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Technology Voices

Virtual Worlds: STEM Education Adds a Dimension

Scene from the hit TV series, *The Office*, October 2007: Dwight Shrute, officious assistant to the regional manager, Dunder & Mifflin – "Limitless Paper for a Paperless Environment" – a paper company, discovers Second Life (http://secondlife.com/), a virtual 3-D world, and describes his interaction with it:

Shrute: *Second Life is not a game; it's a multi-user environment that doesn't have points or scores, winners or losers. I signed up for Second Life about a year ago. Back then, my life was so great that I literally wanted a second one. In my second life I was also a paper salesman, and I was also named Dwight. Absolutely everything was the same, except that I could fly.*

For the many students with physical, sensory and cognitive disabilities who experience difficulty with STEM (science, technology, engineering and math), use of Second Life's 3-D capability as a mentoring and education tool can help them do far more than fly.

Implementing a five-year National Science Founda-

tion grant awarded in 2010, researchers at Georgia Tech and the University of Georgia are currently developing plans to utilize Second Life to more fully engage these students. The researchers' goal is to help raise the number of students with disabilities who earn degrees in STEM disciplines.

The grant will focus on the use of a Virtual World with specially designed virtual classrooms inside Second Life where students, via the avatars they create, can interact with mentors from around the world without leaving home. It will form a package of resources along with Georgia Tech's *SciTrain* (http://www.catea.gatech.edu/scitrain/), a research initiative to train high school math and science teachers to be more effective instructors for students with disabilities; and *SciTrainU* (http://www.catea.gatech.edu/scitrainU/login.php), which provides educators with the tools to incorporate Universal Design for Learning (UDL) principles in college classrooms.

According to Robert Todd, senior research scientist at Georgia Tech's Center for Assistive Technology and Environmental Access (CATEA) (http://www.catea.gatech.edu/), who, along with Noel Gregg of the University of Georgia's Regents' Center for Learning Disorders (http://www.rcld.uga.edu/), is Principal Investigator for the programs, the three projects address the following issues associated with the difficulties experienced by students with disabilities in STEM courses:

- *Connecting students with their STEM mentors.* A virtual worlds scenario via Second Life offered an opportunity to overcome traditional geographic barriers that have separated students from mentors
- *Students with disabilities are often told that STEM courses are too difficult for them to master.* Much of that difficulty exists, Mr. Todd insists, because the courses are not created to be accessible in multiple formats. Implementation of Universal Design for Learning principles, a linchpin of these programs, can alleviate that difficulty, he insists, because those principles account for differences in learning styles among students with cognitive disabilities.

What does this virtual world look like? In addition to exploring the Second Life site, Mr. Todd recommends viewing the movie, *TRON: the Legacy* as well as James Cameron's *Avatar*. Most individuals, Mr. Todd says, have at least watched others play a video game. The virtual worlds concept, he explains, resembles a video game, "minus bullets, guns and gore." In short, he adds, "Our Virtual Worlds program is about communication and meeting in an environment that's conducive to mentoring and learning. And, yes, the avatar students create to interact with their STEM mentors can fly."

This issue of FCTD's *Technology Voices* focuses on the ability of virtual world technology to benefit STEM students with disabilities.

Robert Todd, Principal Investigator, Speaks

There was no "perfect movie moment" in which CATEA Principal Investigator Robert Todd chose his career path. "I was training to be a rehabilitation counselor, a vocation I chose because as a youngster I became acquainted with several young people in their teens who had suffered traumatic injuries."

He followed a course of study pertaining to that profession throughout his undergrad years at Georgia State University and an initial Masters degree from the same university before earning another MS degree, in information design and technology, at Georgia Tech. "As a rehab counselor I accepted the traditional job assignments, which usually included evaluating individuals with traumatic injuries, especially brain injuries. My mission was to find ways to

get these individuals back to work. This was 1990-91, a very different era for computing capabilities.

"I discovered, however, that the training materials, designed to return these individuals to school so that they could earn the high school, college or technical school degree they'd been pursuing at the time of their injury, were ineffective. The materials – which consisted mainly of cognitive software – were supposed to support efforts by these individuals to return to their previous state of functioning. Unfortunately, they were unable to use the software.

"I wanted to know why these materials were so ineffective, so I contacted Georgia Tech and was directed to CATEA. Our goal there was to learn why the software that was supposed to be helping these people was itself inaccessible and why no one was able to make it work. The problem was so challenging that I took a job at CATEA in order to address it. Since then I've been working on accessible web design, accessible information design and, in the past few years, have returned to my original focus: education."

What he learned, he says, is that a high percentage of individuals who were in injury rehabilitation were young men who had been engaging in risk-taking behavior, like extreme sports, or had been performing manual labor when they suffered brain injuries. "That's how the education component fit in for me. I encountered some of these individuals during my college career who were trying to make their way through school. I believed that their issues had to be addressed. The problem has been so challenging that it's nearly 2011 and we continue to study it.

"Seeing those young people and watching their struggles made me realize that what befell them could befall me as well. It was a short hop to researching STEM students born with physical and cognitive disabilities and, for me, a journey that has taken me into a virtual world, a second life, if you will."

Supporting our interview with Robert Todd are resources related to virtual worlds and STEM learning. We also feature members of our Knowledge Network. We invite you to contact these members for further information. Please share this newsletter with other organizations, families and professionals who may benefit from it. We invite you to visit us at http://www.fctd.info. We welcome feedback, new members and all who contribute to our growing knowledge base.

The 2011 FCTD AT Resources CD-Rom has arrived!

