

# Supporting Learners with Cognitive Impairments in Online Environments

By R. Scott Grabinger, Cary Aplin, and Gitanjali Ponnappa-Brenner

**K**ami has a psychiatric disability: bipolar disorder. She is beginning an online class. She opens the one-size-fits-all screen to read the syllabus and sees six navigation buttons on the left and another five at the top. The center of the screen is filled with single-spaced text flowing from one side to the other. The text includes a variety of introductory information, assignments, detailed instructions, and course expectations.

A screen packed with information can be intimidating for anyone; for a person with cognitive impairments it is overwhelming. Kami, working independently, becomes bewildered and frustrated by all of the stimuli on the screens. She checks out the discussion forums and finds them hard to follow as they grow exponentially from one day to another. In a few short days, she finds herself falling behind, has no assistance to help her adapt to online learning, and drops out of the online class, as many with cognitive impairments do (Carlton, 2004; Ito, 2004; Silva, 2004; University of Colorado at Denver Disabilities Office, 2004).

Unfortunately, Kami represents a large group of students for whom little is being done to improve educational access, retention, and completion in online learning environments. Though the focus of this article is on psychiatric disabilities, we have, on the whole, an increasingly diverse student body that includes English as second language speakers, those with physical

as well as psychiatric disabilities, and multiple representations of races, ethnicities, and religions. Traditionally, postsecondary faculty have thought of students as “normal” or “disabled” and have taught in a uniform manner using predominately lecture relying on verbal media of voice and text (Oblinger, 2003) leaving diverse students on their own to adapt to the course (Tollefson, 2003).

Relying solely on verbal methodologies is not an option today, considering the digital innovations (both equipment and applications) that offer opportunities to go beyond cumbersome learning management systems and offer more differentiation. Web 2.0 applications offer increasingly flexible learning options that our students use everyday, including Flickr, YouTube, blogs, podcasts, research aggregators, RSS, instant messaging, iTunesScholar, and on and on. This ever-growing field of applications gives us opportunities to increasingly diversify teaching and, thus, improve learning accessibility for all students, not just those with disabilities.

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Our specific aims in this article are to bring to the forefront the problems that students with mental illness may have and the scope of the problem, to provide a construct to guide the development of more flexible teaching methodologies within universal design for learning, and to review the uses of new Web 2.0 applications.

One of the first problems students with disabilities encounter is finding support. In on-campus classes, students can find support at the disabilities office, which offers tutors, note takers, extra time, and separate rooms for test

taking. However, these offices are ill equipped to deal with distance learning problems for several reasons. First, on-site services are often not available to online learners. Second, obtaining support means that the student must disclose his/her illness – something that almost all students with a mental illness are loath to do (Bushnell et al., 2005). Third, it is our contention that instruction should be inclusive, not exclusive.

The crux of our argument turns the traditional accommodation strategy for students with special needs 180°. Accommodations for those with disabilities must be located *within the instruction* rather

than placing on students the onus of finding support outside of the course environment. Instruction can and should be designed to be flexible enough to support the range of diverse learners – not just the “typical” student. This strategy will serve not just those with psychiatric disabilities but all students, regardless of their particular needs.

### **Extent of Need**

The number of students with psychiatric disabilities is growing in postsecondary education. The National Alliance for the Mentally Ill (2004) found that almost 27% of college students between the ages of 18 and 24 struggle with mental illnesses including depression, ADD, schizophrenia, posttraumatic stress, and bipolar disorders at some point in their lives. As more veterans return home from Iraq

and seek education, dealing with PTSD and traumatic brain injury has become a major issue for postsecondary institutions. HealthyPlace.com (2002) found that counseling centers reported an increase of 56% from 1988 in the number of students with severe psychological problems. Our surveys of several university disabilities offices around the nation (Blalock, 2004; Carlton, 2004; Ito, 2004; Leake, 2004; McCandless, 2005; McGill, 2004; Silva, 2004) report a growth rate of 10% to 50% among students seeking help for psychiatric disabilities.

### **Growth of Online Learning**

The problem with helping students like Kami is made more urgent by the growth of online education. Allen and Seaman (2005) report that 65% of institutions offering face-to-face graduate courses report an 18% growth rate in online courses from 2004 to 2005 at the graduate level and 33% at the baccalaureate level.

