Leveraging AI for Inclusive Education for Student with Learning Disabilities

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Understanding Learning Disabilities

Imagine yourself struggling with reading and writing at a young age as you start to feel confused and out of place when trying to make out the letters and words on the paper that seemed so easy for everyone else. Later you are diagnosed with Dyslexia, Auditory Processing Disorder (APD), or Attention Deficit Disorder (ADD) not knowing what any of those terms means. Now, imagine yourself as a child who only spoke Spanish, being forced by well-meaning teachers in the Individualized Education Program (IEP) to make a choice where you could continue learning in your native language or switch to English, the language of your new home in the United States. Yet you had to choose English at the cost of forgetting Spanish, leading to feelings of isolation and frustration. Well that was my reality. I dreamed of a day when technology could bridge educational gaps and provide better resources to help you learn more effectively. I recognized that many students with learning disabilities go undiagnosed. The journey to diagnosis is often long, difficult, and expensive contributing to many students falling behind and discouraging many from seeking help, yet according to the Learning Disabilities Association of America, "1 in 5 individuals in the United States have learning or attention issues" (Barto, 2017). For such a shocking statistic especially when most individuals do not have the means or resources to undergo diagnosis. Drawing from my own experiences and the general needs of the community, my paper will answer how Artificial Intelligence (AI) can create an equitable solution to make education better and more fair for people with learning disabilities. I will use the idea of a "Paradigm Shift" to help us understand how changing our education system's usual methods can lead to better and new ways of helping students learn.

It is important to understand the problems that students with disabilities struggle with. Neurodivergence is when someone's brain processes, learns, or behaves differently from what is considered typical. Before the concept of neurodivergence people with learning disabilities faced the misconception that there was an issue with their intelligence or motivation when it really meant their brains' process information differently making certain subjects difficult. The most common learning disabilities consist of having trouble with reading/writing comprehension, poor organizational skills, memorization and trouble following classroom discussions. However, "the traditional education system often focuses on learning through memorization and retaining information from long lectures, rather than teaching critical thinking, problem-solving, and creativity, which are essential skills for success in an ever-changing world" (ChimpVine, 2023). Memorization learning methods are insufficient for students with ADHD, Dyslexia, Autism, Dyscalculia, etc which is why it is important to formulate equitable solutions for improving educational systems for individuals with both intellectual and physical disabilities. Solutions started to arise as schools started to shift to online learning due the pandemic and relying more on technology as an educational tool.

The Paradigm Shift is an STS framework that refers to a fundamental change in the underlying assumptions, practices, or beliefs within a particular field or discipline. For instance, when community shifts our usual way of thinking or doing something and replaces it with a new different way that can be a paradigm shift (Merriam-Webster, 2024). There have already been successful examples of a paradigm shift in the science revolution which will be explained in the analysis section. I plan to use the framework to suggest that technological advancements can lead to a shift in how problems in our education are understood by students with learning disabilities

and find long term solutions. A shift in paradigm depends on re-evaluating the definition and connotations of learning disabilities as there is an increase in recognition of students with learning differences. Instead of viewing disability as a barrier to learning it is crucial to shift our mindset to one that embraces inclusivity, accessibility, and personal learning opportunities for all individuals. By eliminating the mindset of one-size-fits-all education and leaning towards customizing content for students' preferred learning methods it can bridge the learning gaps and accessibility in schooling systems nationwide. A paradigm shift towards embracing technology will play a pivotal role as an enabler of equitable education.

Supportive Background Information

The vast information used for this paper is meant to explain the integration of Artificial Intelligence (AI) to enhance inclusivity in education for students with learning disabilities. The information comes from various resources including academic articles, research papers, and case studies that mainly talk about the injustices in our education system today, the main issues individuals with disabilities face and what accommodations have already been made. The introduction describes the personal and worldwide challenges within the United States educational system and later emphasizes the need for a paradigm shift to achieve more adaptive and equitable methods of teaching and learning. It then progresses into a detailed analysis supported on how current inclusive programs are being implemented in classrooms and whether it is an effective solution or not. The essay is structured around the following main key areas: the paradigm shift in educational practices, supportive backgrounds in technology adaptation, and insights into how AI is currently being applied. Keywords such as 'Artificial Intelligence', 'inclusive education', 'learning disabilities', and 'Universal Design for Learning (UDL)' were used

to find the resources needed to facilitate a discussion with relevant academic and practical facts. The results and discussion highlights how AI can address educational inequities while also emphasizing the need for advanced digital tools in redefining learning environments. The gathered information below and the way it has been organized is supposed to seamlessly connect the introductory content to the complex deep analysis that details the exploration of AI's role in revolutionizing education for neurodiverse learners.

