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Beyond Accommodation: Artificial Intelligence's Role in Reimagining Inclusive Classrooms

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ABSTRACT

In this opinion paper, the authors focus on the role of artificial intelligence (AI) in expanding the concept of teaching for students with disabilities beyond the ideas of teaching adaptations or exceptions. We believe that artificial intelligence techniques allow for the development of microlearning environments that are intrinsically inclusive and responsive to learners' differences. The paper explores the interaction of artificial intelligence in making the learning process more individual, increasing the level of feedback during the learning process, and improving students' interaction between them while revealing individual and collective differences. We also address the ethical implications as well as the possible difficulties or hurdles of integrating AI into the inclusive education practice, such as privacy concerns on information processing, biased algorithms, and the necessity of human supervision. Thus, this paper presents an idea of how to incorporate AI into the creation of an inclusive teaching environment that actively involves teachers, learners, and their families. Finally, based on our research, we provide directions for future research and policy implications that develop AI-based supportive and inclusive classrooms that enhance equity, participation, and learners' achievements no matter disabilities and diverse learning needs.

1. Introduction

The inclusion of learners with disabilities has been a major focus of reform efforts in education for many years to eliminate barriers towards all learners' needs. However, the current practice of inclusion mostly involves the use of individual modifications, which consumes a lot of resources and, at times, fails to enhance the delivery of equitable learning environments. With the advent of emerging technologies and continuous innovations, inclusion in learning is best

conceptualized through Artificial Intelligence (AI).

Notably, it has become clear that there are many limitations to accommodation-based approaches. These methods, although beneficial in intent, may take a lot of time and energy to put into practice and, in the process, can overemphasize students' unique statuses as the targeted groups. Also, they often fail to meet the time-varying needs of multiple students in real-life classroom contexts (Rose & Meyer, 2002).

AI technologies are, therefore, a line of solutions to these challenges and can transform the face of inclusive education. It is thus not far from the possibility that AI is able to construct learning environments that are inherently conducive to accommodating a student's specific learning needs and, as such, be universally beneficial. They have moved away from retrofitting accommodation for learning environments and towards designing spaces that are innately accessible and UDL-compliant, which can, in principle, benefit all students − not just those with diagnosed learning disabilities (CAST, 2018).

This paper will explain how AI could metamorphose the conventional teaching environment by creating classrooms for all. Here, we will discuss how AI technologies help customize the learning process, facilitate the learning process in real-time, build an effective augmented learning environment through the collaboration of diverse learners, and assist educators in creating a more effective learning environment that supports diverse students. Furthermore, there will be a discussion regarding the opportunities and risks that come with artificial intelligence in education, as well as the framework for its responsible adoption.

In this paper, the author tries to critically discuss how to make use of the advancement of AI technology and approaches to serve the purpose of inclusive learning for students in need of support or for achieving an environment of equity for all learners.

2. The Evolution of Inclusive Education

As a background to the development of the current state of affairs in IA, the audience is offered to focus on the fact that the change in philosophical and practical approaches to ensure IE was a lengthy process that started in the early 20th century. First, students with disabilities were excluded from general education systems, with most of them being taught in schools or institutions. This segregation was out of the misconceptions that these students needed different teaching and learning models and had no abilities to learn or make any productive contribution to their traditional classroom settings (Winzer, 1993).

Integration in the mid-twentieth century started to take place gradually in line with the civil rights movements and effectual changes in people's mentality. This approach sought to integrate students with disabilities in regular classes in schools with little policy that was designed to alter the classroom environment to suit the students as was expected for mainstream

students. Whereas integration moved the community forward, it was not complete because it did not revolutionize the education system to cater for the needs of diverse learners (Sailer, 2015).

The idea of integration appeared within the framework of an evolutionary perspective in the final part of the twentieth century when it became clear that the changes in educational systems required more profound transformations to accommodate all learners. The essence of this philosophy calls for the recognition of diversity in the learners and that a school should be able to find a way of supporting the learners in light of their differences rather than the student finding a way of fitting into the school system (Ainscow, 2005).

