Barriers and Benefits for Learning Disabled Students in Digital Learning Environments

R. Bryan Barrineau

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The world that educators and students live in today is inescapably informed by and engaged with technology. Technology has forever changed education; neuroscience research-informed pedagogy through the fMRI, the internet both aiding and abetting educational efforts at a distance, and even the Apple IIe in every classroom of the early 1980s.[[1]](#endnote-1)[1] The advent of the internet was one of the most significant educational innovations since the invention of the printing press.[[2]](#endnote-2)[2] The internet, used for education in various ways, is collectively categorized as digital learning environments (DLEs).[[3]](#endnote-3)[3] The advent of DLEs, especially in light of the global Covid pandemic, has opened up many pathways for learning content to be delivered to students.[[4]](#endnote-4)[4] The digital learning environments were a boon to teachers and students separated because of shutdowns and quarantines. These DLEs allowed teachers to deliver learning content and students to digest this content. Despite the benefit of these new channels for educating students, students struggle in a typical classroom and saw this struggle transferred online; those diagnosed with learning disabilities. These learning delivery methods come fraught with possible issues for traditional students, but the relationship is far more complex and varied for learning disabled students. This complex relationship of digital learning for students with learning disabilities is informed through what neuroscience has taught us about how students learn, which is different for those with learning disabilities. Higher education students with learning disabilities that engage in digital learning environments see this varied and complex relationship exemplified in both barriers and benefits to effective learning.[[5]](#endnote-5)[5]

The invention of the internet was not the only technology to shape education in the twentieth and twenty-first centuries. The furthering of neuroscience research and its application to educational theory and pedagogy has far reaching implications.[[6]](#endnote-6)[6] The research conducted on the brain and how people process stimuli during learning has foundationally changed how educators understand learning.[[7]](#endnote-7)[7] However, this research is not complete. Researchers continue to discover more about how the brain processes and stores stimuli and how this process affects learning.[[8]](#endnote-8)[8] Research into neuroscience and learning has intensified with digital learning environments growing as a viable way of delivering content and fostering student development.

The integration of neuroeducation research and technology has significantly changed educational theory's trajectory in the twentieth and twenty-first centuries. Neuroscience research into neurodiversity in students has discovered that some students’ cognition is altered.[[9]](#endnote-9)[9] These students are diagnosed as having learning disabilities (L.D.s). L.D.s are defined by the Learning Disabilities Association of American are,

Learning disabilities are due to genetic and neurobiological factors that alter brain functioning that affects one or more cognitive processes related to learning. These processing problems can interfere with learning essential reading, writing, and math skills. They can also interfere with higher-level skills such as organization, time planning, abstract reasoning, long or short-term memory, and attention.[[10]](#endnote-10)[10]

Students with learning disabilities can struggle in a typical classroom due to a lack of educational strategies meeting the needs of a neurodiverse cohort of students.[[11]](#endnote-11)[11] This disability can manifest as a deficiency in core subjects or deficiencies in life skills needed to function in everyday life.[[12]](#endnote-12)[12] However, students with learning disabilities are not a cohesive group for research and practice.[[13]](#endnote-13)[13] Many of these students need accommodations in order for them to learn on an equal footing with students in the same classroom who do not have learning disabilities. In 1975, the passage of what is now known as the Individuals with Disabilities Education Act (IDEA) meant every student diagnosed with a disability would have the opportunity for "a free, appropriate, public education (FAPE) in the least restrictive environment.”[[14]](#endnote-14)[14] These students were guaranteed an education on par with students who did not suffer from learning disabilities.

**Research Question and Thesis**

The three aforementioned areas of educational innovation over the last forty years interact with and aid students with disabilities to attain an equal opportunity for education.[[15]](#endnote-15)[15] The fact remains that there would have been no need for passage of the IDEA in 1975 if L.D. students already attained an equal education as non-disabled students. In the intervening decades, the importance of neuroscience-informed education and legislation to level the educational playing field for students with learning disabilities has grown.[[16]](#endnote-16)[16] The IDEA has guaranteed, through legislative action, that students with disabilities have open and equal access to education. Neuroscience research has helped us to understand better how the brains of students with learning disabilities process and store information. The internet has helped students find new educational avenues for learning that accommodate their learning disabilities.[[17]](#endnote-17)[17] The advent of digital learning environments informed by neuroscience research have highlighted barriers and benefits to effective learning for those students with learning disabilities.