Current Education Systems

During the COVID-19, schools nationwide struggled to provide the necessary support and service for students' learning needs. The pandemic initiated advancements in learning technology that facilitated learning remotely which broke distance barriers and provided access to educational opportunities for individuals especially for those who may have difficulty attending classrooms due to physical disabilities. Virtual classrooms, online tutoring services, and teleconferencing tools enable students to engage in learning activities from the comfort of their homes, fostering inclusivity and flexibility in education. However, there was a significant learning loss that resulted from long-term online learning especially for marginalized students with disabilities. Since “low-income families are less likely to have access to the internet and the necessary technology for virtual classrooms”(Easop, 2022) it makes it harder for them to effectively learn the material. Students who do not have reliable internet access or modern devices cannot benefit from technical resources, which widens the gap between them and their more advantaged peers. The disparities in access to technology, often referred to as the digital divide, exacerbate educational inequities. Students who do not have reliable internet access or

modern devices cannot benefit from AI resources, which widens the gap between them and their more advantaged peers.It started to raise concerns about the failure of our education system towards accommodating students with disabilities. There have been initiatives to disperse instructional material for students with disabilities, however, most parents were not receiving them. If parents are given the proper resources and information they can put their children in Individualized Education Programs (IEPs) that are meant to accommodate their needs and insure academic success.

Most education systems have IEPs for students with learning disabilities(LDs) who require special education that provide benefits such as adapting academic content, modifying instructions, extending time on assignments on top of frequent support in a particular academic subject by a special instructor. One of the key focuses of an IEP is the customized learning programs which can provide for "[s]tudents with learning disabilities [that] may need information explained in several ways. Depending on the nature of the specific disability, the student may benefit from oral instruction, written instruction, or demonstration" (Johnson, 2024). IEPs provide a solution to accommodate the different learning strategies that are supposed to guarantee students with LDs success by accommodating their unique learning styles. Additionally, it is important to promote IEPs to create a welcoming and supportive environment where students have access to necessary resources and help level the playing field academically. In order to create a welcoming environment there needs to be an overall collaborative effort from parents, teachers, and specialists. Collaboration not only guarantees that the student's needs are met but also creates a network of support to encourage the student's overall well-being. However, it is still good to have that balance in providing students with adequate feedback and constructive

criticism while offering proper adjustments to help improve their learning experience. Without a balance, IEPs can very quickly become ineffective for the student.

Evolution through the Paradigm Shift

When reading "Science-Technology-Society(STS): A New Paradigm in Science Education" by Nasser Mansour, a paradigm shift was used to evaluate and improve the science curriculum to what it is now versus to how it was structured in the 19th century. At the time, science was focused on a collection of specific disciplines such as biology, chemistry, and physics and retaining knowledge based on memorization. However, Thomas Kuhn argues that science does not follow a linear accumulation of knowledge and facts but goes through periodic revolutions based on scientific outlook. Through Kuhn's studies, science curriculum theorists believed that the best method to increase student engagement in a specific subject is to "render it worth knowing, which means to make the knowledge gained usable in one's thinking beyond the situation in which the learning has occurred" (Bruner, 1960, p.31). What Bruner is saying is that students will be more interested if teachers start to relate concepts to real world examples, integrate in class practice, and try different methods of teaching other than lectures. Implementing engaging and interactive learning content is ultimately up to the teacher. "The success of science education reform depends on teachers' ability to integrate the philosophy and practices of current programs of science education reform with their existing philosophy."(Mansour, 2004) Teachers have to consistently evaluate and observe their students' academic progress and determine what teaching methods are the most effective. However, if there are facts and statistics given by newly made technology that proves students would learn

science better by changing the way it is required to be taught then school administrators and teachers can adopt a new change in the current curriculum thus creating a paradigm shift. The evolution of science education goes hand in hand with revolutionary advancements in technology and how it is intersected into our daily lives. If more schooling systems start implementing technology there will be another paradigm shift in our current education system which will play a pivotal role in personalized and accelerated learning for all students.