The disc allows you to access the variety of assistive technology (AT) resources that are found on our website, www.fctd.info. The resources available span a full range of AT topics, and are suitable for both the novice and the experienced professional.

As always, we provide copies to you at no cost. We can send you individual copies or provide bulk orders for you to distribute to colleagues, families you serve or at conferences.

To order the CD, please visit http://www.fctd.info/show/order_form.

3-D Learning with a UDL Flavor: Facilitating Multiple Modalities for STEM Students

An Interview with Robert Todd, Principal Investigator, Virtual Worlds Project, Senior Research Scientist, Center for Assistive Technology and Environmental Access (CATEA), Georgia Tech University

Robert Todd

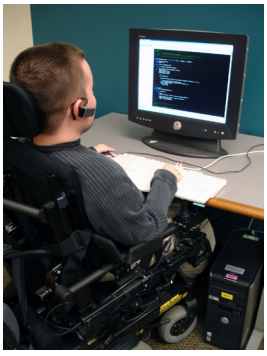
"When I was in school and for decades before that, there weren't many options when it came to teaching science, technology, engineering and math (STEM) courses at any level of education. There were no multiple modalities; there was no capability to present materials for varying learning styles," recalls Robert Todd, Principal Investigator for the $1.5 million five-year Virtual Worlds project funded recently by a National Science Foundation (NSF) grant.

As a result, Todd says, "students with learning disabilities very often fell by the wayside." This mass failure, he insists "was largely a fear response because students with learning disabilities, as we learned from our research, anticipated that STEM courses were going to be extremely difficult for them and thus were rarely disappointed, or successful. That's why we're focusing on a Universal Design for Learning (UDL) approach to our project."

Engaging Avatars

UDL, he continues, is the basis for creation of the virtual learning environment supported by the NSF grant under the auspices of the Georgia STEM Accessibility Alliance (GSAA), which includes Georgia Tech's CATEA, the University of Georgia's Regents' Center for Learning Disorders, Georgia Perimeter College and the public school systems of the state's Greene, Clarke and Gwinnett counties.

The GSAA team overseen by Mr. Todd and his co-PI, Noel Gregg, director of UGA's Regents' Center, will eventually provide a "mentoring island" where students with disabilities meet and interact with mentors to address STEM education needs. Students, explains Mr. Todd, will engage using avatars – simulated representations of the students', and mentors', simulated selves – "which students manipulate and design to be whatever they desire."



Student participants in the Virtual Worlds project, he adds, have the capability to simulate the realities of their disabilities – including, for example, wheelchairs for mobility and orientation tools to accommodate blindness – or create a personal avatar that differs completely from their physical selves.

Employing best practices in accessible, UDL-based real-world design, the team's Virtual Worlds environment gives students access to virtual mentoring and teaching, social networking, academic support, transition assistance and research participation. The ultimate objective of the project is to increase the number of students with disabilities who earn STEM degrees.

Back to the Future

For Robert Todd, involvement in the Virtual Worlds project, combined with his related and continuing work with SciTrain and SciTrainU, represents a re-

turn to the education component of his skill set.

"I spent many years at CATEA focused on assistive technology research," he says. An opportunity to build on his AT experience with an education focus arrived in the form of a project funded by the U.S. Department of Education (US ED), the Georgia Tech Research on Accessible Distance Education (GRADE), which aimed to make online education available to college students (www.catea.gatech.edu/grade/).

"We took the data from GRADE, posed some problems for NSF and informed NSF of our findings: In online or in-person classes, STEM courses are the most difficult for students with disabilities." Mr. Todd and his researchers then asked NSF if the organization would be interested in funding a project that addressed the STEM issue. "NSF requested a proposal. A couple of proposals later we ended up with the SciTrain project."

At that time, he remembers, "NSF preferred that we focus our research on high school students; I shifted our previous research to accommodate that preference."

For SciTrain, he explains, "We used our GRADE research on online education as a foundation and then layered in new information on how to make the in-person classrooms, labs and materials more accessible, not only for students with disabilities but for all students; it's the bedrock of our UDL approach."

After gaining exposure to Mr. Todd's work with SciTrain, he recalls, "the US Department of Education asked us if we would be interested in expanding the SciTrain format to include a post-secondary environment. For us, that was a natural progression, so we created SciTrainU, which is funded by the Office of Postsecondary Education (OPE) at the Department of Education.

SciTrainU, he explains, focuses on the specific needs of college STEM instructors in large classrooms consisting of around 300 students, which include students with disabilities. The current GSAA grant, of which Virtual Worlds is the centerpiece, builds on the SciTrain and SciTrainU foundation.

Common Thread: STEM Difficulty

The common thread binding the three projects, Mr. Todd notes, is the high degree of difficulty – and intimidation -- students with disabilities have traditionally experienced in STEM courses at the secondary and post-secondary levels – as well as the challenges faced by instructors who must present STEM materials to these students.

The intimidation factor has been accentuated, he adds, by the lack of course materials created to be accessible in multiple formats. "In math, for instance, students with vision problems experience difficulty because math is taught visually. The same can be said of a chemistry laboratory in which students with low vision experience difficulty using the equipment, as do students who lack the use of their hands. These are disabilities that inhibit hand-to-eye coordination."

Cognitive disabilities, however, "represent the most significant single factor in terms of sheer numbers of students involved; students with cognitive disabilities are more numerous than students from any other group that we will serve."

Overcoming Geographic Barriers

Geographic factors also contribute to the STEM difficulties experienced by students with disabilities, he emphasizes. Yet geographic barriers, he adds, are the barriers most easily and immediately overcome by the Virtual Worlds approach to STEM learning.