**Toward A Theology of Educating Those with Learning Disabilities**

 Christian education aims to teach God’s truth locked away in the heart and mind and for that learning applicable to everyday life. God’s truth is truth that sees life change through proper belief (orthodoxy), concrete practice (orthopraxy), and right feelings (orthopatheia).[[18]](#endnote-18)[18] However, a Christian educator must consider what happens when a disability prevents students from engaging in orthodoxy, orthopraxy, or orthopatheia because of a disability. This inability on the students' part is not necessarily because they do not desire to draw close to God, but because of the unique way God has wired the neurons in their brain to fire and retain learning.[[19]](#endnote-19)[19] Suppose Christian educators believe that humanity is created in the *imago Dei*. How do the Bible and theology inform pedagogy to understand and educate students that have learning disabilities? If this question is answered honestly, institutions of Christian higher education have a biblical, moral, and legal obligation to educate and minister to those with disabilities, even in digital learning environments.[[20]](#endnote-20)[20]

The Bible does not explicitly mention educating students with learning disabilities. However, the themes of caring for the lowly are interspersed through the whole counsel of God's Word. Jesus tells us that whatever is done for the least of these is done for Him.[[21]](#endnote-21)[21] This verse does not explicitly mention learning disabilities. However, students who struggle with routine tasks because of a disability could very quickly be considered the "least of these" that Jesus mentions. This verse magnifies the investigation in light of Psalm 139:13-14. God has remarkably and wonderfully created people with learning disabilities. These verses tell us God was the author of each person’s specific creation, and he saw their purpose before birth. This view of creation leads teachers to acknowledge that every student is a precious creation of God, despite any learning disabilities. God gave educators a specific calling to help shepherd and care for students who have learning disabilities.[[22]](#endnote-22)[22] This calling to educate others for the glory of God, an example of which can be found in Deuteronomy 6, does not discriminate when it comes to disabilities.[[23]](#endnote-23)[23] God created humanity and called teachers to educate, which leads to the assumption that despite disability, all people can learn.

 The theology of educating the “least of these” mentioned above has led to creating a branch of theological study called disability theology.[[24]](#endnote-24)[24] This branch of theology is based in the *imago Dei*.[[25]](#endnote-25)[25] The study of theology and disability is not new, evidenced by the disciples asking about sin and disability in John 9.[[26]](#endnote-26)[26] Disability theology is also present in the writings of early church theologian Augustine and the eighteenth century writing of John Calvin.[[27]](#endnote-27)[27] The writings of those who have discussed disability theology center on considering the *imago Dei* and disability are not mutually exclusive.[[28]](#endnote-28)[28] Deborah Creamer posits that when considering disability and the *Imago Dei*, one should use a limit model. Creamer states,

Approaching our understanding of humanity from the starting point of disability gives us a more applicable (or "normal," in terms of what is seen across the scope of the human population) vision of human limits. Limits may then be compared and considered, but they are not seen as abhorrent or abnormal.[[29]](#endnote-29)[29]

This idea is the same that Jesus espouses in John 9 when answering the disciples. God has created those with disabilities in order to bring himself honor. Amos Yong continues this thought about disability by stating that the church, and by extension Christian education must support the “full inclusion of all and the reception of each contribution resulting in the enrichment and edification of others.”[[30]](#endnote-30)[30] Those with disabilities must be cared for not only by the church but by all Christian institutions. However, people with disabilities have been called by God to be full and complete members of God’s body.[[31]](#endnote-31)[31] In Christian education, this means that an effort should be made to educate a diverse group of people, just as Jesus did when he taught each person, “as much as they could understand.”[[32]](#endnote-32)[32] Disabled people can and will be used by God to bring honor and glory to himself in the church, education, and society. This is true in the church as well as in Christian educational settings.[[33]](#endnote-33)[33]

Christian higher education tasks include sharing God's general revelation, found in His creation, and his special revelation, found in God's Word, in a productive educational environment.[[34]](#endnote-34)[34] The fact that some students have learning disabilities does not absolve educators of the responsibility they have to teach their specific content area alongside the imperative to engage in spiritual formation with their students. The Great Commission instructs Christians to go and make disciples, baptize those that believe, and teach them what God has commanded.[[35]](#endnote-35)[35] This should be the foundational verse for how Christian educators approach students with learning disabilities. There are no qualifiers in the section where Christians are commanded to teach. The educator’s job is to care for the students and design an equal educational environment for all students to learn. God created each student, disabilities present or not, and called educators to care for and teach these students in an environment that fosters collegiality, belonging, and community in learning.[[36]](#endnote-36)[36] Institutions, and the educators who teach there, have a calling to care for them, regardless of disability.