Technology allows students to have customization of education, which can help meet the diverse needs and abilities of students with disabilities. As of today there have been adaptive learning platforms, interactive multimedia resources, and assistive technologies that are being utilized to create personalized learning pathways that cater to individual learning styles and accessibility requirements. A good example of adaptive learning is artificial intelligence for education (AIEd) that can automate provision of learning support by using data and machine learning to identify students' affective states: engagement, boredom, and frustration (Standen et al, 2020). “Coding assessment tools provide educators with a wealth of data that can be used to inform instruction. For example, teachers can use data from formative assessments to adjust their teaching methods in real-time based on student needs” (Bouchrika, 2023). Formative assessments provide valuable insights into students' learning progress and challenges through analyzing data. Most “teachers use formative assessments more than any other type, checking for understanding throughout the learning process. This allows them to adjust their teaching and learning activities to better meet student needs and find out which students need a little extra assistance.”(We are Teacher Staff, 2024). Educators can identify areas for improvement and tailor instructional strategies to individual needs by collecting and analyzing data on students' performance and engagement. It depends on the teachers' adaptability in trying to understand the

digital tool and utilize it to their best ability. Technological assessment have already started to help teachers make data-informed decisions to support students' learning outcomes which is why education system should continue to embrace technology,

By embracing technology as a catalyst for change and adopting a paradigm shift towards equitable education, learning environments can empower individuals with disabilities to reach their full potential. However, to achieve change requires a commitment to innovation, collaboration, and continuous improvement to make sure that technology is effectively being utilized to support the diverse needs of all learners. An important factor is making sure that technology is accessible for all communities. “Technology is a tool that can assist in the transitions needed for 21st-century learners. Incorporating the devices that students already use into educational programs will be critical to the future direction and success of schools. And making school buildings and - networks accessible to these devices is as crucial as training teachers and staff to incorporate the devices into personalized learning programs” (Grant & Basye, 2014, p.108). So it is imperative to embrace a paradigm of universal design that ensures that educational materials, tools, and environments are accessible to all learners, regardless of their abilities or disabilities. Technology can be used to develop and implement accessible learning resources, such as screen readers, captioning tools, tactile interfaces, and alternative input devices, ensuring that individuals with disabilities can fully participate in educational activities.

Results and Discussion

Research Question

How is Artificial Intelligence being used as a tool to facilitate an inclusive learning environment for students with learning disabilities?

Equity for Students with Learning Disabilities

Learning disabilities(LDs) are a mental impairment that affect the way students process information which is why school administration needs to enforce tailoring education to meet the diverse needs of learners. To provide an equitable solution for the educational challenges students with learning disabilities face it is imperative to integrate inclusive education to schooling systems nationwide through Artificial Intelligence. Educational challenges can be overcome by leveraging technology, such as artificial intelligence and online learning platforms, to prioritize customized support and inclusion for students with learning disabilities. Inclusion allows for initiatives like Individualized Education Program (IEP), Universal Design for Learning (UDL), and the integration of Artificial Intelligence(AI). The following initiatives are examples of actions taken by the disability movement towards achieving justice and inclusion for all brains and minds where students with LDs have the right to access personalized learning experiences that improves their academic success. However, adaptive learning programs are only successful if there is effective collaboration between students, teachers, and school administrators since they all play pivotal roles in shaping educational practices and policies. It is also important to address the advantages and disadvantages of current initiatives that have been

implemented as well as the accessibility of modern technology to ensure that educational endeavors are truly inclusive and beneficial for all learners. Through embracing intersectionality and fostering collaboration among stakeholders hopefully there can be transformative improvements to our educational infrastructure and create a more inclusive experience for students.

