices related to it, training the teachers and

other staff to work on the system and developing an infrastructure that incorporates the use of such systems in it. Around 20% of the teachers participating in the survey were not sure about this impact of AI powered systems on the operational costs and around 30% of the participants agreed that it helped in reducing the operational costs across the educational institutions.

The 9th question of the survey helps in deriving the applicability of machine learning techniques as one of the most effective way of implementing AI based technologies across UAE's education sector. The results are shown in the chart given below.

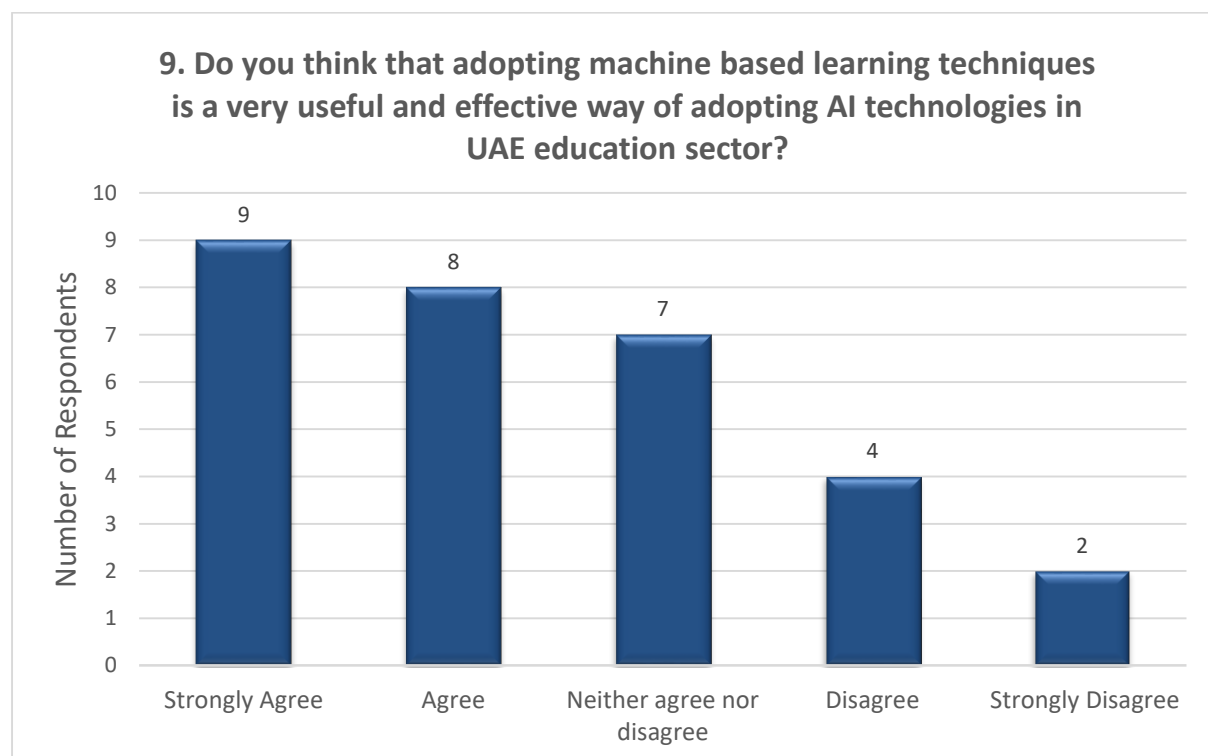


Figure 9: Effectiveness of machine based learning techniques for adopting AI technologies in UAE's education sector

With the help of the above chart, it can be seen that around 57% of the participants agreed that machine based learning techniques would be an effective and feasible way to apply AI technologies across the education sector of UAE. This indicates that machine based learning would help in improving the method of teaching and learning that is adopted across the education sector of UAE. While, 23% of the participants were not sure about the effectiveness and feasibility of machine based learning techniques and 20% of the participants did not agree with the extensive effectiveness of the machine learning techniques in influencing the education sector across UAE. This means that half of the participants feel that machine based

learning techniques are the best way to implement AI technologies across the education sector of UAE.