Christian schools are called to educate all people, no matter their circumstances.[[37]](#endnote-37)[37] This education is a community effort where all people, students, educators, and administrators, should find a common purpose in being a part of the body of God.[[38]](#endnote-38)[38] A dearth of research illuminates how the IDEA interacts with Christian schools that offer primary or secondary education.[[39]](#endnote-39)[39] However, there is a disturbing lack of writing about Christian higher education and serving students with learning disabilities.[[40]](#endnote-40)[40] This does not mean that Christian colleges, universities, and seminaries are not serving students with disabilities. Nevertheless, because of Jesus’ model of minister to all people, Christian universities must be diverse, including those with learning disabilities.[[41]](#endnote-41)[41] Leaders of Christian higher education must be prepared to care for the least of these and institute programs that seek to meet the needs of those with learning disabilities.[[42]](#endnote-42)[42]

**Neuroscience and Learning Disabilities**

Neuroscience is the study of how the brain functions. For Christian educators, this study of the brain is foundational to understand how to educate students in light of the *imago Dei* and learning disabilities.[[43]](#endnote-43)[43] Suppose Christians believe that God is the originator and creator of humanity and that the brain is the center of human learning. In that case, this understanding leads to a need to understand how God created our brains to work to increase the efficacy of educational techniques. The study of our brains has produced educational innovations that come with an imperative for implementation.[[44]](#endnote-44)[44] Over the last ten years, the findings of neuroscientific research have been applied, with great success, in the realm of educational theory.[[45]](#endnote-45)[45] The linking of neuroscience research and educational practice is a subject too large to cover in this article. However, the basics of what this research has uncovered about how the brain engages in learning will be covered in subsequent paragraphs.[[46]](#endnote-46)[46] However, neuroscience research and educational practice can help educators progress to a certain point because of the complex nature of defining learning disabilities in students.[[47]](#endnote-47)[47]

 The study of how the brain learns is a study of memory.[[48]](#endnote-48)[48] The human body takes in sensory inputs, encodes those inputs into information that the brain can understand, and then moves to short-term memory. These sensory inputs can be one of two kinds of inputs; either visual-pictoral or auditory-verbal input channels.[[49]](#endnote-49)[49] There is a prevailing myth that individual learners only learn in one primary way; either auditory, visual, or kinesthetic. However, research has demonstrated significant interconnectedness and inter-modal transfer between the brain sections that process visual, auditory, and kinesthetic inputs.[[50]](#endnote-50)[50] The body will encode both types, but learning is more permanent when these signal inputs are encoded in a dualistic manner involving both types simultaneously.

 From the encoding process, these signal inputs move to short-term or working memory. The average person can only hold seven plus or minus two sensory inputs at a time in working memory.[[51]](#endnote-51)[51] These inputs are held in the working memory until the brain can decide the stimuli's value. Then, the brain recalls information stored in long-term memory to attach to these new sensory inputs. If the brain deems that this information is unimportant, then the inputs are purged from short-term memory. This linking of new inputs with inputs that have been recalled from long-term storage is called "prior learning activation."[[52]](#endnote-52)[52] This activation of prior learning strengthens the connection between mirror neurons in the brain and leads to more robust and longer-lasting learning connections.

