Beyond Accommodations: The Role of Technology in Enhancing Educational Attainment among Students with Special Needs— Gavin Huntley-Fenner

Two major trends in higher education are on a collision course. One is the increasing number of students with disabilities, particularly autism, matriculating in the nation's colleges and universities. The second is the rise of technology as a means of delivering curriculum content. Is the intersection of these trends a tremendous emerging opportunity or a disaster waiting to happen?

Trend #1: Autistic students in College

The number of elementary and high school aged children in the United States diagnosed with autism spectrum disorder ("autism") has grown sharply beginning in the late 1980s. This wave of autistic children has become a wave of adults whose impact is being felt at the post-secondary level today. So far there are no accurate counts of autistic students in post-secondary institutions, as students with disabilities are not obliged to register for official support through campus disability services. However, studies by the National Center for Education Statistics, which track young adults transitioning from high school to college, show that between 1995 and 2005 the rate of growth in the proportion of students with disabilities entering post-secondary institu-

tions in the United States outpaced the overall growth of the general education population. One of the fastest growing segments of the disability subgroup are students with moderate to mild autism (*see* Fig.1).

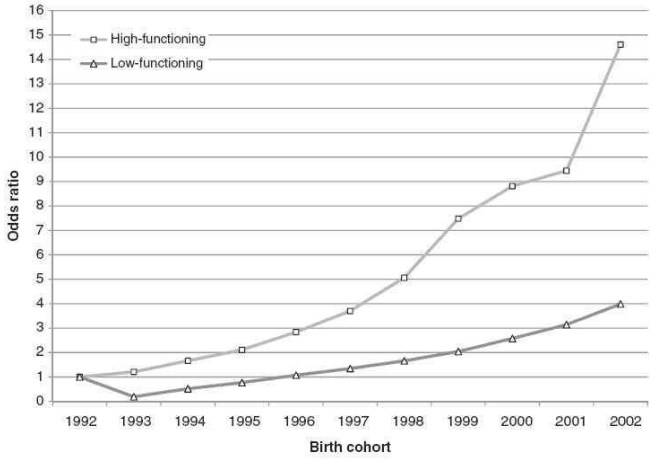

Figure 1. Data are from California. The graph shows to likelihood of autism by birth cohort. Note the acceleration among current high school aged students. Early identification and changing diagnostic criteria have contributed to identification particularly among children in the less impacted region of the spectrum. From Keyes, K., Susser, E., Cheslack-Postava, K., Fountain, C., Liu, K., and Bearman, P. 201

From one perspective, increasing college and university matriculation reflects ongoing educational success. K-12 institutions have long been required by law to create individualized education plans that take into account disabled students' individual educational needs in a "least restrictive" (*i.e.*, as inclusive as possible) setting. Efforts such as early identification, early intervention and ongoing support services have been instrumental in boosting disabled student achievement. Recent improvements in the quality and quantity of autism support services such as speech and language support, physical and occupational therapy and social skills support have contributed to the success of an increasing number of autistic students. As a result, many autistic K-12 students are better prepared than ever for post-secondary education.

However, growing matriculation rates highlight the persistent gap between successful enrollment and graduation for autistic students, as they are less likely to complete college than their peers. Clearly, autistic students' challenges, which may include limited organizational skills, poor executive function and slow information processing, do not disappear upon graduation from high school. The social transition from high school to post-secondary environments can be very challenging, even for high-functioning persons with autism. In relatively loosely structured adult academic settings many of the *social skills* limitations of autistic students become significant limiting *academic* factors. These are sometimes manifest as social anxiety, performance anxiety, rigidity in thinking and inability to engage peers in productive discussion.

Some autistic students benefit from approaches for supporting and retaining students with disabilities in general such as extra-time on exams, tutoring or note-taking support. However these approaches were not developed to serve autistic students specifically, and do not necessarily provide support for their specific deficit areas. Moreover, the needs of the autistic students are as variable as the disorder and those limited supports cannot be as specific and targeted as those offered in K-12 settings. In recent years, some campuses have developed more comprehensive and tailored approaches including a suite of specialized interventions, such as organizational skills mentoring, behavioral therapy/counseling and support groups. However, programs, accommodations and related faculty or staff training can be costly and therefore programs are difficult to sustain or grow. A few private institutions have begun to offer fee-for-service support for autistic students (*i.e.*, at $3,000 to $4,000 over their normal tuition rates). Others have turned to non-professional peer support models which are less expensive.