The 10th question of the survey is related to the issues that may be witnessed on implementing AI technologies across the education sector of UAE. It involves considering the influence that it would have on the traditional method of classroom based learning. The importance of classroom based learning is derived after the implementation of AI technologies. The results obtained are shown in the following chart.

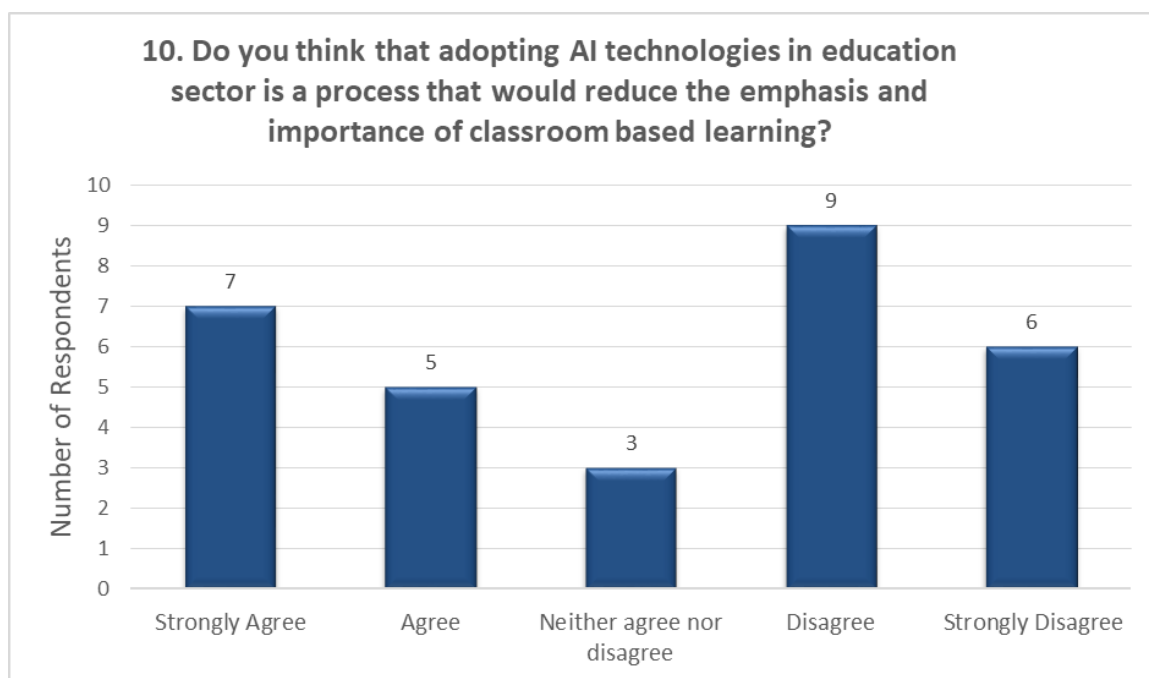


Figure 10: Influence of AI technologies on the importance of classroom based learning

The results obtained in the above chart indicate that there is a mixed response obtained for the changes in the importance of classroom based learning after the implementation of AI based technologies across the education system of UAE. Around 40% of the participants agreed that adopting AI technologies would reduce the emphasis and importance of classroom based learning. While, 10% were not sure about it and about 50% disagreed to it. This 50% stated that the implementation of AI technologies does not reduce the emphasis and importance of classroom based learning. It can be deduced that they believe the adoption of AI technologies does not reduce the importance of the traditional classroom based learning. The results derived also indicate that many teachers feel that adopting AI technologies would reduce the

importance of classroom based learning, while a majority of them feel that it will not reduce this importance and that it would instead, help in optimizing the effectiveness of classroom based learning.

The 11th question is related to the privacy and confidentiality issues that are observed while adopting AI based technologies in the education sector of UAE. The results obtained for the same are provided in the chart given below.