 The next step in strengthening the learning in the brain is to lead students to recall information for practice through prior learning activation. This forces the brain to search the long-term storage to collect the relevant stored sensory inputs to put them into practice. This practice helps strengthen the connections between neurons in the brain and hard encodes the information for more extended storage. The more engaging the practice with these inputs from long-term memory, the more neuronal connections that are made, and the more enduring the encoding of this information is in long-term storage.[[53]](#endnote-53)[53]

 The question must be asked, though, how do people who have learning disabilities learn when their brains do not function normally?[[54]](#endnote-54)[54] The general process for sensory input intake and then moving them to short-term or working memory is not always automatic for those with learning disabilities.[[55]](#endnote-55)[55] The encoding processes present in the brains of students with learning disabilities encode certain stimuli differently than neurotypical students.[[56]](#endnote-56)[56] Those with learning disabilities all have specific areas of their brain that do not process and encode stimuli that those who are neurotypical do.[[57]](#endnote-57)[57] As stated earlier in the article, even though all students with learning disabilities are combined into one category, students with learning disabilities are not equal.

**Learning Disabilities: Equality and Access**

These differences found in individuals with disabilities can manifest in a myriad of ways. However, the IDEA enumerates 13 different categories of disability.[[58]](#endnote-58)[58] These are all included in the list of disabilities that the IDEA states that students will receive an equal opportunity at education. However, not all disabilities on this list involve an impairment in brain function or how the brain processes input signals. These disabilities broadly fit into two categories; those that involve the brain and those that are primarily physical. However, disabilities, such as traumatic brain injuries, include both neurological symptoms and physical symptoms. The vision and hearing impaired are similar as well. However, they have been included in the discussion for the confines of this article since their brains are not receiving stimuli from one or more significant senses and require accommodations. For the confines of this article, the primary focus will be on those disabilities listed in the specific learning disability category of the IDEA and other health impairments.[[59]](#endnote-59)[59]

For those tasked with educating those with learning disabilities, it is important to note how these students have equal access to education. Students identified to have learning disabilities in preschool through twelfth grade have an education plan crafted for them. This plan comes in the form of either a 504 plan or Individualized Education Plan or IEP.[[60]](#endnote-60)[60] These plans are designed to consider the students' disabilities and codify the classroom accommodations that the students are required by law to receive an equal level of education to a student unencumbered by a disability.[[61]](#endnote-61)[61] These plans are designed to reinforce the point that these students do not learn poorly but differently from the average student. A note must be made at this point about learning disabilities and students of higher education. There is no formalized IEP or 504 plans for higher education institutions to implement.[[62]](#endnote-62)[62] However, as a rule, colleges and universities have a student affairs office that will accept the IEP from a student primary educational institute and attempt to make accommodations to fit the college students' disabilities.[[63]](#endnote-63)[63] Educators must take note that because of the self-directed nature of higher education, specifically in light of the proliferation of digital learning environments, learning disabled students may find this transition problematic as they enter higher education on the eve of adulthood.

 The institute of higher education is called to task by the IDEA to create an inclusive and accommodating learning environment for the students with learning disabilities to engage in learning.[[64]](#endnote-64)[64] However, this transition from high school to college is not easy for students afflicted with learning disabilities. For most students with learning disabilities, receiving learning accommodations through IEPs and 504 plans were integral to their educational journey from elementary to high school. However, when they reach college, they are left to their own devices. One study, conducted in 2015-2016, focused on high school students making the transition to higher education while living with learning disabilities.[[65]](#endnote-65)[65] This study revealed that many of these students struggled during the transition to college because of a lack of self-directed and independent learning in secondary school. These students, who had accommodations in secondary school and guidance and special education departmental faculty to advocate for them, are now faced with the reality of learning how to advocate for themselves to receive accommodations in their post-secondary educational journey.[[66]](#endnote-66)[66] Further, this study revealed that every student was at least partially responsible for designing their learning accommodations depending on the severity of their learning disability. This transition is exacerbated when the student is wholly or partially engaged in learning through digital environments.[[67]](#endnote-67)[67] The absence of physical contact and the inherent increase in self-directed and independent learning in digital environments increase the neurological load on students who have increased stress loading in learning disabilities.[[68]](#endnote-68)[68]

These are the categories that necessitate consideration by educators when thinking through how students with learning disabilities can transition well into higher education and learn best in digital environments.[[69]](#endnote-69)[69] The educational landscape has significantly changed over the last eighteen months during COVID, emphasizing the proliferation of digital education environments. This proliferation threatens students, both in primary schools and colleges, with the inability to receive accommodations for their learning disabilities because of the lack of personal contact with administration and instructors. During digital learning environments, special attention will need to be paid to how education happens for regular students and those with learning disabilities.