Taking online classes is an important option for all students. First, for many, online courses may be the only way to take a class not offered at their institution. Many live in rural areas where there is no accessible Institute of Higher Education (IHE). Second, local IHEs may offer limited program options or infrequent course offerings in their interest area. Third, work schedules, job location, and family commitments compete with class times. Fourth, students with disabilities may be more comfortable working at home where they have time to make thoughtful responses in discussion forums or e-mails to faculty or other students. Finally, for students with mobility disabilities, it may be the only way they can take classes.

While growing in sophistication, existing online course platforms and instructional design strategies do not address problems of learners with cognitive impairments. Because of this, students with disabilities frequently fail in their attempts to complete online courses. The lack of appropriate interface flexibility, a narrow choice of instructional design strategies, and specific information about how to address the needs of students with cognitive impairments in online courses limits educational opportunities for this population of students. Below we identify the major kinds of cognitive impairments affecting learning.

[NOTE: Table 1 is integral to the text. It shows how the topics of cognitive impairments, universal design for learning, and the use of brain research provide an integrated conceptual framework for helping learners with disabilities. Table 1 categorizes examples of cognitive impairments affecting several kinds of learning processes and it suggests instructional methodologies and tools to help

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teachers deal with the impairments, organized by three brain networks – recognition network, strategic network, and affective network. We'll treat each in order. The table is a compilation of a variety of sources (Martinez-Aran et al., 2000; Martinez-Aran, Vieta, Colom et al., 2004; Martinez-Aran, Vieta, Reinares et al., 2004; MS Information Sourcebook, 2003; Zarate, Tohen, Land, & Cavanagh, 2000; Zull, 2002).]

## **Cognitive Impairments**

There are many types of psychiatric disabilities: anxiety disorders (e.g., phobias, panic disorders, and obsessive-compulsive disorder), mood disorders (e.g., depression, manic-depression, personality, and PTSD), traumatic brain injury, and schizophrenia are the most common causes. Psychiatric disabilities manifest themselves in cognitive impairments. These impairments affect the range of learning processes including attention, memory, language, executive function, problem solving, and social interaction. The impairments may be temporary, recur episodically, or be life long (Marano, 2002). Not only do diseases and trauma cause impairments, but the cures can also create additional kinds of impairments that affect learning.

### ***Cognitive Impairments: Attention and Memory***

Problems with attention affect perception, concentration, regulation of emotion, and memory. Memory functions in all other cognitive activities. It retrieves words, ideas, general knowledge, prior experience, and procedures. Impairments also include recalling and integrating past experience and memories to new situations. (See column 1 in Table 1.)

### ***Cognitive Impairments: Language***

Language enables us to communicate with others and ourselves in speech, writing, or signing. Impairments include the failure to find the right words, aurally processing logical arguments, conducting the self-reflection necessary for metacognition, and difficulty in organizing and expressing ideas in synchronous and asynchronous environments. (See column 1 in Table 1.)

### ***Cognitive Impairments: Executive Function***

Executive function includes the ability to make plans, carry them out, be flexible in changing strategies and plans, and engage metacognitive skills and self-reflection. Impairments affect managing and organizing time, thoughts and action; monitoring progress; and selecting and changing learning strategies. (See column 1 in Table 1.)

### ***Cognitive Impairments: Problem Solving and Reasoning***

Problem solving and reasoning are complex behaviors including strategizing, critical thinking, hypothetical-deductive reasoning, synthesizing, and giving and receiving feedback. Impairments include the inability to plan a process using appropriate strategies, sequence steps, change direction and strategies, and find relevant resources. (See column 1 in Table 1.)

### ***Cognitive Impairments: Social Function***

The ability to function well with others affects not just an individual's social life, but also education and work lives.

This is a complex problem because it involves interactions with others. Most course platforms provide email, chat, and forums as the primary means of instructions. All are written forms of text and none show body language or voice inflection. Students with psychiatric disabilities can easily misinterpret meanings; they may be prone to defensiveness, see criticism where there is none, and miss subtle attempts at humor and react angrily or despairingly. (See column 1 in Table 1.)

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## **Universal Design for Learning**

The range and multitude of cognitive impairments indicate the complexity of this problem. It is even more confounding when we realize that every individual does not present every symptom and that symptoms vary in intensity within individuals and in different time frames. It looks like an impossible task to take on each symptom as a unique problem to be solved, or to take each individual with his or her unique set of symptoms and try to design instruction for each. Either option, while doable, is practically impossible. *Universal Design for Learning* (UDL) provides a framework around which we can approach the problem of designing more accessible instruction for learners with cognitive impairments.

