Using a Universal Design Approach to Find Barriers and Solutions in the Curriculum

This resource was developed collaboratively with our subcontract partners from the Center for Applied Special Technology (CAST). The exercise was adapted from a presentation conducted by our colleagues from CAST, at the 2003 IDEA Summit Meeting in Washington, DC.

Intent of This Exercise

Our efforts to help all students learn and participate in the general education curriculum can be strengthened as we gain a greater understanding of both the barriers that exist in educational goals, methods, materials, and assessments and the flexible strategies that exist to meet the diverse needs of students. The purpose of the *Finding Barriers and Solutions Exercise* is to give educators, administrators, and family members the opportunity to share ways of making learning more accessible and effective for all students. Universal Design for Learning (UDL) is one philosophy and educational framework that advocates designing instructional goals, methods, assessments, and curricular materials that incorporate the learning needs of the widest range of students. This exercise provides a brief overview of UDL, highlights potential barriers and opportunities for flexibility in educational practices, and provides a template for replicating this exercise with others.

Background

UDL is an approach to designing educational environments, curricula, and pedagogy that reduces barriers to learning for students with diverse backgrounds, learning styles, and abilities. The UDL framework is based on scientific research on the neural networks that facilitate the learning process. Brain research using imaging technology has allowed researchers to view brain activity and neural connections during a task or learning activity. This research found that learning involves three distinguishable but connected networks — one network that recognizes patterns, a second that coordinates the performance of skills and actions, and a third that discriminates important stimuli and provides the motivation for learning (Meyer & Rose, 2001). A Center for Applied Special Technology (CAST) article, *The Learning Brain* (http://www.cast.org/udl/index.cfm?i=10), provides more information about this neurological research and the neural networks involved in learning. Below is a brief discussion of these networks.

- **Recognition Networks** enable the learner to identify and recognize patterns in the environment, such as voices, letters, colors, pictures, words, and more complex patterns, and to attach meaning to them. People have unique recognition networks based on abilities, experiences with the environment, and so on. For example, a student who is musically gifted may have an aptitude for

recognizing minute changes in the pitch of a note; a person who is blind may use tactile and auditory stimuli as a means of recognition. BACK

- **Strategic Networks** tell the learner how to do things by monitoring and carrying out actions. For example, listening, writing, and problem solving are educational skills that are developed and performed using this network. Students acquire and improve skills and thinking processes through experience, reinforcement, and practice. However, the optimal frequency, types, and level of difficulty for practice and reinforcement vary for different learners. BACK

- **Affective Networks** determine what is important and provide the motivation for learning. Students have many different motivating factors that are based on individual differences in culture, emotional states, interests, level of challenge, history of success with the activity, and so on. BACK

These networks describe three types of processing that occur in learning; however, individual brains and their use of these networks in learning situations vary greatly. UDL approaches to instruction and curriculum development provide flexibility in the presentation of information, multiple ways for students to demonstrate knowledge, and diversity and choice in the content of lessons and assignments to support students' diverse interests and learning styles (Meyer & Rose, 2000). Traditional methods of instruction, assessment, and materials, such as lectures, written tests, and textbooks, may create barriers for some students (Meyer & Rose, 2000). Often, traditional methods and materials are not developed with the broadest needs of students in mind. For example, consider the potential barriers in the following lesson and assignment:

A middle school science teacher is teaching a unit lesson on ecosystems. He assigns the students to read a chapter in the textbook and write answers to the questions at the end of the chapter. The teacher has a diverse class including Stacey, who has cerebral palsy with severe motor impairments; Sara and Kevin, who are in the gifted and talented program; Mike, who speaks Spanish as a first language; and Joe, who has a reading disability.