**Digital Education Environments**

Digital learning environments are a reality of today’s educational landscape. DLEs were present before the spring of 2020 but are even more prevalent today after institutes of higher education had to move to strictly online classes during the Covid pandemic.[[70]](#endnote-70)[70] Most of society has received a crash course in learning through digital learning environments during the pandemic, but many do not know that this was not a recent trend. Distance learning has been present for almost a century, with digital learning environments being an almost 40-year-old subset as part of the larger distance learning category. [[71]](#endnote-71)[71]

Digital learning in higher education has changed immensely over the last forty years. The roots of digital learning environments can be found in first half of the twentieth century, which was through correspondence courses. However, correspondence courses were just the beginning of distance education, not digital education. Digital education first entered the cultural milieu in the 1980s with the proliferation of computers in education. K-12 classrooms across the nation had access to a classroom computer, and higher education saw the proliferation of computer labs. However, this still was not the advent of digital learning environments; this was just the beginning of computer-mediated learning environments. Educational use of the internet was the true beginning of digital learning environments. These environments began as asynchronous environments, where students accessed learning activities on-demand, but there was no ability to connect in real-time.

 Digital learning environments are designed for content to be delivered to students who are not physically present in the classroom for effective learning to happen. Educators should carefully consider engaging in any educational environment with students without a clearly defined pedagogy for digital learning environments. These learning environments that happen in digital spaces have seen a rise in the creation of digital-specific philosophies of education.[[72]](#endnote-72)[72] The creation of digital-specific pedagogical frameworks is also true of Christian higher education.[[73]](#endnote-73)[73]

 Educational research into neuroscience and digital learning environments have been combined to create new methods of engaging higher education students in learning. However, despite these new paradigms of digital learning, the equality of accessibility and accommodations that are legislated for in the IDEA are still present to ensure that students with learning disabilities have access to equal learning.[[74]](#endnote-74)[74] This access to equal learning is a goal of educators that are designing digital learning environments. The students with learning disabilities will experience both barriers and benefits to engaging in digital learning. The benefits and barriers can simultaneously be present in the same digital learning environment, dependent on the specific type of disability present in the student. However, these benefits and barriers can broadly be explained across a wide variety of learning disabilities. This way, the application of equality of education and accommodations made for specific learning disabilities can also be broadly explained, despite the varied nature of learning disabilities.

**Digital Barriers and Learning Disabilities**

The proliferation of digital learning environments has increased accessibility for the traditional higher education student, but equality must be raised when discussing the barriers inherent for student with learning disabilities. For example, during the Covid-19 pandemic, data from the U.S. census bureau showed an accessibility gap in access to technology and access to internet connectivity for students in lower-income brackets.[[75]](#endnote-75)[75] This gap in accessibility also presents itself when comparing traditional students with those students who have been diagnosed with one of the many types of learning disabilities. Each of the barriers that are discussed in the following paragraphs comes back to the issues of equality, accessibility, and accommodation. If Christian educators and higher education administrators believe that all students are "fearfully and wonderfully made," in the *imago Dei* then God has ordained that they must attempt to meet the educational needs and build bridges over learning barriers for students with equality and access in mind.

The study of education and neuroscience informs the way educators guide students in learning. Higher education in digital formats, because of the adult students, lends itself to a more dynamic form of education through self-directed and independent learning.[[76]](#endnote-76)[76] However, learning disabilities can become barriers to learning because of the neurological differences present in most students diagnosed with learning disabilities. These barriers manifest themselves in three main categories in digital environments; self-advocacy, self-awareness, and self-management.[[77]](#endnote-77)[77] Research has shown that most barriers for learning disabled students are intrinsic rather than extrinsic.[[78]](#endnote-78)[78] However, these barriers are accentuated in digital learning environments, separated physically from their peers and instructors. In the following paragraphs, these three categories will be discussed, emphasizing the specific barriers and their effect on practical and effective learning in digital environments.