The expansion of the inclusive education movement was carried forward to the 1990s by the advancement of the Universal Design for Learning (UDL). UDL essentially involves designing for variability by enhancing teaching and learning activities that can meet every learner's need by regulating the means by which they acquire information, process it, and demonstrate what they have learnt. This framework is quite in sync with the principles of inclusion and has been accepted in the policy and practice domain of education worldwide.

However, the practices spearheaded today are different and have the following drawbacks. It is for these reasons that several schools have not been able to embrace the principles of UDL fully since they practically lack the resources to do so, teachers have not been trained enough to embrace it from scratch, and the curriculum does not allow for such flexibility. Further, sometimes, the use of IEPs and accommodations that direct teaching towards learners with special needs can be seen as a problem as it creates a culture of the 'deficit' model of learning difficulties (Florian & Black-Hawkins, 2011).

With the advancements in the 21st century, there is more appreciation for the recent changes and, therefore, a call for change in the existing model of inclusive education. Such a change means going beyond providing accommodation and designing learning contexts that do not require subsequent modification for accessibility to students with various types of learning disabilities. It is in this light that the prospect of applying artificial intelligence in inclusive education takes on a new dimension and is quite promising.

3. Understanding AI in Education

This paper defines AI in education as the use of machine learning algorithms, natural language processing, and many more in teaching and learning activities. These technologies are able to sort through tremendous quantities of data, encode them, identify trends, and come to conclusions or provide forecasts, all of which resemble human thought processes and actions (Holmes et al., 2019).

In the context of general education, AI has already experienced remarkable development, which has been well expounded in the following aspects. Computerized learning aid systems deliver information and feedback to the learner according to the range of needs and learning

curves. LMS enables AI to monitor the learner's actions and guide them to the right learning path. Examples of the use of artificial intelligence include AI-assisted chatbots that are able to respond to students' questions as well as guide them on their coursework at any given time of day (Luckin et al., 2016).

New AI applications also signify inclusive classrooms even more. There are continuing developments in natural language processing and in text-to-speech and speech-to-text technology, which could be valuable to students with visual impairment or Dyslexia. Technologies such as computer vision are improving access to visual content, particularly for students who are impaired. Intelligent emotion recognition is being worked upon to assist children with social-emotional difficulties and enhance their ability to understand social signals (Drigas & Ioannidou, 2013).

Out of the various areas, it is important to note that the integration of AI and assistive technologies in the education system will benefit students with disabilities. More conventional technologies can be recognized as screen readers or pointing devices, and they are complemented with AI functions, making the technologies perform smarter. For example, AI-equipped prostheses can be self-learning and have the capability to adapt to the specific user's patterns, and it is also possible to describe surrounding environments in real-time using smart glasses for visually impaired users with the help of computer vision (Domingo, 2012).

Consequently, opportunities are emerging to build the very learning contexts themselves that are inherently inclusive, responding to the learners' individual differences in real-time as the learning technologies evolve further. However, it is important to do this in a way that will consider the positive uses of AI in education as well as the negative and ethical issues that are associated with it.

4. AI-Enabled Personalization in Inclusive Classrooms

With the help of AI, new possibilities for improving inclusive classrooms can be vividly discussed, namely the individualization of learning activities in accordance with the peculiarities of the student's profile. It is highly relevant to the principles of Universal Design for Learning (UDL) and may further improve the quality of education for all learners, especially SL animals.

Intelligent adaptive learning systems can be designed to track and analyze data that pertain to the effectiveness of learning as well as the learner's engagement levels and change the difficulty level, speed, and presentation mode offered therein in line with the data gathered. These systems accumulate data on the students' interactions, strengths, and weaknesses of the delivery of instructional content, and learning outcomes, and they make corresponding adjustments to the learning process (Kulik and Fletcher, 2016). For students with learning disability or those who may need some extra help, this makes it possible to challenge such learners without overloading them.

Intelligent Tutoring Systems go further than that, as they mimic the one-on-one teachings that are offered in most learning settings. These AI tutors are capable of giving the needed explanations, posing questions that can foster more reasoned answers, or even giving back immediate kind of feedback, all the while adjusting to the student's learning style as well as the established rate of learning (VanLehn 2011). In particular, for those students who do not address difficulties with asking questions in an organized class, these systems will let them avoid any judgments from other participants and continue their learning process.