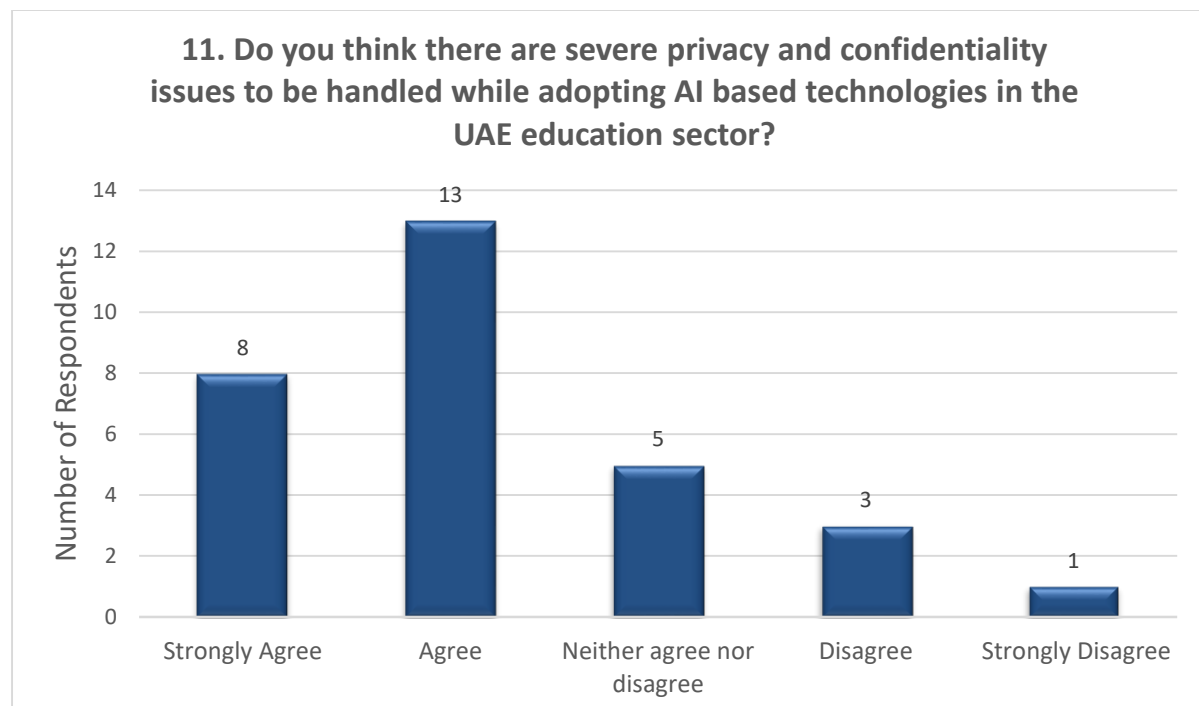


Figure 11: Privacy and confidentiality issues in implementing AI technologies across the education sector of UAE

With the help of the above chart, it can be observed that about 70% of the teachers participating in the survey agreed or strongly agreed that there are several key privacy and confidentiality issues that are to be handled while adopting AI based technologies across the education sector of UAE. Around 17% were not sure about the privacy and confidentiality issues observed due to the adoption of these technologies and 13% did not agree with the prevalence of severe privacy and confidentiality issues while adopting AI based technologies across the education sector of UAE.

The 12th question of the survey helps in determining the training that is currently available related to the adoption of AI based technologies across the education system

throughout the country. It is an important issue identified through the use of secondary sources of literature in the literature review section provided above. The results for this parameter are shown in the following chart.