"We learned from our research that mentoring can be a critical component for students with disabilities who are taking STEM courses, that success in STEM can often be tied to students having someone to guide them through the learning process over time. However, getting students in place physically and geographically to receive mentoring advice and to allow us to perform modeling with the student can be an extraordinarily difficult problem, especially for students not near a major urban center."

Creating a virtual world, it seemed to Mr. Todd and his UGA counterpart, Noel Gregg, offered a way to eliminate barriers of transportation that are so critical and problematic for many students with disabilities. According to Mr. Todd, "We asked ourselves, 'What if we could eliminate those barriers and still find a way to connect STEM students with mentors in a meaningful way?' A Second Life virtual world learning environment offered that opportunity."

Second Life, he explains, is proprietary and is the largest virtual world in existence. "We're using Second Life because it has more accessibility features for individuals with disabilities."

The Look and Feel of a Virtual World: Cool Aspects

According to Robert Todd, "the best way to describe Virtual Worlds is that it is a very different means of communication that is intended to be completely absorbing and engaging because it makes users forget that they are sitting behind their computer, pulling users into a world that then becomes more real and exciting than they imagined."

In theory, many individuals, thanks to video games, movies and television shows like The Office, which featured Second Life in several episodes, have an idea of how a virtual world functions. But what is such a world like for those whose avatars inhabit it?

"Only a few people have had exposure to a virtual world in action," says Mr. Todd. "It will be far more common in a few years but it remains a new concept."

Nevertheless, he remarks, "many of us think we know how a virtual world works. We've all seen video games. We've seen kids or neighbors play electronic games. In each game there is a character that is being manipulated. In a virtual world a character is actually created to exist there, to function there."

This world, he explains, "consists of buildings, islands and transportation. It's populated by other characters who represent real individuals."

The movie, Avatar, he advises, "is the best introduction to virtual worlds for most people who have little or no exposure to the virtual worlds concept."

The movie, *Tron: Legacy*, released this holiday season "is an effective reference point for individuals who are trying to envision what a 3-D virtual world looks like. We advise people to re-view *Avatar* –

and usually the light bulb will go on. If I say, 'Virtual worlds are like a video game, minus the bullets and guns,' the reference point is there."

To experience a virtual world, Mr. Todd explains, it is necessary to create a character that will inhabit that world. "Students can assign any attributes they wish to their character – their avatar. That's one of the cool aspects. Students can design a character whose physical characteristics resemble their own, if they choose, or their avatar can assume the physical characteristics of an animal or of anything they can imagine. There are people with very vivid imaginations!"

For example, he explains, "Let's say you want your character to look like you. Your character can walk through this virtual world, sometimes use transportation or even fly like Superman – or Dwight Shrute of The Office. Flying is easy. All you have to do is hit a key stroke or a control on the screen and your character can fly. Flying is fun and it's an easy way to get around. You'll see other characters flying in your virtual world, as well as avatars that move about by car or motorcycle, for instance, because some students will enjoy simulations and building their own vehicles."

"Sometimes students might want an avatar that's in a wheelchair because they are proud of who they are and want to present to the world. On the other hand, some may decide not to take that approach because they want to be like everyone else. We give them the choice."

Controlling the Physics

The point, he notes, is that virtual world users can control the physics of the virtual world. "What makes the virtual world more like a real world, though, is that the virtual world shares characteristics that resemble the real world; the virtual world, for example, has buildings, grass, parks, waterfalls, anything one would see in a cartoon. A user's character interacts with people in real time because those other people, who are observed by walking around, or flying, are created by others who are also at their computers using the virtual world."

When Mr. Todd enters the GSAA virtual world now under development he says he occasionally encounters one of the Virtual Worlds designers, who works on the grant and lives in Holland. "To chat and communicate with each other all we have to do is to log on. I can chat using the chat interface, just as if I were using Yahoo Messenger, for example. Or I and other users can chat using a microphone. We can talk in real time."

What is interesting, he notes, is that users can exchange items in this world, "so that if I wanted to gift someone with an object I've created in the virtual world I can give that item to the individual and he/she can exchange items with me."

In Virtual Worlds, he explains, "we will create places where students are mentored, where they can meet up with their mentors. But we will also have areas that resemble Times Square with enormous screens, where people can come with their avatars and view videos and webcasts."

An Invigorating Sense of Buoyancy: the Sonar Effect

Mr. Todd likens the effect of participation in virtual worlds by students with disabilities to an individual recovering from a back or leg injury who ex-

ercises in a swimming pool, which serves to lessen the weight of damaged limbs, thus creating a comforting and invigorating sense of buoyancy which largely neutralizes the constraints of disabilities.

"The neutralization of disabilities was exactly the effect we aimed for when we decided to use Virtual Worlds to bridge the geographic gap and to create a world that was level for all participants."

He adds: "We're designing Virtual Worlds so that it will be accessible to blind users, for instance; we're tagging every item. It's as if every item in Virtual Worlds has something that most users may never encounter, but a blind user who's using what we call an alternate browser method to access Virtual Worlds will hear a description of each item and are informed about how far away their avatar is from those items. It's almost as if users are employing sonar.

"Student users who usually experience problems with transportation or mobility or with the use of their hands and arms and therefore have difficulty interacting in the real world in the same way so-called 'normal' people interact, won't experience those difficulties in Virtual Worlds," Mr. Todd claims.

Students with speech disabilities can use the chat interface, Mr. Todd says. "Or, if students have difficulty typing, they can use a microphone."

