AN EXAMINATION OF THE EVOLUTION OF ACCOMMODATIONS OF NEURODIVERSE STUDENTS IN US PUBLIC EDUCATION

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By

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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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INTRODUCTION AND HISTORY OF LEARNING DISABILITIES AND ACCOMMODATIONS

In the technical report, a biochemical process was designed with the goal of continuously producing the monoclonal antibody trastuzumab, used for targeted breast cancer therapy, at a rate such that it could be priced lower and therefore make targeted cancer treatment more accessible. Antibodies are large proteins produced by our adaptive immune system that are biochemically compatible with, and bind to, specific pathogen ligands. Monoclonal antibodies are artificially produced antibodies designed to target a desired ligand using a genetically engineered clonal cell line. In the upstream section of the process design, optimal growth conditions are specified for cell culture scale-up using type I Monod model kinetics and mass transfer concepts. In the downstream section, separation and purification conditions are specified for various unit operations (e.g. Solid-Fluid based separations, membrane based filtration, chromatographic separation). The overall process design enabled a potential for production of purified formula that meets FDA standards, is economically feasible, and improves the lives of more target cancer patients.

Optimized modern societies offer essential, effective, and accessible social services, such as healthcare and schooling. Institutions within such a society are guided by norms from the people they serve. Organizations owe their successes in part to their institutional norms. Such norms may have contributed to the success of researchers at UCLA Cancer Center and Genentech, who inadvertently developed a monoclonal antibody useful in treating breast cancer, during a collective effort to develop a cure for cancer by altering oncogene expression (Mukherjee, 2010, 463-69). In 2020 about 1.8 million people in the U.S. will be diagnosed with cancer; breast cancer will account for about 15 percent of such cases (NCI, 2020). By 2016, about 2.3 million eligible patients had been treated with Herceptin. Herceptin is expensive; the overall high out-of-pocket price of cancer treatment is about $30,000 (Kantarjian, 2014). Overall, the US is quite poor at investing in human capital that is essential to maintaining societies that thrive. According to a systematic analysis of 195 countries, the US ranks 27th in quality of education and health (Lim et al., 2018).

Problems of access afflict public education in the United States. According to Forshay (1999, p. 277), a successful education system ultimately guides students toward a realization of their human potentiality. Use of socially constructed limitations beyond their proper prescriptive value, such as “disability,” may obstruct this educational path. Less than half of U.S. working-age adults with learning disabilities are employed, compared to 71 percent of adults without learning disabilities (NCLD, 2019). When school systems fail segments of the population they serve, such as students who learn differently, they contribute to burdens on other social institutions, such as healthcare, incarceration, and social services.

Treatment of those affected by behavioral and cognitive impairments throughout history can best be examined through the theory of the social construction of technology. First authored by Trevor Pinch and Wiebe Bijker (1987); the theory evaluates social groups, their evolving interpretations of a technological artifact, and how said interpretations have shaped the specified artifact. Evaluating the medical treatment of neuropsychiatric patients as a technological artifact: relevant social groups include patients, doctors, researchers, and those heavily involved in patients’ lives. Although countless social groups and events have influenced major and minor changes to the outlook of neuropsychiatric patients, it is most useful to examine major events throughout the 20th century since the drastic changes of influential social groups’ interpretation of proper treatment methods occurred during this time period. Figure 1 on page 4 illustrates how the collectively flawed interpretation of the encephalitis epidemic during the early 1900's, in combination with the larger influence of medical researchers at the time period, contributed to long-lasting harmful impacts on patients with neuropsychiatric impairments.