**Self-Management Barrier**

Self-management difficulties can be a way in which learning disabilities manifest themselves in the lives of students. A deficiency with self-management means that students struggle with making executive decisions for themselves concerning their learning.[[79]](#endnote-79)[79] This difficulty can be manifested as indecision, stress, and anxiety for the student attempting to make educational and personal decisions for themselves. In addition, research has demonstrated that students with learning disabilities are more likely to struggle during their freshman year of college than students that do not have learning disabilities.[[80]](#endnote-80)[80] These struggles are enhanced during students' studies in higher education, especially digital learning environments because they are required to engage in a more independent form of learning as adults than they were required to do as children. This independence is exemplified through the student having to plan every aspect of their academic life; the need to schedule classes, time for study, adequate sleep, and social time are all contributing factors. This independent learning required of higher education students engaged in digital learning is fraught with distractions. It is made worse through the lack of a physical connection with peers and instructors in digital environments. Learning disabled students struggle when left to manage their learning with little to no physical contact with peers and instructors.

**Self-Awareness Barrier**

Self-awareness can be another significant barrier to effective learning in digital learning environments. This awareness of self for students with learning disabilities is simply knowing themselves and knowing how they best learn. This self-awareness involves knowing your strength, weaknesses, emotional tolerances, and anxieties.[[81]](#endnote-81)[81] The issue inherent in this is that, depending on the students' primary and secondary school experiences, they may not know what they need to succeed as students when they reach the higher education classroom. Students, especially freshmen, face a brand-new world of learning without a road map to understand their directions. This road map should include goals for learning and themselves, but many students do not know where to begin setting these goals. The self-awareness barrier is also present because these students have been introduced into a new world with more freedom and distraction. If students do not know themselves, they can get lost to interests, diversions, or other adverse reactions to this disability, which are all antithetical to the learning process.[[82]](#endnote-82)[82]

**Self-Advocacy Barrier**

Self-advocacy is another possible barrier to effective learning in digital learning environments. Students no longer have specified people in their school advocating on their behalf for accommodated learning; they must now advocate for themselves. This is why many students are silent about their disability when engaged in higher education classes.[[83]](#endnote-83)[83] As a result, they have received ridicule, outright refusal to help, and confusion from classmates and instructors in the past.[[84]](#endnote-84)[84] They are aware that many college instructors have never been trained on how to accommodate those with learning disabilities. Because of this lack of training, they are afraid to broach the subject with instructors.[[85]](#endnote-85)[85] They were aware of their need and engaging in digital learning environments, meaning that these students could not meet face-to-face with someone in the student services office.[[86]](#endnote-86)[86] Higher education students engaged in digital learning find being aware of themselves and how others perceive them as a possible barrier to effective learning.

**Emotional and Psychological Barriers**

The stress involved in learning in a traditional classroom is multiplied when attempting to learn in a digital environment with a teacher that is only present through a learning management system and videos, whether synchronous or asynchronous. In addition, these teachers may not know that the student has a learning disability unless the student chooses to disclose this disability to the instructor.[[87]](#endnote-87)[87] Learning disabled students involved in digital learning environments deal with an increased level of stress and a decided decrease in their view of personal success. The emotional and psychological weight of a sense of disappointment and lack of success has been proven through research to be present in all students with learning disabilities.[[88]](#endnote-88)[88]

**Overcoming Barriers to Effective Learning**

The preceding section has focused on the barriers to effective learning inherent with learning disabled students engaged in digital learning environments in higher education. However insurmountable the barriers to learning may seem, most can be overcome for those with learning disabilities. Proper coaching and preparation can overcome many barriers, but there needs to be a sense of perseverance and the knowledge of the ability to overcome for digital students with learning disabilities. There are some inherent benefits for these digital students as well as definitive ways to overcome these barriers.

**Student Directed Learning**

Student-directed learning may seem to be a barrier for those that struggle with learning disabilities when engaged in digital learning environments.[[89]](#endnote-89)[89] Students engage in DLEs are allowed to direct their learning and are given more freedom to advocate for themselves and the accommodations they need to learn effectively.[[90]](#endnote-90)[90] Digital learning environments allow students to assess the assigned work and develop a plan to complete this assignment. However, this can be difficult for students with severe neurological disabilities because every student and their learning disabilities are unique.[[91]](#endnote-91)[91] However, this allows students not just to learn the content for the class but also to structure their learning in way that promotes effective neuronal connections.[[92]](#endnote-92)[92] As these students become adults, they must learn the skills to be practical students, whether it is a physical, hybrid, or digital learning environment.[[93]](#endnote-93)[93]

