**Connect, Learn, BreakThru: Increasing Outcomes for Students with Disabilities through Virtual World Mentoring**

**What Is BreakThru?**

*BreakThru* is the core project of the Georgia STEM Accessibility Alliance (GSAA), which is supported by Research in Disabilities Education (RDE) program of the National Science Foundation (NSF). Launched in 2010, GSAA is one of 10 RDE Alliances throughout the United States designed to broaden the participation and achievement of people with disabilities in STEM education and careers. Alliances employ evidence-based and promising practices to increase the number of students with disabilities completing degrees and entering the STEM workforce, and typically serve students and other partners within their regions or states. GSAA is a collaborative jointly led by Principal Investigators Noel Gregg (University of Georgia) and Robert Todd (Georgia Institute of Technology), with partners at Georgia Perimeter College and the Clarke, Greene, and Gwinnett County school systems in Georgia.

*BreakThru* is unique among mentoring programs due to its use of the virtual world Second Life to support or implement most project activities. This “virtual learning reserve” within Second Life is the core of *BreakThru*, serving as the primary meeting space for mentoring and training activities across all GSAA partner institutions. *BreakThru* responds to NSF’s request for research on virtual worlds to support outcomes for students with disabilities. It also addresses a priority common to all Alliances, student advancement through critical junctures to STEM careers, particularly from high school to college, and from undergraduate to graduate education. Toward this end, GSAA measures the efficacy of BreakThru in part through its enrollment and retention of secondary and postsecondary students with disabilities into virtual mentoring. *BreakThru* has developed from an exploration of an idea into a full-fledged mentoring program that currently enrolls more than 80 students and 35 mentors.

**Electronic Mentoring (E-Mentoring)**

The technology components of *BreakThru* facilitate the mentoring activities at the heart of the project. Rather than focus on direct instruction or content knowledge, *BreakThru* is based on a mentorship model to support student retention and graduation from STEM degree programs and to facilitate progression through critical transition points. Prior research shows that mentoring programs are most effective when they have clear objectives (DuBois, Holloway, Valentine, & Cooper, 2002) and are consistently applied (Grossman & Rhodes, 2001). When properly implemented, mentorship encourages students with disabilities to aim for higher goals (Burgstahler & Cronheim, 2001) and provides a greater sense of self-efficacy (Sowers et al., 2012). The overall aim of *BreakThru* is to increase the persistence in STEM of students with disabilities who are enrolled in the mentoring program. The National Research Council identifies persistence as critical to learning, and highlights self-determination and self-efficacy among areas of persistence that are especially vital.

Project mentors work to achieve the personal and educational growth of students through digital communication using a variety of social media and online platforms to support mentoring relationships. This type of mentoring is known as electronic mentoring or, simply, “e-mentoring” to distinguish it from traditional face-to-face mentoring. As e-mentoring can occur asynchronously and remotely, it offers benefits not associated with conventional mentoring. A growing literature has described the usefulness of e-mentoring in educational, business, human resources, and social environments. Unfortunately, while conceptual models have been developed to describe the e-mentoring relationship, there is limited empirical evidence for their overall effectiveness. For students with disabilities interested in STEM careers, the use of e-mentoring allows for more access to mentors representing a variety of disciplines and locations.

**Second Life and *BreakThru* Island**

Virtual worlds have shown significant promise for mentoring and teaching. Science teaching in virtual spaces using constructivist models is effective for students at all levels (Bruckman, 1998, Turkay, 2008). Research on virtual reality has demonstrated that people identify with their avatars and transfer positive experiences to their physical bodies (Bailenson & Fox 2009), which in turn increases motivation, engagement, self-efficacy, and social skills for students with disabilities (Kizelshteyn, 2008; Holden et al. 1999). Additionally, electronic mentoring has had positive impacts on minority students' educational and personal goals (iMentor project, MentorNet 2009). In addition to conceptual advantages offered by virtual worlds are more practical considerations of connecting mentors and mentees who may be separated by time and space. GSAA serves students with disabilities across a large geographic area, including rural school districts. Use of virtual worlds increases access to a larger pool of qualified mentors than might normally be possible, while still allowing for a feature and media-rich environment that more faithfully replicates in-person mentoring experiences. Virtual worlds also allow participants to continue their mentoring relationship even when individuals relocate.

Second Life was chosen after consideration of several virtual world platforms to provide the keystone platform of *BreakThru*. Project staff reviewed each platform based on the ease with which a virtual world could be developed, the ability to rapidly prototype, availability on multiple platforms (PC and Mac), longevity of the software, and current development support. Most importantly, *BreakThru* staff carefully assessed the accessibility of each platform while recognizing that a great deal of work remained undone in terms of making 3-D virtual worlds fully accessible to all users. Second Life was chosen because it had active support from a private industry developer, a thriving open source development community, and the most accessibility tools of any platform.

GSAA serves both secondary and postsecondary students, requiring attention to rigorous standards for security and safety. Second Life also was chosen as the platform for the *BreakThru* because it allowed the project to create a self-contained, safe area to provide university-approved content while also enabling access to content related to STEM disciplines and disability. Because of the need for increased online security features for minors, GSAA duplicated the virtual learning reserve on the Second Life Teen Grid to create a reserve just for high school students. Using Teen Grid security features, only GSAA staff, secondary teachers, and related personnel who have passed background checks are allowed into the space. However, a bridge in Second Life between the two virtual learning reserves allows for a commons area for hosting events relevant for both student populations.