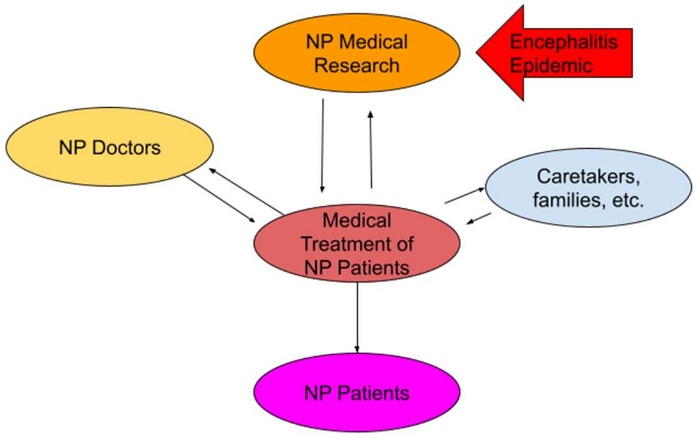

Figure 1: An evaluation of the treatment of neuropsychiatric (NP) patients using the theory of social construction of technology (Adapted by Letteri (2021) from Pinch & Bijker, 1984)

Mass public interest in the etiologies of behavioral and cognitive differences first began as a result of the encephalitis lethargica epidemic in 1917 (Barkley 2018). The epidemic provided medical researchers with an abundance of cases of children who survived the infection, and subsequently displayed both behavioral and cognitive impairments. At the time of the epidemic, such impairments were correctly attributed as the result of physical damage to the brain caused by encephalitis. As a result of this mysterious epidemic, an abundance of research arose throughout the first half of the 20th century attempting to determine the physical causes of behavioral and cognitive impairments. Such research resulted in doctors diagnosing patients with physical brain damage even if they had no history of trauma or birth defect, citing their reason as undetectable "minor brain damage." The idea of undetectable brain damage as the cause of otherwise unexplained behavioral/cognitive impairments prevailed throughout much of the 20th century. It would not be until the 1960's that the concept of minor brain damage would be recognized as overinclusive, merit almost no prescriptive value, and lack substantial neurological evidence (Kirk 1962).

Official medical diagnoses of learning and attention disorders using more specific labels, such as attention-deficit hyperactivity disorder (ADHD), dyslexia, and dyscalculia, were first made in the second half of the twentieth century. Such labels applied more homogenous classifications based on observable and symptomatic deficits, rather than unobservable mechanisms. By design, these symptomatic-based diagnoses allowed for better treatment focused on such symptoms. Focus on symptomatic classification also allows for an earlier diagnosis, and therefore an earlier intervention. The National Council of Learning Disabilities (NCLD) emphasizes, "early recognition of warning signs, well-targeted screening and assessment, effective intervention, and ongoing monitoring of progress are critical to helping individuals with [learning disabilities] to succeed in school, in the workplace, and in life." (NCLD, 2019, p. 2)

The US government created its first major policy guaranteeing rights to those labeled with disabilities with the passing of the Rehabilitation Act of 1973. Specifically, section 504 of this act specified "No otherwise qualified handicapped individual in the United States … shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. (93rd US Congress, 1973)" Section 504 would prove to serve as a legal precedent for the full rights guaranteed to all Americans with disabilities with an emphasis on reasonable accommodations. Shortly after, Congress passed the Education for All Handicapped Children Act (EHA) in 1975. EHA requires all public schools receiving national funding to provide equal access to education for children with physical and mental disabilities.

Advocacies for further disability rights continued throughout the 1980s. In parallel with disability advocacy movements, the idea of disability as a social construct used to oppress those who did not conform with the thinking of others in society arose. The term “neurodivergence” first appeared in sociologist Judy Singer’s 1999 thesis featured in the journal *Disability Discourse*, where she states: “the key significance of the Autism Spectrum lies in its call for and anticipation of a politics of neurological diversity, or ‘neurodiversity.’ The neurologically different represent a new addition to the familiar political categories of class/gender/race and will augment the insights of the social model of disability. The rise of neurodiversity takes postmodern fragmentation one step further. Just as the postmodern era sees every once too solid belief melt into air, even our most taken-for granted assumptions: that we all more or less see, feel, touch, hear, smell, and sort information, in more or less the same way, (unless visibly disabled) – are being dissolved. (Corker, 1999, p. 64)”