It also may enable the use of AI algorithms to provide content according to the learning pace of the student. AI can identify these materials from a student's learning history, interests, and aims and present the content that will be suitable for a learner in formats that will suit the student. For example, a particular learner may have issues with visual processing and hence will be exposed to a lot of audio content, while another learner who is best at using a hands-on approach will be taken for simulation activities.

Formative assessment by means of AI makes it possible to check students' progress constantly and correct the process if necessary. This is not the typical model of testing students, which is only done after certain intervals, but rather offers a more detailed and up-to-date insight into the students' comprehension. Due to the continuous and frequent nature of this assessment, this is especially helpful for students who have issues of focus or are not comfortable with traditional tests and quizzes (Shute & Rahimi, 2017).

AI-driven systems can build individual learning trajectories, which are a combination of cognitive, affective, and motivational learning characteristics. Such systems can also use data from the various devices' interfaces or bodily sensors for facial expressions, movements, and biometrics to determine if a learner is frustrated, bored, or ready for more difficult content (D'Mello et al., 2017).

Some specific examples have been presented in this article as to how precise personalization has been achieved with the help of AI and how it has proved to be effective even when it comes to people from all kinds of backgrounds. For instance, Kolb et al. (2019) noted that the use of the AI- adaptive learning platform had an overall positive impact on students' mathematics performance, especially students with learning disabilities; as such, there was a reduction in the achievement gap between and between students with learning disabilities and non-learners. That has been shown in another study by Li et al. (2020), where the use of an AI-assisted language learning application boosted students' achievement in English by a great margin, including those with L1 disorders.

AI use for personalization expanding in the future can be sure to develop learning environments that are inclusive by default and change from the real-time learner necessities. However, it should be wise to adopt these innovations to be used as supplements to human teachings and intercessions, and we need to be ready to answer some ethical questions like privacy and balanced algorithms.

5. Enhancing Accessibility through AI

AI technology is enhancing the teaching-learning process among learners in inclusive classrooms by providing effective tools that overcome challenges faced by children with disabilities in the classroom. This means that not only are the possibilities of the existing assistive technologies expanded, but new types of technologies to improve inclusive education are also being developed.

Current and innovative text-to-speech and speech-to-text applications have advanced to work with artificial intelligence tools. Due to the enhancement of natural language processing techniques, it is now possible to transform written text into natural-sounding speech with great correctness and in different languages. The students who would particularly benefit from this technology are those with visual impairment, Dyslexia or students who easily comprehend through audio. On the other hand, speech-to-text features help learners who have writing difficulties or those with motor disabilities, writing disabilities to write essays and discuss issues as everyone else (Shadiev et al., 2014).

Technologies in computer vision help to improve student support for those with visual impairments. With image acknowledgement and image classification, AI can write a descriptor for a picture to present a student who is visually impaired with a description of the content contained in a graphical form in a diagram or even in a demonstration. The integration of such technologies into smart glasses enables students to hear what is going on in the classroom, including spatial closeness and contact with other people (Bhowmick & Hazarika, 2017).

Read today into focus on how natural language processing NLP is helping students who have language and communication difficulties. Real-time language translation tools that have been developed through Artificial Intelligence can help students with language disorders or students who are non-native in a classroom setting. In regard to students on the autistic spectrum, NLP can help assist in the understanding of social signals and IDs as well as the metaphorical language used, thus improving the integration of the students with other students in the classroom (Vulcu et al., 2018).

Emotion recognition AI is turning out to be an important asset towards social skill practice. Such systems can more or less capture facial and voice expressions and even the posture of the subject to convey emotional conditions. For students with social and emotional learning difficulties, this technology can provide opportunities for immediate feedback on how to resolve facets of a social situation and enhance peer relations and self-control (Chen et al., 2020).

Integrating augmented and virtual reality (AR/VR) with the assistance of Artificial Intelligence in the learning process provides an enhanced learning experience for students, especially those with a learning disability such as attention disorders and or students who have poor performance in traditional learning environments. AI algorithms could alter these branded environments in a manner that is contingent upon the level of individual student engagement

and/or academic achievement to give the students more realistic technological-aided learning experiences (Southgate et al., 2019).