*BreakThru* partnered with Second Life developers The Vesuvius Group to design and build both virtual facilities. The design of *BreakThru* Island has followed best practices in UDL, including assistive technologies (AT) and alternative media for virtual environments, and it was constructed to be maximally accessible according to the WCAG 2.0 standards. Georgia Tech researchers also worked to implement solutions to address common disability access issues, such as ensuring low vision/blindness access to the Second Life platform through a Second Life-specific screen reader, a "guide dog" to locate objects within the virtual world.

To build virtual learning environments for individuals with disabilities, proper design principles are required. Therefore, a virtual learning environment requires opportunities for differentiated learning opportunities, mentoring preferences, and academic choices. For many adolescents and adults with disabilities, learning presents a substantial barrier and has a negative impact on academic and employment outcomes. In helping to design e-mentoring opportunities throughout the *BreakThru*activities, attention was paid toward incorporating the principles of universal design within the virtual environment. Much of the architecture on the island takes inspiration from real-world universally designed structures. Ramps are used in place of stairs, doorways and sidewalks are scaled appropriately for wheelchair access, and information is provided through multiple means on signage and interactive devices. A BreakThru participant who uses alternative input devices or is a wheelchair user in real life can expect an accessible experience from a mentoring session taking place on BreakThru Island.

Furthermore, *BreakThru* Island has grown and developed across the project’s lifespan. In Years 2 and 3 of the project, the island was further expanded to include interactive 3D objects that function as a web browser to access the *BreakThru* website, accessible visual aesthetic for all structures in VLRHS, and landscaping for aesthetics and visual privacy. To improve the user experience and facilitate increased use of the island beyond mentoring, additions included a marketplace area for use of game currency for “vanity rewards” to incentivize commitment to project and a weekly payment system of small stipends in game currency. In addition, interactive elements including vehicles (bicycles, boats, balloons, wheelchairs), science demonstrations (solar system, nuclear reactions), and dance floor were added. Mentoring activities were enhanced through the addition of a private mentor lounge and lighthouse meeting space bridging islands to allow students from both groups to meet. Finally, accessibility of the island was further increased through extra accessibility markup language to describe orientation in text for low vision/blind users.

Use of Other Social Media Platforms

Although virtual worlds remain a focus for GSAA, *BreakThru* has diversified its e-mentoring efforts to include an integrated array of social media and other communications tools to realize a truly “virtual” Alliance for students with disabilities. Key social media platforms include Facebook, LinkedIn, You Tube, as well as an interactive project website and blog. These additional software platforms supplement the use of the Virtual Learning Reserve. Research has found self-efficacy and self-determination are two criteria which influence the choice of a specific communication platform and reduce rates of abandonment (Coryell & Chlup, 2007; Jacobson, 2008). While many adults spend a great deal of time reading and writing outside of classrooms posting messages to social networks, chatting via instant message (IM), and communicating by text messaging, understanding the strategies that effective help them manage these technologies has received less attention (Lenhart, Arafeh, Smith, & Macgill, 2008). Researchers examining social media usage patterns of college students provide evidence that they vary across contexts. For instance, Druid (2010) found significant, positive relationships between text messaging frequency and literacy skills, but significant, negative relationships between text usage in certain contexts (e.g., Facebook and emails) and reading accuracy. This research suggests that postsecondary students demonstrating advance literacy abilities may be using social media differently than less academic proficiency.

Though Second Life remains the marquee platform for research, *BreakThru* recognizes the necessity to support the use of Second Life through more traditional online methods. *BreakThru* hosts a project website, [georgia*BreakThru*.org](http://www.georgiabreakthru.org), which serves as the central hub of all online and social media efforts for the project. In addition, the project staff maintains an active social media presence on Facebook and Twitter. These efforts, when combined with email and text messaging form the basis of all communication within the project. *BreakThru* attempts to provide each participant with options so that mentorship can take place using the platform that is most accessible and convenient for each individual.

Key Findings to Date

In the most recent project year (Year 4, 2013-2014), a total of 1,003 mentor-mentee meetings were recorded in monthly mentor reports received on 21 secondary mentees and 19 postsecondary mentees (N=40). This figure is drawn from voluntary self-report data, suggesting that actual mentoring may be higher. The most popular mediums for mentoring have included e-mail, texting, and telephone (voice) communications, with the majority of mentor-mentee pairs opting to use a combination of platforms. During Year 4, 35 percent of mentees used Second Life for at least some of their meetings, with meetings conducted in Second Life, as well as Skype, lasting longer than meetings using other mediums.

GSAA has adapted its mentorship model each year in response to the platform preferences of its participants. Second Life presents a number of challenges for participants beyond just the accessibility of the software. The hardware requirements of Second Life, while considerably lower than a modern computer game, still remain beyond the reach of some participants with older machines. Increasingly, students and mentors are connecting via mobile platforms such as smartphones and tablets. While third-party mobile applications for communicating with Second Life do exist, the experience of connecting to Second Life is much less immersive and nearly unrecognizable to participants accustomed to the traditional Second Life client. As a result, participants fall back on the communication platforms that are most readily available, typically text messaging or a simple phone call. The lesson for GSAA has been that a successful program must remain agile and capable of adopting new platforms in response to larger technology trends. Data suggests that the most popular platforms are also the most familiar, and that you must allow participants to take advantage of existing comfort levels and skills in order to ensure strong participation.

Scalable Model

GSAA was tasked by NSF to create a scalable model for incorporating the use of virtual resources and e-mentoring to transform current student learning practices in STEM degree programs. Development of the scalable model is a major component of year 5 development. The project’s outcomes are potentially transformative for secondary and postsecondary student with disabilities as the research will provide data and promising practices on how best to facilitate persistence for students transitioning to or currently in STEM degree programs. Project investigators will disseminate research findings on the technological, personal, infrastructural, and organizational aspects of successful virtual mentoring for key stakeholders.