The Center for Applied Special Technology (CAST) defines *Universal Design for Learning* “Universal Design for Learning (UDL) is a framework for designing curricula that enable all individuals to gain knowledge, skills,

<b>1. Attention and Memory Symptoms</b>	<b>Recognition Network</b> <i>Use . . .</i>	<b>Strategic Network</b> <i>Use . . .</i>	<b>Affective Network</b> <i>Use . . .</i>
<ul style="list-style-type: none"> <li>• Inability to divide attention among separate tasks</li> <li>• Trouble focusing on multiple steps</li> <li>• Regulating emotional responses to stimuli and challenges</li> <li>• Lack of mental alertness cause by the disease or medications</li> <li>• Difficulty in relating past experience with new situation</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple examples to take advantage of strengths and prior knowledge;</li> <li>• Multiple versions of content using video, slide shows, PDFs, animation, audio etc.;</li> <li>• Graphic organizers and headings to separate content items to focus attention and avoid over stimulation;</li> <li>• Predetermined paths through information;</li> <li>• Small chunks to maintain attention and reduce anxiety.</li> </ul>	<ul style="list-style-type: none"> <li>• Models of skilled performance and processes;</li> <li>• Make expectations clear and provide exemplars;</li> <li>• Narrated video/illustrated podcasts to show project steps and to clarify assignments;</li> <li>• Critical thinking questions and provide sample answers;</li> <li>• Time estimates for completing tasks.</li> </ul>	<ul style="list-style-type: none"> <li>• Relevance and choices within the units to enhance buy-in;</li> <li>• Know students' interests;</li> <li>• Variety of content to appeal to a variety of interests;</li> <li>• Video, blogs, and podcasts to encourage expression and relevance;</li> <li>• Relate assignments to actual events in the students' interest areas.</li> </ul>
<b>2. Language Symptoms</b>	<b>Recognition Network</b> <i>Use . . .</i>	<b>Strategic Network</b> <i>Use . . .</i>	<b>Affective Network</b> <i>Use . . .</i>
<ul style="list-style-type: none"> <li>• Inability to find the right words</li> <li>• Lack of ability to write or follow a logical argument</li> <li>• Poor processing of sentences</li> <li>• Inability to organize and express thoughts and ideas simultaneously through several modalities (e.g., lexical, syntactic, gesture)</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple media formats to enhance decoding of material:</li> <li>• Text-to-speech;</li> <li>• Voice recognition;</li> <li>• Text outlines;</li> <li>• Digital, slide shows, video, and audio;</li> <li>• Support text readers;</li> <li>• Write captions for embedded media.</li> </ul>	<ul style="list-style-type: none"> <li>• Templates to structure assignments and projects;</li> <li>• Clear steps to help students work in a logical order;</li> <li>• Rubrics to help students self-assess their work,</li> <li>• Cooperative learning;</li> <li>• Multiple symbol systems: graphics, video, audio, writing, etc.;</li> <li>• Asynchronous communication with blogs, wikis, and other tools to build knowledge bases.</li> </ul>	<ul style="list-style-type: none"> <li>• Help students avoid over stimulation and give plenty of scaffolding;</li> <li>• Provide time for students to formulate thoughts and words;</li> <li>• Promote teamwork through the use of "groups" applications;</li> <li>• Asynchronous communication to give time to think of responses and ideas.</li> </ul>
<b>3. Executive Function Symptoms</b>	<b>Recognition Network</b> <i>Use . . .</i>	<b>Strategic Network</b> <i>Use . . .</i>	<b>Affective Network</b> <i>Use . . .</i>
<ul style="list-style-type: none"> <li>• Difficulty setting goals, planning, and beginning</li> <li>• Lack of flexibility shifting strategies and tasks</li> <li>• Difficulty in monitoring progress for pace and quality</li> <li>• Fails to anticipate problems</li> <li>• Does not utilize past experience</li> <li>• Does not engage in self-reflection</li> <li>• Low tolerance for failure or frustration, will quit easily</li> </ul>	<ul style="list-style-type: none"> <li>• Background knowledge;</li> <li>• Web links to information already learned;</li> <li>• Link students to experts;</li> <li>• Multimedia glossary including text and images and links to other sources;</li> <li>• Ask students to explicitly state the relationship of the new knowledge to past knowledge and experience;</li> <li>• Use blogs to ask for writing about relevance of new projects.</li> </ul>	<ul style="list-style-type: none"> <li>• Forms to ask students to set goals and devise plans:</li> <li>• Ask students to think about their goals and compare to exemplars or other students;</li> <li>• Ask for plans and timelines using project management software;</li> <li>• Periodically ask about progress and strategies used;</li> <li>• Use podcasts to explain processes.</li> </ul>	<ul style="list-style-type: none"> <li>• Communicate frequently via personal email to reduce stress and encourage thinking;</li> <li>• Gradually increase levels of difficulty;</li> <li>• Give selection of projects;</li> <li>• Encourage alternative plans from the beginning;</li> <li>• Show different examples for solving problems;</li> <li>• Use flexible, collaborative work groups.</li> </ul>