What exactly these AI-based accessibility tools bring to the table is great, but the process must be considered best practices, so integration is additive to human intervention rather than a subtraction from it. Also, further work is needed to solve issues already present in most commercial applications, including accuracy, flexibility to accommodate the variety of users in an educational environment, and compatibility with current learning technologies.

6. AI-Facilitated Collaboration and Peer Support

AI not only improves a student's learning process but also transforms cooperative learning and peer assistance in integrated classrooms. Thus, by applying AI technologies to educational processes, educators will be able to design and implement better-quality group learning environments wherein all the students, as well as those with different learning needs and backgrounds, learn in a more efficacious manner.

Intelligent grouping algorithms are a major improvement in the way that different learners will be grouped together. These AI-learning systems consider various aspects like academic performance, preferred learning modalities, inter-person skills and learning personality of the students with a view to coming up with the most appropriate learning groups. Thus, by using multiple dimensions, AI can construct fairly good groups that foster learning and positive social interactions. To students with such disabilities or with social difficulties, these selected groups give a favorable setting for programming and learning from peers (Cen et al., 2016).

Organizations providing peer support in classrooms, particularly in today's inclusive classrooms, are benefiting from new technologies involving artificial intelligence to bring about more efficiency in peer tutoring and peer mentoring. Such platforms can make an ideal match for students according to their ability complementarities and with regard to the learning requirements that they may have. For example, a student who has a gifted performance in mathematics but has a lot of problems in reading can be grouped with one who has a problem in mathematics but particularly has a joy in reading. These interactions can be captured by AI algorithms, which can give advice concerning the use of effective tutoring approaches and if there is a need to offer more support (Kulkarni et al., 2015).

Artificial intelligence, combined with multimedia conferencing, is bridging collaborative spaces from physical barriers to potential spaces of free group work. These features include real-time translation of different languages, closed captioning, and social cue interpreting to help students with learning disabilities fully engage in discussions or group projects. Moderators within these spaces can be AI assistants who aim to control group dynamics, guarantee fair contribution involvement, and bring appropriate questions to provide direction to the discussions (Caballé & Clarisó, 2016).

Computational allying mediated by social robots is, therefore, seen to be developing into useful facilitators of classroom learning and peer interaction. These robots can relay instructions about how to behave in social stories, so students diagnosed with these special needs can practice while conversing with the robot. For instance, these robots can provide programmed and structured social interactions for students on the autism spectrum to enhance their perception of peer interaction (Scassellati et al., 2018).

The advantages that are procured from collaboration tools assisted by AI agenda are apparent; however, they should be integrated carefully to augment and not replace real people connection. Teachers also need to be aware of the possibility of biases in the AI systems and include teaching that is more diverse and effective and takes everyone's perceptions into account.

7. AI for Teacher Support and Professional Development

It has, however, emerged clearly that Artificial Intelligence not only enhances student experiences but also modifies the support and professional learning of teachers in inclusive education contexts. AI technologies, therefore, create opportunities for educators to improve instructional practices as well as organizational practices while learning ways to help every student better.

With the help of lesson planning supported by AI and resource collection, the preparation takes less time, and teachers are able to spend most of their time with students. Experience smart solutions can take into account curriculum standards, student information, and learning outcomes to recommend teaching schedules and materials. In this respect, such systems can help to suggest changes and adjustments required to make the lessons as inclusive as possible for every learner or child (Luckin, 2018).

Some office-like recurrent tasks with the assistance of AI in schools are becoming unburdensome in order to allow teachers to spend more time with their students. Additional responsibilities of intelligent systems include working on routine processes in grading, including multiple choice exams, monitoring attendance and – preparing progress reports. In inclusive learning environments, they can also track compliance with IEPs and raise concerns to the teacher for evaluation and attention to the students with CP who are out of the mainstream learning ability (Holstein et al., 2019).

Class monitoring and decision support systems, which were unimaginable some years ago, are now offering teachers useful information on student participation and learning profiles. Several metrics could be tracked using AI-based tools and products, ranging from students' responses and activity levels to learning patterns to the data that would be invaluable to teachers. These systems can also be useful in indicating, in real-time, when a student needs more support or when the lesson plans should involve modification of the pedagogy (Blikstein & Worsley, 2016).