Consider the challenges these students will have with this assignment and the retrofitting or accommodations that will be needed for them to achieve optimal learning from the lesson:

- ***Stacey*** *will have difficulty holding the textbook, and she cannot write the answers to the lesson plan with a pencil and paper.*
- ***Sara*** *and* ***Kevin*** *do the assignment easily and quickly but are not challenged by it.*
- ***Mike*** *reads the chapter but has to look up many of the words in a Spanish to English dictionary, and he is not able to abstract the concepts from the text.*
- ***Joe*** *has difficulty decoding and comprehending the information through reading the text, and he becomes frustrated that he cannot do his homework.*

For these students, the curricular materials (e.g., textbook) and the assignment are not flexible enough to accommodate their needs, exemplifying that no one medium works best for all students. For additional information about identifying barriers in curriculum, visit CAST's Curriculum Barriers Finder at http://www.cast.org/teachingeverystudent/tools/curriculumbarriers.cfm.

Flexibility to Support Diverse Learners

Flexibility in curriculum, classroom environment, teaching approaches, and assessment is a key component in making learning opportunities accessible for all students. UDL aims to reduce barriers and the need to retrofit or make accommodations for the needs of individual students by thinking about the needs of the widest range of students in the design of lessons and curricular materials. Rose, Meyer, Rappolt, and Strangman (2001) suggest the following ways that educators can use flexibility to support the three learning networks in UDL:

- **Recognition Networks** can be supported by providing multiple and malleable formats for students to receive information and reinforce important concepts (e.g., video, digitized text, modeling, oral presentation, graphic organizers, animation, highlighting), providing multiple examples of a concept, highlighting salient features of a lesson, and providing appropriate contextual and background information.

- **Strategic Networks** can be supported by providing multiple ways to express knowledge (e.g., oral, written, graphical, PowerPoint, group presentation), providing opportunities for practice with supports to scaffold learning, and providing feedback for students to monitor progress.

- **Affective Networks** can be supported by providing students with choices of content and tools, providing challenging activities, offering a variety of rewards, and providing choices for the learning context (e.g., choosing to work independently instead of in a group or choosing workspace). A balance of challenging curricula with appropriate supports is often needed for engagement (Orkwis & McLane, 1998).

Flexibility that supports diverse learning styles within these networks is the cornerstone of UDL. Many traditional instructional and curricular materials do not address the range of student differences that exist in classrooms today. UDL's approach allows educators to explore innovative methods to meet the needs of a wide range of students (Meyer & Rose, 2000).

Join the Information Exchange on Universal Design for Learning

UDL is still an emerging field. Many educators are interested in how other teachers and administrators incorporate UDL practices into their schools. On June 13, 2003,

Chuck Hitchcock and Grace Meo from CAST made a presentation on ***Using UDL to Individualize Teaching and Eliminate Barriers*** at the IDEA summit meeting in Washington, DC. The presentation featured the following Massachusetts education standard and goal (Massachusetts Department of Education, 2001):

Grade: 7th grade, English Language Arts

MA ELA Standard #11: *Students will identify, analyze, and apply knowledge of theme in a literary work and provide evidence from the text to support their understanding.*

Learning goal: *Students will analyze and evaluate similar themes across a variety of selections, distinguishing theme from topic.*

Participants discussed methods of instruction and presentation of materials that create for some students potential barriers to achieving this standard and learning goal. They discussed these barriers in relation to the three networks of learning: recognition, strategic, and affective networks. The group also brainstormed high- and low-tech solutions to support students with diverse learning styles and abilities.

Below we provide three tables, each focusing on a different network and each offering a sample of responses provided by CAST presenters and session participants. Each table is divided into four columns:

1) *Potential Barriers* — Participants listed barriers in educational materials, instruction, and so on that may result in missed educational opportunities for some students.
2) *Methods for Supporting Each Network* — Participants listed approaches that support the brain networks and address the barrier in the first column.
3) *Technology-Based Solutions* to address the barrier — Participants listed software, computer applications, assistive technology, and so on that can be used to make learning more accessible.
4) *Non-Technology-Based Solutions* to address the barrier — Participants listed materials, instructional strategies, lesson plan ideas, and so on that do not require technology and can be used to make learning more accessible.

The filled-in chart may be used as a resource for examples of barriers and solutions to make the curriculum more universally designed.

We have provided a blank chart that can be used as a template in a workshop, staff development activity, and so on. This exercise can provide educators and administrators with opportunities to think about barriers and solutions related to the learning goals and standards in their state or district. This exercise is also useful for thinking about specific instructional practices and educational materials in terms of the three brain networks in the UDL approach.