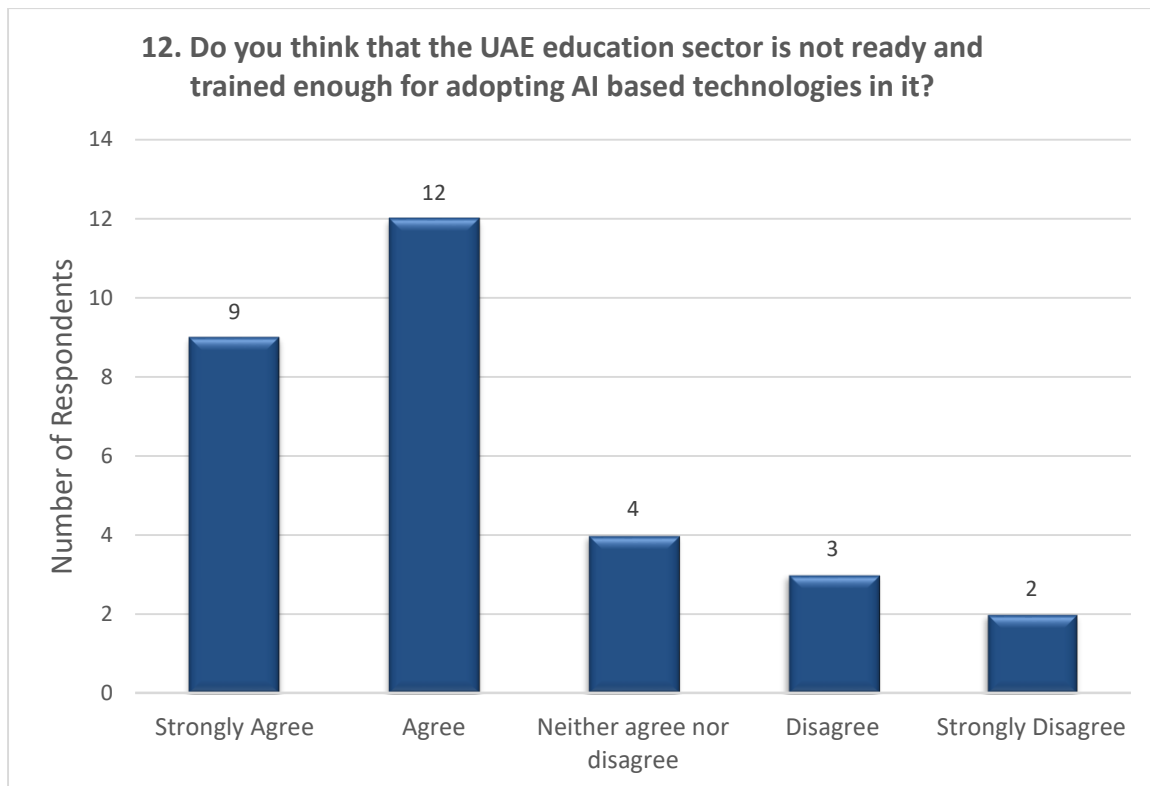


Figure 12: Training and readiness across the UAE education sector related to AI based technologies

The results shown in the above chart indicate that there is a severe need to provide training and make the teachers and other staff across the UAE education sector ready for effective implementation of AI based technologies. About 70% of the participants felt that the current training and knowledge about the AI based technologies that are implemented in the education system is not enough for successful teaching and learning of the students in UAE schools. While, 13% were not sure about the level of training and readiness of the teachers for adopting AI technologies across their schedule and method of teaching. While, the remaining 17% disagreed to the low level of training provided to the teachers while implementing AI based technologies. They felt that the level of training currently provided is sufficient enough to get the desired results across the UAE's education sector after implementing AI technologies across it.

The last three questions of the survey questionnaire are based on retrieving the key issues that might be faced while implementing Ai based technologies across the education sector of UAE. It involves considering the key aspects of privacy and confidentiality when adopting an AI based system that will have all the information of the students and their behaviors. It is a key concern as stated by most of the teachers in the survey and a proper security system is to be adopted that will safeguard the information that is stored and shared using the AI based systems and devices. The analysis indicates that the identity of each and every student would go online through the use of AI based technologies and this can pose a serious threat to the safety of the students as well as to the safety of the education systems and institutions.

Another disadvantage that is discussed through the questionnaire involves the loss of the traditional methods of teaching that involves classroom oriented teaching. Excessive use of AI based technologies are identified by the teachers to harm the interests of the traditional method of teaching. However, they also stated that it would be better if these technologies are adopted as a secondary tool of teaching and not the primary tool of teaching. It should be a tool that guides and assists the teachers in imparting knowledge and information to the students across the UAE.