"The Pressure Is Off"

Among students with disabilities, those on the autism spectrum, including students with Asperger's, are often attracted to STEM courses, especially science and math, Mr. Todd points out. "Here at Georgia Tech there are many students on the autism spectrum who are interested in technical fields. They tell me that part of the appeal of STEM courses, and of technical fields in general, is that they believe technology professions demand less person-to-person contact.

"I have seen an amazing response from students with Asperger's and other autism spectrum disorders who love virtual worlds because the pressure is off."

"They can communicate more effectively and in a more relaxed manner in Virtual Worlds. If these students take time between communications, those with whom they're communicating relax and don't worry about the lack of an immediate response because they assume that these students might have been called away, or may have trouble typing.

"This finding was one that really piqued NSF's interest; it was one of the items we very much wanted to do more extensive research on in order to obtain hard data."

Data from Varied Student Sets

The hard baseline data on that and other issues, he explains, will be generated via interactions with the other GSAA project participants, the University of Georgia and Georgia Perimeter College.

"The data obtained from Georgia Perimeter College is significant," Mr. Todd explains, "because Georgia Perimeter is a two-year college with a set of students who differ from those at Georgia Tech and UGA and it's critical for us to gauge the effectiveness of Virtual Worlds for varied student types."

The project also generates data from three high

school test beds in the three Georgia counties.

"Disparity Is the Ideal"

Mr. Todd expects a wide disparity between student sets. Some students have learning disabilities; others have far more severe cognitive and/or physical disabilities.

"That disparity is the ideal," Mr. Todd declares. "This grant emphasizes development, intervention and dissemination, but there is also a research component. We hope to have a positive effect on these students. We want to see them more engaged. We're going to use batteries of engagement for evaluation purposes to learn if they are more engaged. And we also want to ascertain if the students' grades and course completion improve."

Disparity in socialization factors among the student sets will also impact the data, he says. For example, he explains, student participants with learning disabilities tend to be thoroughly engaged in their communities. Those with far more severe cognitive and/or physical disabilities are more isolated.

"We're building a socialization area into the virtual island," he notes. "This is a place that should be a fun, engaging and relaxing environment where students can chat about their issues and exchange stories. We are going to encourage that exchange because not only do we have mentors working with the students, we are going to do our best to encourage the students to form cadres to help each other."

Virtual Worlds Is only a Start

Virtual Worlds would seem to be a fruitful environment for general education STEM students as well as those with disabilities.

"We hope to be able to open Virtual Worlds to students beyond those that we wrote into our proposal. Limits have to be set according to the funding, of course, although we especially want to open it up to students who are generally under-represented – rural students who have very little opportunity for this level of mentoring and enrichment; also students from a wider socio-economic range. We want to give preference at first to the under-represented students should the opportunity to open it up to more students arise.

"We consider this alliance grant to the Virtual Worlds to be only a start. My goal, eventually, is to have this facility available for any students.

"NSF wants Virtual Worlds to be a scalable model. Our mandate from NSF is to scale this up and they want us to be able guide others in replicating as well. We want to make the plan so coherent, easily scalable and well-documented that another organization can emulate it."

No District Resources Required

Implementation of Virtual Worlds at the district level will require the expenditure of no district resources, Mr. Todd states, except for time spent on the project by teachers and some students. "We've built funding into the proposal to compensate them for their time, which will be spent outside their classroom.

"We are not trying to interfere with their classroom objectives. We have worked enough with high schools to know how difficult that can be. We're imagining their commitment to be outside of normal school hours. We provide stipends for participating teachers and students to encourage their in-

volvement. We're hoping that the resources and the potential learning benefits of Virtual Worlds will provide sufficient incentive."

Who Are the Mentors?

Visual Worlds mentors cross many academic disciplines, explains Mr. Todd. "They are college instructors, the teaching assistants who work with those instructors, graduate students in the STEM fields, as well as advanced undergrad students. We have interest from mentors whose specializations range from engineering to computing to biology to chemistry, physics and math."

Because the Virtual Worlds project is in the development stage, "we're not running students through interventions this year. We've selected potential mentors but are waiting to see the mix of students that we get. The question we'll be asking ourselves is, 'How much do we need to tweak this mix of mentors before we proceed further?'"

When assessing mentor candidates, he says, "number one among our criteria is a candidate's interest in the project and in the virtual worlds concept. We don't want to try to convince someone to be a mentor when it is clear that that individual does not wish to be one. Anyone who in the past has expressed an interest in our previous grants and has shown an interest in working with UDL principles for students with disabilities, we're going to approach first because their commitment to what we do is obvious.

"Secondly, we look at the candidate's knowledge base. Mentors must be classified as 'advanced' in their discipline. We're seeking mentors who have demonstrated their ability.

"Thirdly, we seek candidates who have teaching aptitude. Finding these individuals may be our most difficult challenge. Individuals with a teaching background or who are in teacher education programs are desirable. For example, here at Georgia Tech, there are teachers in teacher education programs who are participating in those programs in order to teach science and math. We are targeting them early and asking them if they want to be mentors, because they meet all of our criteria." Mentors will receive stipends for their participation, with credit for participation applied to their tenure process.

"A Simple Interface"

Virtual Worlds mentors, he emphasizes, need not be technology whizzes, now or in the foreseeable future. "If an individual can use his/her computer to do Facebook, for example, that individual can participate in this project. Almost everyone uses Facebook and, after all, Facebook is not the easiest format to decipher from scratch. With Virtual Worlds it is merely a matter of logging in. If users wish to create a fancy avatar, they can do so. If they want only to utilize the generic, "vanilla" character that is provided, that is fine too. Just click a button.