4. Problem Solving and Reasoning Symptoms	Recognition Network	Strategic Network	Affective Network
<ul style="list-style-type: none"> <li>• Difficulty analyzing problems and recognizing steps</li> <li>• Inability selecting most appropriate strategy with a problem step</li> <li>• May continue to use ineffective strategies</li> <li>• Have very low tolerance for failure or frustration;</li> <li>• Tend to locate the source of their troubles outside their control</li> </ul>	<ul style="list-style-type: none"> <li>• Highlight critical features of content with color and graphic organizers:</li> <li>• Use different kinds of software (e.g. word processing, PDF, PowerPoint, concept maps) offering different modes of presentations;</li> <li>• Limit quantity of information presented on one screen;</li> <li>• Organize definitions into glossaries.</li> </ul>	<ul style="list-style-type: none"> <li>• Ask students to stop and rate progress frequently,</li> <li>• Provide examples of learning strategies and when they are used, suggest specific strategies for a specific assignment;</li> <li>• Provide examples of problem-solving steps;</li> <li>• Keep problem solving process steps small;</li> <li>• Provide examples of alternate strategies.</li> </ul>	<ul style="list-style-type: none"> <li>• See items under “Executive Function.”</li> </ul>
5. Social Function Symptoms	Recognition Network	Strategic Network	Affective Network
<ul style="list-style-type: none"> <li>• Inappropriate reaction to a situation or messages</li> <li>• Difficulty in shifting perspectives and seeing another’s point of view</li> <li>• Failure to recognize or to take into account feelings of others</li> <li>• Judge their behavior on the approval</li> <li>• Overly sensitive to criticism of others</li> <li>• Low self-esteem and fear of betrayal</li> </ul>	<ul style="list-style-type: none"> <li>• Organize discussion forums around single topics;</li> <li>• Break discussions into smaller teams to help people get to know each other;</li> <li>• Encourage conversations about things other than class, and the posting of personal pictures and information;</li> <li>• Present instructions in both oral and written formats;</li> </ul>	<ul style="list-style-type: none"> <li>• Asynchronous communication gives students chances to think before response;</li> <li>• Utilize “groups” to;</li> <li>• Encourage use of blogs to ask questions and test ideas in another forum;</li> <li>• Ask students to argue ideas from different points of view to develop flexibility of thought.</li> </ul>	<ul style="list-style-type: none"> <li>• Help students handle stress and anxiety through frequent personal conversations;</li> <li>• Work with teams to discuss progress and strengths of members;</li> <li>• Ensure that students know that accommodations are available;</li> <li>• Set rules of etiquette; avoid flaming and inappropriate posts and messages.</li> </ul>

Table 1: Cognitive Impairments, Symptoms, and UDL Strategies

and enthusiasm for learning. UDL provides rich supports for learning and reduces barriers to the curriculum while maintaining high achievement standards for all” (2002). The underlying premise is that students fall along a continuum of learner differences – not just “normal” vs. disabled. Therefore, instruction should be designed for the wide range of diversity represented in the classroom, in other words, instruction should be universal. Rather than requiring students to go elsewhere for assistance, UDL promotes the use of digital tools to improve differentiation.

#### UDL and Brain Research and Digital Tools

Another aspect of CAST’s UDL is their application of recent brain research to provide

a framework to organize recommendations for dealing with cognitive impairments (Center for Applied Special Technology, 2003a, 2003b, 2004). This framework focuses on three brain networks: recognition, strategic, and affective (see columns 2, 3, and 4 in Table 1) broadly covering the instructional process. These networks provide the means to organize recommendations for designing instruction.

We use our *recognition network* to identify information including names, facts, numbers, etc. Our recognition networks answer the question “what”? What are we learning? What information do I need? What does term “x” mean? We relate our new knowledge to our memories and knowledge asking, “How is this similar to what I already know?”