The last and one of the most important drawback of adopting Ai based technologies across the education sector of UAE is the training required to teach on these devices. As a result of the training required, the teachers are resistant to adopt new technologies that would make them change the process of learning and would also require them to learn a new technology that would be detrimental to their psychology. The patience of the teachers is put to test when they are learning the different aspects of adopting AI based technologies across the education sector of UAE. The students are also not aware about what AI has to offer them in the field of learning. Thus, students too, resist the implementation of new technologies that are based on

AI in the field of education across UAE. A discussion of the information collected and analyzed in the above section is carried in the below section.

Chapter 5: Discussion and Conclusion

Discussion

It is very important to organize and sort the data that is collected in the research with the help of survey. It requires the data to be assorted in three main themes that comprise of the following things, a) Benefits of adopting AI based technologies in UAE education sector, b) Different AI based devices and technologies that are available for implementing AI in education sector of UAE and c) The issues and problems witnessed while implementing AI across the education sector of UAE. These here themes are evaluated and discussed in the following section.

The data collected and the results obtained in the above section help in determining the influence that AI based technologies would have on the teaching and learning system across the education sector of UAE. It would help in adding to the fun experience of the students when they are learning from methods that have AI technologies implemented across them. Majority of the teachers from the UAE schools stated that the implementation of the technologies related to artificial intelligence would help in making the learning process more fun and that this would help in increasing the efficiency and effectiveness of the teaching system.

The influence of the AI technologies on the education sector is not only limited to the fun experience that the students get while learning from these methods, but also the level of useful and relevant feedback that the students get when they are learning through these methods. Many teachers agreed to the notion that the use of AI based technologies would help in providing better feedback to the students through improve data mining and learning analytics that will also guide the teachers about the characteristics and attributes of the students. The traditional method of teaching does not involve providing intensive feedbacks to the students and hence, the learning of the students is restricted after a point. While, in the case of AI based technologies, the teachers are able to process more detailed information about the behavior and performance of the students. This brings us to the next core feature achieved through the

adoption of AI based technologies in the education sector of UAE. It is the attribute of tracking the performance of the students in such a way that it will help in improving their performance and make the learning more meaningful.

The use of AI based technologies help in carrying collaborative learning which is a very important characteristics of adopting these devices. The use of such AI based devices would help the students in learning from different physical locations and this is possible through the online conferencing teaching that can be incorporated using AI based devices. Deeper learning is possible with the help of these technologies. They would help in ensuring that an effective Computer Assisted Learning (CAL) is achieved throughout the education sector. The results of the survey also indicate the same. The results are inclined on highlighting the positive influence that AI based devices have on the process of teaching and learning. The use of the algorithms using big data would help in understanding the behavioral characteristics of the students and thereby, help the teachers to customize their teaching process for the students. In this way, teaching would become a very easy and effective process through the use of these devices.

The use of Computer based learning that is complemented with advanced data analytics would help in identifying the learning patterns of each and every student and will help in generating solutions accordingly. The process of learning is based on the use of data that would help the teachers in teaching their students in such a way that the students are able to understand and learn the things in a much better and effective way. The implementation of AI based technologies would help in ensuring that the effectiveness with which these technologies are adopted are to be evaluated and the accessibility and availability of these technologies is a major concern which is discussed below.

The results derived and analyzed above also indicate that the use of AI based technologies would help in bringing the students of UAE on the global map and it will prepare

them to survive the competition that is prevailing across the globe. It is observed to have provided the required level of global exposure to the students as a result of the AI technologies that are implemented across the education sector of UAE. Along with it, it can also help in customizing the teaching and the learning process for the students. This would lead to the attainment of hyperpersonalization which refers to high level of customization amongst the target population. The role played by AI in deriving a customized process of teaching and learning for the UAE students is stated to be very important by most of the teachers that were contacted in this research. The attribute of hyperpersonalization would help in ensuring that each and every student progresses across the education sector of UAE through the customized teaching and learning process adopted using AI technologies.