"Then the user next learns to speak and to move around. Achieving comfort with these processes takes time. Like Facebook, though, once a new user becomes accustomed to the format continued use becomes second-nature. In fact, our format is much simpler than video games, where quick reflexes are paramount. Visual Worlds users don't need any reflexes at all.

"Some of our users who lack the use of their arms employ mouse sticks. They are very effective at moving around in the virtual world. We will have tuto-

rials to help new users master the format quickly. Users will be taught, not just thrown in the pool without knowing how to swim. The tutorials will apply mainly to the mentors. We anticipate that the students will catch on much more quickly."

Transition: Keeping Mentors on Board and Supports in Place

In grades 6-12, children with disabilities become accustomed to supports. Those moving on to post-secondary education, however, soon find that those supports may no longer exist. According to Mr. Todd, though, continued mentor engagement will help provide post-secondary STEM students with their customary level of support through the transition period.

"Whether those students are going to be departing high school to attend technical school or college or move on to earn a certificate in a specific skill, such as firefighting, for instance, we are hoping to keep the mentors working with them through that transition, which provides some continuity and stability.

"In addition, learning seminars will be provided to those students. These seminars are designed in a modular way in order to touch on the areas of knowledge the students will require in order to make a successful transition. Seminar topics will include: how to self-advocate in a college or technical school environment; interacting appropriately and presenting to the disability resource center at a students' institution; or making contacts within a university to reduce isolation.

"We have several modules that we are developing and are using some of the past work we've done with SciTrain to help ease this development.

"We focus on the transition between high school and some form of higher education, and the transition between higher education and grad school. For example, we're helping high school seniors complete their college applications: what's the time line for writing these applications? How far in advance does a student have to request financial aid? We'll cover that."

The Future: "We Want to See All the Numbers Go Up"

Robert Todd expects Visual Worlds to be fully operational later in 2011. "We're aiming to achieve increased engagement from students. We want to see more course completion and better grades; we want to see students choosing to move from high school into STEM majors in a technical field or college; we want to see students move from college to grad school in a STEM field. We want to see all of those numbers go up."

In the process, he predicts the popularity and use of virtual STEM education will also increase. "We've already seen online education taking off in the past decade. Virtual education is undoubtedly going to grow as well, in practice and in popularity. It's still in its infancy, but its increased utilization will be accelerated by the development of easier virtual world control interfaces." Virtual worlds usage will increase for other reasons as well, he points out.

"One reason is that virtual worlds allow for real-time interaction, for a more personable interaction than talking into a microphone with a web page in front of the user, like a webinar.

Another reason is that virtual worlds facilitate the ability to conduct demonstrations. "For example, we are focusing on mentoring, not on demonstration of scientific principles, but we have some demonstrations that we want to use with the students and teachers to show them what is possible."

One demonstration, which already exists, he says, "allows the user to become a planet or an object orbiting the sun in the solar system; the user can experience how his/her motion changes in greater proximity to the sun, or further away. This is a way to learn about physics in a way that's enjoyable."

"In a Virtual World, Almost Anything One Can Imagine Is Possible"

Declares Mr. Todd: "Virtual Worlds presents a great opportunity for those with active imaginations to create engaging science and math projects. After all, in a virtual world, almost anything one can imagine is possible."

Given the possibilities inherent in the virtual worlds concept, its growth is certain, Mr. Todd says, "but universal acceptance will nevertheless take time, because the barrier to virtual worlds remains somewhat formidable to potential users who lack first-hand familiarity with the concept."

As usual, however, in the technology age the young will lead the way to general acceptance of the new. "Kids are totally immersed in video games, like World of Warcraft. To them, the virtual worlds concept is already old news."

The capability of virtual worlds to surmount barriers of geography, however, will make universal acceptance inevitable, he insists, "because driving a child with disabilities 90 miles to school is no longer a feasible or sensible option when another option is easily available. For this reason alone, I see virtual worlds becoming as universal as the telephone."

Think Wii

Robert Todd views virtual worlds technology as transitional, like most current technology. "We still have not determined a formula for complete engagement. but there's already research underway, here at Georgia Tech and elsewhere, to make that happen."

He is encouraged, however, by the increasing popularity of video games among populations that have previously shunned them.

"Think about video games like the Wii or the X-Box, which are creating sensors or devices that are hand-held and easily manipulated to simulate playing tennis, for example, or bowling. Once the virtual worlds, like ours, begin adapting that kind of technology, where users can move their hands, or create a motion that causes users to walk with their bodies and not even have to worry about a keyboard anymore, we can only imagine how fast virtual worlds usage will accelerate and expand. We're not far from that now."

Organization Database Update!

FCTD has recently updated its database of over 3,800 organizations - disability, education, advocacy, parent support groups, and others - that serve the families of children with disabilities.

Our ongoing goal is to keep our databases current and accurate. Please let us know if the information about your organization has changed.
Thanks!

To check your entry, go to:
http://www.fctd.info/members/search.php

Focus on UDL Aids All

Incorporation of UDL is the pillar of Mr. Todd's team's development of a virtual worlds learning environment. "We want to account for different learning styles. Many students can be accommodated who may or may not choose to specifically identify with their disability." Employment of UDL principles, he explains, "will make these courses more palatable for all students, not only those with disabilities."

Mr. Todd defines UDL as "a design for materials, learning and space that takes into account the abilities of all people. There are seven set principles for UDL, which are underlined by the concept that all learning styles can be accommodated when the appropriate materials are created."

Next semester, he says, "when I'm teaching one of my grad courses I'll utilize visual and auditory means for most of my material so that there will be more than one modality available for students. That's one way that I address UDL. When I take this approach I don't have to create special materials for each student, because the material is already available in a format students can use.