Problems with Existing Accommodations

Despite the many advantages of IEPs stated in the supportive background section, it does unfortunately come with its challenges. One of the challenges people with learning disabilities often face is stigmatization and misunderstanding which can negatively impact a student's self-esteem and academic growth. The stigma associated with having an IEP is often based around students with learning disabilities being labeled as different or less intelligent, which can affect their overall confidence in their academic performance and themselves. Labeling and stereotypes can contribute to a "significant disadvantage tied to the IEP is the concern that students might not be pushed to their limits. The intention behind accommodations is to level the playing field, but there's a risk that educators might, consciously or unconsciously, set the bar lower for IEP students." (Farmer, 2023) When faculty and classmates have low expectations of students with learning disabilities it can create an environment where the student does not feel supported or capable of succeeding, which ultimately hinders their academic development. Professors should aim to find a good balance between providing students accommodations and making sure students are getting challenged enough.

However, with that being said, navigating the complexities implementing an IEP can be a burden for families that can lead to emotional strain and doubt from the student in question

about the effectiveness of the process. The lack of resources and burden lead to only “6% of students with special needs are in an inclusive program”(Adam & Harris, 2016) such a low percentage presents a disparity that brings forth a bigger problem on the systemic issues students face. The most difficult aspect of IEP is being placed in the program at earlier learning stages since you have to be formally diagnosed by a psychiatrist with a series of tests. The accessibility of disability testing remains a problem as the process can be unaffordable and time-consuming, which is why it encourages collaboration between teachers, parents, psychologists, administration and politicians. Additionally, educators have to explore the availability and effectiveness of support services and accommodations including assistive technologies and adapted learning materials is crucial. However, a huge issue is the costs associated with technology-based education such as software subscription and internet connectivity which can be pricey for some families. In addition, educators also often face challenges in implementing inclusive practices with AI due to limited resources and lack of training. Integrating AI tools effectively requires substantial training and ongoing support, which may not always be available or prioritized within school budgets. In spite of this, not having enough funds streamlining into the education system to provide the necessary classroom accommodations to integrate technology that would benefit every student is why there continues to be disparities for individuals with LDs. Effective collaboration between educational stakeholders can be an example of how promoting intersectionality and the implementation of technology is the first step towards achieving a paradigm shift in providing inclusive education.

Intersectionality between Educational Stakeholders

While reading "Reconstructing the Paradigm of Learning Disabilities: A Holistic/Constructivist Interpretation," author Grobecker question the nature of knowledge acquisitions assessments being based on mental structure of relational thinking Technology challenges the “assumptions regarding the nature of knowledge acquisition as well as assessment and remedial techniques that are derived from such a paradigm” (Grobecker, 1996). By using a paradigm shift to approach the question of improving education systems for individuals with disabilities by considering a fundamental change in the approach to education. In terms of how to best accommodate their needs that is dependent on the intersectionality of all stakeholders. Intersectionality between educational stakeholders and addressing the challenges faced by students with learning disabilities can create a more inclusive and equitable learning environment to address the challenges faced by students with LDs.

Once our society shifts their perspective away from the notion that learning disabilities (LDs) come from a lack of intelligence which is a common misconception but instead focuses on how students process information within their current educational frameworks then a paradigm shift is created. People who understand the current problem of inclusion in our education system support disability rights are starting to advocate for adaptive thinking over merely honing specific skills. Once other educational stakeholders can see the problem at hand and shift their mindset towards finding a solution that will make it one step closer to changing the current education system as a collective. It is imperative for all stakeholders to practice effective collaboration by first working towards the same goal to help provide meaningful education for the students with LDs and commence a movement towards disability justice. In order to adequately plan an IEP program both teachers and parents need to have proactive

communication to be able to discuss ways of improving student performance and make an equal effort to come up with adequate learning strategies (Adams & Harris, 2016) . The teacher is responsible for observing and identifying children's shortcomings while the parents should try to provide internal support both financially and emotionally to properly support the needs of their child. Teachers should implement inclusive teaching practices within their classroom by collaborating with specialists such as psychologists to support students with disabilities. Psychologists are meant to provide valuable and crucial insights into the cognitive and emotional needs of students with LDs.