References

Center for Applied Special Technology. (2003). *The Learning Brain.* Wakefield, MA: Author. Retrieved August 14, 2003, from http://www.cast.org/udl/index.cfm?i=10.

Massachusetts Department of Education. (2001). Massachusetts English language arts curriculum framework. Boston: Author. Retrieved October 23, 2003, from <http://www.doe.mass.edu/frameworks/ela/0601.pdf/>.

Orkwis, R., & McLane, K. (1998). *A curriculum every student can use: Design principles for student access.* Reston, VA: Council for Exceptional Children. Retrieved July 15, 2003, from http://www.cec.sped.org/osep/udesign.html.

Rose, D. H., Meyer, A., Rappolt, G., & Strangman, N. M. (2001). *Teaching every student in the digital age: Universal design for learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Recognition Networks **Strategic Networks** **Affective Networks**

Identifying Barriers and Providing Solutions to Support Diverse Recognition Networks[1]

Grade: 7th grade, English Language Arts

MA ELA Standard #11: Students will identify, analyze, and apply knowledge of theme in a literary work and provide evidence from the text to support their understanding.

Learning goal: Students will analyze and evaluate similar themes across a variety of selections, distinguishing theme from topic.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Recognition Networks	Technology-Based Solutions	Non Technology-Based Solutions
Presentations and materials fail to provide sufficient examples for critical concepts.	Provide multiple examples.	PowerPoint® let student pick CAST eReader™ identify and explore info on differences – what is theme? what is topic? search digital books Inspiration software, concept mapping, visual examples, auditory examples highlight theme one way, a topic in another print	pictures, sound bites, and video clips with captioning role play graphic organizers real world simulation highlighted handouts accompanying cards jeopardy game work in small groups discussion/cooperative learning group

[1] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Recognition Networks	Technology-Based Solutions	Non Technology-Based Solutions
		bookmark Web site	books on tape video overheads with highlighted text, discussion/cooperative learning group different versions of the same novel models with prompts to guide to themes cards with tactile or color-coded paper/ink

[1] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Recognition Networks	Technology-Based Solutions	Non Technology-Based Solutions
Lecture may be hard to extract key points from and take notes for.	Highlight critical features.	Kidspiration®/graphic organizers context map computer works with highlighted areas put lecture up on screen and highlight central concepts with color and font and voice lecture notes highlighted MSWord® Art, PowerPoint®	highlight outline, 3 by 5 cards, Post-it notes give accompanying materials, handouts, graphic organization/concept map color code simulations student note taker teacher outline of key points close passages peer tutor handouts with fill in the blank

[1] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Recognition Networks	Technology-Based Solutions	Non Technology-Based Solutions
Print materials may be difficult to see, decode, or comprehend.	Provide multiple media and formats.	big font size CAST eReader™/computer book/screen reader talking books/audio Braille put lecture up on screen with highlighting and font and voice options writing with symbols graphic organizer talking books	audio cooperative learning diagrams magnifier/large print ruler with highlighted sections reading boards writing with symbols color overlays/ color code/ provide white space retelling stories rebus writing lower reading level interpretation of same book

[1] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Recognition Networks	Technology-Based Solutions	Non-Technology-Based Solutions
Content presentation and activities assume same basic background knowledge.	Support background context.	different cases electronic books with audio name substitutions for characters to engage students	different scenarios different level of content with same terms group discussion parent involvement read trade books to get background levels

BACK

[1] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Identifying Barriers and Providing Solutions to Support Diverse Strategic Networks[2]

Grade: 7th grade, English Language Arts

MA ELA Standard #11: Students will identify, analyze, and apply knowledge of theme in a literary work and provide evidence from the text to support their understanding.