**Use of Educational Tools**

Students must learn to use educational tools effectively to be more effective learners. This learning of tools must be evident in how students learn to deal with friction in their learning. So, how does a learning disabled student develop a plan to overcome learning difficulty?[[94]](#endnote-94)[94] In higher education, it becomes easier for students to electronically communicate with their instructor and peers through various means; video chat, LMS messages, email, text, among others, to communicate their learning disability, discuss accommodations, and develop a plan and goals for effective learning.[[95]](#endnote-95)[95] The student and instructor can develop a joint plan and goals for success that reduces the friction caused by the learning disability and leads to student success.[[96]](#endnote-96)[96] Developing these plans and goals also leads to a sense of accomplishment and self-worth for those with learning disabilities.

Accessibility through technology aids in effective learning that is improved through digital learning environments.[[97]](#endnote-97)[97] Digital learning environments allow instructors to deploy technological solutions that meet each learning disability where there is learning fiction and help to smooth the learning process. However, instructors must be willing to work with students to design accommodations that work.[[98]](#endnote-98)[98] Technologies that aid students with learning disabilities can be simple. Examples include a student with dysgraphia being able to type all of their work on a keyboard instead of writing. It could be as complex as a program that audibly reads all print words on a screen for a student who suffers from an auditory or visual processing disability.[[99]](#endnote-99)[99] Technology can seem daunting, but if applied correctly, it can effectively aid students in learning that is more permanent and reduce the stress of navigating accommodations for learning disabilities.

**Customization of Learning**

Effective learning for students engaged in digital learning environments also benefits from the customizable nature of learning in these environments.[[100]](#endnote-100)[100] Adult learners should be more independent and able to set their own learning pace; however, this process can be interrupted and prolonged through learning disabilities. Therefore, effective learning in digital environments must be thought of as customizable in order for the learning to be compelling indeed.[[101]](#endnote-101)[101] An example of this customizability is the differences between synchronous and asynchronous and a learning-disabled student being able to pick when they engage with online learning activities for a specific class.[[102]](#endnote-102)[102] This concept does not mean that students can decide what assignments outlined on the course syllabus are necessary and which are optional. However, it allows students with learning disabilities to customize how and when they access learning content in order to maximize the potential for effective learning.

A student's ability to customize the learning process in digital environments simply means that students have more flexibility in setting schedules, connecting with other students, and connecting with their instructors.[[103]](#endnote-103)[103] Students must learn how to prioritize their time and be diligent in scheduling learning tasks that are individual tasks. Students also can reduce distractions by engaging in digital classrooms instead of traditional classrooms. Without the distraction of other students, those students with learning disabilities can more easily focus on practical learning. However, research has shown that synchronous video learning is more difficult for the brain to encode learning and focus on the task at hand. This difficulty can be ameliorated through interleaving learning and practice and instructors using various learning tasks, both individual and group, to foster effective learning. Students and instructors must also be willing to connect outside of the digital classroom. One of the most significant benefits of digital learning is that there are fewer boundaries and time constraints for connecting between student and teacher.[[104]](#endnote-104)[104] For many students, this connection is not sought out, as digital learning environments can feel isolating. Students with learning disabilities many times will choose to stay anonymous and not disclose their disability or ask for accommodations.[[105]](#endnote-105)[105] However, not only should instructors advocate for learning, but they should also desire to see a connection to be made with students, especially those with learning disabilities. This connecting between student and instructor can lead to a smoother accommodation process and more effective learning.

**Conclusion**

The confluence of neuroscience and educational research, digital learning environments, and students with learning disabilities do not need to be a relationship fraught with peril and angst. Neuroscience educational research informs how students, both traditional and those with learning disabilities, are effectively taught and how they effectively learn. When applied to digital learning environments, these research-informed teaching and learning principles provide both educators and students with the tools to make digital learning effective. However, injecting students with learning disabilities into the digital higher education classroom is hardly a relationship without peril. An effort must be made to help care for the "least of these" in digital environments. In addition, efforts must be made to meet the goals for effective learning with students with learning disabilities. The onus for this process is not only on instructors and administrators engaged in higher education but also on the students. Students with learning disabilities must take on the responsibility for their learning and learn how to overcome, with the help of their institute of higher education, their learning disabilities to foster effective learning.