Recommendations on professional learning for teachers based on an AI system have encouraged teachers to improve their inclusion practices continually. Using data related to teachers' performance, students' achievements and the current state of literature reporting on approaches to inclusion, AI can provide recommendations on concomitant high-impact professional learning. This approach allows for professional development of teachers that will target the specifics required in their classrooms and the students they teach (Dillenög 2016).

Avatars are making possible simulations for teacher training in inclusive keeping-realist settings that allow educators to enhance their inclusive practices. These simulations may involve various activities with students with a variety of learning styles, behaviors, and communication barriers, as this gives the teacher a feel for how to manage the class and support each child. The AI can assist teachers in making corrections while teaching, thus helping them enhance inclusive teaching practices (Dieker et al., 2014).

However, when applying such solutions, it is important not to subordinate these systems to the machine but to use AI as complementary to the teacher and to provide intelligent support for his professional activities. Teachers need to be directly involved in the innovation of AI inventories to conform to the needs of learning institutions, especially inclusive classroom requirements.

8. Ethical Considerations and Challenges

AI is being incorporated into inclusive classrooms; meanwhile, several ethical issues and issues of concern arise related to inclusive classroom education that need to be met to ensure that they are implemented responsibly and sustainably.

Privacy and security of learners' data in AI-supported Instruction is central to the discussion. The implementation of collecting large amounts of data for personalizing lessons raises issues regarding students' privacy and data ownership. Privacy concerns have to be addressed to ensure that information collected and recorded about students' learning processes and characteristics of their disabilities and behavior is well protected from misuse. Commitment to the principles set by data protection acts such as GDPR and FERPA to ensure the protection of learners' data is mandatory, apart from addressing the learners and parents on how the data will be used (Williamson, 2017).

Issues that can be associated with algorithmic bias in educational AI systems and how fairly they can operate. The AI models' performance suffers from the data used to train them because such data samples may reinforce prejudice based on race, gender, or social status or hinder the proper development of models for people with disabilities. This could result in compromising students' rights or categorizing them wrongfully, which does not augur well for the matter of education. Research has to continuously focus on producing and deploying real-time fairness-aware machine learning algorithms, as well as on periodically reviewing the fairness of such systems (Kizilcec & Lee, 2020).

Another crucial issue is the digital divide and the proper availability of AI systems. Challenges like these arise when students from low-income backgrounds or from under-resourced schools do not have access to the tools enhanced by artificial intelligence, hence increasing the achievement gap. Therefore, converting technology adoption to true implementation requires that these technologies be made available for use across people of varying socioeconomic status (Reich & Ito, 2017).

Mitigating the use of AI in education while integrating human relations is as important as finding oil and water mixtures. Hence, they are sure that although AI's help in writing is very useful, one must not totally eliminate the possibility of direct communication and personal understanding. For learners with social and emotional learning difficulties or students who need human touch, the best balance between the AI provision and the teacher's contact time is critical (Luckin et al., 2016).

Due to the lack of accountability in the decision-making process of implemented artificial intelligence, their use in education requires transparency and explainability. Some AI algorithms are black box in nature, and hence, it becomes quite challenging for educators, students, and parents to distinguish how decisions are being made and where they truly count, for example, in assessment, selection of resources, and other related services. Interpretable models should be built to get the proper working of AI systems, and it is essential to explain how the AI process reached the final decision (Papamitsiou & Economides, 2014).

Social-emotional development may also be affected negatively; hence, these have to be looked at. Thus, excessive usage of AI-mediated interactions may have a detrimental impact on the development of social competencies, specifically for students with social-emotional difficulties. It is important and necessary to truly weigh how AI-infused tools can be incorporated into social learning environments (Bernardini et al., 2014).

Solving these ethical concerns and issues needs the effort of educators, technologists, ethicists, policymakers, and professionals from different student populations. It has become pertinent to continue research work, formulate proactive and innovative policies, and conduct an effective, ethical review of AI in learning environments to guarantee the maximization of the application of AI in learning environments for the benefit of all learners.

9. Framework for Integrating AI in Inclusive Classroom Design

Thus, to work out the further strategy of AI's introduction into inclusive classroom design, I consider it necessary to offer an intricate framework. This framework should, therefore, include aspects of stakeholder engagement, ethicality, and improvement processes.