The absence of that obligation, he explains, is a boon to instructors and students. "I teach about 20 students in my grad course, but if an instructor is teaching 300 students in a lecture hall, a very common scenario at any university, that instructor can't make special accommodations for everyone.

"I also make a deliberate effort to present the material didactically and then provide real-world examples. Then I'll use an appropriate metaphor, if available. It's a slower process but with each lecture I'm probably hitting the buttons with a majority of my students.

"I've never had a student in one of my classes request that I change something due to that student's documented disability; I've been able to circumvent those requests by presenting my material in a variety of ways."

RESOURCES

ARTICLES

3-D 'Occupational Therapy' for Children: A Virtual Muscle Machine for Kids with Disabilities

Science Daily (April 28, 2010)

This article describes the efforts of Israel's Dr. Dido Green, a retired dancer turned occupational therapist, to employ a virtual method of analyzing children's physical movements in order to treat those with debilitating motor disorders. It notes: "Dr. Green utilizes a 'virtual tabletop' method, known as the Elements System, developed by her partners at Australia's Royal Melbourne Institute of Technology, to "move" children with disabilities and provide home-based treatments using virtual reality tools. Combining three-dimensional exercises with two-dimensional graphical movement games already programmed into the tabletop (which resembles an early video game), she reports not only success but also enthusiasm among her young patients."

"Dr. Green determined that children with partial paralysis and motor dysfunction resulting from disorders such as cerebral palsy may be aided by giving them a new interface to explore. Building upon earlier research she conducted at the Evelina Children's Hospital in London, Dr. Green found that virtual reality applications enhance the skill sets learned by her patients. Coupled with new technology involving 3D Movement Analysis, a technique she is now integrating into research at Tel Aviv University, Dr. Green hopes to develop this virtual tabletop-type game into new and effective therapy treatment regimes."

http://www.sciencedaily.com/releases/2010/04/100427171842.htm

Welcome to Our Virtual Worlds

By James Paul Gee and Michael H. Levine
Educational Leadership (March 2009)

Authors Gee and Levine maintain that virtual worlds can play a crucial role in enhancing students' classroom engagement by tapping into their affinity for complex video games that involve sophisticated problem-solving techniques. Games like Civilization (http://games.playfin.com/games/civ2/index.php?brand=playfin.com&s=google&c=civilII_bm2_alotpfpf_pg_wb_at&k={keywords}&pk=40-2)and Rise of Nations (http://www.microsoft.com/games/riseofnations/) encourage players to think on a large scale about history, development across time, and civilizations. SimCity (http://simcity3000unlimited.ea.com/us/guide/), The Sims (http://thesims.ea.com/), and, for very young children, Animal Crossing (http://www.animalcrossingcommunity.com/) ask players to build and sustain cities and communities. Age of Mythology (http://www.microsoft.com/games/ageofmythology/greek_home.aspx) players regularly read and write about mythologies across the world, specifically from Greek, Egyptian and Norse civilizations. Some students write strategy guides for the games they play and share them over the Internet.
http://www.ascd.org/ASCD/pdf/journals/ed_lead/el200903_gee.pdf

Therapists Use Virtual Worlds to Address Real Problems

By Karen A. Frenkel
Scientific American (April 3, 2009)

Ms. Frenkel addresses an emerging technique that helps troubled teens combine role-play in computer generated environments with talk therapy. The author examines 20 troubled teens who have been treated using a program – SECTER, the Simulated Environment for Counseling, Training and Evaluation -- that is actually a 3-D virtual world in which teens communicate with counselors via avatars. The article focuses on social worker Heather Foley and her eight weekly meetings with Joe, a troubled teen with ADHD. During that time, social worker and client sat in adjoining computers in her office, donned headphones and communicated with each other's avatars, just as gamers do in virtual environments. According to Ms. Frenkel, SECTER avatars can assume various postures as do humans when interacting with one another. Users can also add special features to their avatars, including facial expressions, hair and skin color and different mannerisms. For instance, Ms. Foley says, Joe made his avatar do high fives and sport a swagger when it moved.

Ms. Foley is employed by CFG Health Systems in Marlton, New Jersey. CFG, along with Greenleaf Medical, Palo Alto, CA, created SECTER. Foley says that Joe played himself and she role-played his adoptive mom, with whom he had a combative relationship in real life. At first, Joe refused to engage—and instead moved his avatar to make it flee from Ms. Foley's, mimicking his actions in response to his adoptive mom. He made his avatar run through the computer-generated town's streets and along its beach. Ms. Foley, however, followed with her avatar. "My role was to not give up on him," the therapist recalls. "I made the virtual mom avatar chase Joe's avatar everywhere so Joe would realize he couldn't find a way out of a conversation." To help Joe stay focused, Foley set clear limits and expectations for each half hour role-playing session, rewarding him afterward with five minutes of free play in the virtual world.