Such movements proved to be useful in the passing of more efficient, equitable, and defined policy for disability rights. In 1990, both the Individuals with Disabilities Act (IDEA) and the Americans with Disabilities Act (ADA) were passed. IDEA served as a major redesign of EHA, and allowed for more focus on the individual rather than the learning disability they possessed. Mainly, IDEA introduced the concept of an individualized education plan (IEP), where the act requires that all public schools create a tailored plan specifying the individual’s academic achievement, diagnosed disability, involvement in general curriculum, and relevant accommodations (101st US Congress, 1990). Overall, IDEA allowed for more individualized support to affected public school students that could be fueled by newer research. Although this newer policy would prove to be much more effective, it is important to note that such a robust policy tool took several years to implement and was still far from adequate. IDEA was amended most recently in 2015 as the Every Student Succeeds Act, and aimed to give more control of education to state governments and address the lack of flexibility that prevented certain students from receiving the full benefit of quality public education from the previous amendment: No Child Left Behind.

Although advocacy movements involved with neurodivergence and the idea of socially constructed disabilities paved the way for more robust disability rights and education policy, subsets of the neurodivergent movement continued to conflict against the field of neuropsychiatric medicine. The concept of disability as a social construct has led some individuals and families to become apprehensive in receiving medical intervention, whether it be behavioral or medication treatment. Neuropsychiatric (NP) medicine and research has improved remarkably over the past several decades, but education policy is still subject to unbalanced influence from potential flaws in research. The idea of strict and austere curriculum modifications for individuals with disabilities from flawed neuropsychiatric research in the early 20th century drove design of earlier policies, such as the Rehabilitation Act and the EHA. Although these policies have been updated, remnants of such flawed research are still found in current policy and even current special education curriculums across the US (Barkley 2018). Overall, the neurodivergent model of disability can be helpful in education since it can empower individuals with learning disabilities, but blur verified scientific evidence of learning disabilities, their effects, and the substantial benefits of treatment. Currently, such an unbalanced influence between neuropsychiatric medicine, education policy, and the neurodivergent community still affects learning difference individuals. The influence of outdated and flawed research from Figure 2 illustrates the continued bias of previously flawed neuropsychiatric medical research in education policy, as well as the damaging conflict between the neurodivergent model and medical models of treatment for disability.

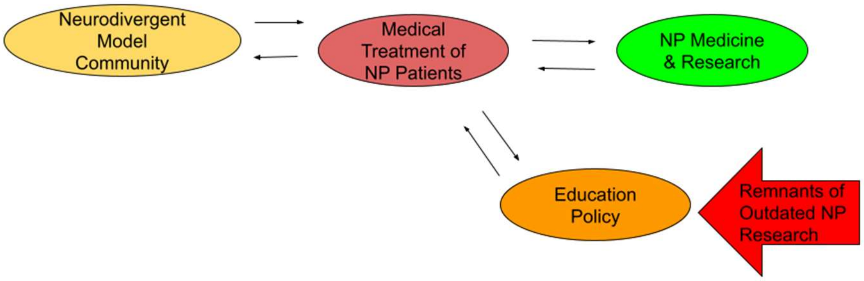

Figure 2: An examination of the unbalanced system influencing learning disability education & accommodations using the social construction of technology theory (Adapted by Letteri (2021) from Pinch & Bijker, 1984)

OVERVIEW OF CURRENT STATE OF ACCOMMODATIONS

According to NCLD, the four major laws responsible for working towards equity for neurodiverse students to be the Individuals with Disabilities Education Act, Section 504 of the Rehabilitation Act, ADA, and Every Student Succeeds Act. Balanced advocacy groups incorporate verified neuropsychiatric research, education policy expertise, and LD individual experiences. Classroom accommodations for neurodivergent children have been scarce with respect to the demand required for true education equity. Harrison (2020) reviewed and evaluated accommodation and intervention methods from the perspective of the neurodivergent model, and highlighted the benefits of self-determination training in contrast to the more intensive, traditional Applied Behavioral Analysis method. Self-determination training proved to be remarkably useful during defined transition periods. An example of a defined transition period can be the transfer from one social institution to another. Parents can markedly improve student outcomes, which can serve to create stark differences in student outcome across socioeconomic tiers (Van der Oord, 2020). Researchers have critically reexamined teachers' methods of evaluating neurodivergent students' behavior and academic performance (Iznardo, 2020). Notable balanced advocacy groups, such as NCLD and Understood for All, attempt to diminish the lack of support for proper accommodations by providing expert-verified resources, guides to navigating current policy for optimal student support (e.g. proper use of IEPs and 504 plans), and advocating for more comprehensive education policies.