Learning goal: Students will analyze and evaluate similar themes across a variety of selections, distinguishing theme from topic.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	**Methods for Supporting Strategic Networks**	**Technology-Based Solutions**	**Non-Technology-Based Solutions**
Students are expected to understand the presented concepts through *reading and lecture*.	Provide flexible models of skilled performance.	dictate answers to computer to write choose answer from multiple expanded choice book on tape peer reader graphics graphing with computer Thinking Reader™	oral tests graphics role play/acting out listing of questions to think about rubric graphic organizer think aloud recreate a story draw a picture/pictures/graphics

[2] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Strategic Networks	Technology-Based Solutions	Non-Technology-Based Solutions
			discussions make inquiry by paragraph or page cooperative learning hands-on activity literature circle sorting out concepts
Students are expected to understand the structure and function of cells after *reading the book and listening to the lecture*.	Provide opportunities to practice with supports.	rank answers dictate answers summary on computer, multimedia electronic books with highlighted key words write thoughts PowerPoint® students bookmark author sites with similar themes	cooperative learning check for understanding graphic organizer small groups (peer) to demonstrate understanding of concepts role play book recreate a story demonstrating the concepts applied to own situation illustrate the summary of the book graphically

[2] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Strategic Networks	Technology-Based Solutions	Non-Technology-Based Solutions
			study skills teams making posters hands-on activities color code post-its, use symbols, library scavenger hunt
One end-of-unit test and one project are used as the only means of giving feedback to students.	Provide ongoing, relevant feedback.	Inspiration use computer to take test create visual using graphics Thinking Reader™	poster story continuous feedback multiple project performance opportunities break up unit test into sections smaller projects focused on skill development alternative assessment format portfolio, different options for output rubric applied to project components,

[2] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers **(e.g., materials and methods that can lead to missed opportunities for some students)**	**Methods for Supporting Strategic Networks**	**Technology-Based Solutions**	**Non-Technology-Based Solutions**
			homework guided practice in classroom write a play, write/sing songs, make games
A multiple-choice test may not be effective for some students to demonstrate understanding.	Offer flexible opportunities for demonstrating skill.	PowerPoint® slides computer test using pictures for testing	oral presentation portfolio creative presentations to demonstrate understanding of theme and topics rubrics different ways to present multiple-choice tests performance-based assessment drawing pictures/posters retelling with pre-made diagrams role playing/skits

[2] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Identifying Barriers and Providing Solutions to Support Diverse Affective Networks[3]

Grade: 7th grade, English Language Arts
MA ELA Standard #11: Students will identify, analyze, and apply knowledge of theme in a literary work and provide evidence from the text to support their understanding.

Learning goal: Students will analyze and evaluate similar themes across a variety of selections, distinguishing theme from topic.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	**Methods for Supporting Affective Networks**	**Technology-Based Solutions**	**Non-Technology-Based Solutions**
Book content and teacher-selected tools are expected to be of interest to all.	Offer choices of content and tools.	list of books digitally available e-books substitute names color-coded words	have lists of books on topic and let students choose give students range of learning tools adjust lesson to students' interests break down the content to see imbedded interests focus on topic within a book
Lesson activities have a limited range of difficulty level that makes learning too easy or too hard.	Offer adjustable levels of challenge.	No suggestions offered	taxonomy, awareness, synthesis choice of learning style–based learning activities partner-non-partner options options for activities to interact with the

[3] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers (e.g., materials and methods that can lead to missed opportunities for some students)	Methods for Supporting Affective Networks	Technology-Based Solutions	Non-Technology-Based Solutions
			material different versions of the activities graphic organizers collaborative learning group sequence map highlighted vocabulary

[3] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.

Potential Barriers **(e.g., materials and methods that can lead to missed opportunities for some students)**	**Methods for Supporting Affective Networks**	**Technology-Based Solutions**	**Non-Technology-Based Solutions**
Feedback and rewards are selected in advance and are identical for all learners.	Offer choices of rewards.	No suggestions offered	reward menu student-selected rewards accessible format feedback (tactile, audio) certificates, stickers, party for class
Individual effort and competition is the norm for all learning activities.	Offer choices of learning context.	No suggestions offered	cooperatives/peer group activities/team work rather than competition individual graphing partner presentations menu of rewards feedback – tactile and audio

BACK

*** You can also read about other educators' experiences on our threaded discussion on UDL***

[3] The examples below were provided by conference participants with the support of staff from CAST. The Access Center does not ensure that all the solutions are scientifically validated practices.