Current trends towards greater reliance on educational technology to deliver post-secondary curriculum represent both an opportunity to improve (a) access to higher education, and (b) retention of matriculated non-traditional students.

Trend #2: Changing Educational Technology

Widespread adoption of information processing technology has conferred lasting changes in US productivity across economic sectors including retail, computer manufacturing and retail banking. However, the education and healthcare marketplaces have been insulated from these changes, and thus experienced lower productivity growth in the late 20th century. Nevertheless in the last decade, as U.S. educational performance gains and attainment began to slow, there has been an intensified focus on harnessing information technology for education. Currently, there is a broad perception across the political spectrum, within the education community and in the business community that accelerated adoption of educational technology tied to national standards in K-12 will lead to fundamental improvements in the nation's educational success. Ultimately, the approaches under consideration by the Federal Department of Education and State Boards of Education, known as "Common Core," seek to transform student access to high quality curriculum and materials, deliver content more efficiently and effectively and foster self-improvement through timely and targeted assessments of performance.

Post-secondary institutions are experiencing similar pressure to consider alternative models of curriculum delivery. In post-secondary environments, the internet has emerged as an important alternative tool for curriculum delivery. The relative degree of internet/face-to-face intensity can serve as a useful organizing structure for a spectrum of approaches to curriculum delivery which vary by institution and to some degree by instructors within institutions (*see* Fig. 2, for a Sloan Consortium-published taxonomy of approaches). On one end of the spectrum are traditional classroom or lecture courses based on professionally guided face-to-face instruction,

with printed textbooks and online access to additional class support materials such as lecture notes or syllabi ("web-facilitated"). On the other end of the spectrum are massive open online courses (MOOCs) where there is no face-to-face classroom contact between instructors and students, there may be no printed text and where the entirety of the course takes place in a virtual environment.

Figure 2. Taxonomy of online courses from the Sloan Consortium (Allen, IE, Seaman, J., and Garrett, R. (2007). Blending In: The Extent and Promise of Blended Education in the United States.

Proportion of Content Delivered Online	Type of Course	Typical Description
0%	Traditional	Course with no online technology used — content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course which uses web-based technology to facilitate what is essentially a face-to-face course. Uses a course management system (CMS) or web pages to post the syllabus and assignments, for example.
30 to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to-face meetings.
80+%	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

MOOCs are the fastest growing area of curriculum development today. They are attractive because they potentially offer high quality curriculum to very large groups of students who would not otherwise have such access. They are also financially favorable from the capital and operation costs points of view. Campuses that are capacity constrained either by geography or by lack of access to sufficient capital can offer online courses to more students without expanding their physical facilities. The ratio of students to primary professional instructors can be quite large for MOOCs, *e.g.*, in the hundreds or thousands, thereby reducing the pressure to hire additional instructors. Colleges and universities that have renowned faculty and engaging course content can partner with private entities which supply the technical know-how and marketing to develop and sell MOOC offerings. Elite higher education institutions see MOOCs as a way to enhance and extend the reach of their brands. Public universities, which have been impacted by reduced state funding for higher education, are attracted to MOOCs because they offer lower cost per student and higher throughput, thus reducing time to graduation.

Many institutions are also experimenting with "blended" or "hybrid" approaches in which there is a significant quantity of online material paired with direct classroom guidance and professional instructional support for students. These courses usually have a substantial classroom or face-to-face component, where students attend lectures in person or simultaneously online via video-chat systems and/or work together in collaborative small groups. Blended or

hybrid instruction approaches do not seek to supplant traditional classroom instruction and socialization. Rather they aspire to use the online based curriculum to build support for effective classroom engagement. They also allow students to preview material and develop their interests in an online environment that supports self-directed exploration and learning. It is hypothesized that engaging students in this way will tend to maximize the effectiveness of the socialization rich traditional face-to-face environment with a professional instructor.