Advocacies for the neurodivergent serve as their intermediaries with the legal system, and fight for the policies and the resources neurodivergent people need (NCLD, 2019). Parents of children with learning disabilities often find themselves experiencing greater amounts of stress, which may negatively impact the family's attainment of proper work-life balance. Also, parents of affected children often have to become more involved with their child's day to day education, and therefore may become advocates for their children. Because younger students with learning disabilities may be disruptive in class, teachers may develop an antagonism toward them (Dyson, 1996). Physicians are not always well prepared to guide parents of neurodivergent children. In primary care, only about two thirds of physicians feel comfortable in recommending evaluations for learning needs, and only 66 percent of healthcare professionals feel confident in identifying learning and attention issues (NCLD, 2019, para. 17).

According to Fofaria (2019, para. 3), Teachers are challenged in teaching students who learn differently, as they believe they need to provide them with individualized learning plans in addition to instructing their entire class. First year teacher Lauren Acree states:

> I had to figure out how to make a day work for each of them. Making my classroom work in one way was not going to meet the needs of each of them. And if I wasn't meeting their needs, we had lots of behavioral issues. But instead of kind of casting that on them, I felt like: Okay, what can I do to set them up for success? (p. 1).

Other teachers believe that common classroom conditions can become detrimental to students with attention deficits. Educator Kate Garnett claims:

> Students with learning disabilities are among the most vulnerable-at chronic risk for "not learning" under the aforementioned conditions, for long-term academic and social problems, and for lifelong debilitating side-effects of their classroom experiences (p. 1)

College level educators can observe the effects of neurodiverse students creating false labels for themselves as a result of poor learning experiences early on. Stanford University Math Professor Jo Boaler (2019, para. 4) writes:

> There are many problems with the procedural approach to mathematics that emphasizes memorization of methods, instead of deep understanding. Students come to believe they are "not a math person" and that they are incapable (p. 1).

Lack of early intervention can severely impact LD students long term, and proper support and accommodations to such students must be evaluated at every stage in their education to allow for the best chance of their success. Given the innate flaws of our current education system, education policies, and access to proper medical interventions; collaboration between policy-makers, education experts, neuropsychiatric researchers, and LD community advocates will be required to allow for more balanced and comprehensive support of individuals with learning disabilities. More social interventions, such as mentorship programs and support groups, have been introduced and evaluated. Mentoring, especially by older students who identify as having a learning difference, can improve neurodivergent students' mental health (Haft, 2019).

RESEARCH ON LEARNING DISABILITIES AND LONG-TERM EFFECTS

To be more comprehensive in evaluating learning and attention disabilities, and their effects, it is best to examine the most common attention disability, ADHD; the most common learning disability, Dyslexia.

According to the CDC, Attention Deficit Hyperactivity Disorder (ADHD) is diagnosed in approximately 6.1 million children aged 2-17 years old, or about 9.4% of the pediatric population (CDC 2020). Russell Barkley, one of the world's leading experts on the disorder, states that ADHD has traditionally been subtyped into two categories: inattention-dominant and impulsive/hyperactive dominant (Barkley 2018). As an attempt to unify ADHD as a disability for a more robust clinical evaluation and treatment, Barkley highlights emotional impulsivity and deficient emotional self-regulation as consistent core components of ADHD. Focus on emotional dysregulation, in conjunction with executive dysfunction, can lead to a more comprehensive classification of ADHD impairments. Overall, citing emotional dysfunction as the cause of inattention or hyperactivity can lead to a better understanding of root causes the individual strengths and weaknesses.

Dyslexia is a Learning disability where you have trouble identifying words and key details. Dyslexia affects parts of the brain with processing sentences and language (Dyslexia, Symptoms). Doctors can prepare an assessment with the child to figure out proper diagnosis and classification of dyslexia (Dyslexia, Diagnosis). The child could have problems reading and sounding out the word or the child could have a problem mixing up the words while reading.