Teachers have to collaborate with the child's parents in order to inform them of the difficulties that the child may face as well as finding effective interventions and support strategies to help with their academic development. Another important stakeholder are school administrators who play a key role in allocating resources and establishing policies that promote accessibility for students and equity in education. Lastly, there are politicians who advocate for educational policies that can improve our education system but that means prioritizing funding and resources for inclusive education, ensuring that all students have access to the support they need to succeed. The perspective of embracing inclusion emphasizes the importance of understanding students' unique ways of learning rather than just correcting perceived deficiencies. Most people with disabilities do not see themselves as damaged but see themselves as having differences that need accommodations by a society that is unaccepting of them. Most of the time parents would rather seek a cure for neurodivergence when society should be taught to celebrate neurological differences and come together to provide resources, accommodation, and opportunities to make others feel included rather than isolated. In achieving true collaboration there can be a fundamental change in our fixed mindset from people with learning

disabilities as someone who is damaged in need of care to a contributing member of society who can bring another perspective to the table that others can not. An alternative is for school administrators to advocate for implementing Universal Design for Learning compared to parents sending students to an Individualized Education Program (IEP) already in place for the majority of schools.

Universal Design Learning

One effective way to achieve accessibility is having universal access to an inclusive design that promotes an equitable educational experience for all learners, regardless of their backgrounds or abilities. Universal Design Learning (UDL) emphasizes adaptive thinking and inclusivity and has been the stepping stone to "inclusive design approaches [that] are being applied to change the way that education systems address learner variation, support accessibility, and enable teachers to be more effective in achieving inclusion" (Dalton & Gronseth, 2019). If there is a shift towards embracing inclusive instructional design principles educators can ensure that learning materials and environments facilitate the diverse needs of all students, including those with disabilities. For instance, the effectiveness of teacher-parent collaboration across different schools internationally, especially the inclusive programs in Malaysia's education system, can be an exemplary example in ensuring the success of UDL for all students. The Malaysian school approach emphasizes proactive measures to remove learning barriers rather than imposing accommodations. If the schooling systems implemented various means of representation, engagement, and expression then course materials would be more inclusive and accessible to a broader range of learners. For instance, integrating assistive technology into

English curriculums can play a critical role in empowering students by providing tools such as text-to-speech software, screen readers, and alternative input devices.

Adaptive learning technologies, such as AIEd systems, cam utilize data analytics and machine learning to customize learning experiences effectively as it allows for real-time adjustments in teaching methods based on individual student performance and engagement levels, as highlighted by researchers like Standen et al. (2020) and Bouchrika (2023). Such tools not only facilitate personalized learning but also promote equitable educational opportunities by accommodating diverse learning styles and needs. By advocating for a paradigm shift towards a technologically inclusive education system there can be a potential transformation in our learning environments. A shift not only aims to enhance educational outcomes for students with disabilities but also supports the broader goal of achieving equity in education through continuous innovation and adaptation. As Grant & Basye (2014) suggest, integrating accessible technologies and practices is crucial for preparing all students to succeed in a rapidly evolving, digital world. Integrating accessible technologies proposes a paradigm shift in itself as it achieves the goal to have a more inclusive and technologically adept educational system. Thus, embracing artificial intelligence as an assistive technology is not just beneficial but essential for fostering an educational environment where every student has an opportunity.

Artificial Intelligence used in Education

Artificial intelligence(AI) is a recent technology that lets computers mimic human intelligence and perform common tasks commonly and solve problems. leveraging AI in education can further strengthen the paradigm shift as it offers assistance and adaptive learning

experiences tailored to individual student needs. AI generated algorithms help analyze students' learning patterns, preferences, and challenges, providing personalized recommendations and interventions in real-time. Furthermore, online platforms can offer interactive tools which cater to different learning methods and enhance engagement for students with learning disabilities. Online platforms have started to have accessibility tools that "typically include a magnifier, colour overlay, and highlighter. [Online assessments] also allow self-paced progress through the test and offer functionality, such as the ability to listen to audio multiple times" (Taylor & Banerjee, 2023). Implementing online tools into the English curriculum can create interactive and accessible learning experiences for students with dyslexia and ADHD. Assistive technologies let students with learning disabilities navigate educational content more effectively while encouraging them to be less codependent on special instructors on their learning journeys. Overall, AI has the capability to enhance personalized learning experiences and align perfectly with the goal of achieving educational equity through continuous innovation.