It is, therefore, important that stakeholders are involved in the design and implementation of the AI system so as to realize the development of technological solutions that meet the needs of all students. It is necessary for teachers, learners, parents/carers, disability

organizations, and AI programmers to be involved at every stage of the design process. When implemented, this type of participation aids in recognizing possible concerns ensures that the innovations are for achieving the desired goals of instruction and assists all stakeholders in the adoption of technology (Reich & Ito, 2017).

Some of the key guidelines that should underpin this framework include the following: Some of the principles that could be embraced include transparency, fairness, accountability, and privacy, as well as recognizing the importance of the human factor in major education decisions. This means that instead of making the idea of human teaching obsolete, the AI system should be designed in a manner that complements the teaching profession. Further, these principles should help to stress the need for people's interactions and socio-emotional growth in the context of smart learning environments (Holmes et al., 2019).

The process of 'design as a sequence of refinements of ideas as abilities to repeatedly implement improvements is critical when developing AI systems that have to be applied in practice. There should be cyclical feedback in order to get information from the teachers, students and parents. This data should feed back into the continuing refinement of the delivery of the AI systems that serve the educational needs at that present time, as well as respecting the current ethical standards (Holstein et al., 2019).

Making the right degree of standardization and customization decisions for AI-integrated inclusive classrooms is the next factor to consider. Despite the fact that there is some inevitable degree of standardization required to enable the systems integration and scaling, customization of AI tools for the particular classroom and learners' circumstances is essential for embedding an equal learning environment for all. This quinary balance should be evident in a framework designed to prescribe how this can be achieved whilst maintaining the flexibility of a system (Luckin et al., 2016).

Staff development and support have to be one of the major drills in the framework. Teachers require both formal instruction and learning experiences in regard to the content and pedagogy of AI as a technology and the AI technologies being taught. Further support should be given to teachers in order to facilitate AI use in classroom practice and to consider the AI-produced findings (Dillenbourg, 2016).

It has to be flexible in the sense that it changes based on the new advancements in technology, studies, or something new and discovered in the education sector. In order to make sure that the framework presented here is effective in the assessment of how AI can be integrated into the process of Inclusive Classroom Design, the latter has to be regularly reviewed and updated, with the participation of all stakeholders involved.

10. Policy Implications and Recommendations

Hence, the pedagogical application of AI in inclusive classrooms poses monumental

policy shifts and recommendations for effective, ethical and equitable applications.

Educational policies are in the process of being updated with regard to AI integration in integrated classrooms. There is a need to modify current legislation to modernize AI technology policies that are required in the education process, but they must also protect students' rights in relation to their data. This can include setting up new rules of data protection to regulate AI-related issues, the rules for using students' data ethically, and/ or setting up new rules of AI transparency and responsibility of AI in an educational context (Regan & Jesse, 2019).

Financial support for programs to develop AI for inclusive education is necessary. The governments and the institutions that are in charge of education affairs should invest funds to finance the creation of new AI technologies that will be developed for use in inclusive classrooms. Such funding should be geared towards initiatives that support needy learners and learners with disabilities and encourage fairness in the deployment of artificial intelligence in learning processes.

The safeguarding of the ethical application of AI in learning institutions, therefore, requires a policy-related approach. Such recommendations should focus on problems like the excess of bias in an algorithm, the protection of personal data, and the optimal degree of incorporation of AI into the learning process. They should also offer the frameworks for the continuous examination of the ethical implications of using AI systems in learning and should also map channels for reimbursement in case destructive or questionable effects from AI systems are produced (Holmes et al., 2019).

Artificial intelligence, combined with multimedia conferencing, is bridging collaborative spaces from physical barriers to potential spaces of free group work. Policies should also support collaborations to mobilize different forms of knowledge to build, deploy and use AI in education for all. It will also be beneficial in facilitating a rapport for the proper implementation of AI in education by conforming with the best practices of education as well as the needs of the learners (Luckin et al., 2016).

The use of AI in IE and its advancement should be encouraged by policymakers, and there should be provision for collaboration and knowledge sharing with other countries. Nonetheless, since the advancement of AI is international, policies need to encourage international cooperation, data sharing, and the development of common standards for the use of AI in education. Such cooperation can lead to faster advancement and contribute towards sharing the best practices with the community at large (Tuomi, 2018).