The article describes Ms. Foley's report that "Joe experienced a breakthrough at the end of the seventh session, when she used SECTER's 'after action review' feature, which replays role-playing sessions from any avatar's point of view. In this case, she wanted Joe to view the interaction from her—or

his adoptive mom's—perspective. Ms. Foley says the feature helped Joe recognize that his behavior in the virtual world—and by virtue of that in the real world, too—'was inappropriate and hurtful.'" http://www.scientificamerican.com/article.cfm?id=therapists-use-virtual-worlds

Virtual Worlds: A new opportunity for people with lifelong disabilities

By Karen Stendahl, Judith Molka-Danielsen and Susan Balandin
Scandinavian-Iris (2010)

According to the authors, who are researchers from Norwegian universities, virtual worlds offer a possibility for individuals with disabilities to overcome communication and socialization challenges experienced in real life. The authors' goal in this report is to identify gaps in current research. They concede that the virtual worlds medium may not be suitable for all individuals, but argue that it is important to examine the possibility that it might be beneficial for some of those with disabilities. Virtual worlds, the authors conclude, can be manipulated in ways not possible in the real world, which makes them a suitable environment for repetitive work. The feasibility of manipulation, they note, has resulted in the virtual worlds environment gaining acknowledgement "as a potential rehab and learning context for individuals with mild or moderate intellectual disability." Individuals with intellectual disability, they explain, "tend to be poor at generalizing skills across settings and situations. Whereas in the real world it is difficult to manipulate and repeat situations, in a virtual world the environment can be changed and fitted to the needs of each user repeatedly." http://scandinavian-iris.org/2010/wp-content/uploads/2010/08/iris2010_submission_39.pdf

Eye-Tracking: as Virtual Environment Interaction for Disabilities

Virtual Worldlets (2010)

Eye-gaze technology acts as a mouse for individuals unable to manipulate a mouse. And eye-gaze interface and software has been designed by COmmunication by GAze INteraction (COGAIN), a European Union-funded project whose objective is the holistic development of interfaces to enable individuals with a range of disabilities to interact with virtual reality environments on an equal footing. These interfaces often mimic other modalities for interaction. The software, called "gaming with gaze," has been successfully tested in two virtual worlds, Second Life and World of Warcraft. http://www.virtualworldlets.net/Resources/Hosted/Resource.php?Name=COGAIN-SnapClutch

Allen Institute's iSocial Shows Promise for Children with Autism

By Michelle Markelz
The Missourian (December 10, 2010)

iSocial, is a virtual learning program under development at the University of Missouri's Allen Institute. The interactive online experience teaches social skills to children with autism. Using a 3-D world in which users create avatars, the program teaches children to interact with others and practice social rules. The virtual world presents a group of users with tasks such as designing a restaurant. They then make decisions about organizing the menu or arranging furniture. As they make their choices, the virtual world changes. The process helps them practice teamwork and cooperation. iSocial project director Jim Laffey said he believes the potential is also there to extend it for children to use independently, without a facilitator or other users online. To learn empathy, for example, a student practices recognizing facial expressions. Because iSocial is Web-based, developers hope the program will become a tool used by schools and par-

ents in both urban and rural Missouri. http://www.columbiamissourian.com/stories/2010/12/16/allen-institutes-isocial-shows-promise-kids-autism/

A Framework for Children's Participatory Practices in Virtual Worlds

Terhi Tuukkanen, Ahmer Iqbal, Marja Kankaanranta
Journal of Virtual Worlds Research (December 2010)

The authors, researchers at Finland's Agora Center, affiliated with the University of Jyväskylä, acknowledge that children represent the bulk of virtual worlds users and that participation in virtual worlds is enjoying an overall upswing. Noting the general concern about virtual worlds' possible impact on children's lives, the authors have developed and tested a framework for participation in virtual worlds. The objective of the research is to consider the opportunities presented by virtual worlds to educate children about their civic life. According to the researchers, their framework views children in virtual worlds as social actors, learners of civic participation and as citizens. The results of the study and the accompanying survey indicate that children are highly interested in socializing with friends and in engaging in avatar-related activities. Results also reveal that traditional forms of civic participation are not common in virtual worlds, indicating, the researchers state, "a need to promote traditional forms of civic participation and at the same time look at new opportunities presented by virtual worlds for civic participation.
https://journals.tdl.org/jvwr/article/view/1889/1158

Virtual Worlds Offer Opportunities to People with Disabilities

By Robert Bennett
Disaboom (2010)

Confined to a wheelchair since an auto accident two decades ago, the cites as his inspiration the Star Trek pilot from the mid-1960s in which the quadriplegic protagonist, Captain Pike, a starship captain, is thrust into a virtual world by aliens in order to relive his pre-disability experiences. Mr. Bennett writes, "On a daily basis we are asked to see, feel, or in some other way experience the world. Many of us—due to visual, cognitive, or mobility impairments—can't. Computer-generated virtual worlds help." In a virtual world, he writes, many disabilities can seem to disappear. "Wheelchair users create characters that walk. People who are deaf have characters that listen to music. These avatars help their creators feel freer and more at ease than they might in their 'real' world. Actions of the avatars give users a sense of accomplishment, allowing them to experience things they could not in the real world."
http://www.disaboom.com/assistive-technology-general/virtual-worlds-offer-opportunities-for-people-with-disabilities

Teacher in a Strange Land

By Nancy Flannagan
Education Week's Blogs (August 5, 2010)

The author, an education writer, interviews Michigan special education consultant education expert Kathleen Kosobud about the possibility that the use of virtual worlds and online education to teach learners with behavioral issues may consign those learners to an education vacuum. Declares Ms. Kosobud: "Virtual schooling, while possibly allowing a student with emotional/behavioral issues to continue his 'academic' learning, can as easily become a convenient way to actively exclude a variety of 'problem' students from the general classroom: children whose behavior is disruptive, children who are hard to teach, children who need more attention or feedback. .