Additionally, the integration of AI "tools, such as text-to-speech programs and writing assistance software, offer innovative assistive features that help overcome the challenges associated with dyslexia and other learning difficulties" (Paz, 2023). AI tools provide real-time feedback, suggestions, and corrections, enhancing writing skills that will boost student's confidence. The real time data can provide valuable insights on student learning and help professors to gauge students' progress and areas of improvement allowing them to adjust their curriculum to meet diverse learning needs effectively. In spite of this, it is crucial to implement early intervention facilitated by AI-based assessments as it enables the timely identification of learning disabilities, allowing for prompt interventions and support mechanisms. However, there are potential risks associated with the use of AI tools, such as the risk of students being way too

dependent on AI to the point they are not retaining any knowledge. It is important for teachers to maintain a balance between providing students too much assistance and providing them just enough resources to develop their own learning skills.

Disadvantages to Artificial Intelligence

The possibility of over-reliance and dependence on AI can lead to learning loss rather than academic development. Over-dependency occurs when students have become accustomed to the assistance from AI and it inhibits their ability to think independently and solve problems without technological assistance.RAI tools that provide immediate answers or extensive support can lead to students being laziness when it comes to completing assignments and no longer engaging deeply with content to understand or solve it independently. Students might find it easier to let AI do all the hard work such as analyzing texts or solving equations, however "[r]elying too heavily on AI can lead to weak understanding of complex systems and processes" (Yasar, 2023). As students start to rely more on technology rather than their abilities it will start to hinder their overall learning due to lack of use of fundamental skills like calculations and reading comprehension. Educators are going to have to find a balance where AI complements traditional teaching methods without replacing them. Using AI as a tool rather than a crutch helps prevent dependency by ensuring that students continue to develop independent thinking skills and problem-solving abilities. Another suggestion is to implement UDL simultaneously with AI assistance as it can help mitigate some of the disadvantages of AI by promoting inclusive teaching practices that accommodate the diverse needs of all students, not just those who can access and benefit from AI.

Another factor to consider is the potential disadvantages and barriers that students with learning disabilities face when trying to access artificial intelligence (AI) in the education system. One of the big disadvantages is that not all technology is designed to be accessible which excludes certain students from accessing certain educational resources. “Educators often face challenges in implementing inclusive practices, such as limited resources, lack of training, and the need for individualized support” (Hoole, 2023). For instance, disability evaluations are not always accessible to all students due to the amount of money that goes into paying for a family physician to assess the patient's disabling conditions on top of the money needed to provide the child with the right resources such as tutoring and medication. There is disparity for low income families with children with learning disabilities as many are unable to access the resources for their child to succeed which creates a barrier known as the digital divide. A digital divide contributes to inequities in education, particularly for students from marginalized communities. The most common disparities are the access to technology and internet connection. An equitable solution would be to implement UDL which promotes inclusive teaching to accommodate all students' learning needs. Through adopting inclusive instructional design principles, education systems can ensure access to educational resources for all students, regardless of their abilities or backgrounds.

Conclusion

In conclusion, I believe that artificial intelligence has the potential to revolutionize the way individuals with learning disabilities are taught and lead to a more fair and inclusive education system that caters to the unique needs of every learner. Using personalized learning

algorithms from an early age can help gain valuable insights into each student's learning style and provide educators with the right resources. However, it is important to keep in mind that there are potential downsides to using modern technology in education, such as accessibility issues and over-reliance. It is crucial to address the risks of over-reliance and the economic and accessibility barriers that could negate the benefits. Once the challenges are overcome then it is possible to consider how AI can be integrated into curriculums to ensure that all students have equal opportunities to benefit from learning technologies implemented by educational systems. While AI can be used to enhance learning it is essential to not compromise the development of critical thinking and problem-solving skills. It is up to everyone involved in education, including psychologists, politicians, teachers, and school administrators, to work together to address the challenges that come with AI and ensure that every student has access to a high-quality education. Ultimately, inclusivity and prioritizing personalized support can create a learning environment that empowers individuals with learning disabilities to reach their full potential and achieve academic success. Moreover, the integration of AI and online learning can provide promising opportunities and solutions to creating a more equitable and inclusive learning environment that are needed for individuals with learning disabilities. AI not only supports but significantly propels the paradigm shift towards a universally accessible and equitable education system.

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