Dyslexia can have a range from severe to mild. Having mild dyslexia can be easy to overcome since reading to a certain extent and reduction of reading error will enable the individual to overcome your learning difference in a short amount of time. On the other hand, severe dyslexia can result in a wider range of impairments. Speech-language pathology, along with occupational therapy, can help dyslexic students develop an alternate understanding of how to read. It is important to note that with severe dyslexia, one could have another branch of a learning difference like Dysgraphia and ADHD, which makes it even harder to learn how to read. Social implications of this disability can be severe, as students with dyslexia may be prone to comparing their progress with other students. Proper intervention, especially at earlier stages of child development can set dyslexic students up for a higher chance of success. Exploring specific strengths specific to students with dyslexia is also important. As dyslexic student Aaron Letteri states, “I believe that my strengths are in my auditory perception and visual perception and one observation I've noticed is that I look outside the box and look at the bigger picture.”

SCOT FRAMEWORK ANALYSIS

Determining a truly comprehensive coverage of accommodations and resources for students with learning differences can be determined using the social construction of technology framework. It is important to first consider the close relationship between learning difference affected individuals and their respective community, whether it be biased toward medical models or socially constructed neurodivergence models, and that individuals affected by learning differences are most affected by members of their own community.

Zooming out of this social group of LD affected individuals and their respective communities: the three most influential social groups affecting the LD community at large are the public education community, neuropsychiatric research & medicine community, and LD relevant policy community. Compensating for the flaws in public education, potential downfalls of medical research, and delayed implementation of LD relevant policy will require collaborative communication and exchange of research/information between all three social groups, as well as those in the LD community. Figure 3 demonstrates an idealized communication between social groups that can greatly impact the outcome of LD individuals, and demonstrates the application of the theory of social construction of technology around LD individuals using their community, treatment, and accommodations as a form of technology to improve their quality of life

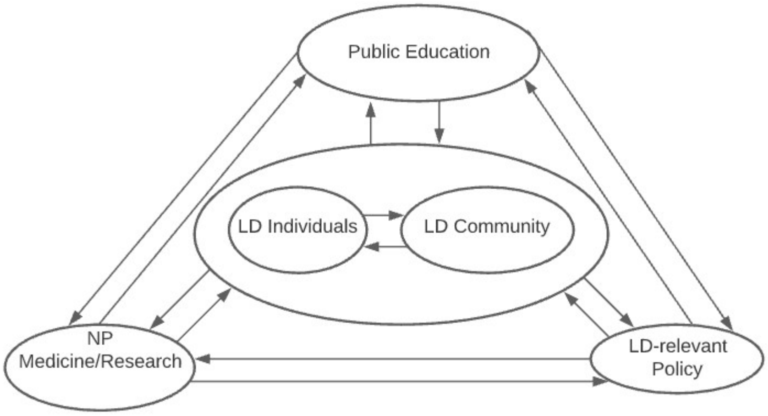

Figure 3: Balanced system of LD education/accommodations utilizing the social construction of technology theory (Adapted by Letteri (2021) from Pinch & Bijker, 1984)

CONCLUSIONS AND RECOMMENDATIONS

Upon completion of this research, it can be concluded that the individual flaws of the United States' youth can be greatly mitigated by careful collaboration of the key social groups within the SCOT framework described above. To achieve this, it would require valiant effort by legislators, public educators, and parents across the nation. While each of these groups are currently doing what they can to help those affected by learning disabilities, what is greatly underestimated is the careful communication between them that is necessary to agree on what are proper accommodations. The true potential of those affected by learning disabilities is far greater than what credit they are given due to the systemic flaws that have described. Through rigorous mentoring, further advocacy of support groups, and thorough social intervention, the untapped potential of these underrepresented individuals can reveal new and unprecedented human capital for the United States.

Finally, support at post-secondary levels of public education, such as college, is necessary to compensate for potential lack of support at lower levels of education. Appropriate levels of support could be made possible through the passing of policy that extends public education disability rights to students in college, such as the passing of the RISE Act.

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