"Virtual learning may provide an alternative to face-to-face instruction for a student who responds poorly to the social environment of the classroom, but how does it help that same student progres-

sively adapt to a world that continually offers many similar social challenges? When the milieu for social interaction is removed, has he been further handicapped? In a world where 'practice makes perfect' do we disadvantage him by removing all opportunity to practice and perfect his ability to adapt? If he returned to the classroom, would we have had any opportunity to improve the likelihood of his success?"
http://blogs.edweek.org/teachers/teacher_in_a_strange_land/2010/08/moving_special_education_to_the_virtual_world.html

JOURNALS

Journal of Virtual Worlds Research

Virtual Worlds Institute

Founded in 2008, JVWR is an online academic journal that provides a forum for peer-reviewed articles on aspects of current virtual worlds research. Topics include: Virtual Worlds Research, Past, Present and future; Consumer Behavior in Virtual Worlds; The Culture of Virtual Worlds; Pedagogy, Education and Innovation in 3-d Virtual Worlds.
http://www.jvwresearch.org/page/home

VIDEOS

What are Virtual Worlds? An Intro to Second Life

The narrator of this three-minute YouTube intro video defines Second Life as "Online environments that have game-like immersion and social functionality without game-like goals or rules. At the heart is a sense of presence with others at the same time and in the same place. This means that you are with other people together. At the center of Second Life is the avatar. The avatar is a 3-D rendering of your physical self. It is the embodiment of expression, identity, creativity and experience. Avatars can be conservative, exotic, even abstract. And behind every avatar is a real human being often being themselves or trying out who they really want to be, but also sometimes engaging in imaginary role-play."
http://www.youtube.com/watch?v=O62GHcIVKS4

Philip Rosedale – Virtual Worlds and Second Life

Singularity University (2010)

Second Life founder Philip Rosedale describes and defines the significance of Second Life to an audience consisting mainly of Second Life users at Singularity University. (http://singularityu.org/about/). Based at the NASA Ames campus in Silicon Valley, Singularity focuses on employing disruptive thinking to solve global problems.
http://www.youtube.com/watch?v=J3LFqX6YNY0

KNOWLEDGE NETWORK MEMBERS

Virtual Ability, Inc. (VAI)

VAI helps individuals with physical disabilities to become active in virtual worlds like Second Life. During its intake process, VAI conducts an individualized skills assessment, refers clients for help with assistive hardware and software and provides customized training and orientation. Once individuals enter the virtual world, VAI assists them in integrating into the virtual society and provides an ongoing community of support. This community offers virtual worlds members information, encouragement, training, companionship, referrals to other online resources, ways to give back to the community, and ways to have fun. New users take field trips as part of their curriculum and receive individualized attention. VAI projects include:

- Virtual Ability Island - provides orientation and training for residents with disabilities or chronic illnesses
- Cape Able, within Second Life - is primarily for residents who are deaf or heard of hearing
- Amputee Virtual Environment Support Space (AVESS) - establishes best practices and protocols for the provision of online peer-to-peer support services for military amputees and their families

For additional information, contact:
Virtual Ability, Inc.
2220 S. Fraser St., Unit 1
Aurora, Colorado 80014
Email: info@VirtualAbility.org
http://virtualability.org/aboutus.aspx

Allen Institute for Research on Learning, Information & Technology

Affiliated with the University of Missouri's School of Information Science & Learning Technologies (SISLT), the Institute provides an infrastructure of support and collaborative space for SISLT research activities. Among the projects housed at the Institute is iSocial, a 3-D virtual learning environment, developed using the Open Wonderland (http://openwonderland.org/) toolkit for creating virtual worlds and for teaching social competence to youths who have been diagnosed with autism spectrum disorders. iSocial provides learners with competencies that make social participation possible in both virtual and natural settings. It is designed to provide supports in a safe, controlled environment.

For further information, contact:
The Allen Institute
111 London Hall
Columbia, MO 65211
Phone: (573) 884-8350
Contact: Jim Laffey, iSocial Director
http://isocial.missouri.edu/iSocial/?q=taxonomy/term/7
http://alleninstitute.missouri.edu/

Louisiana Universal Design for Learning Initiative

The LUDL initiative designs and implements a Universal Design for Learning (UDL) model for K-20 teaching and learning that incorporates best practices, adaptive technologies and instructional techniques to accommodate all teaching and learning styles.

The Louisiana UDL Action Team is coordinated through the Louisiana Board of Regents' Office of Information and Learning Technology. The Office's mission is to maximize opportunities for learning for the state's citizens through the effective, efficient, and cooperative utilization of electronic learning technologies regardless of time and distance.

LUDL professional development models include:

- What Is Universal Design for Learning and How Does It Relate to Technology Use for all Students?
- Exploring Technology Resources
- Analyzing Lesson Plans
- Raising Awareness and Promoting Advocacy

Their website includes many links to national resources that may be useful to educators and practitioners across the country.
http://udl.mcneese.edu/

Open Wonderland Foundation

The Foundation maintains, enhances and supports the Open Wonderland open source virtual world platform (http://openwonderland.org/about/about-project-wonderland). The Open Wonderland platform, based entirely on open standards, is a free and open source toolkit designed to create 3D virtual worlds for education, business and government applications. Open Wonderland is a 100% Java open source toolkit for creating collaborative 3D virtual worlds. Within those worlds, users can communicate with high-fidelity, immersive audio, share live desktop applications, and collaborate in an education, business, or government context. Wonderland is completely extensible; developers and graphic artists can extend its functionality to create entirely new worlds and add new features to existing worlds. For more information on the foundation, contact:

Open Wonderland Foundation
P.O. Box 44926
Eden Prairie, MN 55344-9998
Phone: 206-426-6294 (fax or voice mail)
http://openwonderland.org/foundation

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Project Director: Jacqueline Hess
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Design & Distribution: Ana-Maria Gutierrez

Family Center on Technology and Disability
1825 Connecticut Avenue, NW
Washington, DC 20009
Phone 202-884-8068 Fax (202) 884-8441
fctd@aed.org www.fctd.info