The confluence of Christian higher education, neuroscience and educational research, digital learning environments, and adults with learning disabilities is an area that requires further study. Future studies can research the compliance of institutes of Christian higher education with the IDEA legislation in digital learning environments. Also, the theology of Christian education intersection with learning disabilities in digital environments is another area that can be explored with further research. Lastly, it would be beneficial to research how institutions of Christian higher education are training their instructors to not only recognize learning disabilities, but also how those instructors are partnering with students to create accommodations to see effective learning happen. Research into these seemingly disparate pieces of Christian higher education are not only pertinent to the future, necessary to teach “as much as they could understand” as Jesus did.[[106]](#endnote-106)[106]

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| --- | --- | --- | --- |
| Name | Affected Area | Characteristics |  Educational Implications in DLEs |
| Auditory Processing Disorder | Processing or interpretation of sound in the brain | * Difficulty making sense of sounds
* Problems with blocking our background noise
* Trouble telling where sound is coming from
 | * Difficulty with video-based learning because extraneous noise (i.e., someone forgets to mute their microphone on a video call)
* Increased distraction depending on location of learning
 |
| Dyscalculia | Numbers and Mathematics skills | * Difficulty learning math facts such as symbols and place value
* Problems with counting
* Trouble telling time
 | * Online mathematics learning exhibits the same difficulty no matter the medium of instruction
* These are online programs that aid those with dyscalculia in mathematics.
 |
| Dysgraphia | Fine motor skills and handwriting | * Illegible handwriting
* Inconsistent use of letters
* Difficulty with spatial planning on paper
 | * The written difficulty in the traditional classroom is exhibited and even accentuated with technology-based learning. More time to complete assignments or alternate forms of assessment, such as presentations, are beneficial.
 |
| Dyslexia | Reading and language processing skills | * Reading slowly
* Difficulty decoding words, especially the order of letters
* Problems with verbal expression
 | * Screen based text accentuates the difficulty with reading.
* These are digital programs that aid those with dyslexia in reading.
* Text to speech apps aid in disseminating information to those with dyslexia.
 |
| Language Processing Disorder | Language Processing Skills | * Difficulty understanding meaning of spoken language
* Poor reading comprehension
* Problems with verbal expression
 | * These students will have difficulty with accessing the primary ways of delivering educational content in DLEs (video and reading). Allowing more time for digestion of content will help.
 |
| Nonverbal Learning Disabilities | Nonverbal skills such as motor, visual-spatial, and social skills | * Difficulty interpreting body language or facial expressions
* Poor motor coordination
* Trouble with multistep instructions

  | * Video based learning and technology-based expression are difficult. It may help to slow down instruction to afford these students more time to finish assignments.
* Simpler assignment instructions and single platform assignments help.
 |
| Visual PerceptualVisual Motor Deficit | Interpreting visual information or drawing | * Mistakes in writing, such as reversing letters
* Too-tight grip on pencil or other writing tool
* Poor hand/eye coordination
 | * These students benefit from the ability to use technology to produce assignments rather than writing.
* More time to complete assignments that involve hand eye coordination is a valid accommodation.
 |
| Other Health ImpairmentsSection 300.8(c)9 | Other health impairment means having limited strength, vitality, or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment | * Due to a chronic or acute health problems
* Affects a child’s educational performance
* Very broad and vague category that many different diagnoses fit within
* Includes executive function issues, ADHD, sleeping disorders, and a host of others.
 | * These impairments must be taken on a case-by-case basis because of the variety here. However, all of these impairments involve some level of difficulty in processing stimuli.
* More time to complete assignments and clearer instructions are helpful.
 |

Source: adapted from Anne M. Hayes et al., Learning Disabilities Screening and Evaluation Guide for Low- and Middle-Income Countries (RTI Press, April 30, 2018), 3. <https://www.rti.org/rti-press-publication/learning-disabilities-screening-and-evaluation-guide-low-and-middle-income>.; US Department of Education IDEA website <https://sites.ed.gov/idea/regs/b/a/300.8/c>

**Table 1: Explanation of IDEA section 300.8(c)9-10**

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