The various approaches to adapting education technology in post-secondary settings all share the virtue of allowing more flexibility for students and instructors in terms of when, where and how instruction takes place. However, some of the factors that make MOOCs attractive are potentially troubling for some populations of students. MOOCs have substantially greater throughput than traditional classrooms, but dismal completion rates and pass rates particularly for traditionally underserved populations. The large class sizes and the lack of direct guidance means that students who need additional support are less likely to receive that support. Finally, although the potential exists in the long run to customize courses to individual student learning needs and capabilities, MOOCs are usually generically tailored to a broad audience with varying levels of capabilities and preparation – a one-size-fits-all approach which may not serve atypical learners well.

Potential to help autistic students

There is a gap in the research literature regarding how these sorts of technological changes will impact the wave of autistic students entering post-secondary institutions. Intuitively, there are some advantages for autistic students to take courses that have a greater online component. For example, students can self-pace their learning, *i.e.*, students with information processing speed challenges can listen to recorded lectures as often as they like. For students who struggle with face-to-face social engagement, there is an advantage to having moderated online forums with structured social engagement. MOOC marketers often refer to the fact that students with autism who are uncomfortable around other people can learn better in the socially impoverished environment of MOOCs. Anecdotally, Tom Friedman in the *New York Times* wrote about a 17-year old named Daniel who "took an online modern poetry class from Penn. He and his parents wrote that the combination of rigorous academic curriculum, which requires Daniel to stay on task, and the online learning system that does not strain his social skills, attention deficits or force him to look anyone in the eye, enable him to better manage his autism."

MOOCs may also pose specific challenges for students with autism. College is a time of important socialization for all students with and without disabilities. For example, students cannot be well prepared for certain professional careers without practicing looking their peers or professors in the eye, working in collaborative small group teams or presenting their work to an audience. Students with autism in traditional academic settings have more opportunities to learn

these important social skills. Also, it should be noted that students with autism often suffer from loneliness and alienation in post-secondary environments. Even though they struggle with making and keeping friends, autistic students frequently still experience or seek to experience some emotional connections with their peers. Unless they are accompanied by broader support and socialization opportunities, MOOCs may intensify the pressure for alienated autistic students to drop out of school altogether. Blended courses that have facilitated small group collaborative projects – where available support staff are professional and knowledgeable about autism may be one way of addressing this concern. Autistic students will require a combination of coaching, training and counseling support to be fully engaged in academic life and better prepared for workplace and career.

It is important to note that a limiting factor in any classroom is the quality of the instructor and the quality of the contact between that instructor and their students. Adoption of new technology or curriculum delivery is slow and uneven and largely driven by specific inclinations of individual instructors. Unlike K-12, there is almost no professional development for post-secondary instructors who wish to adopt cutting edge technology. With respect to teaching of autistic students, those instructors who are more inclined to foster learning will sometimes draw upon prior experience such as personal relationships involving family, and friends or other direct connections with disabled students. To some degree, greater inclusion throughout K-12 education has made it more likely that an instructor would have interacted with a disabled person as a peer while growing up and thus more likely to be personally invested in the success of disabled students. But personal experience can only go so far. Professional development has to be part of any technological based program rollout in order for the program to meet its potential.

Conclusion

Growth in the number of post-secondary autistic students represents a tremendous opportunity. Institutions that manage to develop and refine a combination of high quality direct instruction and technology together with coaching and training for staff and counseling support for autistic students are likely to be rewarded: (1) they shall be well poised to make an important contribution to meeting national goals of increasing graduation rates by 2020-2025; (2) they will doing that in a way that reflects the diversity of human capital; (3) the nation needs graduates who are interested in STEM careers and autistic students who successfully matriculate are more likely to be STEM majors than their peers; and finally, (4) persons with autism have many positive traits to offer potential employers and colleagues whatever their field of choice. Generally speaking, they are honest, they attend to detail in areas of specific interest, they are capable of deep study and they are logical thinkers in areas where emotions may interfere. The evidence shows that autistic students often struggle in today's colleges and universities, but they may thrive in the institutions of tomorrow.

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