The training that is required for teaching the teachers these new AI based technologies and devices is an extensive and time consuming affair. The use of these technologies demands a thorough understanding of these devices and for this, the teachers would have to break their own stereotype and become a student for learning the functioning and effectiveness of the AI based devices. Many of the teachers were reluctant to learn any new technology that would require changing their method of teaching and as a result of it, AI based devices are not currently adopted on a very large scale in UAE. The use of AI based devices is also stated to have generated security and privacy concerns in the minds of the teachers in UAE that would be adopting these devices across the Uae education sector.

The issues observed across the implementation of AI technologies are also derived and analyzed in the above section. It can be seen that the use of AI based technologies was stated by many of the teachers to have increase the operational costs by a huge margin in the initial phase of its adoption. Hence, proper funding and resources are required for adopting AI technologies across the education sector of UAE. The adoption of AI based technologies would help in reducing the operational costs after few months of its adoption for the educational institutions when considering long term impact of its adoption.

Conclusion

With the help of the above discussion, it can be stated that the use of AI based technologies is extremely beneficial for increasing the effectiveness and efficiency of the education sector of UAE. However, at the same time, it requires an extensive effort to implement these devices across the UAE education sector. The training and induction of the teachers while working on the AI based technologies and devices should be carried out effectively and properly by ensuring that the entire process is carried smoothly without unnecessary rush. The reluctance of the teachers in UAE to adopt AI based technologies can be reduced by providing an interactive learning of these devices. The use of technologies that would involve developing an AI based technology would also require the technology and the related devices to be affordable enough and have to be available very easily,

On the basis of the results derived, it can be concluded that the use of AI powered systems would not be reducing the operational costs in the beginning as there would be several costs incurred while implementing such systems in the teaching system. On the contrary, it would tend to increase the operational costs in the initial phase owing to the different expenses that would be incurred when adopting these systems for teaching in the educational institutions across UAE. Thus, it can be concluded that the adoption of AI based technologies and devices across UAE's education sector is highly fruitful given that proper efforts and steps are taken to train the teachers about these devices and the devices are economic enough to be adopted on a large scale in the country.

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Appendices

Survey Questionnaire

Introduction to the survey

Dear Respondents,

“This is a survey regarding determining the benefits of implementing AI in UAE education sector, the promising AI technologies and the issues that are faced during this implementation. The data and information that will be provided by you will be kept confidential and will not be disclosed to anyone or anywhere. The data would in no way used against you. Kindly fill in the questionnaire that has been given below”.

Demographic Profile:

The survey questions 1 and 2 would help in determining the gender and the work-experience demographic of the research.

1. Gender
 - Male
 - Female
2. Since how long are you working in the education sector in UAE?
 - Less than one year
 - 1-2 years
 - 2-3 years
 - 3-5 years
 - 5-8 years
 - More than 8 years
3. Do you think that adopting AI technologies in education sector would make it a fun experience?

- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
4. Do you think that adopting AI technologies in UAE education sector would help in providing useful feedback to the students in a much better way than the traditional methods of teaching?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
5. Do you think that adopting AI technologies in education sector would help in providing global exposure and interaction to the UAE students?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
6. Do you think that adopting AI technologies in UAE education sector would help the teachers to track the performance of the students in a much better and effective manner?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree

7. Do you think that adopting AI technologies in education sector would help in customizing the teaching and learning process for each and every student through AI enabled hyperpersonalization?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
8. Do you think that adopting AI powered systems for teaching the UAE students would reduce the operational costs of the educational institutions?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
9. Do you think that adopting machine based learning techniques is a very useful and effective way of adopting AI technologies in UAE education sector?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly Disagree
10. Do you think that adopting AI technologies in education sector is a process that would reduce the emphasis and importance of classroom based learning?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree

- Strongly Disagree

11. Do you think there are severe privacy and confidentiality issues to be handled while adopting AI based technologies in the UAE education sector?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly Disagree

12. Do you think that the UAE education sector is not ready and trained enough for adopting AI based technologies in it?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly Disagree