We use our *strategic network* to plan, to determine how we will learn, to solve problems. We learn things for a reason and that reason leads to action. We use the information that we recognize to plan an action such as taking a test, writing a paper, creating a video, solving a problem, and on and on. Finally, we engage in metacognition to monitor and reflect on learning strategies and progress.

We use our *affective network* to engage in learning. We have emotional reactions to content, strategies, and assignments. We have preferences for different styles of presentations, ways to study, and learning activities. We want to utilize our strengths while learning and relate what we are doing to our lives.

These three networks provide a means for organizing methodologies that will create more accessible instruction (see columns 2, 3, and 4 in Table 1). A critical component in CAST's concept of UDL is the use of a variety of digital tools. First, there are the well-known tools including text readers, large print formatters, handless control devices, and voice recognition software. Second, there is the growing number of new web-based tools often called Web 2.0 technologies. These give faculty and learners greater options in learning and teaching. Meeting increasingly varied learner needs would not be possible without digital tools. Some of the applications and functions include:

1. *Communication.* Digital applications and technology make it possible to communicate in multiple ways such as asynchronous (forums, email, groups), synchronous (chat, telephone), blogs, multimedia podcasting, group software, email etc.
2. *Multiple examples.* Teachers and students can provide multiple examples for learning, metacognition, and teaching such as Flickr, YouTube, web sites, building presentations, wikis, etc.
3. *Scaffolding* can include examples of problem-solving processes, step-by-step forms to help one focus, project management software (eProject.

com), RSS applications (bloglines.com), planning techniques, timelines, online library access, cognitive modeling software (neuromod.org), etc.

4. *Self-expression.* Provide multiple ways of self-expression such as blogs, PowerPoints, slide shows, synchronous chat, web design (Macintosh iLife is great for this), MySpace, Flickr, iTunesScholar, PDAs, etc.

Of course, tools have multiple purposes and cross instructional boundaries. Follow-up articles will review specific categories of tools and likely applications for instruction and learning.

## Summary

This paper has three aims. The first is to bring to the forefront the problem of mental illness, psychiatric disabilities, and cognitive impairments in postsecondary education. Cognitive impairments from psychiatric and traumatic causes affect a large number of postsecondary students. In looking at the overall scope of diversity we can see that the "normal" student does not exist and that there are many reasons for improving the accessibility of instruction. Improved retention and education lead those with psychiatric disabilities to become more productive and stable members of the society. Kileen and O'Day (2004) found that "only 27% of those with psychiatric disabilities are part of the labor force." Helping students learn to cope with their disabilities and learning will contribute to increasing that number.

The second aim is to provide a construct to guide the increasing differentiation necessary to meet the needs of all students – to make designing for a diverse population possible and manageable. We realize that changing instruction and increasing the variety of methods is not an easy process under the best of circumstances, but it can be done and needs to be done. It isn't something that can be done all at once, but in stages and in bits and pieces. Helping faculty meet these needs is going to take concerted efforts at professional development.

Finally, the third aim is to bring the use of Web 2.0 tools into the mix for teaching and learning. Using digital tools is one way that we will be able to ensure education for "all". Digital innovations offer us an opportunity to go beyond cumbersome learning management systems and offer more differentiation. The Web 2.0 world is changing so fast that keeping up with the new opportunities takes constant attention. As you can see, this isn't all about online instruction, it's about growth in our ability to teach and help all students.

*This report introduced portions of research published on the Formatex.org website in 2006. TechTrends is pleased to encourage this research and to bring its findings to educators. The complete report is available at <http://www.formatex.org/micte2006/pdf/1131-1135.pdf>*

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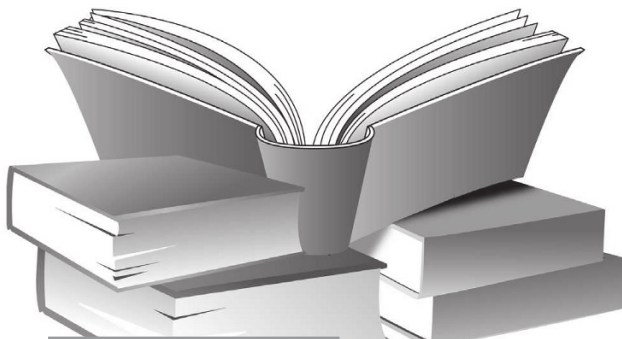
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