These policy implications and recommendations serve as a guide in developing an environment that will support the utilization of AI as a tool in the teaching-learning environment to enhance effective and innovative pedagogy in inclusive classes. Thus, addressing these areas will enable policymakers to ensure that AI technology will actually provide students with educational opportunities irrespective of their abilities and backgrounds.

11. Future Research Directions

As inclusive education advances with the help of AI, some important issues are to be further researched to enhance the effective use of AI and eliminate possible challenges.

It is important to examine the long-term effects of AI on learning and learning attainment for learners with disabilities. Thus, small-scale cross-sectional research studies should be followed by large-scale and, more importantly, longitudinal research studies to determine the long-term impact of using AI in teaching and learning on students' academic achievement, social-emotional well-being and post-school outcomes for all students. All these studies should be done on diverse populations of students across different educational environments to gain a diverse perspective on the application of AI (Reich & Ito, 2017).

Culture-sensitive AI for culturally diverse inclusive classrooms is, therefore, a potential area of research in the future. Cultural sensitivity is also another aspect that needs to be addressed in the development of AI systems, and this should entail the ability of an artificial intelligence system to avoid making biased decisions and to be relevant across the different cultural groups present in the world. This type of research should entail collective work with distinct communities in the development of AI that can foster an educated society bonded together in culture while at the same time implementing and embracing cultural diversity (Esteban-Guitart et al., 2020).

When it comes to the development of pedagogical practices in inclusive education, the possibilities of using, for example, the newest technologies like non-invasive brain-computer interfaces might seem very promising. In this area of study, technological advancements might allow students with severe physical impairments unprecedented ways of learning through assistive technologies. However, this research has to be conducted in line with the possible ethical issues and risks that can be encountered (Abdulkader et al., 2015).

Another important line of research is to explore the use of AI for learning for students with multiple or multiple forms of disability. As AI deepens, the ability to help students with very special and unique learning conditions also enlarges. Future studies should, therefore, aim to produce AI adapted to disability profiling in order to provide personalized solutions (Drigas & Ioannidou, 2013).

Due to the dynamic and complex nature of ethical issues in AI decision-making in education, there has been a need to carry out continuous studies and work on how to develop such frames. With AI systems increasingly involved with such decision-making aspects as resource allocation and learning model selection, strong ethical norms are a prerequisite. This research should answer questions of fairness, transparency and accountability in decision-making processes in learning facilitated by Artificial Intelligence (Papamitsiou and Economides, 2014).

This is underlined by future research directions that signal the continuation of research and development in the use of AI to support the education of learners with special needs. By

venturing into these areas of research, scholars shall make sure that AI-based technologies are brought into the education sector in a manner that will improve the opportunities for learners.

12. Conclusion

The use of Artificial Intelligence in the process of making education more inclusive presents a new view of how schools should be made efficient for students who have special needs. In this paper, we have seen how it is now possible to take a fresh look at what teaching with accommodations can mean by building AI technologies from the ground up.

From the examples above, we can see how users can be made to learn based on their needs and level, how students who have special needs can be made to learn, and how it can support group learning and peer encouragement. We have also discussed the benefits of AI for professional development and classroom management that can help teachers identify the needs of students in order to address them.

That said, while the integration of these transformative technologies is direly appropriate and capable of creating value on their own, social impacts and ethical concerns should not be neglected. Controversies of data privacy, algorithms, and self-governance should not lag behind in our implementation strategies. The concept we have shared for including AI in the creation of inclusive classrooms has stressed the triad of stakeholder engagement, ethical considerations and iteration.

AI can prove to become one of the most transformative powers in education by making a shift towards the inclusion of a true learning environment. We are given the great responsibility and potential of using these technologies consciously and properly in order to design learning environments and experiences that are liberal, flexible, and helpful for all people who come for education and learning, no matter if they have some disabilities or are from disadvantaged backgrounds.

Therefore, as we contemplate the future, the distinct responsibilities of educators, researchers, policymakers, and technology developers will have to come together to unlock this potential. The only way to move forward is to keep pushing the field of research in new AI approaches and the development and application of inclusive artificial intelligence systems for learners with every possible need and background.

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